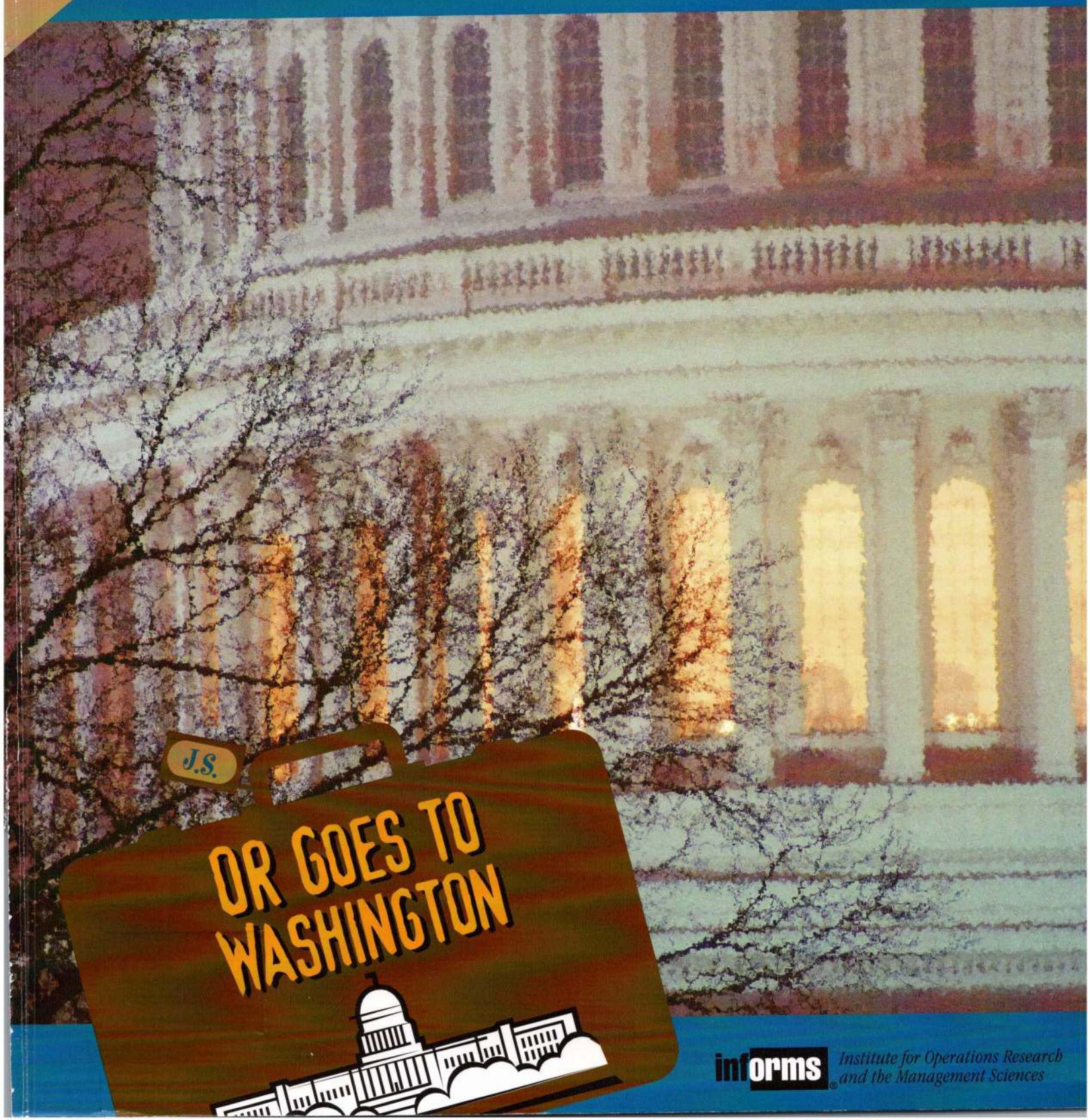
Attendees: Pick up your complimentary CD
TUTORIALS IN OPERATIONS RESEARCH
Details Inside...

INFORMS ANNUAL MEETING
WASHINGTON DC

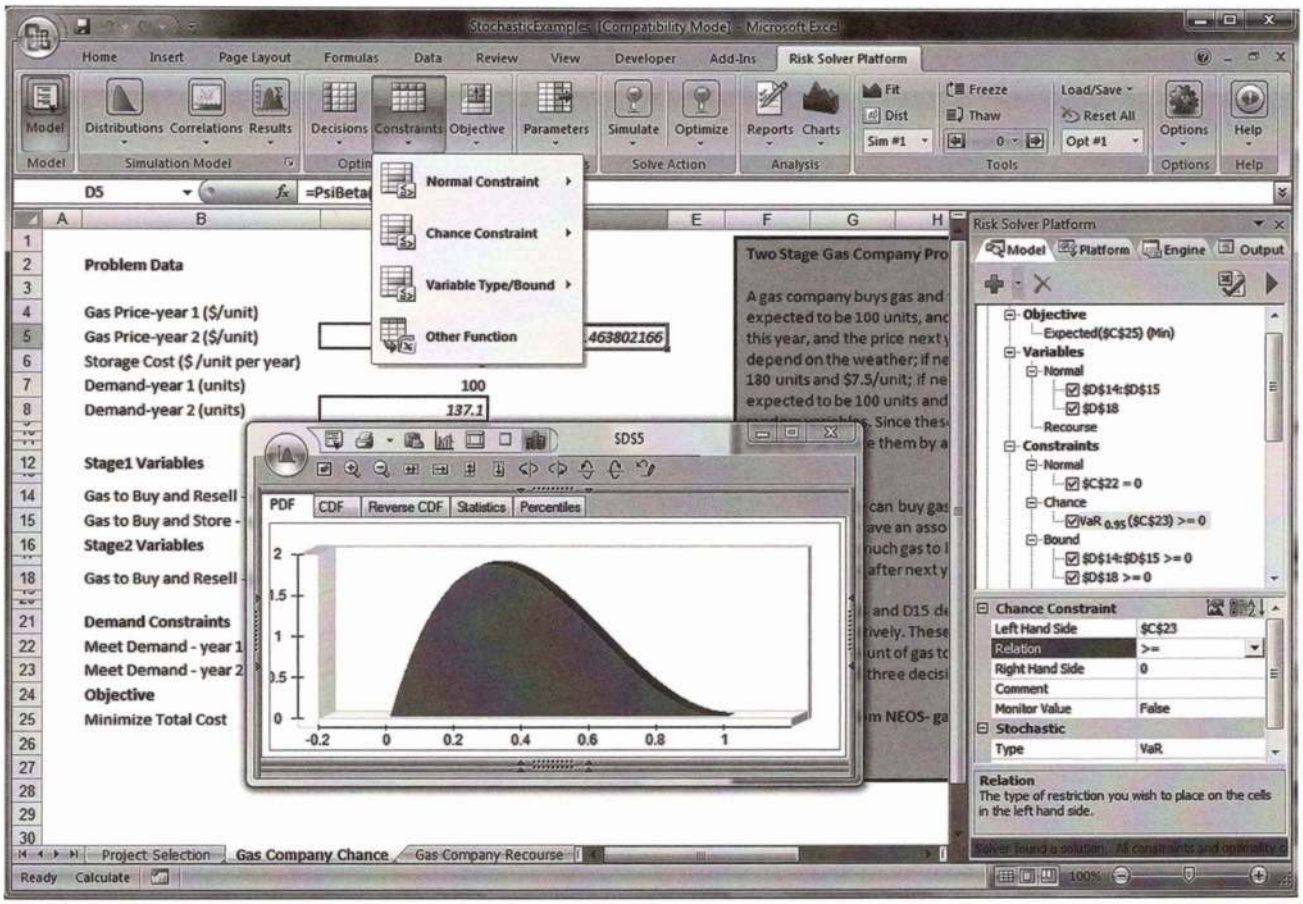
October 12-15, 2008
Marriott Wardman Park Hotel
and Omni Shoreham Hotel
Washington, DC



informs® Institute for Operations Research and the Management Sciences

BEST-OF-BREED SIMULATION AND OPTIMIZATION

RISK SOLVER PLATFORM



We've Lowered the Learning Curve and Raised the Power for Risk Analysis and Optimization.

Get the best simulation and optimization for Excel – *fully integrated* – with robust optimization, stochastic programming and simulation optimization power you can't get anywhere else. And if you're not an expert in stochastic optimization, let Risk Solver Platform's ***Automatic mode*** diagnose your model and choose transformations, Solvers and options for you.

Go Far Beyond Algebraic Modeling Languages.

Build stochastic and deterministic models quickly, with *automatic* detection of model linearity, convexity and sparsity, *automatic* linearization of IF and conditional expressions, *automatic* differentiation of nonlinear models, *automatic* creation of robust counterpart models, and easy definition of recourse decisions and chance constraints.

Capacity and Speed for Industrial Size Models.

Run simulations up to 100 times faster than Excel. Solve LP models up to millions of variables. Solve your toughest LP/MIP models with Xpress[MP], SOCP models with MOSEK, huge nonlinear models with KNITRO, arbitrary models with OptQuest, and more.

Start with Just Simulation or Just Optimization.

Risk Solver for simulation and **Premium Solver** or **Premium Solver Platform** for optimization are better than ever, and are subsets of Risk Solver Platform. Trade up at any time to the full power of our platform with a new license code. Use your existing Excel Solver, Premium Solver or Risk Solver models and VBA macros without any changes.

Download a Free Trial at www.solver.com.

Don't miss the next wave of OR/MS technology. Download a FREE trial version (limited to 15 days) of Risk Solver Platform from our Website. Ask us about academic pricing, upgrades, support contracts, and flexible licensing for deployment.

FRONTLINE solvers

The Leader in Spreadsheet Optimization

Frontline Systems Inc.
Tel 775 831 0300 • Fax 775 831 0314 • info@solver.com

TABLE OF CONTENTS

ORGANIZING COMMITTEE

General Chair
Hani S. Mahmassani
Northwestern University
masmah@northwestern.edu

Program Co-Chairs
G."Anand" Anandalingam
University of Maryland
ganand@rhsmith.umd.edu

Michael O. Ball
University of Maryland
mball@rhsmith.umd.edu

Plenary/Keynotes Chair
G."Anand" Anandalingam
University of Maryland
ganand@rhsmith.umd.edu

Invited Sessions Co-Chairs
Alper Atamturk
Univ. of California-Berkeley
atamturk@ieor.berkeley.edu

Benjamin F. Hobbs
Johns Hopkins University
bhobbs@jhu.edu

Sponsored Sessions Chair
Gilvan Souza
University of Maryland
gsouza@rhsmith.umd.edu

Contributed Sessions Chair
Chun-Hung Chen
George Mason University
cchen9@gmu.edu

Technical Coordinator, Teachers Workshop
Frank T. Trippi
ftrippi1@verizon.net

Tutorials Co-Chairs
S."Raghu" Raghavan
University of Maryland
raghavan@umd.edu

Zhi-Long Chen
University of Maryland
zchen@rhsmith.umd.edu

Practitioner Program Co-Chairs
Lawrence D. Stone
Metron Inc.
stone@metsci.com

Arnold Greenland
IBM Corporation
agreenland@us.ibm.com

Interactive Sessions Co-Chairs
Pablo Durango-Cohen
Northwestern University
pdc@northwestern.edu

Karen Smilowitz
Northwestern University
ksmilowitz@northwestern.edu

Special Events Co-Chairs
Elise Miller-Hooks
University of Maryland
elisemh@umd.edu

Edward A. Wasil
American University
ewasil@american.edu

Advisory Board
Lawrence D. Bodin
University of Maryland

Howard Frank
University of Maryland

Jacques Gansler
University of Maryland

Saul I. Gass
University of Maryland

Karla L. Hoffman
George Mason University

Copies of papers abstracted in the meeting program are available only from the authors. Requests for papers should be sent to the authors at the addresses shown in the program. Published annually prior to the meeting by the Institute for Operations Research and the Management Sciences. Individual issues of the program are available for $20US per copy. Orders must be prepaid and sent to INFORMS, PO Box 631704, Baltimore, MD 21263-1704.

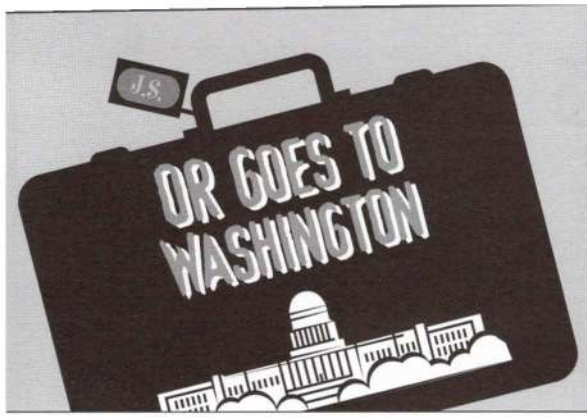
Sponsors 2
Welcome from the General Chair 3
Program at a Glance 4
Schedule of Special Events 6
Schedule of Community Business Meetings 11
Speaker Information 13
Guest Program & Guest Tours 15
Special Receptions 16
Networking & Social Events 19
Saturday Workshops 20
For Practitioners 21
Special Programs 23
Technical Program
- Plenary & Keynote Presentations 24
- Doing Good with Good OR 28
- Tutorials 31
- Software Demonstrations 35
- Interactive Sessions 41

Guide to Exhibitors 43
Maps & Floor Plans 47
Master Track Schedule 50
Sponsored Cluster Chairs 58
Invited Cluster Chairs 59
Future Meetings 60
Technical Sessions
- Sunday 61
- Monday 150
- Tuesday 240
- Wednesday 331

Session Chair Index 423
Author Index 427
Session Index 453

INDEX OF ADVERTISERS

Frontline Systems, Inc. ..... **Inside Front Cover**
OptiRisk Systems 8
Oxford University Press 9
INFORMS Communities 10
South-Western, Cengage Learning 12
Wiley 14, 32
University of Chicago Press 15
Innovative Scheduling 18
INFORMS Practice Conference 2009 21
USC-Viterbi School of Engineering 22
Imagine That, Inc. 26
World Scientific Publishing 30
INFORMS Journals 34
Springer 36
Palgrave Macmillan 38
CORS-INFORMS International Meeting 2009 40
INFORMS Annual Meeting 2009 464
statistics.com ..... **Inside Back Cover**
ILOG, Inc. ..... **Back Cover**



Thanks to our Sponsors

Leadership Sponsors

SmartOps®

ILOG

Corporate & University Sponsors

GAMS

AIMMS THE MODELING SYSTEM 3

FairIsaac

dash optimization

UNIVERSITY OF MARYLAND
ROBERT H. SMITH SCHOOL OF BUSINESS

IBM

SCHOOL OF MANAGEMENT
THE UNIVERSITY OF TEXAS AT DALLAS

INNOVATIVE SCHEDULING

sas

University of Massachusetts

Lehigh University

Washington University in St. Louis

AEgis Technologies Group, Inc.

WELCOME FROM THE GENERAL CHAIR

The Transportation Center Northwestern University
Chambers Hall
600 Foster Street
Evanston, Illinois 60208-4055

Phone 847-491-7287
http://transportation.northwestern.edu

NORTHWESTERN
UNIVERSITY

Dear Colleagues:

What an exciting yet sobering time to be celebrating the best of what our discipline has to offer in one of the places where it is most needed – Washington, DC, our Nation's Capital and arguably the world's epicenter of power and public decision-making, home to "the good, the bad and the ugly" in public and not-so-public policy. In a year that has seen disruptive floods and natural disasters necessitating mass evacuations, financial crises requiring massive bail-outs, actively surging wars and a heightened sense of threat, and fossil fuel prices that have finally revealed that the demand for auto travel is not indefinitely inelastic, we are reminded of just how important and essential our arsenal of operations research and management science tools really is.

When (the classic movie's) Mr. Smith went to Washington, armed with the best tools that an elite education could bestow, with a dream and conviction to make a difference in our society, little did he know of the challenges facing him in the proverbial "real world". Just like Mr. Smith, INFORMS returns to Washington, intent on showcasing the vital contribution that our profession is making towards solving the challenging large-scale problems and public policy questions facing our increasingly complex society and interacting global community. But unlike Mr. Smith, our idealism is tempered by a solid grasp of reality, and the requirements it imposes on OR/MS tools and systems.

In an election year that is increasingly taking on a historic character, our Conference's theme and focus on OR/MS in support of public policy could not be more timely. From signature sessions showcasing OR's role in health care, energy and transportation, to high-profile plenaries and keynotes on collective decision processes and market mechanisms, to special clusters on humanitarian logistics, supply chain disruptions, green production systems, elections and fairness, and health care informatics, to name a few, the contribution of OR/MS to society's big challenges is front and center throughout the program.

On behalf of my colleagues of the Organizing Committee, it is my great pleasure to welcome you to Washington DC. In addition to the incredibly rich and stimulating program that has emerged from the collective efforts of so many of you, the meeting offers abundant social networking opportunities, culminating with the general reception at the Air and Space Museum, reserved for our exclusive use on Tuesday evening. Equally important are the small-scale connections formed and renewed over a pleasant meal at one of the city's many fine restaurants, bistrots, trattorias and power steakhouses (sorry, no moose burger joints yet).

The list of acknowledgments for a meeting of this magnitude is indeed quite long. First and foremost, my deep gratitude goes to Anand Anandalingam and Mike Ball, our indefatigable and most resourceful program co-chairs; it has been a true pleasure and honor to work with you on this project. Everyone on the Organizing Committee has gone above and beyond, and contributed selflessly to the success of the meeting – Alper Atamturk, Chung-Hung Chen, Zhi-Long Chen, Pablo Durango-Cohen, Arnold Greenland, Ben Hobbs, Elise Miller-Hooks, S. Raghu Ragavan, Karen Smilowitz, Larry Stone, Gilvan Souza, Frank Trippi, and Ed Wasil. Very special thanks go to Rebecca Weaver-Gill for the many roles she has juggled throughout the process, including local coordination, and to the superb team at INFORMS – Paulette Bronis, Cheryl Clark, Sandy Owens and Jessica Bennett, under the most able guidance of Terry Cryan. Special appreciation goes to our sponsors – SmartOps, ILOG, AIMMS, GAMS, Fair Isaac, IBM, Innovative Scheduling, University of Texas at Dallas, Northwestern University and the University of Maryland – you make an excellent meeting even better.

Welcome to Washington DC – enjoy the meeting, our city's history, beautiful monuments, rich museums, and policy-intensity, and by the time you return home you will undoubtedly be all charged up and better INFORMed.

Hani S. Mahmassani
General Chair, INFORMS 08

PROGRAM AT A GLANCE

LOCATIONS
Technical sessions are held at the Marriott Wardman Park and Omni Shoreham Hotels. Check the Master Track Schedule on pages 50-57 for specific room locations.

KEY
M-Marriott
O-Omni

BADGES REQUIRED FOR TECHNICAL SESSIONS

INFORMS Annual Meeting 2008 badges must be worn to all sessions and events. Badges will be checked at the entrance to technical session areas, as well as the Exhibit Hall. Attendees without badges will be directed to the INFORMS registration desk to register and pick up their badges. *All attendees, including speakers and session chairs, must register and pay the registration fee.* Lost badges can be replaced at the registration desk for a fee of $5.00.

QUICK REFERENCE
including the Master Track Schedule

Don't miss this handy reference. It's a separate flyer that came with your program. The Master Track Schedule is also printed on pages 50-57.

FRIDAY, OCTOBER 10

7:30am-5:00pm	Teaching Effectiveness Colloquium	M – Washington 1-2, Exhibit Level
6:00pm-8:00pm	Combined Colloquia	M – Wilson, Mezzanine Level

SATURDAY, OCTOBER 11

7:30am-4:30pm	Future Academician Colloquium	M – Washington 4, Exhibit Level
7:30am-4:30pm	Future Practitioner Colloquium	M – Lincoln 6, Exhibit Level
7:30am-4:30pm	Teaching Effectiveness Colloquium	M – Washington 1, Exhibit Level
8:00am-5:00pm	DM-HI Workshop	M – Lincoln 3-4, Exhibit Level
8:00am-5:00pm	CIST Conference	M – Virginia A & Delaware A, Lobby Level
9:00am-6:00pm	Vendor (Exhibitor) Workshops	M – See p. 20
7:00am-7:00pm	Registration	M – Lobby Level
5:00pm-6:00pm	INFORMS Membership Meeting	M – Washington 5-6, Exhibit Level

SUNDAY, OCTOBER 12

7:00am-5:00pm	Registration	M – Lobby Level
8:00am-9:30am	Technical Sessions (SA)	Marriott & Omni
8:00am-4:30pm	CIST Conference	M – Virginia B-C, Lobby Level
9:00am-12:00pm	Email Center (no wireless)	M – Exhibit Hall A
9:30am-10:00am	Coffee Break	M – Atrium, Exhibit Level
		M – Lincoln 6 Foyer, Exhibit Level
		M – Marriott Foyer, Mezzanine
		O – East & West Lobbies
10:00am-10:50am	Welcome/Edelman Reprise	M – Marriott Ballroom 2, Lobby Level
11:00am-12:30pm	Technical Sessions (SB)	Marriott & Omni
12:00pm-5:00pm	Exhibits, Job Fair, Email	M – Exhibit Hall A
12:30pm-1:30pm	Lunch Break (on your own)	
1:30pm-3:00pm	Technical Sessions (SC)	Marriott & Omni
3:10pm-4:00pm	Plenary: Omega Rho, Karla Hoffman	M – Marriott Ballroom 2, Lobby Level
4:00pm-4:30pm	Coffee Break	M – Exhibit Hall A
		O – East & West Lobbies
4:30pm-6:00pm	Technical Sessions (SD)	Marriott & Omni
6:15pm-7:15pm	INFORMS Community Business Meetings	See p. 11
7:30pm-9:00pm	Welcome Reception-Exhibits Open	M – Exhibit Hall A
8:30pm-9:45pm	Awards Ceremony & Dessert Reception	M – Marriott Ballroom 2, Lobby Level

MONDAY, OCTOBER 13

7:00am-5:00pm	Registration	M – Lobby Level
8:00am-9:30am	Technical Sessions (MA)	Marriott & Omni
9:00am-5:00pm	Exhibits, Job Placement, Email	M – Exhibit Hall A
9:30am-10:00am	Coffee Break	M – Exhibit Hall A
		O – East & West Lobbies
10:00am-10:50am	Plenary: Roger Myerson	M – Marriott Ballroom 2, Lobby Level
11:00am-12:30pm	Technical Sessions (MB)	Marriott & Omni
12:30pm-1:30pm	Interactive Session	M – Exhibit Hall A
12:30pm-1:30pm	Lunch Break (on your own)	
1:30pm-3:00pm	Technical Sessions (MC)	Marriott & Omni
3:10pm-4:00pm	Keynote: IFORS, Michel Balinski	M – Marriott Ballroom 2, Lobby Level
3:10pm-4:00pm	Keynote: Practice/MAS, Halverson	M – Marriott Ballroom 3, Lobby Level
4:00pm-4:30pm	Coffee Break	M – Exhibit Hall A
		O – East & West Lobbies
4:30pm-6:00pm	Technical Sessions (MD)	Marriott & Omni
6:15pm-7:15pm	INFORMS Community Business Meetings	See p. 11

PROGRAM AT A GLANCE

TUESDAY, OCTOBER 14

7:00am-5:00pm	Registration	M – Lobby Level
8:00am-9:30am	Technical Sessions (TA)	Marriott & Omni
9:00am-5:00pm	Exhibits, Job Placement, Email	M – Exhibit Hall A
9:30am-10:00am	Coffee Break	M – Exhibit Hall A
		O – East & West Lobbies
10:00am-10:50am	McCord Morse: Lawrence Wein	M – Marriott Ballroom 3, Lobby Level
10:00am-10:50am	Doing Good with O.R.: Energy	M – Marriott Ballroom 2, Lobby Level
11:00am-12:30pm	Technical Sessions (TB)	Marriott & Omni
12:30pm-1:30pm	Interactive Session	M – Exhibit Hall A
12:30pm-1:30pm	Lunch Break (on your own)	
1:30pm-3:00pm	Technical Sessions (TC)	Marriott & Omni
3:10pm-4:00pm	Doing Good with O.R.: Health Policy	M – Marriott Ballroom 2, Lobby Level
4:00pm-4:30pm	Coffee Break	M – Exhibit Hall A
		O – East & West Lobbies
4:30pm-6:00pm	Technical Sessions (TD)	Marriott & Omni
6:15pm-7:15pm	INFORMS Community Business Meetings	See p. 11
7:30-9:30pm	General Reception	Smithsonian Air & Space Museum
	Buses depart beginning at 7:00pm. See p. 17.	

WEDNESDAY, OCTOBER 15

7:00am-5:00pm	Registration	M – Lobby Level
8:00am-9:30am	Technical Sessions (WA)	Marriott & Omni
9:00am-5:00pm	Email	M – Washington 3
9:30am-10:00am	Coffee Break	M – Atrium, Exhibit Level
		M – Lincoln 6 Foyer, Exhibit Level
		M – Marriott Foyer, Mezzanine
		O – East & West Lobbies
10:00am-10:50am	Doing Good with O.R.: Air Congestion	M – Marriott Ballroom 2, Lobby Level
11:00am-12:30pm	Technical Sessions (WB)	Marriott & Omni
12:30pm-1:30pm	Lunch Break (on your own)	
1:30pm-3:00pm	Technical Sessions (WC)	Marriott & Omni
3:10pm-4:00pm	Plenary: Daniel Cook	M – Marriott Ballroom 2, Lobby Level
4:00pm-4:30pm	Coffee Break	M – Atrium, Exhibit Level
		M – Lincoln 6 Foyer, Exhibit Level
		M – Marriott Foyer, Mezzanine
		O – East & West Lobbies
4:30pm-6:00pm	Technical Sessions (WD)	Marriott & Omni

How Cirque du Soleil Integrates Technology with Entertainment

Don't miss the Wednesday afternoon plenary, when Daniel Cook provides a backstage view of how Cirque du Soleil uses automation and engineering to create its amazing effects. Dr. Cook is head of the Entertainment Engineering and Design Program at University of Nevada, Las Vegas. 3:10-4:00pm, Marriott Ballroom 2, Lobby Level.

WHERE TO GO FOR LUNCH?

Marriott Wardman Park

Woodley Market
6:00am-6:00pm
Take-out food including sandwiches, snacks, drinks.

Starbucks
6:00am-4:00pm

Stone's Throw Restaurant & Bar
Breakfast 6:00am-10:30am, lunch 11:00am-2:30pm, dinner 5:00pm-11:00pm.

Harry's Pub
11:00am-1:00am, lunch and dinner.

Omni Shoreham Hotel

Robert's Restaurant
6:30am-10:30pm

Morsel's
Take-out food and snacks.
6:00am to late afternoon

Mark Russell Marquee & Lounge
4:00pm-1:00am

Additional Nearby Restaurants

Woodley Cafe - 2619 Connecticut Ave.
10:00am-10:00pm

Taste of India - 2621 Connecticut Ave.
11:00am-10:00pm

Lebanese Taverna - 2641 Connecticut Ave.
11:30am-2:30am

Murphy's of DC - 2609 24th St.
11:00am-Midnight

Rajaji - 2603 Connecticut Ave.
Lunch 11:30am-3:00pm;
dinner 4:30pm-11:30pm

Cafe Paradiso - 2649 Connecticut Ave.
Lunch 11:30am-3:00pm,
dinner 5:00pm-10:00pm (no Sunday lunch)

Nic Nac Deli - 2600 Connecticut Ave.
10:00am-9:00pm (closed Sunday)

SCHEDULE OF SPECIAL EVENTS

All special events take place at the Marriott Wardman Park.

For INFORMS Community business meetings, see page 11.

JOB PLACEMENT SERVICES

Job Fair
Sunday, 12:00pm-5:00pm
Exhibit Hall A, Exhibit Level
The Job Fair provides an opportunity for job seekers to meet participating employers in an informal atmosphere and to discuss employment opportunities within those organizations. Employers meet and collect resumes from many job seekers in a short period of time early in the meeting, giving them the chance to set up interviews during the meeting.

INFORMS Job Placement Service
Monday-Tuesday, 9:00am-5:00pm
Exhibit Hall A, Exhibit Level
This service provides employers and applicants a convenient venue for on-site interviews to explore opportunities in academia, industry and government. In addition, the job placement service offers:
-Online access to job listings and applicant files,
-Expanded information about jobs and applicants,
-Weekly updates of the database,
-Improved database search capabilities,
-Online data entry for applicants and employers,
-Extended availability of the database.
www.informs.org/JPS/

Job Placement Panel Discussions
Select panels will lead informal discussions about the industry and academic interview processes.

THE INDUSTRY JOB SEARCH
Monday – MC29, 1:30pm-3:00pm
Washington 2, Exhibit Level

THE ACADEMIC JOB SEARCH
Tuesday - TB29, 11:00am-12:30pm
Washington 2, Exhibit Level

FRIDAY, OCTOBER 10

Teaching Effectiveness Colloquium	Washington 1-2, Exhibit Level	7:30am-5:00pm
OR Practice in Africa	Washington 3,5,6, Exhibit Level	8:00am-5:00pm
Combined Colloquia	Wilson, Mezzanine Level	6:00pm-8:00pm

SATURDAY, OCTOBER 11

Combined Colloquia		
Breakfast	Washington 5-6, Exhibit Level	7:30am-8:00am
Future Academician Colloquium	Washington 4, Exhibit Level	8:00am-4:30pm
Future Practitioner Colloquium	Lincoln 6, Exhibit Level	8:00am-4:30pm
Teaching Effectiveness Colloquium	Washington 1, Exhibit Level	8:00am-4:30pm
Dinner	Offsite-Capitol City Brewing	7:00pm-9:00pm
OR Practice in Africa	Maryland A-B-C, Lobby Level	8:00am-5:00pm
DM-HI Workshop	Lincoln 2-3-4, Exhibit Level	8:00am-5:00pm
CIST Conference	Virginia A, Delaware A, Lobby Level	8:00am-5:00pm
ISR Editors	Taft, Mezzanine Level	8:30am-3:00pm
Organization Science Competition	Hoover, Mezzanine Level	8:30am-5:00pm
INFORMS Executive Committee	Capital Boardroom, Lobby Level	9:00am-11:30am
Meetings Committee	Suite 7340, Wardman Tower	9:00am-12:00pm
Vendor Workshops – Session I		
GAMS Development Corp.	Balcony C-D, Mezzanine Level	9:00am-12:00pm
JMP Division-SAS	Washington 2, Exhibit Level	9:00am-12:00pm
OptiRisk Systems	Room 8209, Lobby Level	9:00am-12:00pm
River Logic, Inc.	Room 8219, Lobby Level	9:00am-12:00pm
TranSystems	Room 8226, Lobby Level	9:00am-12:00pm
Vendor Workshops – Session II		
AIMMS (Paragon)	Wilson C, Mezzanine Level	12:00pm-3:00pm
COIN-OR	Wilson A-B, Mezzanine Level	12:00pm-3:00pm
Fair Isaac	Room 8209, Lobby Level	12:00pm-3:00pm
Lumina Decision Systems	Room 8219, Lobby Level	12:00pm-3:00pm
Maximal Software, Inc.	Room 8226, Lobby Level	12:00pm-3:00pm
SAS	Balcony C-D, Mezzanine Level	12:00pm-3:00pm
INFORMS Board	Delaware B, Lobby Level	12:00pm-5:00pm
Vendor Workshops – Session III		
Frontline Systems, Inc.	Balcony C-D, Mezzanine Level	3:00pm-6:00pm
ILOG, Inc.	Washington 2, Exhibit Level	3:00pm-6:00pm
LINDO Systems, Inc.	Wilson C, Mezzanine Level	3:00pm-6:00pm
Responsive Learning Technologies	Wilson A-B, Mezzanine Level	3:00pm-6:00pm
Salford Systems	Room 8226, Lobby Level	3:00pm-6:00pm
INFORMS Membership Meeting/Reception	Washington 5-6, Exhibit Level	5:00pm-6:00pm
Roundtable	Marshall North, Mezzanine Level	5:00pm-10:00pm
ISR Senior & Associate Editors	McKinley, Mezzanine Level	6:00pm-7:30pm
University of Texas at Dallas Reception	Delaware A, Lobby Level	6:00pm-9:00pm

SUNDAY, OCTOBER 12

New Member Breakfast	Marshall South-East, Mezzanine Level	7:00am-8:00am
Roundtable	Marshall North, Mezzanine Level	7:00am-4:30pm
JPS Breakfast	Delaware A, Lobby Level	7:30am-9:00am
INFORMS Board	Delaware B, Lobby Level	7:30am-3:30pm
Guest Breakfast	Stones Throw Restaurant	8:00am-9:00am
CIST Conference	Virginia B-C, Lobby Level	8:00am-4:30pm

Schedule of Special Events

Plenary: Welcome/Edelman Reprise	Marriott Ballroom 2, Lobby Level	10:00am-10:50am
Colloquia Committee	Room 8211, Lobby Level	10:00am-11:00am
CIEADH	Virginia A, Lobby Level	10:00am-5:00pm
IPC Reunion	Hoover, Mezzanine Level	12:00pm-1:00pm
Junior Faculty Interest Group Lunch	Marshall South, Mezzanine Level	12:00pm-1:30pm
OR Editors Lunch/Meeting	T.Paine, Wardman Tower, Lobby Level	12:00pm-2:00pm
JOC Editors	E. Allen, Wardman Tower, Lobby Level	12:30pm-1:30pm
MS Editors	Cleveland 2, Mezzanine Level	12:30pm-3:00pm
Omega Rho Lunch/Meeting	Cleveland 1, Mezzanine Level	12:45pm-2:45pm
Plenary-Omega Rho: Karla Hoffman	Marriott Ballroom 2, Lobby Level	3:10pm-4:00pm
Chapters/Fora Committee	T.Paine, Wardman Tower, Lobby Level	4:00pm-5:00pm
Roundtable/INFORMS Board	Marshall North, Mezzanine Level	4:30pm-5:30pm
Section/Societies Committee	T.Paine, Wardman Tower, Lobby Level	5:00pm-6:00pm
President's Reception-Roundtable	Marshall South, Mezzanine Level	5:30pm-6:30pm
INFORMS Online Reception	Virginia A, Lobby Level	6:00pm-7:00pm
Welcome Reception & Exhibits	Exhibit Hall A	7:30pm-9:00pm
Minority Issues Forum Reception	Virginia B, Lobby Level	8:00pm-9:00pm
Awards Ceremony & Dessert Reception	Marriott Ballroom 2, Lobby Level	8:30pm-9:45pm

MONDAY, OCTOBER 13

Board/Editors/Committee Chair Breakfast	Marshall South, Mezzanine Level	7:00am-8:00am
Decision Analysis Editors	T.Paine, Wardman Tower, Lobby Level	7:00am-8:30am
Korea Chapter Breakfast	E. Allen, Wardman Tower, Lobby Level	7:00am-9:00am
ACORD Breakfast/Meeting	Marshall North, Mezzanine Level	7:30am-9:00am
Guest Breakfast	Stones Throw Restaurant	8:00am-9:00am
Washington Area Math Teachers Program	Marshall East, Mezzanine Level	8:00am-5:00pm
Strategic Planning Committee	Delaware A. Lobby Level	8:30am-10:00am
Continuing Education Committee	Room 8205, Lobby Level	9:00am-10:00am
Subdivisions/Communities Council	Virginia A, Lobby Level	9:30am-11:30am
Plenary: Roger B. Myerson	Marriott Ballroom 2, Lobby Level	10:00am-10:50am
Education Committee	Room 8205, Lobby Level	10:00am-11:00am
COIN-OR Members & Users	Wilson A, Mezzanine Level	12:15pm-1:15pm
Publications/Editors in Chief	Delaware A, Lobby Level	12:30pm-3:30pm
Fellows Lunch	Marshall North, Mezzanine Level	12:45pm-2:30pm
Keynote-IFORS: Michel Balinski	Marriott Ballroom 2, Lobby Level	3:10pm-4:00pm
Keynote-Practice/MAS: Halverson	Marriott Ballroom 3, Lobby Level	3:10pm-4:00pm
Isolated Academics	T.Paine, Wardman Tower, Lobby Level	3:15pm-4:15pm
Carnegie Mellon Univ. Reception	Delaware B, Lobby Level	6:00pm-8:00pm
Computing Society Reception	Lincoln 6, Exhibit Level	6:15pm-6:45pm
CPMS Isolated Practitioners Workshop	Washington 5, Exhibit Level	6:15pm-7:15pm
IFORS 2011 Program Committee	Jefferson, Mezzanine Level	6:15pm-7:15pm
Interfaces Editors	E. Allen, Wardman Tower, Lobby Level	6:15pm-7:15pm
ISI-IEOR (Iranians in OR)	Jackson, Mezzanine Level	6:15pm-7:15pm
Univ. of Florida ISE Reception	Delaware A, Lobby Level	6:30pm-7:30pm
Univ. of Michigan Reception	Virginia A, Lobby Level	6:30pm-9:00pm
Deans Reception	Harding, Mezzanine Level	7:00pm-8:00pm
Texas A&M University	Wilson A, Mezzanine Level	7:00pm-8:30pm
Northwestern Univ. Reception	Wilson B, Mezzanine Level	7:00pm-8:30pm
Penn State Univ. Reception	Wilson C, Mezzanine Level	7:00pm-8:30pm
Wharton School Reception	Maryland B, Lobby Level	7:00pm-8:30pm
Student Reception	Marshall North-East, Mezzanine Level	7:30pm-9:00pm
Sloan Industries Studies Reception	Maryland A, Lobby Level	7:45pm-9:45pm
Women in OR/MS Forum Reception	Offsite-Ireland's Four Fields 3412 Connecticut Ave. NW	8:00pm-10:00pm

COFFEE BREAKS

KEY
M-Marriott Wardman Park
O-Omni Shoreham

Sunday
9:30am-10:00am
M – Atrium, Exhibit Level
M – Lincoln 6 Foyer, Exhibit Level
M – Marriott Foyer, Mezzanine Level
O – East & West Lobbies

4:00pm – 4:30pm
M – Exhibit Hall
O – East & West Lobbies
Sponsored by Fair Isaac

Monday
9:30am – 10:00am
M – Exhibit Hall
O – East & West Lobbies
Sponsored by Fair Isaac

4:00pm – 4:30pm
M – Exhibit Hall
O – East & West Lobbies
Sponsored by Fair Isaac

Tuesday
9:30am – 10:00am
M – Exhibit Hall
O – East & West Lobbies

4:00pm – 4:30pm
M – Exhibit Hall
O – East & West Lobbies

Wednesday
9:30am – 10:00am
M – Atrium, Exhibit Level
M – Lincoln 6 Foyer, Exhibit Level
M – Marriott Foyer, Mezzanine Level
O – East & West Lobbies

4:00pm – 4:30pm
M – Atrium, Exhibit Level
M – Lincoln 6 Foyer, Exhibit Level
M – Marriott Foyer, Mezzanine Level

Thank You
FairIsaac.
dash optimization

OptiRisk SYSTEMS

www.optirisk-systems.com

INVESTOR IN PEOPLE
BS EN ISO 9000 : 2000

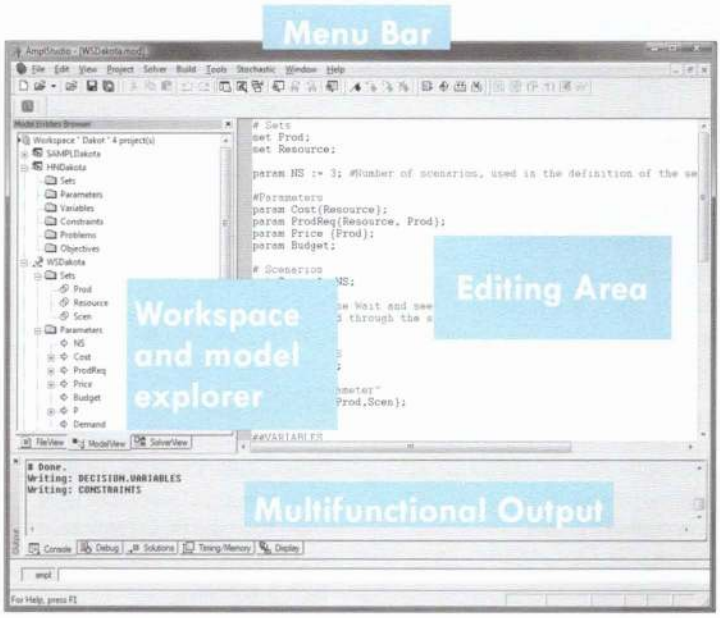
Products

✓**Modelling Tools**
- AMPL
- AMPLStudio

✓**Solvers**
- CPLEX(Full Range with AMPL)
- FortMP (SSX, IPM, MIP, QP, QMIP)
- FortSP (Stochastic Solver: Benders & Stochastic Decomposition)

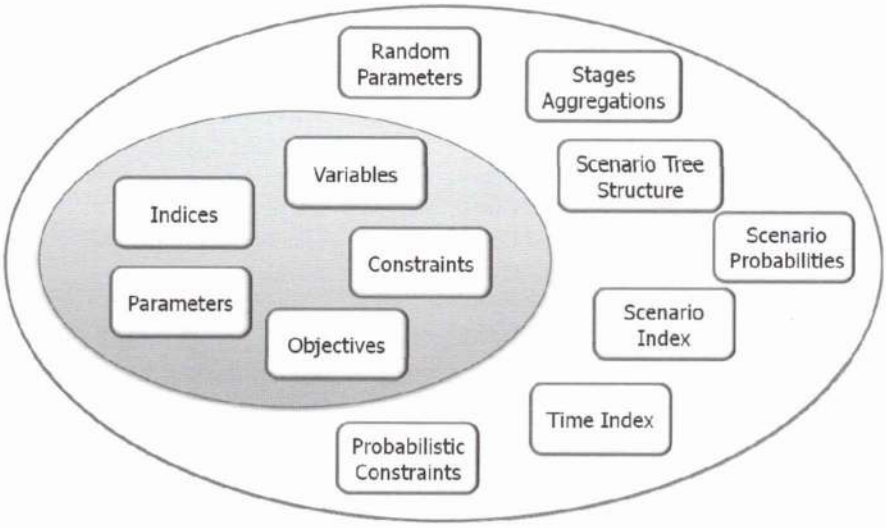
✓**Add-on**
- FortMP (MEX file for MATLAB)

✓**Stochastic Extensions**
- SAMPL/SPInE



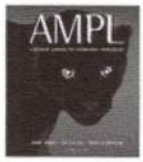
Services

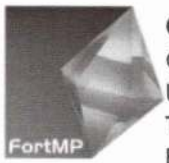
✓MP Modelling
✓MP Solver Tuning
✓Uncertainty and Risk Analysis/Modelling
✓Outsourced MP Modelling



Training

✓Linear and Integer Programming
✓Stochastic Programming
✓Quadratic Programming
✓Portfolio Planning
✓Asset and Liability Management





Contact OptiRisk Systems
One Oxford Road, Uxbridge, UB9 4DA, UK
Tel: +44 (0)1895 819 483
Fax: +44 (0)1895 813 095

US Contact AMPL LLC
Fax: +1 425 940 6286
Email: info@ampl.com

SCHEDULE OF SPECIAL EVENTS

TUESDAY, OCTOBER 14

Chapters/Fora Officers Breakfast	Delaware A, Lobby Level	7:00am-8:00am
CPMS Council	Marshall North-East, Mezzanine Level	7:00am-8:30am
Transportation Science Editors	Cleveland 1, Mezzanine Level	7:30am-8:30am
Student Chapter Officers	Delaware A, Lobby Level	8:00am-8:45am
Guest Breakfast	Stones Throw Restaurant	8:00am-9:00am
Meetings Comm./Future Org. Committees	Suite 7340, Wardman Tower	9:00am-5:00pm
Doing Good / Good OR: Energy-Environment	Marriott Ballroom 2, Lobby Level	10:00am-10:50am
McCord Morse Lecture: Lawrence M. Wein	Marriott Ballroom 3, Lobby Level	10:00am-10:50am
Sections/Societies Officers Lunch	Marshall North, Mezzanine Level	12:00pm-1:30pm
Academic/Practitioner Interface Lunch	Marshall South, Mezzanine Level	12:30pm-1:30pm
Women in OR/MS Lunch/Meeting	Marshall East, Mezzanine Level	12:30pm-1:30pm
Doing Good with Good OR: Health Policy	Marriott Ballroom 2, Lobby Level	3:10pm-4:00pm
Future Organizing Committee Reception	Suite 7340, Wardman Tower	5:00pm-6:00pm
General Reception	Smithsonian Air & Space Museum	7:30pm-9:30pm

Buses depart beginning at 7:00pm. See p. 17.

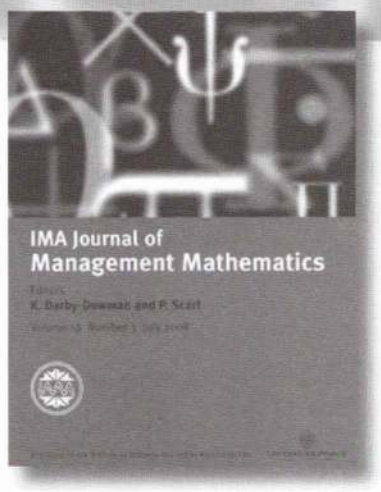
WEDNESDAY, OCTOBER 15

Doing Good / Good OR: Aviation Congestion	Marriott Ballroom 2, Lobby Level	10:00am-10:50am
Plenary: Daniel P. Cook	Marriott Ballroom 2, Lobby Level	3:10pm-4:00pm

25+ Year Member Ribbon

If you have been an ORSA-TIMS-INFORMS member for 25 or more years, please stop by the INFORMS booth (#700-702 in the Exhibit Hall) to pick up a special ribbon designating your 25+ year membership. We salute our long-time members!

IMA Journal of Management Mathematics



This quarterly, peer reviewed journal covers selected areas of OR and management science including:

- **financial modelling and risk analysis**
- **model building and optimization**
- **production processes**
- **logistics & supply chain management**
- **decision making tools**

ADVANCE ACCESS
Rapid online publication

The journal publishes mathematics that is innovative in the context of applications to real problems. It has particular appeal to business schools, departments of industrial engineering, and mathematics departments with a special interest in OR financial mathematics.

FREE@www.imaman.oxfordjournals.org

Published on behalf of the Institute of Mathematics and its Applications

- ***EDITORS CHOICE*** - a selection of key articles FREE online
- ***FREE CONTENT ALERTING*** - sign up to for tables of contents free by e-mail or RSS feed
- ***FREE SAMPLE ISSUE*** – register to view an issue free online

www.imaman.oxfordjournals.org

OXFORD JOURNALS
OXFORD UNIVERSITY PRESS

:: Societies :: Sections :: Fora :: Chapters :: Student Chapters::

INFORMS communities - also known as subdivisions - are important, independent bodies that unite members into local regional groups, focus on special technical interests, and provide the backbone for the organization. Many members belong to more than one group. Communities sponsor conferences, regular meetings, sessions at annual meetings, educational programs, and awards; some provide professional journals and resource publications.

New to INFORMS?

Get the most out of your membership!
Don't forget to select your Subdivisions!
Log onto: https://join.informs.org
At this meeting: Check out the schedule of subdivision business meetings and special events. Open to all attendees and a great opportunity to meet people who share your interests.

www.informs.org/Subdiv
800.446.3676 or email: informs@informs.org

informs®

INFORMS COMMUNITY BUSINESS MEETINGS

KEY
M-Marriott Wardman Park
O-Omni Shoreham

QUICK REFERENCE
including the Master Track Schedule

Don't miss this handy reference. It's a separate flyer that came with your program. The Master Track Schedule is also printed on pages 50-57.

SUNDAY, OCTOBER 12

Information Systems	M – Virginia C, Lobby Level	5:30pm-6:30pm
Service Science	M – Room 8219, Lobby Level	6:00pm-8:00pm
Aviation Applications	O – Capitol	6:15pm-7:15pm
Data Mining & Artificial Intelligence	M – Maryland C, Lobby Level	6:15pm-7:15pm
eBusiness	M – Coolidge, Mezzanine Level	6:15pm-7:15pm
Energy, Natural Resources & the Environment	M – Maryland A, Lobby Level	6:15pm-7:15pm
Forum on Education (INFORM-ED)	M – Jackson, Mezzanine Level	6:15pm-7:15pm
Location Analysis	O – Forum	6:15pm-7:15pm
Military Applications Society Council	M – Room 8205, Lobby Level	6:15pm-7:15pm
Minority Issues Forum	M – Maryland B, Lobby Level	6:15pm-7:15pm
Optimization	M - Marshall West, Mezzanine Level	6:15pm-7:15pm
Railway Applications	O – Hampton Ballroom	6:15pm-7:15pm
Revenue Management & Pricing	O – Governor's Ballroom	6:15pm-7:15pm
Simulation	M – Harding, Mezzanine Level	6:15pm-7:15pm
Telecommunications	M – Embassy, Wardman Twr, Lobby Lev.	6:15pm-7:15pm
Transportation Science & Logistics Board	O – Chairman's Room	6:15pm-7:15pm
Decision Analysis Society Council	M - T.Paine, Wardman Twr, Lobby Lev.	6:15pm-7:30pm

MONDAY, OCTOBER 13

Decision Analysis Society	M – Lincoln 3, Exhibit Level	6:00pm-7:15pm
Technology Management	M – Coolidge, Mezzanine Level	6:00pm-8:00pm
Applied Probability	M – Lincoln 5, Exhibit Level	6:15pm-7:15pm
Financial Services	M – N. Hale, Wardman Twr, Lobby Lev.	6:15pm-7:15pm
Health Applications	M - Marshall West, Mezzanine Level	6:15pm-7:15pm
Manufacturing & Service Operations Mgt	M – Marriott Ballroom 1, Lobby Level	6:15pm-7:15pm
Military Applications Society	M – Washington 4, Exhibit Level	6:15pm-7:15pm
Public Programs & Processes	M – Taft, Mezzanine Level	6:15pm-7:15pm
Quality, Statistics & Reliability	M – Maryland C, Lobby Level	6:15pm-7:15pm
Spreadsheet Productivity Research	O – Cabinet Room	6:15pm-7:15pm
Transportation Science & Logistics	O – Blue Room	6:15pm-7:15pm
Computing Society	M – Lincoln 6, Exhibit Level	6:45pm-7:45pm
Behavioral Process Management	M – Taylor, Mezzanine Level	7:15pm-8:15pm

TUESDAY, OCTOBER 14

CPMS Council	M - Marshall North, Mezzanine Level	7:00am-8:30am
Women in OR/MS Meeting/Lunch	M - Marshall East, Mezzanine Level	12:30pm-1:30pm
SpORts in OR	M – Maryland A, Lobby Level	6:00pm-7:00pm

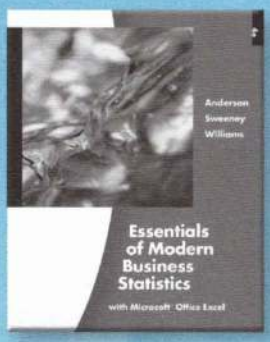
Join an INFORMS Community!

Stop by the Community counter at the INFORMS Registration Desk (Lobby Level) to join one or more INFORMS Communities.

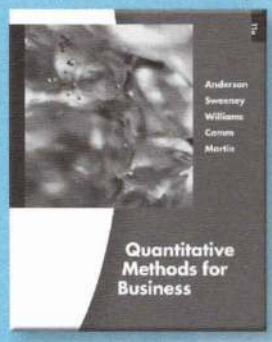
South-Western is Your Premier Publisher for Decision Sciences

NEW!

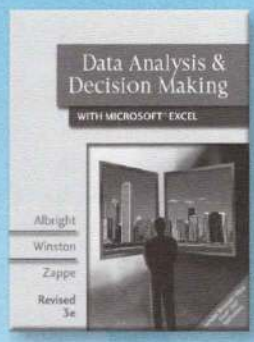
SOUTH-WESTERN CENGAGE Learning™



ANDERSON/SWEENEY/WILLIAMS
Essentials of Modern Business Statistics with Microsoft® Office Excel®, 4e
0-324-78351-5

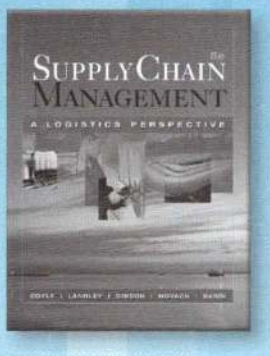


ANDERSON/SWEENEY/WILLIAMS/CAMM/MARTIN
Quantitative Methods for Business, 11e
0-324-65181-3

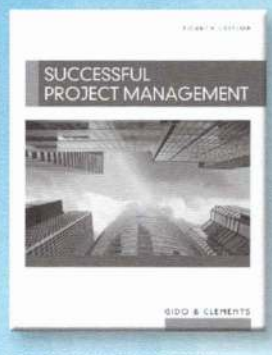


ALBRIGHT/WINSTON/ZAPPE
Data Analysis & Decision Making, Revised 3e
0-324-66244-0

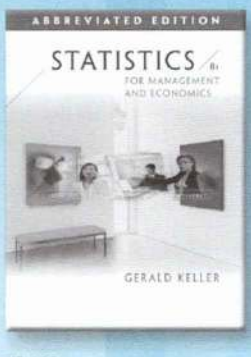
COLLIER/EVANS
OM
0-324-66255-6



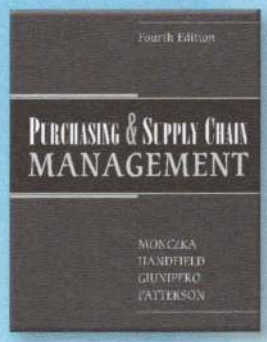
COYLE/LANGLEY/GIBSON/NOVACK/BARDI
Supply Chain Management: A Logistics Perspective, 8e
0-324-37692-8



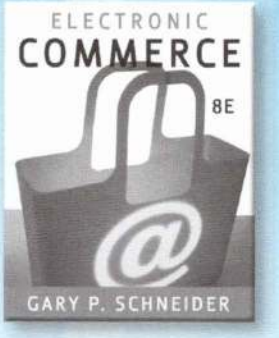
GIDO/CLEMENTS SUCCESSFUL
Project Management, 4e
0-324-65615-7



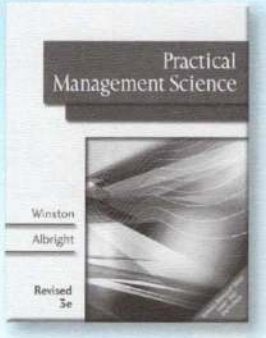
KELLER
Statistics for Management and Economics, Abbrev. Edition, 8e
0-324-59427-5



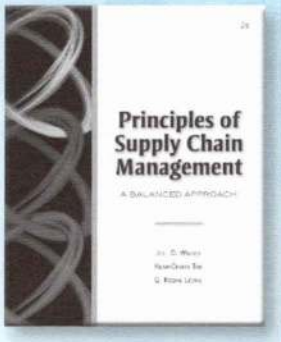
MONCZKA/HANDFIELD/GIUNIPERO/PATTERSON
Purchasing & Supply Chain Management, 4e
0-324-38134-4



SCHNEIDER
Electronic Commerce, 8e
1-4239-0305-6



WINSTON/ALBRIGHT
Practical Management Science, Revised 3e
0-324-66250-5



WISNER/TAN/LEONG
Principles of Supply Chain Management, 2e
0-324-65791-9

ADDITIONAL TITLES:

BUSINESS STATISTICS

ANDERSON/SWEENEY/WILLIAMS
- *Statistics for Business and Economics, Revised 10e*
- *Essentials of Statistics for Business and Economics, 5e*
- *Modern Business Statistics, 3e*

KELLER
- *Statistics for Management and Economics, 8e*

OPERATIONS/PRODUCTION MANAGEMENT

COYLE/BARDI/NOVACK
- *Transportation, 6e*

KLOPPENBORG
- *Contemporary Project Management*

SCHWALBE
- *Information Technology Project Management, 6e*

WISNER/STANLEY
- *Process Management: Creating Value Along the Supply Chain*

MANAGEMENT SCIENCE

ANDERSON/SWEENEY/WILLIAMS/MARTIN
- *An Introduction to Management Science: A Quantitative Approach to Decision Making, 12e*

RAGSDALE
- *Spreadsheet Modeling & Decision Analysis, Revised 5e*

For more information, please stop by our booth or visit
www.cengage.com/decisionsciences

SPEAKER INFORMATION

SPEAKER GUIDELINES

Audio/Visual Equipment

Every room will be equipped with an LCD (data) projector and an overhead. Please follow these guidelines to ensure a successful presentation using the LCD projector:

- Bring your laptop PC to your session. We supply the projector, but we DO NOT supply the computer.
- Bring your AC power adaptor with you. There will be convenient AC power in every session room.
- Arrive at your session at least 30 minutes before it begins. All presenters in a session should set up and test the connection to the projector before the session begins.
- Do NOT attempt to run your presentation off the laptop battery.
- Produce and bring overhead transparencies as a backup.

Speaker Ready Room

There will be a special Speaker Ready Room available in the Marriott Wardman Park, Exhibit Level, (enter the Exhibit Hall and follow signage) during the meeting. You can stop by and practice connecting your laptop to the projector. We will also have quick instructions at each session room and technical assistance available for any problems

Presentation Guidelines

The room and location of your session are listed in the Technical Sessions section and in the Master Track Schedule. Please be on time for your session and check in with the session chair. Presentations should be limited to key issues with a brief summary. Time your presentation to fit within your designated time span and leave an opportunity for questions and audience participation. Bring copies of your paper to distribute or provide a handout with information relating to your oral presentation. INFORMS does not produce proceedings with complete papers. To obtain complete copies of any papers abstracted in the program, please contact the authors directly at the addresses supplied with each abstract.

For Questions about the Program: Program Information Desk

If you have general questions about the meeting and/or questions about your own presentation, stop by one of the Program Information Desks. Desks are located in the Marriott (next to INFORMS Registration) and the Omni (near East Lobby elevators). We ask Session Chairs to notify the Information Desk about any last-minute changes or cancellations; these changes will be posted outside the meeting rooms. The Program Desks are staffed by students from University of Maryland, George Mason Univ., George Washington Univ., Northwestern Univ. and Cornell University, as well as INFORMS staff members.

For Assistance During Your Session: Session Monitor Desks

Session Monitor Desks are located in several areas in both the Marriott and Omni (see hotel maps for specific locations). If you have a problem in your session room (related to AV needs or any other requests), go to the Session Monitor Desk in the area to ask for assistance.

SESSION CHAIR GUIDELINES

The role of the Chair is to coordinate the smooth running of the session. The Chair:

- Begins and ends each session on time. Each session lasts 90 minutes, with the time per presentation determined by the number of papers in the session. Equal time should be given to each paper.
- Introduces each presentation (just the title of the paper and the name of the presenting author).
- Ensures that presentations are made **in the order shown in the program.** This allows for "session jumping." If a speaker cancels or does not attend, the original time schedule should be adhered to rather than sliding every talk forward.
- Completes the session attendance forms (forms will be in the room).

EXHIBITS

Name badges must be worn for admittance to the Exhibit Hall, located in the Marriott, Exhibit Level, during the following hours:

Sunday, Oct. 12	12:00pm-5:00pm
	7:30pm-9:00pm*
Monday, Oct. 13	9:00am-5:00pm
Tuesday, Oct. 14	9:00am-5:00pm

*The Exhibit Hall is open Sunday evening for a gala Welcome Reception. All registrants are invited to the reception for the chance to meet colleagues and renew acquaintances. Note: The Exhibit Hall is not open on Wednesday.

Thank You

Conference Bag Sponsor

ILOG

Badge Holder Sponsor

AIMMS 3

INTERNET & BUSINESS SERVICES

Email Center-Wireless Areas

Marriott, Exhibit Hall A

There are two options for Internet access. If you bring your laptop, you can use the special wireless area in the Exhibit Hall. If you need a computer, go to the Email Center, located in the Exhibit Hall. See map on page 49 for locations. Name badges must be worn for admittance. The Email Center will be open during the following hours:

Sunday, Oct. 12	7:00am-5:00pm
Monday, Oct. 13	9:00am-5:00pm
Tuesday, Oct. 14	9:00am-5:00pm
Wednesday, Oct. 15	9:00am-5:00pm

Business Centers

The Marriott Business Center is open 7:00am-7:00pm Monday-Friday. Access on the weekends is by guest key only. Attendees not staying at the Marriott can go to the front desk for assistance.

REGISTRATION

Badges Required for Technical Sessions

INFORMS Annual Meeting 2008 badges must be worn to all sessions and events. Badges will be checked at the entrance to technical session areas, as well as the Exhibit Hall. Attendees without badges will be directed to the INFORMS registration desk to register and pick up their badges. All attendees, including speakers and session chairs, must register and pay the registration fee. Lost badges can be replaced at the registration desk for a fee of $5.

SPEAKER INFORMATION

Registration Fee
Your registration fee includes admittance to the complete technical program, the Exhibit Hall, Email Center and most special programs. The following social/food events are also included: Sunday evening Welcome Reception, Sunday evening Awards Ceremony, Tuesday evening General Reception, and all morning and afternoon coffee breaks. No other meals are included.

Guest Registration
If your guest would like to accompany you to the major social events, you can purchase a guest registration ($75) that covers admission to the Sunday Welcome Reception, Sunday Awards Ceremony and Tuesday General Reception. Continental breakfasts on Sunday, Monday and Tuesday are also included (guest breakfasts are held at the Marriott, Stones Throw Restaurant). Guests are not eligible to attend the technical sessions. Go to the Registration Desk to register your guest.

25+ Year Member Ribbon
If you have been an ORSA-TIMS-INFORMS member for 25 or more years, please stop by the INFORMS booth (#700-702 in the Exhibit Hall) to pick up a special ribbon designating your 25+ year membership. We salute our long-time members!

OTHER SERVICES

Luggage Check
The Marriott will take luggage and store it for attendees, even those not staying at the Marriott. Go to the bellstand in the main lobby entrance for assistance.

Washington Visitor Information
Located next to the INFORMS registration desk, the Washington Convention & Visitors Bureau staff will assist you with restaurant reservations and tickets for cultural events. Stop by for information on what to see and do in Washington.

Saturday	2:00pm-7:00pm
Sunday-Tuesday	9:00am-5:00pm

INTRODUCING:
Annual Meeting E-News Daily
INFORMS is publishing the first ever E-News Daily during the DC meeting. Each morning of the meeting, attendees will receive in their email inboxes a recap of the previous day's activities and a preview of the coming day's activities. Don't miss the feature articles, session change information, upcoming events, photos, and more.

NEW FROM WILEY

WILEY PLUS

Managing and Using Information Systems, 4th Edition
Pearlson, Saunders
ISBN: 978-0-470-34381-4
©2009

Introduction to Information Systems: Supporting and Transforming Business, 2nd Edition
Rainer, Turban
ISBN: 978-0-470-16900-1
©2008

Essentials of Business Processes and Information Systems
Magal, Word
ISBN: 978-0-470-23059-6
©2010

Information Technology for Management: Transforming Organizations in the Digital Economy, 7th Edition
Turban, McLean, Wetherbe
ISBN: 978-0-470-28748-4
©2010

9-01507 rhm/se

WILEY

To find out more and request examination copies, visit us online at: www.wiley.com/college/is

GUEST PROGRAM & GUEST TOURS

GUEST PROGRAM

The program for registered guests includes a continental breakfast on Sunday, Monday and Tuesday mornings; the Sunday Welcome Reception and Awards Ceremony; and Tuesday evening General Reception. Registered guests will receive a colored name badge that must be worn for admittance to these events. Guests are not eligible to attend the technical sessions. Guest registration is $75 – go to the INFORMS Registration Desk to register your guest.

Guest Breakfasts

Marriott, Stones Throw Restaurant
Sunday-Tuesday 7:30am – 9:00am
Identify yourself as an INFORMS guest and present your ticket when you arrive at the restaurant. Walk to the back of the restaurant to a private dining room where the INFORMS guest breakfast will be held. Tickets are included in your registration packet.

GUEST TOURS

You may still be able to register for the following guest tours. Go to the INFORMS Registration Desk for information on availability. ***Meet in the Marriott Wardman Park, at the 24th St. entrance (near Harry's Pub), see map on page 47 for guest tour departures. Buses will leave at the beginning time listed for each tour, and will return to the Marriott at the ending time listed.***

Whirlwind Tour of Washington, DC

Sunday, October 12, 9:00am-1:00pm $45
The tour includes views of monuments, famous sites, the Potomac River and White House on its way to Capitol Hill and the majestic U.S. Capitol Building. The tour guide will also point out the Smithsonian Museums, the U.S. Holocaust Memorial Museum, the Washington Monument and the Jefferson Memorial. The first stop will be the Lincoln Memorial, where you can climb the marble steps. It is then a short walk to the Vietnam Veterans Memorial. End the tour with a stop on Pennsylvania Avenue to view the White House.

Mount Vernon - America's Colonial Past

Monday, October 13, 9:00am-3:00pm $65
Go back in time for a look at the life of George and Martha Washington. The home, garden and 25 galleries and theaters depict Washington's evolution from a young man into the first U.S. president. Next, have lunch on your own at the Food Court. The afternoon includes a trip to Historic Old Town Alexandria, the famous Virginia port city along the Potomac. While in Old Town, visit the city's numerous galleries and quaint shops along historic King Street.

World War II Memorial & U.S. Holocaust Memorial Museum

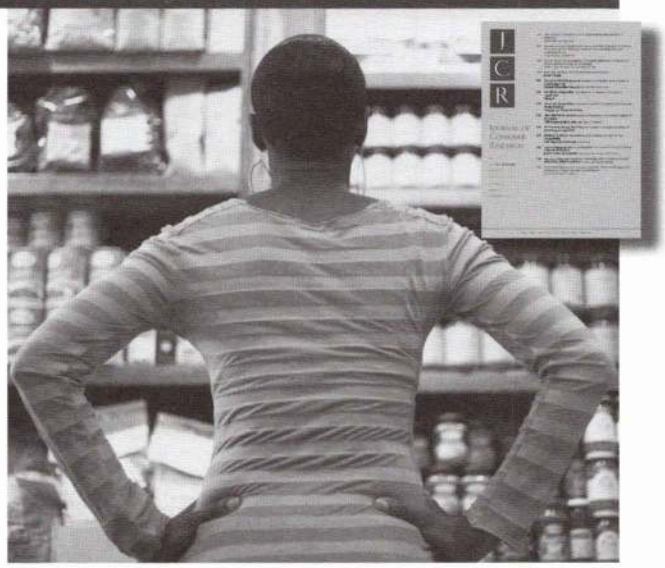
Tuesday, October 14, 9:00am-1:00pm $50
The World War II Memorial honors those who served in the armed forces of the U.S. during World War II. The U.S. Holocaust Memorial Museum is dedicated to presenting the history of the persecution and murder of six million Jews and of other victims from 1933 to 1945. The permanent exhibition presents a comprehensive history of the Holocaust through artifacts, photographs, films and eyewitness testimonies.

JOURNAL OF CONSUMER RESEARCH
AN INTERDISCIPLINARY BIMONTHLY

Since 1974, the *Journal of Consumer Research* has published interdisciplinary research that describes and explains consumer behavior.

JCR features empirical, theoretical, and methodological articles spanning a broad range of fields, including psychology, marketing, communications, sociology, economics, and anthropology.

Every serious scholar and student of consumer behavior should have a subscription.



Gaining access to journal content is easy these days. Your personal subscription is essential because it will support *JCR*'s educational initiatives and will ensure that *JCR* remains the premier publication for consumer behavior research for years to come.

Submit your best research to *JCR*

✓ Prompt turnaround on reviews
✓ Deep domain expertise among reviewers
✓ Outstanding publicity and citation rates

JCR's articles are highly cited by scholars and receive prominent media attention. In fact, an article in *JCR* was one of the most cited business and economics articles ever, according to Thomson Scientific, which tracks citations for more than 11,000 academic journals. Departments with scholars who publish in *JCR* are flourishing.

Manuscript Submission Information:
http://ejcr.org

Recent *JCR* research is featured in the *New York Times*, *The Washington Post*, *The Wall Street Journal*, *Business Week*, and *The New Yorker*.

www.journals.uchicago.edu/JCR

Order Online
www.journals.uchicago.edu/JCR/order1.html
Choose the MEMBER rate

Order by Phone
Toll-free 1.877.705.1878 or 773.753.3347
Mention the MEMBER rate

Take advantage of your member discount.

INFORMS Members pay only $65 for six issues.

This is $95 off the regular price of $160.

THE UNIVERSITY OF CHICAGO PRESS
JOURNALS DIVISION

SPECIAL RECEPTIONS

YOUR BADGE IS YOUR TICKET

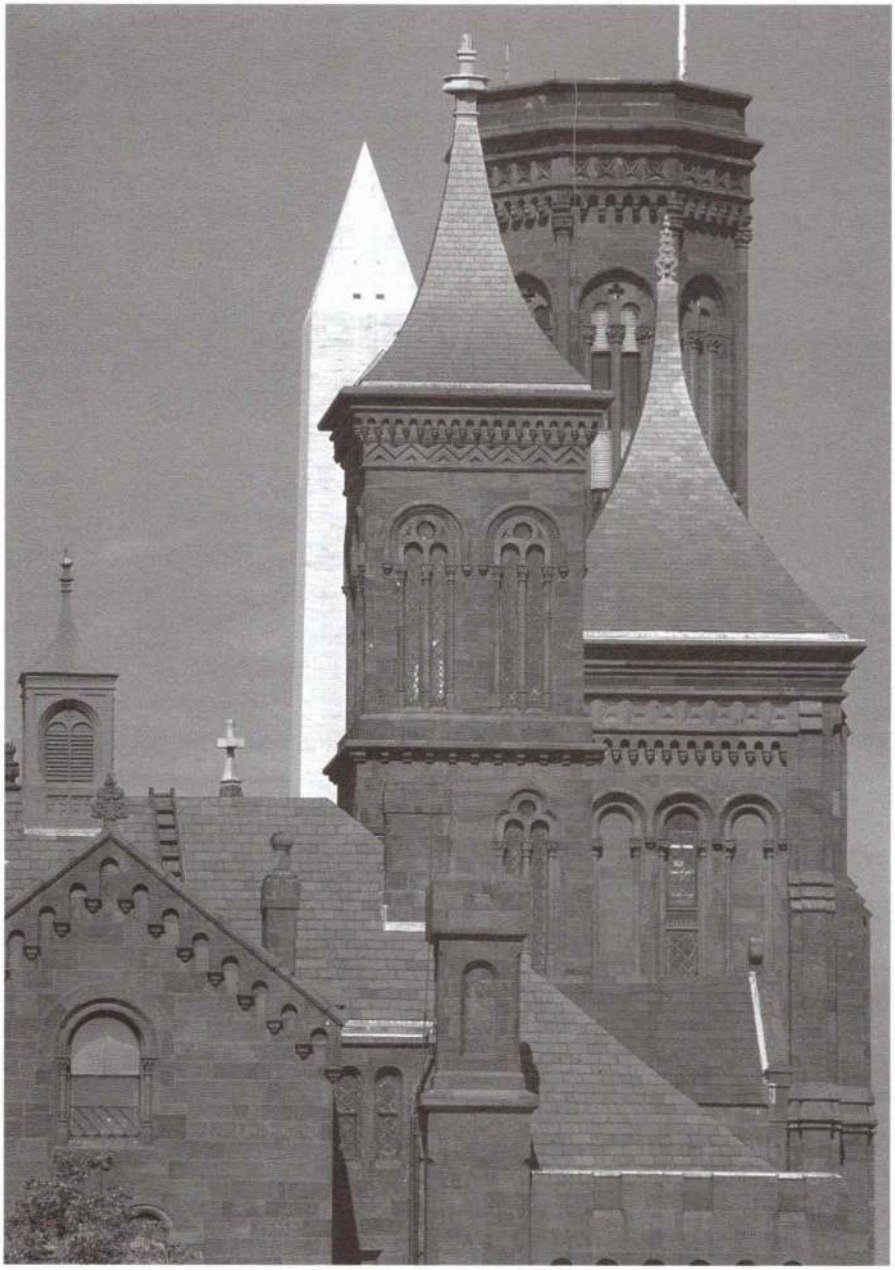
Wear your badge for admission to these events; your meeting registration fee includes these receptions. If your guest would like to accompany you, a guest registration must be purchased (guests will receive a special badge). The $75 guest fee includes the Sunday Welcome Reception, Sunday Awards Ceremony, Tuesday General Reception and continental breakfasts on Sunday, Monday and Tuesday (breakfasts held at the Marriott Hotel, Stone's Throw Restaurant private dining room).

SUNDAY

WELCOME RECEPTION

7:30pm-9:00pm
Marriott Wardman Park
Exhibit Hall A

INFORMS and the DC Organizing Committee welcome you to the 2008 Annual Meeting with an evening of fellowship and fun. The Welcome Reception is the perfect venue to meet with colleagues, visit the exhibits and enjoy some great food. Soft drinks and water are complimentary, with a cash bar available for other beverages.



INFORMS AWARDS CEREMONY & DESSERT RECEPTION

8:30pm-9:45pm
Marriott Wardman Park
Marriott Ballroom 2, Lobby Level

The INFORMS Board of Directors invites you to honor and celebrate the achievements of our colleagues at the annual Awards Ceremony. You can attend the Welcome Reception first and then take the escalator up to the Lobby Level for the Awards Ceremony. Following the ceremony, you'll have an opportunity to congratulate the awardees at a special dessert reception.

The society's 2008 awards will be bestowed on these deserving individuals:

INFORMS Prize for the Teaching of OR/MS Practice
James J. Cochran

INFORMS Expository Writing Prize
Henk Tijms

INFORMS Impact Prize
Thomas L. Saaty

John von Neumann Theory Prize
Frank Kelly

George E. Kimball Medal
Kathryn E. Stecke
John Birge

Frederick W. Lanchester Prize
Warren P. Adams and Hanif D. Sherali
Lawrence M. Wein

INFORMS President's Award
Margaret Brandeau

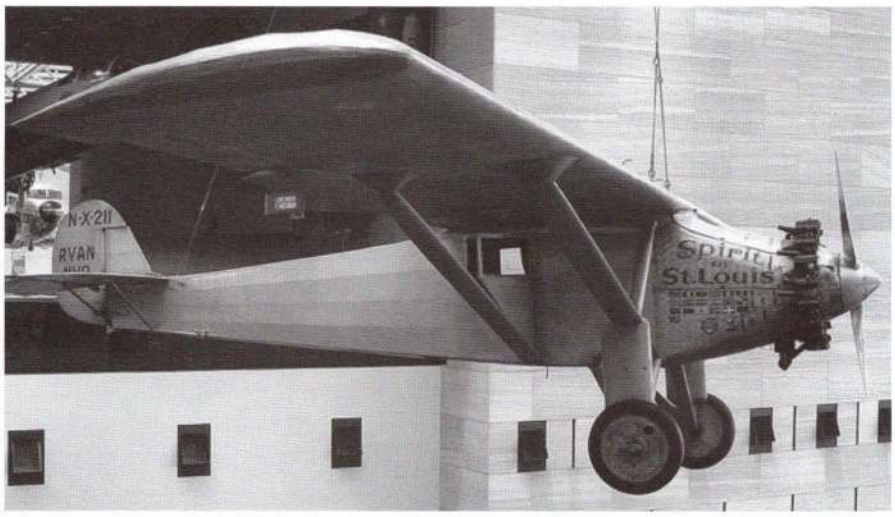
Two student paper awards will also be announced during the ceremony: the George E. Nicholson Student Paper Competition and the George B. Dantzig Dissertation Awards. In addition, the winners of the Bonder Scholarships for Applied Operations Research in Health Science and in Military Applications will be presented.

Thank You

GAMS

GAMS Development Corporation

SPECIAL RECEPTIONS



TUESDAY

GENERAL RECEPTION – SMITHSONIAN NATIONAL AIR & SPACE MUSEUM

7:30pm-9:30pm (buses leave the Marriott, 24th Street Entrance, beginning at 7:00pm)

An icon in the museum world, the Smithsonian National Air & Space boasts the most dazzling array of flying machines ever assembled in one place. Soon after it opened in 1976, it became the most visited museum in the world – a distinction it still holds today. The artifacts in its 23 exhibit areas span the history of flight, from the shores of Kitty Hawk to the surface of the Moon and Mars.

All the major exhibits of the museum are open to our attendees: the milestones of flight gallery, the space race, the golden age of flight, lunar exploration vehicles and much more. You can see Charles Lindbergh's Spirit of St. Louis, Chuck Yeager's Bell X-1, John Glenn's Friendship 7 spacecraft and the Apollo 11 command module. There will be two showings each of the IMAX feature, "To Fly," and of the Planetarium Show.

We'll be serving great food and drink throughout the evening. You will receive two tickets for complimentary beer or wine when you enter the museum. Soft drinks and bottled water are also complimentary.

PLEASE NOTE: Because the Smithsonian is a U.S. government property, purchase of alcohol is not allowed. Therefore, you will not be able to purchase additional tickets for beer or wine.

See important bus information at right.

Thank You
SmartOps®

BUS INFORMATION

To Museum from Omni & Marriott

Schedule: Buses will leave beginning at 7:00pm. The last bus will leave the hotels at 7:45pm.

Departure Locations: Marriott–24th Street Entrance; Omni–Parkview Entrance. See maps on pages 47-48 for exact locations.

Trip: The drive to the museum is approximately 20 minutes. During the trip, you will receive information on the museum. When you enter the museum, you will receive two complimentary drink tickets for wine or beer.

Return from Museum

To Omni & Marriott:

Buses will begin departing from the museum at 8:30pm from the Mall Entrance, and will run continuously. **The last bus will leave the museum at 9:45pm.**

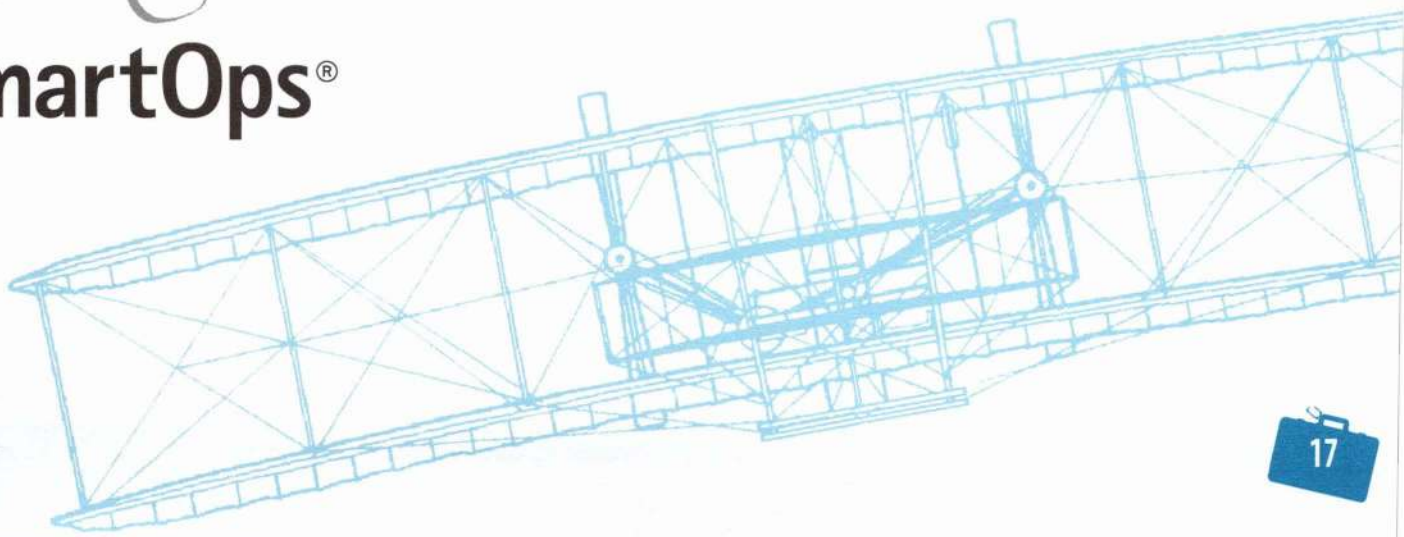
To Other INFORMS Hotels

If you are staying at another INFORMS hotel (see list below), you have two options for the return.

- Take a bus back to the Omni/Marriott and then travel to your hotel by cab or Metro. The Metro closes at 11:45pm.
- Take a bus direct to your hotel at 9:30pm. There will be only one trip scheduled for these routes, all leaving the museum at 9:30pm: *Bus 1:* Churchill Hotel, Windsor Park Hotel, and Carlyle Suites, *Bus 2:* Days Inn Connecticut Avenue and Savoy Suites, *Bus 3:* Hilton Rockville.

These 9:30pm buses will leave from the Independence Avenue Entrance of the Museum. Bus monitors will direct you to the correct bus.

INFORMS hotels: Carlyle Suites, Churchill Hotel, Days Inn Connecticut Ave., Hilton Rockville, Savoy Suites, Windsor Park Hotel.



Building Custom Decision Support Systems

Innovative Scheduling is engaged in building custom decision support systems for solving planning and scheduling problems arising in logistics, distribution, and transportation.

We specialize in:

- Developing custom optimization and simulation algorithms and software using cutting-edge operations research techniques.
- Building fast, robust, and scalable methods for solving large-scale and highly constrained problems.
- Packaging algorithms into spreadsheet-based, desktop-based, or web-enabled interactive decision support systems (including maps).

We recommend progressive implementation where a large project is decomposed into multiple phases; each phase builds upon the previous phase, creates a value of its own, and generates sufficient benefits to fund the next phase.

Feel free to stop by at our exhibition booth to learn how we can create value for your organization and a guaranteed return on your investment.

info@InnovativeScheduling.com
(352) 334-7283, Ext. 301

2153 SE Hawthorne Road, Suite 128
Gainesville, FL 32641, USA

INNOVATIVE SCHEDULING

TRANSFORMING THE WORLD OF TRANSPORTATION

www.InnovativeScheduling.com

Networking & Social Events

All events are located in the Marriott Wardman Park.

SATURDAY, OCTOBER 11

INFORMS Membership Meeting & Reception
5:00pm-6:00pm
Washington 5 & 6, Exhibit Level
The INFORMS Board of Directors encourages all members to bring their ideas, opinions and suggestions to this annual meeting. Current business and future directions for INFORMS are on the agenda. Wine and cheese will be served.

SUNDAY, OCTOBER 12

New Member Breakfast
7:00am-8:00am (Ticket Required)
Marshall South, Mezzanine Level
The INFORMS Membership Committee will host this breakfast to welcome and orient people who are new INFORMS members. Representatives from several INFORMS communities will be on hand to provide information about their services. Continental breakfast will be served. New members will receive a ticket with their registration materials.

Junior Faculty Interest Group Luncheon
12:00pm-1:30pm
Marshall South, Mezzanine Level
$15 – *A limited number of tickets may be available on-site.* Go to the INFORMS registration desk for information on availability.

All junior faculty are invited to participate. This event gives junior faculty in engineering and business schools the opportunity to discuss career development and exchange ideas. A buffet lunch will be served.

Luncheon and JFIG paper competition are sponsored by Olin Business School at Washington University in St. Louis; P.C. Rossin College of Engineering and Applied Science at Lehigh University; and Operations and Technology Management Department at Boston University School of Management.

INFORMS Professional Colloquium (IPC) Meeting & Reunion
12:00pm-1:00 pm
Hoover, Mezzanine Level
Calling all IPC alumni and meeting attendees who support making the transition from "OR student" to "OR practitioner" a successful one! Network, share your experiences, and brainstorm on what the INFORMS community can do to help industry-bound students succeed as they launch their careers. Bring your own lunch. The 5th IPC for Masters and PhD level students will be held on April 26, 2009 in Phoenix, AZ in conjunction with the INFORMS Practice Conference.

INFORMS Online (IOL) Reception
6:00pm-7:00pm
Virginia A, Lobby Level
What's your online strategy for yourself or for your INFORMS community? How can INFORMS Online (IOL) help you advance that? Come and tell us over refreshments and drinks. We are your IOL team.

Minority Issues Forum Reception
8:00pm-9:00pm
Virginia B, Lobby Level
Come meet old friends and make new ones while talking about minority issues and other intellectual issues and opportunities.

Sponsored by Cornell University, ORIE Dept.; Duke University and Rice University.

MONDAY, OCTOBER 13

COIN-OR Members & Users Meeting - Bag Lunch
12:15pm-1:15pm
Wilson A, Mezzanine Level
Anyone interested in open-source software tools, open standards, and data and model repositories for any aspect of operations research is encouraged to attend this Computational Infrastructure for OR (COIN-OR) meeting. Bring your own lunch and ideas. For more information, visit www.coin-or.org.

CPMS Isolated Practitioner Workshop & Reception
6:15pm-7:15pm
Washington 5, Exhibit Level
CPMS, The Practice Section of INFORMS, sponsors this workshop on topics of interest to isolated practitioners, the "Lone Rangers" of OR/MS. This 25th workshop will address timely issues that affect isolated practitioners. All are welcome to participate. Wine and cheese will be served.

Student Reception
7:30pm-9:00pm
Marshall North & East, Mezzanine Level
All students registered for the meeting are encouraged to attend this special reception for an opportunity to socialize and network with other students.
Sponsored by IBM Research

Women in OR/MS Forum Reception
8:00pm-10:00pm
Ireland's Four Fields – 3412 Connecticut Ave. NW
All those interested in encouraging women in the OR/MS profession are invited to join us for the reception. Hors d'oeuvres and drinks will be served.

Sponsored by: ILOG, Inc.; Northwestern University; University of Alabama; and University of Washington, College of Engineering

TUESDAY, OCTOBER 14

Women in OR/MS Forum Business Meeting & Luncheon
12:30pm-1:30pm
Marshall East, Mezzanine Level
$10 ($5, students) – *A limited number of tickets may be available on-site.* Go to the INFORMS registration desk for information on availability.
All those interested in issues related to women professionals in OR/MS are invited to join us.

Sponsored by: University of Massachusetts, College of Engineering; ILOG, Inc.; SAS Institute, Inc.; University of Massachusetts, Isenberg School of Management; Northwestern University, IEMS Department; Union Pacific Railroad; University of Alabama, Operations Management Program; University of Washington, College of Engineering; Virginia Commonwealth University; University of Wisconsin-Madison, Department of Industrial and Systems Engineering .

Academic/Practitioner Interface Luncheon
12:30pm-1:30pm
Marshall South, Mezzanine Level
$30 – *Ticket required - sign up at the INFORMS registration desk.*
Don't miss this opportunity to network with colleagues, both in the practice and academic arenas. Facilitated roundtable discussions will focus on academic-practitioner collaboration during this sit-down luncheon.

SATURDAY WORKSHOPS

All workshops are located in the Marriott Wardman Park.

DM-HI WORKSHOP

Breakfast/Welcome Session
8:00am-8:30am - Lincoln 2, Exhibit Level

Workshop
8:30am-5:00pm - Lincoln 2-3-4, Exhibit Level

The Data Mining (DM), Artificial Intelligence (AI) and Health Applications (HA) subdivisions of INFORMS are jointly organizing this pre-conference workshop. The DM, AI and HA sections are interdisciplinary subdivisions that bring together researchers and practitioners in science, engineering and business that are interested in the theories, applications and methodologies of DM, AI and health informatics.

The DM-HI Workshop highlights the frontiers of fundamental and applied research in DM, AI, knowledge discovery, and informatics related to health applications. The workshop consists of two parallel tracks, and each track consists of two morning and three afternoon sessions including a tutorial session.

Thank You

Sponsored by:
INFORMS Section on Artificial Intelligence
INFORMS Section on Data Mining
INFORMS Section on Health Applications

VENDOR WORKSHOPS

AIMMS® (Paragon)
Creating and Diagnosing Your Advanced Optimization Models
12:00pm - 3:00pm
Wilson C, Mezzanine Level

COIN-OR
COmputational INfrastructure for Operations Research
12:00pm - 3:00pm
Wilson A & B, Mezzanine Level

Fair Isaac
Fast Track Optimization Modeling using Xpress-MP
12:00pm - 3:00pm
Room 8209, Lobby Level

Frontline Systems, Inc.
First Look: Optimal Decisions for Uncertain Models – Made Easy
3:00pm - 6:00pm
Balcony C & D, Mezzanine Level

GAMS Development Corporation
GAMS Modeling System and Productivity Tools
9:00am – 12:00pm
Balcony C & D, Mezzanine Level

ILOG, Inc.
ILOG CPLEX Workshop
3:00pm - 6:00pm
Washington 2, Exhibit Level

JMP Division - SAS
Exploration, Experimentation, and Visualization with JMP
9:00am – 12:00pm
Washington 2, Exhibit Level

LINDO Systems, Inc
Incorporating Uncertainty (Intentionally) into Your Optimization Models
3:00pm - 6:00pm
Wilson C, Mezzanine Level

Lumina Decision Systems
Analytica Workshop
12:00pm - 3:00pm
Room 8219, Lobby Level

Maximal Software, Inc.
Optimization Modeling with MPL: Integrating Optimization in Real-World Business Applications
12:00pm - 3:00pm
Room 8226, Lobby Level

OptiRisk Systems
Genetic Algorithm and Deterministic Planning Model
9:00am – 12:00pm
Room 8209, Lobby Level

Responsive Learning Technologies
Online Games for Operations Management and Supply Chain Courses
3:00pm - 6:00pm
Wilson A & B, Mezzanine Level

River Logic, Inc.
Integrated Business Planning with Enterprise Optimizer (EO)
9:00am – 12:00pm
Room 8219, Lobby Level

Salford Systems
Getting Started with Data Mining
3:00pm - 6:00pm
Room 8226, Lobby Level

SAS
Building and Solving Optimization Models with OPTMODEL
12:00pm - 3:00pm
Balcony C & D, Mezzanine Level

TranSystems
Using Simulation Models to Analyze Systems: What is it, How Does it Work and What's the Benefit?
9:00am – 12:00pm
Room 8226, Lobby Level

FOR PRACTITIONERS

Whether you work in industry, government or consulting, you'll find the best applications resources at the INFORMS Annual Meeting.

Focus on Practice
Sunday-Tuesday
Tracks 31-32, Washington 5 & 6, Exhibit Level
Real-world applications are the focus of practice-oriented sessions, including presentations by speakers from IBM, Ford, Metron, Concurrent Technologies, Lockheed Martin, ASR Analytics, MIT, U.S. Coast Guard, GE and more. The Daniel H. Wagner Prize Competition (Monday, Track 32) features seven finalist teams for this prize for excellence in O.R. practice. You can also find practice-oriented talks in many of the 68 tracks including sessions on data mining, health applications, supply chain, revenue management and marketing.

2008 Franz Edelman Award Reprise
Sponsored by CPMS, The Practice Section of INFORMS
Sunday, October 12
10:00am-10:50am
Marriott Ballroom 2, Lobby Level
Netherlands Railways - 2008 First Place Winner
The New Dutch Timetable: The O.R. Revolution

CPMS Isolated Practitioner Workshop & Reception
Monday, October 13
6:15pm–7:15pm
Washington 5, Exhibit Level
CPMS, The Practice Section of INFORMS, sponsors this workshop on topics of interest to isolated practitioners, the "Lone Rangers" of OR/MS. The 25th workshop in this series will address timely issues that affect the isolated practitioner community. All are welcome - wine and cheese will be served.

Tutorials
Sunday-Wednesday
See pages 31-34 for abstracts and schedule.
These 90-minute sessions offer an in-depth look at current methodologies. Topics include OR and healthcare, airline safety, optimization and more. INFORMS has published 15 of the 18 tutorials in a CD. All meeting attendees get a complimentary CD – tear out the card inside this program and bring to the special booth next to the registration desk or the INFORMS booth (#700) in the exhibit hall to get your copy. Book format and additional CDs may also be purchased during the meeting at discounted prices.

Software Demonstrations
Sunday–Tuesday
See pages 35-39 for abstracts and schedule.
See new product releases, case studies and software presented by leading vendors and solution providers.

Academic/Practitioner Interface Luncheon
Tuesday, October 14
12:30pm-1:30pm
Marshall South, Mezzanine Level
$30 – *Ticket required – sign up at the INFORMS registration desk.*
Don't miss this opportunity to network with your colleagues in the practice and academic arenas. Facilitated roundtable discussions will focus on academic-practitioner collaboration during this sit-down luncheon.

Practice/MAS Keynote
Co-sponsored by CPMS, The Practice Section of INFORMS and the Military Applications Society
Monday, October 13
Marriott Ballroom 3, Lobby Level
David Halverson, Director of Force Development, Office of the Deputy Chief of Staff, G-8, U.S. Army, will speak on "Innovative Methods Required for Future Challenges." His talk outlines the modernization taking place in modern warfare essential to fielding the capabilities required to prevail in combat.

USC Viterbi School of Engineering

Daniel J. Epstein Department of Industrial & Systems Engineering

THE ELEMENT OF SURPRISE

A research project at the Center for Risk and Economic Analysis of Terrorism Events (CREATE), the Department of Homeland Security national research center headed by Epstein ISE professor Detlof von Winterfeldt, recently garnered worldwide media attention.

A team led by USC computer science professor Milind Tambe and Epstein ISE Associate Professor Fernando Ordonez, are creating randomization software to make vehicle checkpoints at airports unpredictable for observers. A doctoral thesis by their student, Praveen Paruchuri, is the basis for the software.

LEADING SCIENTIST JOINS EPSTEIN FACULTY

Grid computing pioneer Carl Kesselman has accepted a primary appointment in the Viterbi School's Epstein ISE Department, with a joint appointment in the Computer Science Department beginning this fall.

DISTANCE LEARNING

The Viterbi School has 30+ MS degrees available 100% online, including the following from the ISE department:

- Engineering Management
- Industrial & Systems Engineering
- Product Development Engineering
- System Safety & Security
- Systems Architecting & Engineering

Visit http://den.usc.edu for more information.

OR EXCELLENCE

Epstein ISE Professor Maged Dessouky won the IIE Operations Research Division's Teaching Award, and a best paper award from the INFORMS Transportation Science and Logistics Society.

Don N. Kleinmuntz, a Research Professor in the Epstein Department working with CREATE, will become the President of INFORMS in 2009. Kleinmuntz was named an INFORMS Fellow last November.

SYSTEMS-ARTS COLLABORATION FRONTIER

Elaine Chew, an Associate Professor in the Epstein Department, spent the last year as a Radcliffe Fellow at Harvard. Her activities included organizing a symposium featuring state-of-the-art, award-winning systems for computer-assisted music composition, human-machine improvisation, and automated accompaniment, juxtaposing four unique viewpoints on intelligent interactive music systems.

USC Viterbi School of Engineering

USING SE TO STRENGTHEN HEALTH CARE MANAGEMENT

The Epstein ISE Department has received a new grant from the California HealthCare Foundation to provide management engineering services to California safety net hospitals and develop methods to expand the use of such engineering to reduce health care costs.

Early in the 2008-09 academic year, the Epstein ISE Department and USC's School of Policy, Planning and Development will collaborate on the launch of a new MS degree in Health Systems Management Engineering.

USC For the full story and complete picture, visit www.usc.edu/dept/ise

SPECIAL PROGRAMS

Operations Research Practice in Africa (ORPA) Joint Annual Conference 2008
Friday-Saturday (Separate registration required)
Schedule and room locations on page 6.

A first joint effort between ORPA, INFORMS and IFORS, the conference is focused on the use of O.R. in Africa to aid development and promote sustainable growth through the use of cutting-edge techniques unique to the field. Two major topics will be addressed: urban transportation and water resource management issues.

2008 Combined Colloquia with New Teaching Effectiveness Colloquium
Schedule and room locations on page 6

The new, two-day Teaching Effectiveness Colloquium incorporates elements previously covered by the INFORMS Teaching of Management Science summer workshops. The Future Academician and Future Practitioner Colloquia begin their activities with a Friday evening dinner meeting, and continue a full-day Saturday program. Participation in the colloquia is by nomination only.

Sponsored by George Washington University, SAS, Omega Rho and Cengage Learning

Organization Science: Dissertation Proposal Competition
Saturday, 8:30am-5:00pm
Hoover, Mezzanine Level
This competition is one of the most prestigious available to doctoral students studying organizations. Finalists present their dissertation proposals and receive detailed feedback from a panel of respected organizational scholars who act as judges. The workshop also provides an opportunity for attendees to interact with a small group of future colleagues.

CIST 2008 – Conference on Information Systems and Technology
Saturday: Virginia A, Delaware A, Lobby Level
Sunday: Virginia B & C, Lobby Level
The theme of the 2008 conference is Expanding the Boundaries of IS Research. The goal of this conference is to engage academic and industry researchers in a dialogue that examines a broad range of topics consistent with the main thrust of this theme.

Sponsored by the University of Maryland, University of Texas at Dallas and INFORMS Information Systems Society.

Tribute to Richard Rosenthal
Sunday SD01, 4:30pm-6:00pm
Marriott Ballroom 3, Lobby Level
Monday MB03, 11:00am-12:30pm
Marriott Ballroom 1, Lobby Level
Tuesday TD04, 4:30pm-6:00pm
Delaware B, Lobby Level
Wednesday WB35, 11:00am-12:30pm
Jackson, Mezzanine Level
WD04, 4:30pm-6:00pm
Delaware B, Lobby Level

Colleagues will recall and honor Rick Rosenthal's mentoring skills and breadth, passion and commitment to operations research in these presentations.

Tribute to Michael Rothkopf
Monday Track 6, Virginia C, Lobby Level
Wednesday WA35, 8:00am-9:30am
Jackson, Mezzanine Level

These presentations highlight Mike Rothkopf's influence on auctions theory and on his role as an outstanding teacher and mentor.

Dantzig Memorial Sessions
Tuesday Track 3, Marriott Ballroom 1, Lobby Level

Most of the 12 distinguished speakers featured in this cluster were either colleagues or students of George Dantzig. They will present their thoughts on his life and scientific legacy.

Washington Area Math Teachers Program
Monday
8:00am-5:00pm
Marshall East, Mezzanine Level
This program, geared to middle/high school/community college math and science teachers, will consist of introductory O.R. and computer application presentations followed by hands-on participation. Participants are also welcome to attend technical sessions, and will receive copies of all program materials.

Sponsored by AEgis Technologies Group, Inc.

Special Presentations
DOING GOOD WITH GOOD OR

These special presentations are aimed at demonstrating how OR provides important insights that can be used to inform and shape public policy. We focus on three daunting societal challenges: energy and the environment; public health; and air congestion. Each focus area features a presentation by a leader in the field, followed by a panel discussion involving key stakeholders and experts from government, industry and academia.
See pages 28-29 for complete details.

Sloan Industry Studies Program
The Sloan Foundation Industry Studies Program and INFORMS have jointly organized several sessions that demonstrate how industry studies, and in particular direct observational engagement, shape the research being done by scholars in our community. Check the Master Track Schedule for the times and locations of these sessions.

- SB58 - airline planning,
- MC39 – knowledge networks,
- MD63 – planning problems in transportation,
- MD65 – healthcare scheduling,
- MD68 – new technologies and brands in the automotive industry,
- TA56 – freight issues,
- TB32 – travel and tourism industry,
- TC32 –supply chain and healthcare.

Applied Probability Society Markov Lecture
A featured presentation by Steven Shreve, Orion Hock Professor of Mathematics at Carnegie Mellon University, on "Mixing Models to Capture Stock Price Volatility" is scheduled for Monday, MA23, 8:00-9:30am.

PLENARY & KEYNOTE PRESENTATIONS

SUNDAY

WELCOME & EDELMAN REPRISE

10:00am-10:50am
Marriott Ballroom 2, Lobby Level

Welcome

Cynthia Barnhart, President, INFORMS
Associate Dean for Academic Affairs
Civil and Environmental Engineering and
Engineering Systems, School of Engineering
Co-director, Operations Research Center
Massachusetts Institute of Technology

Reprise Presentation

Edelman Competition 2008 Award Winner
The New Dutch Timetable:
The O.R. Revolution

Netherlands Railways: Erwin Abbink, Pieter-Jan Fioole, Dennis Huisman, Leo Kroon, Roelof Ybema, Bert Meerstadt

University of Padua: Matteo Fischetti

Erasmus University Rotterdam: Gábor Maróti

CWI: Lex Schrijver

Safiro Software Solutions: Adri Steenbeek

In December 2006, Netherlands Railways introduced a completely new timetable, designed to facilitate further growth of passenger and freight transport on a highly utilized railway network, and to improve the robustness of the timetable in order to reduce the number of train delays in the operation. The construction of a railway timetable from scratch for about 5,500 daily trains was a complex puzzle. To support this process, sophisticated OR techniques were used to generate several timetables, one of which was finally selected and implemented. Furthermore, the costs of a railway operator are mainly determined by the rolling stock and crew schedules. Two innovative OR tools were used to come up with efficient schedules for these two resources. The more efficient resource schedules and the increased number of passengers has already resulted in an annual additional profit of 40 million Euros ($60 million US). It is expected that this will increase to 70 million Euros ($105 million US) in coming years. However, the benefits of the new timetable for the Dutch society as a whole are much higher: more trains are transporting more passengers on the same railway infrastructure, and all these trains run more on time than ever before. As a result, future growth in transportation demand can be handled by rail transport, allowing cities to remain accessible. Moreover, the emission of greenhouse gases has been reduced.

The Franz Edelman Award for Achievement in Operations Research and the Management Sciences calls out, recognizes and rewards outstanding, high-impact applications of OR/MS. Each year, six to seven finalists compete in the "Super Bowl" of O.R. in practice. The 2008 finalists included City of Stockholm, Federal Aviation Administration, StatoilHydro and Gassco, U.S. Environmental Protection Agency and Xerox Corporation In this keynote, the first-place Netherlands Railways team will reprise their winning presentation.

OMEGA RHO DISTINGUISHED LECTURE

3:10pm-4:00pm
Marriott Ballroom 2, Lobby Level

Auctions: Why are they proliferating and what do you need to know to participate?

Karla Hoffman
Professor, Systems Engineering & Operations Research
School of Information Technology and Engineering
George Mason University

The advent of the Internet has led to the creation of truly global marketplaces in which sales of everything from low-cost used merchandise to billion dollar government procurements are conducted by auction. While some auction designs have been extremely successful, others have failed disastrously. This talk will describe a variety of alternative auction designs, and will explore why one design is likely to be more appropriate than another for a given application. We will begin with a brief history of auctions, provide reasons for eBay's spectacular success, and highlight the Internet's impact on auction theory and practice. We will then move on to a discussion of the strategies that are available to bidders in the most-utilized auction formats, thereby providing each of you with hints on how to be more successful when participating in auctions. Throughout the talk, we will highlight the role that operations research analysts can play in designing, running, and assisting participants in business-to-business and high-stakes government auctions.

Karla Hoffman is a Professor in the Systems Engineering and Operations Research Department at George Mason University where she was Chair for five years ending in 2001. She received her BS in mathematics from Rutgers University, and her MBA and D.Sc. from George Washington University. She worked as a mathematician in the Operations Research Department of the Center for Applied Mathematics of the National Institute of Standards and Technology where, in 1984, she was awarded the Applied Research Award for her research in solving large combinatorial optimization problems. Her other awards include George Mason University's Distinguished Faculty Award, the INFORMS Fellows Award, and the George E. Kimball Medal. She was President of INFORMS in 1999 and has also served on the Executive Committees of ORSA and the Mathematical Programming Society. Dr. Hoffman's primary area of research is auction design and testing, and combinatorial optimization. Her research focuses on the development of new algorithms for solving complex problems arising in industry and government. She is currently a consultant to the FAA on auction design for arrival and takeoff slots and had previously consulted to the FCC on spectrum auctions.

OMEGA RHO

Omega Rho, the official Honor Society of INFORMS, was founded in 1976 to recognize superior scholarship and encourage leadership in operations research, management science and related disciplines. The society has 37 active collegiate chapters and more than 5,000 student and faculty members. It is a member of the Association of College Honor Societies. In addition to sponsoring Omega Rho Distinguished Lectures at INFORMS annual and international meetings, Omega Rho provides financial support to the annual INFORMS Colloquium and to its local chapters.

Honorary Membership in Omega Rho is bestowed upon individuals who provide leadership and extraordinary support for the encouragement of operations research and management science through their professional activities.

PLENARY & KEYNOTE PRESENTATIONS

MONDAY

PLENARY

10:00am-10:50am
Marriott Ballroom 2, Lobby Level

Perspectives on Mechanism Design in Economic Theory

Roger B. Myerson
2007 Nobel Memorial Prize in Economic Sciences
Glen A. Lloyd Distinguished Service Professor
Professor of Economics
University of Chicago

Mechanism design has extended the scope of economic analysis by adding incentive constraints to resource constraints in our definition of the economic problem. Incentive constraints provide an analytical framework for understanding failures of allocative efficiency, showing how such failures may depend on the initial allocation of property rights in a society. But mechanism-design theory changes the basic object of analysis from the resource allocation to the social plan or allocation mechanism that specifies how resource allocations should depend on people's information. Concepts of incentive efficiency can be applied to identify good institutional rules or mechanisms, taking incentive constraints into account. The cases for collectivism or private ownership may depend on trade-offs between different kinds of incentive problems: moral hazard and adverse selection.

Roger B. Myerson was awarded the 2007 Nobel Memorial Prize in Economic Sciences. He was recognized for his contributions to mechanism design theory, initiated by co-winner Leonid Hurwicz of the University of Minnesota, and which he further developed with others, including co-winner Eric Maskin of the Institute for Advanced Study. Dr. Myerson has made seminal contributions to the fields of economics and political science. In game theory he introduced a refinement of Nash's equilibrium concept, called "proper equilibrium." He has applied game theoretic tools to political science to study and compare electoral systems, and he also developed fundamental ideas of mechanism design, such as the revelation principle and "revenue-equivalence theorem." Dr. Myerson also has developed computer software for auditing formulas and for simulation and decision analysis for use with Microsoft spreadsheet software. He is the author of *Game Theory: Analysis of Conflict* (1991) and *Probability Models for Economic Decisions* (2005), and also has published numerous articles in *Econometrica, Mathematics of Operations Research* and the *International Journal of Game Theory*, for which he served as an editorial board member for 10 years. During his 25-year tenure at Northwestern University, Dr. Myerson twice served as a Visiting Professor in Economics at Chicago. He joined the Chicago faculty in 2001. He received his A.B., summa cum laude, and S.M. in applied mathematics in 1973 from Harvard University and a PhD, also in applied mathematics, from Harvard University in 1976.

DOING GOOD WITH GOOD OR

Don't miss these special presentations followed by panel discussions on:

Energy and the Environment
Tuesday 10:00-10:50am

Health Policy
Tuesday 3:10-4:00pm

Aviation Congestion
Wednesday 10:00-10:50am

Complete information on pages 28-29.

KEYNOTE

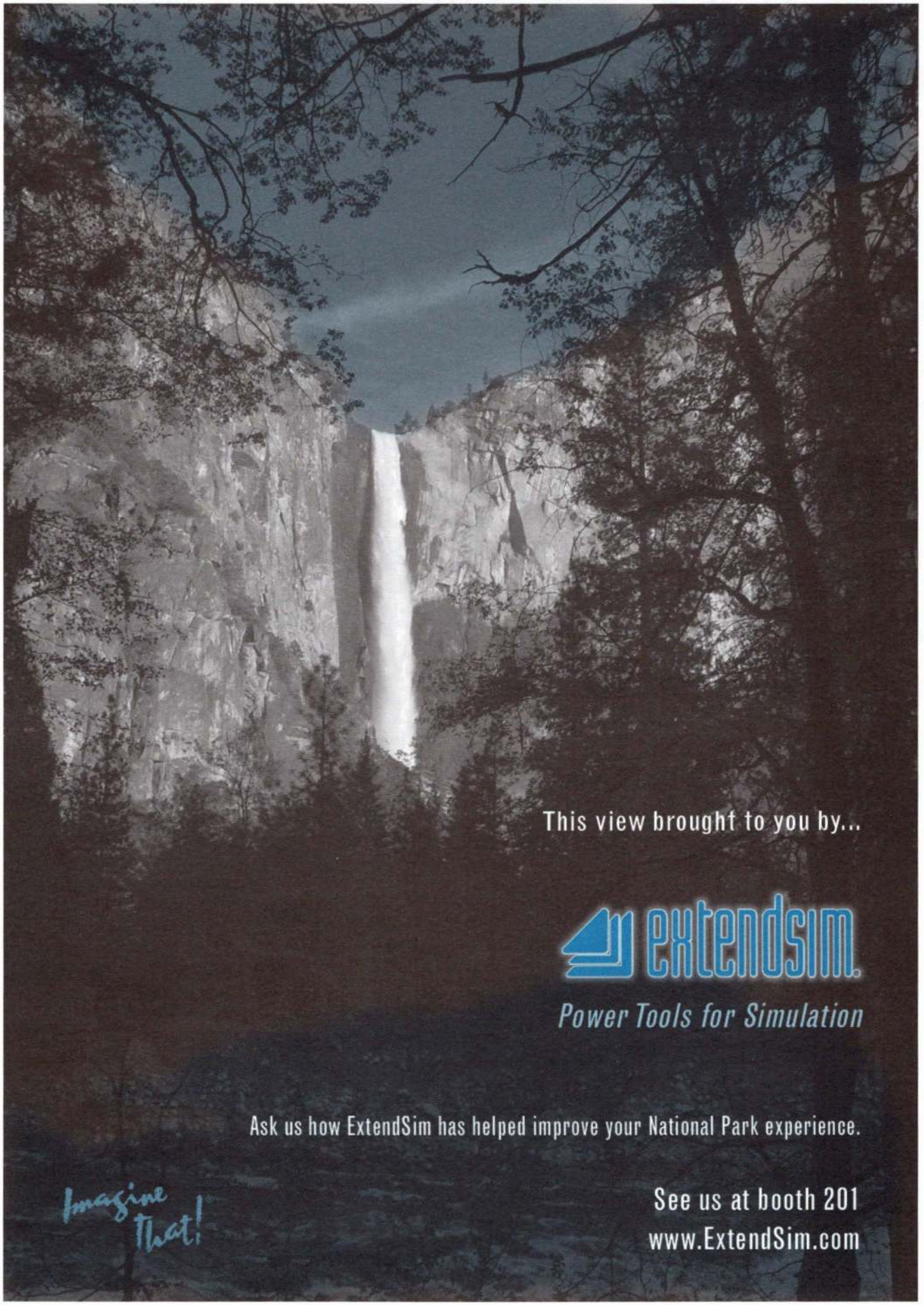
IFORS Distinguished Lecture
3:10pm-4:00pm
Marriott Ballroom 2, Lobby Level
Session Chair: Thomas Magnanti
IFORS Past President

One-Vote, One-Value: The Majority Judgment

Michel Balinski
Directeur de Recherche de classe exceptionnelle
École Polytechnique and CNRS, Paris

Mechanisms of every imaginable type have been invented across the ages to designate the winners and orders of finish among competing skaters, wines, restaurants, universities, beauty queens... and political candidates. The traditional theory of social choice asks: how are the "evaluations" of voters or judges to be amalgamated into a decision of the electorate or jury? It answers: there is no good method (the Condorcet paradox, Arrow's impossibility theorem, etc.). A new theory models the problem differently. Arrow's theorem now says there is no satisfactory mechanism unless there is a common language of measuring the qualities or the performances of competitors. But when there is a common language – and practice shows they exist and can be defined – then one simple, practical mechanism that has been tested and applied should be used: the majority judgment.

Michel Balinski, a Williams graduate, studied at MIT and Princeton. He has taught at Princeton, Penn, CUNY Graduate Center, Yale and SUNY, Stony Brook. Since 1982 he has been Directeur de Recherche de classe exceptionnelle, CNRS and Ecole Polytechnique, Paris, and Director of the Laboratoire d'Econométrie (1989-1999). He was awarded the Lanchester Prize in 1965, and an honorary degree in mathematics from the University of Augsburg in 2004. He is the founding editor of *Mathematical Programming* and a past President of the Mathematical Programming Society. Dr. Balinski is the author of *Fair Representation: Meeting the Ideal of One Man, One Vote* (1982, reissued 2001, with H. P. Young) and *Le suffrage universel inachevé* (2004), and author or co-author of some one hundred scientific articles (OR, mathematics and other journals). His principal current interest is the theory and applications of ranking and the design of electoral systems. One of his electoral systems is used in Zürich, Switzerland.


This view brought to you by...
extendsim
Power Tools for Simulation
Ask us how ExtendSim has helped improve your National Park experience.
Imagine That!
See us at booth 201
www.ExtendSim.com

PLENARY & KEYNOTE PRESENTATIONS

MONDAY

PRACTICE /MAS PLENARY PRACTICE SECTION, MILITARY APPLICATIONS SOCIETY

3:10pm-4:00pm

Marriott Ballroom 3, Lobby Level

Innovative Methods Required for Future Challenges

David D. Halverson
Director, Force Development, Office of the Deputy Chief of Staff, G-8
U.S. Army

Our nation's security requirements have changed significantly during the last decade. For the next twenty years there will be a period of protracted confrontation among state, non-state and individual actors who use violence to achieve their political and ideological ends. Given this setting, the U.S. Army is developing a viable combination of alternative materiel and non-materiel solutions based on revised strategic guidance and doctrine. The army is undertaking a quantum leap forward in modern warfare essential to fielding the capabilities required to prevail in combat. This modernization is being accomplished within given constraints while addressing critical capability gaps and risks to our security.

David D. Halverson was awarded a Bachelor of Science Degree from the United States Military Academy in 1979, and a Master of Science degree in Operations Research and Systems Analysis from the Naval Postgraduate School in 1989. He has held a variety of troop and staff positions, both in the U.S. and overseas. In June of 2001, Halverson became the CENTCOM J3, Chief of Plans and planned, coordinated and executed war plans for Operation Enduring Freedom and Operation Iraqi Freedom. On January 2007, he assumed duties as the Director of Operations, Readiness and Mobilization. Currently, Halverson serves as the Director of Force Development, G-8. Awards and decorations include the Defense Superior Service Medal with Oak Leaf Cluster, Bronze Star, Legion Of Merit with three Oak Leaf Clusters, Defense Meritorious Service Medal, Meritorious Service Medal with three Oak Leaf Clusters, Joint Commendation Medal, Army Commendation Medal, Army Achievement Medal with Oak Leaf Cluster, Armed Forces Expeditionary Medal, Humanitarian Service Medal, Joint Unit Medal, Korean Defense Service Medal, Global War on Terrorism Service Medal, Army Staff Badge and the Parachutist Badge.

TUESDAY

PHILIP MCCORD MORSE LECTURE

10:00am-10:50am
Marriott Ballroom 3, Lobby Level

Operations Research and Homeland Security: From Models to Implementation

Lawrence M. Wein
Paul E. Holden Professor of Management Science
Graduate School of Business
Stanford University

We give a brief description of our research on four topics in homeland security and public health: preparedness and response to a bioterror anthrax attack and to a bioterror attack on the food supply, routes of transmission and infection control for pandemic influenza, and biometrics (e.g., fingerprint matching) to prevent terrorists from entering the country. We focus on the modeling, the policy recommendations and the implementation of these recommendations. At the end of the talk, we attempt to draw lessons about policy implementation from these examples and from examples from our other homeland security work, including a bioterror smallpox attack, preventing nuclear weapons from entering the country on a shipping container, preventing nuclear weapons from entering a city, and preventing terrorists from sneaking across the U.S.-Mexico border.

Lawrence M. Wein is the Paul E. Holden Professor of Management Science at the Graduate School of Business, Stanford University. He received a PhD from the Operations Research Department at Stanford University in 1988. He was a professor at MIT's Sloan School of Management from 1988 to 2002. His research interests are in manufacturing and public health. Early in his career, Dr. Wein worked on heavy traffic analysis of queueing models for manufacturing systems, and his research on workload regulating release was implemented widely in the semiconductor industry. Later he worked on a variety of health problems related to kidney transplants, and treatments for HIV (which led to a successful multi-center clinical trial on drug switching protocols), cancer, Alzheimer's disease and influenza. Since the September 11, 2001 attacks, much of his research has focused on homeland security. His most recent work addresses post-traumatic stress disorder in Operation Iraqi Freedom soldiers, and space debris. He was Editor-in-Chief of *Operations Research* from 2000 to 2005.

WEDNESDAY

PLENARY

3:10pm-4:00pm
Marriott Ballroom 2, Lobby Level

Engineering in the Entertainment Industry

Daniel P. Cook
Professor, Entertainment Engineering and Design Program
University of Nevada, Las Vegas

Developments in technology drive, and in turn, are driven by the entertainment industry. Nowhere is this more obvious than in the live theatrical productions created by Montreal-based Cirque du Soleil. Known originally for its acrobatics, Cirque du Soleil has become a powerhouse in the modern theatrical world through the sophisticated integration of automation systems into its shows to control motion, lighting, audio, pyrotechnic, and projection effects. This presentation will focus on the show Ka, the $200 million Cirque du Soleil production located at the MGM Grand hotel and casino in Las Vegas, and will give a backstage look at how technology allows Cirque du Soleil to breath new life into familiar stories.

Daniel P. Cook has spent the last three years working extensively with entertainment companies such as Cirque du Soleil as coordinator of UNLV's new Entertainment Engineering and Design program. He spent the summer of 2007 employed as an on-call stage hand at Cirque's show Ka in order to gain a first-hand understanding of how technology is incorporated into the modern, live entertainment industry. His more traditional engineering experience includes work for Reynolds Metals, Phillip Morris, Hamilton-Beach, Alcoa and Apple Computer. He holds a BS in Metallurgical Engineering from Ohio State, and a PhD in Materials Science from the University of California, Berkeley.

Doing Good with Good OR

These special presentations are aimed at demonstrating how operations research can (and does) provide important insights that can be used to inform and shape public policy. Each focus area features a presentation by a leader in the field, followed by a panel discussion involving key stakeholders from government and industry together with academic experts.

ENERGY & THE ENVIRONMENT

Tuesday, October 14
Presentation: 10:00am-10:50am
Panel Discussion: 11:00am-12:30pm
Marriott Ballroom 2, Lobby Level

The world currently faces a number of crucial energy and environmental challenges – from oil security to local air pollution to global climate change to sustainable development. These challenges have all moved from being back page news to front page news over the last couple of decades, reflecting a growing sense of urgency for the development of solutions felt by both policy makers and the public. Policy makers at all levels – local, state, national and international – have long relied on OR/MS style models to provide insights into the choices they face. This presentation and panel will assess our experience in using models to inform energy and environmental policy making at the national and international levels. Since we are now moving closer to the carrying capacity of the earth's most vital life support systems – the atmosphere, the oceans, the ecosystems, etc.– the speakers will also identify the most important directions for future research for meeting the challenges we face.

MORE "DOING GOOD"

There are many other sessions on the program that demonstrate how ORMS professionals are helping to solve the toughest societal problems. Here are just a few.

- Humanitarian Logistics & Disaster Preparedness – Track 52, Tuesday & Wednesday, with sessions on relief logistics, preparedness for pandemics, development assistance and more.
- Environmentally Conscious Operations – Track 52, Sunday & Monday, with sessions on closed-loop supply chain, remanufacturing, impacts of environmental legislation and others.
- Public Programs and Policies – Track 4, Tuesday & Wednesday, with sessions on security, elections and evacuation planning
- Plus full tracks and clusters on topics like healthcare applications, environmental issues, military applications, voting and elections, homeland security and much more.

Plenary
Philip R. Sharp
President, Resources for the Future
Former Congressman from Indiana, US House of Representatives

Philip Sharp became President of Resources for the Future on September 1, 2005. His career in public service includes ten terms as a member of the U.S. House of Representatives from Indiana, and a lengthy tenure on the faculty of the John F. Kennedy School of Government and the Institute of Politics at Harvard University. Founded in 1952 as an independent and nonpartisan research institute, RFF is the oldest Washington think tank devoted exclusively to policy analysis on energy, environmental and natural resources. Prior to his service in Congress from 1975 to 1995, Dr. Sharp taught political science at Ball State University, was a Lecturer in Public Policy at Harvard's Kennedy School, and served as Director of Harvard's Institute of Politics. He also was a Senior Research Fellow in the Environmental and Natural Resources Program. Dr. Sharp was Congressional chair of the National Commission on Energy Policy, a panel established by the Hewlett Foundation and other major foundations to make energy policy recommendations to the federal government. The commission issued its findings in a major report, "Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges," widely recognized as a comprehensive roadmap for future energy policy. He is a graduate of Georgetown University's School of Foreign Service, and received his PhD in government from Georgetown in 1974.

Panel Discussion
Moderators:
James Sweeney and John Weyant
Department of Management Science and Engineering, Stanford University

Panelists:
- Brian McLean, Director, Office of Atmospheric Programs, USEPA Headquarters
- Howard K. Gruenspecht, Deputy Administrator, Energy Information Administration, US Department of Energy
- Jae Edmonds, Laboratory Fellow, Joint Global Change Research Institute
- Richard Richels, Director, Climate Policy Research, Electric Power Research Institute

HEALTH POLICY

Tuesday, October 14
Presentation: 3:10pm-4:00pm
Panel Discussion: 4:30pm-6:00pm
Marriott Ballroom 2, Lobby Level

The United States spends more per capita on health than any other nation, yet has worse health outcomes than many other countries. Moreover, expenditures on health in the U.S. are growing rapidly, and are taking up an increasingly larger share of per capita gross domestic product. Elsewhere in the world, some nations struggle with basic health issues such as sanitation and control of infectious diseases, while others are beginning to see epidemics of "Western style" diseases such as obesity, heart disease, and cancer. In all cases, resources for health are insufficient to meet the need for disease prevention and treatment, so difficult resource allocation choices must be made. In this special "Health Policy" section, we bring together experts from government and academia to present views on how operations research and management science can play a role in understanding and improving decisions about investment in health care. The presentation and subsequent panel discussion will provide perspective on how OR/MS can help improve clinical decisions, health care operations, management of health care technology, and healthcare-related public policy – and thus help make the best use of limited healthcare resources both in the U.S. and abroad. The sessions will highlight the potential for operations researchers to "do good with good operations research" in this critically important area.

Plenary
Carolyn M. Clancy
Director
Agency for Healthcare Research and Quality (AHRQ)
U.S. Department of Health and Human Services

Carolyn M. Clancy was appointed Director of the Agency for Healthcare Research and Quality (AHRQ) on February 5, 2003. Prior to her appointment, she served as AHRQ's Acting Director since March 2002 and previously was Director of the Agency's Center for Outcomes and Effectiveness Research (COER). Dr. Clancy, who is a general internist and health services researcher, is a graduate of Boston College and the University of Massachusetts Medical School. Following clinical training in internal medicine, Dr. Clancy was a Henry J. Kaiser Family Foundation Fellow at the University of Pennsylvania. She was also an assistant professor in the Department of Internal Medicine at the Medical College of Virginia in Richmond before joining AHRQ in 1990. Dr. Clancy holds an academic appointment at George Washington University School of Medicine (Clinical Associate Professor, Department of Medicine) and serves as Senior Associate Editor, Health Services Research. She has served on multiple editorial boards. She has published widely in peer reviewed journals and has edited or contributed to seven books. Dr. Clancy is a member of the Institute of Medicine and was elected a Master of the American College of Physicians in 2004. Her major research interests include various dimensions of healthcare quality and patient care, including women's health, primary care, access to care services, and the impact of financial incentives on physicians' decisions.

Panel Discussion:
Moderator:
Margaret L. Brandeau, Professor of Management Science and Engineering, and Professor of Medicine (by Courtesy), Stanford University

Panelists:
- Carolyn Clancy, M.D., Director, Agency for Healthcare Research and Quality
- Peter Hartsock, Research Scientist Officer, National Institute on Drug Abuse

AVIATION CONGESTION

Wednesday, October 15
Presentation: 10:00am-10:50am
Panel Discussion: 11:00am-12:30pm
Marriott Ballroom 2

The National Air Transportation System (NATS) and the airline industry are vital to the United States, and the economy depends in critical ways on the reliable, smooth functioning of the NATS. Recent studies suggest that the current NATS is on the verge of becoming unstable, with disturbance-induced congestion and delays likely to arrest growth and expansion, rendering the existing system unsustainable. In this special "Aviation Congestion" section, we bring together industry experts from the aviation industry, government and academia to present views on the many challenges associated with the provision of reliable air transportation in an increasingly congested aviation system. The presentation and subsequent panel discussion will provide perspectives on the critical issues surrounding this topic, and will include discussion and debate on the possible problem resolutions. These sessions will reveal the tremendous complexity surrounding aviation congestion and will serve to underscore the potential for operations researchers to "do good with good operations research" by informing and shaping public policy on this critical issue.

Plenary
Dorothy Robyn
Principal
The Brattle Group

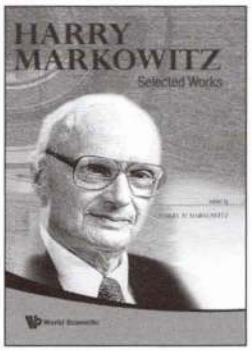
Dorothy Robyn is a principal with The Brattle Group, an economic research and consulting firm. Prior to joining Brattle in 2002, she was a Guest Scholar at the Brookings Institution. From 1993 to 2001, she was Special Assistant to the President for Economic Policy and senior staff member of the White House National Economic Council; her portfolio included transportation, aviation, aerospace and defense, science and technology, and competition. From 1983-1987, she was an Assistant Professor at Harvard's John F. Kennedy School of Government. Dr. Robyn's career has been devoted to analyzing, implementing and working to reform federal economic and regulatory policy. Her recent work has focused on issues in aviation and telecom characterized by political opposition to greater reliance on market mechanisms. In aviation, she has written on liberalization of international airline markets, pricing of airport and airway capacity, and reform of the air traffic control system. She recently completed a report for the prestigious Hamilton Project at the Brookings Institution entitled, "Air Support: Creating a Safer and More Reliable Air Traffic Control System." In 2006, she collaborated with William Baumol on a monograph, "Toward an Evolutionary Regime for Spectrum Governance: Licensing or Unrestricted Entry?" (Brookings Press), which argues for market-based allocation of wireless spectrum. Her first book, *Braking the Special Interests: Trucking Deregulation and the Politics of Policy Reform* (University of Chicago Press, 1987), analyzes a rare political battle in which the views of economists carried the day. Dr. Robyn has an MPP and PhD in Public Policy from the University of California, Berkeley.

Panel Discussion
Moderator/Chair:
Jane F. Garvey, Executive VP and Chairman, APCO Worldwide (Former Head of the Federal Aviation Administration)

Panelists:
- Dorothy Robyn, Principal, The Brattle Group
- Daniel M. Kasper, Managing Director, LECG, LLC
- James M. (Jim) Crites, Executive Vice President of Operations, DFW Airport
- D.J. Gribbin, General Counsel, U.S. Department of Transportation
- Amedeo R. Odoni, Professor of Aeronautics and Astronautics, Professor of Civil and Environmental Engineering, MIT

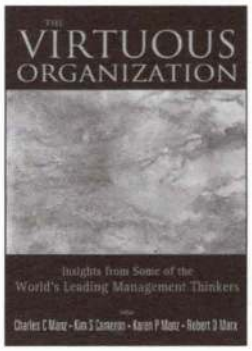
World Scientific
Connecting Great Minds

Quote **INFORMS** for a **20%** discount on all books! Valid till **30 Nov 2008**.



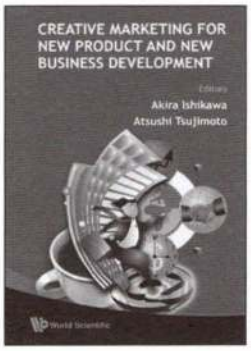
Nov 2008
978-981-283-363-1 US$120 / £65
978-981-283-364-8(pbk) US$65 / £35

edited by **Harry M Markowitz** *(University of California, San Diego, USA)*



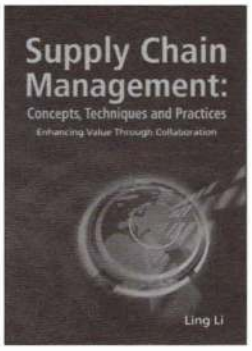
Aug 2008
978-981-281-859-1 US$55 / £30

edited by **Charles C Manz** *(University of Massachusetts, USA)*, **Kim S Cameron** *(University of Michigan, USA)* et al.



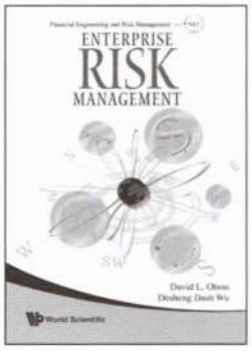
Sept 2008
978-981-277-218-3 US$68 / £37

edited by **Akira Ishikawa** *(Aoyama Gakuin University, Japan)* & **Atsushi Tsujimoto** *(University of Tokyo, Japan)*



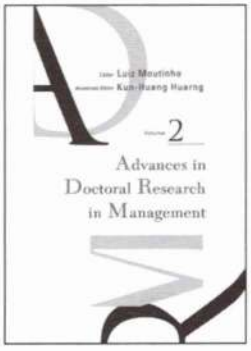
Jun 2007
978-981-270-072-8 US$88 / £51

by **Ling Li** *(Old Dominion University, USA)*



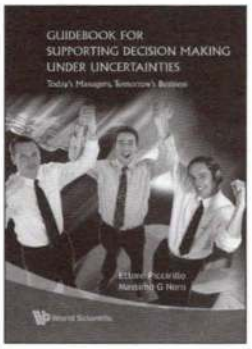
Dec 2007
978-981-279-148-1 US$76 / £39

by **David L Olson** *(University of Nebraska, USA)* & **Desheng Dash Wu** *(University of Toronto, Canada)*



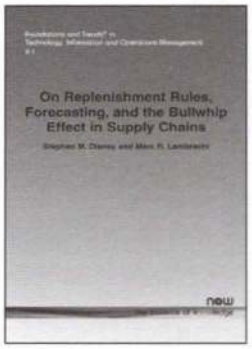
Apr 2008
978-981-277-865-9 US$82 / £45

edited by **Luiz Moutinho** *(University of Glasgow, UK)* & **Kun-Huang Huarng** *(Feng Chia University, Taiwan)*



Feb 2008
978-981-270-803-8 US$38 / £19

by **Ettore Piccirillo** *(Unilever Supply Chain, UK)* & **Massimo G Noro** *(Unilever R&D Port Sunlight, UK)*



May 2008
978-1-60198-132-5(pbk) US$70 / £56

by **Stephen M Disney** *(Cardiff University)* & **Marc R Lambrecht** *(Katholieke Universiteit Leuven)*

JOURNALS

ASIA-PACIFIC JOURNAL OF OPERATIONAL RESEARCH (APJOR)
www.worldscinet.com/apjor
Editor-in-Chief: Gongyun Zhao, *National University of Singapore*
* Included in **Science Citation Index Expanded**

ASIAN CASE RESEARCH JOURNAL (ACRJ)
www.worldscinet.com/acrj
Chief Editor: Lau Geok Theng, *National University of Singapore*
* Included in **Social Sciences Citation Index®**

FOUNDATIONS AND TRENDS® IN TECHNOLOGY, INFORMATION AND OPERATIONS MANAGEMENT (FTTOM)
http://www.nowpublishers.com/TOM
Editor-in-Chief: Uday Karmarkar, *University of California, Los Angeles*

AD/HY/09/08/02/HC

More titles @ www.worldscientific.com

TUTORIALS

All tutorials are located in the Marriott Wardman Park

■ SA37 - Marshall West, Mezzanine Level
8:00am-9:30am
Retail Category Management and Assortment Planning
Gurhan Kok, Duke University

The assortment a retailer carries has a significant impact on sales, margins and customer traffic. Therefore, assortment planning has received high priority from retailers, consultants and software providers. The literature on assortment planning from an operations perspective is quickly growing. We discuss the consumer choice models and the optimization based assortment-planning studies in the literature. We present a few industry examples by describing the process at prominent retailers.

■ SB29 - Washington 2, Exhibit Level
11:00am-12:30pm
Solving Chance-Constrained Stochastic Programs via Sampling and Integer Programming*
Shabbir Ahmed and Alexander Shapiro, Georgia Institute of Technology

We discuss sampling-based approximations of chance constraint optimization problems, wherein we replace the distribution of the underlying uncertain parameters by an empirical distribution corresponding to a Monte Carlo sample. The sampled approximation serves to provide good quality feasible solutions and optimality gap estimates for the true problem. Since the approximate problem is an NP-hard combinatorial problem, we adopt integer programming based methods for its solution.

TutORials CD

INFORMS has published 15 of the 18 tutorials in a CD. All meeting attendees get a complimentary CD – tear out the card inside this program and bring to the special booth next to the registration desk or the INFORMS booth (#700) in the exhibit hall to get your copy. Book format and additional CDs may also be purchased during the meeting at discounted prices.

■ SB37 - Marshall West, Mezzanine Level
11:00am-12:30am
Project MINDSET: High School Mathematics and Operations Research*
Kenneth Chelst, Thomas Edwards, Wayne State University; Karen Keane, Robert Young, North Carolina State University; David Royster, University of North Carolina

Can you imagine a more exciting high school math course than one driven by OR and IE principles and applications? Project MINDSET (Mathematics Instruction using Decision Science and Engineering Tools) is a $3 million NSF funded project designed to develop, implement and evaluate a two-semester course for high school seniors based on the mathematics of OR and IE. We will discuss the forces driving efforts to raise mathematics proficiency at the high school level and will describe how the course we are developing is ideally designed to meet this growing need as well as address widely recognized US deficiencies in mathematics education. The primary goal of this tutorial is to motivate you to take on the challenge of bringing Project MINDSET to your local school district or possibly statewide. We will provide you with the skills and support services that will enable you to make it happen.

■ SC37 - Marshall West, Mezzanine Level
1:30pm-3:00pm
Using Operations Research to Reduce Delays for Health Care*
Linda V. Green, Columbia Business School

The Institute of Medicine identified "timeliness" as 1 of 6 key "aims for improvement" in its most recent report on healthcare quality. Yet patient delays remain prevalent resulting in dissatisfaction, adverse clinical consequences and often, higher costs. This talk will describe several areas in which patients routinely experience significant and potentially dangerous delays and present OR models which have been developed to help reduce these delays, often at little or no cost.

■ SD37 - Marshall West, Mezzanine Level
4:30pm-6:00pm
Total Quality Management and Operational Risk in the Service Industries*
Michael Pinedo, New York University; Marcelo Cruz, Aviva

This tutorial focuses on the relationship between total quality management (TQM) and operational risk in the service industries. TQM and operational risk have received an enormous amount of attention from academicians as well as from practitioners. However, these topics have been kept somewhat separate in the literature. We consider TQM and operational risk in four types of service industries, namely transportation, health care, financial services and hospitality industries. We compare the types of losses that can be incurred in each type of industry, the measurements of the losses, and the risk mitigation processes, and show how TQM should be seen as part of a robust operational risk management process.

■ MA37 - Marshall West, Mezzanine Level
8:00am-9:30am
Optimal Learning*
Warren B. Powell and Peter Frazier, Princeton Univ.

Optimal learning addresses the challenge of efficiently collecting information to improve our knowledge of the parameters of an optimization problem. Applications include finding the best choice from a list, allocating resources and finding the best path through an uncertain network. We describe on-line and off-line applications, and review a variety of practical techniques, including the knowledge gradient algorithm, which we illustrate for a general class of learning problems.

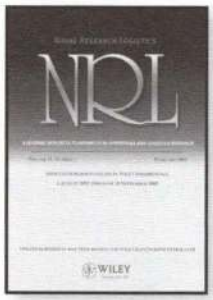
■ MB37 - Marshall West, Mezzanine Level
11:00am-12:30pm
Is It Really Safe to Fly?*
Arnold Barnett, MIT

This tutorial investigates how the mortality risk of passenger air travel has evolved over the last half-century. Much of the news is good: fatal air accidents in the First World are on the verge of extinction. But a near-extinct species can stage a major comeback, and I discuss future risks related to airport and midair collisions. I also discuss the menace of aviation terrorism, which might pose considerably greater risk to future air travelers than all other hazards combined.

* **These tutorials are included in *TutORials 2008*.**

INDISPENSABLE RESOURCES FOR OPERATIONS RESEARCHERS

You can't afford to miss



Naval Research Logistics (NRL)

A Journal Dedicated to the Advances in Operations and Logistics Research

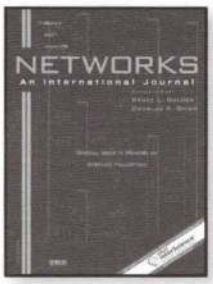
Founded in 1954, ***NRL*** has a distinguished history of publication of both seminal methodological contributions and innovative applications. While retaining its interest in naval and other military applications, ***NRL*** has for decades been a broad-based, peer-reviewed journal devoted to operations and analysis problems in business, industry and government.

Most Accessed Articles:

Optimal capacity in a coordinated supply chain (Vol. 55, No.2)

Simultaneous determination of production and maintenance schedules using in-line equipment condition and yield information (Vol. 55, No.2)

www.interscience.wiley.com/journal/nrl



Networks

An International Journal

Networks provides a central forum for the distribution of timely information about network problems, their design and mathematical analysis, as well as efficient algorithms for carrying out optimization on networks. The nonstandard modeling of diverse processes using networks and network concepts is also of interest. Disciplines useful in studying networks are varied, including applied mathematics, operations research, computer science, discrete mathematics, and economics.

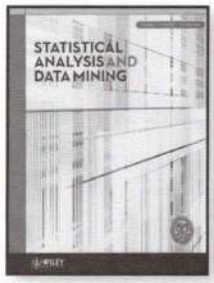
Most Accessed Articles:

Some edge-fault-tolerant properties of the folded hypercube (Vol. 51, No. 2)

Techniques for analyzing dynamic random graph models of web-like networks: An overview (Vol. 51, No. 4)

www.interscience.wiley.com/journal/networks

Special Rates for INFORMS Members to Networks and Naval Research Logistics!
Contact customer service at cs-journals@wiley.com for details.



Statistical Analysis and Data Mining

Statistical Analysis and Data Mining is the new journal that addresses the broad area of data analysis, including data mining algorithms, statistical approaches, and practical applications.

John Wiley & Sons and the American Statistical Association have entered into a new, cooperative publishing agreement for the journal. Under terms of the agreement the ASA and Wiley will cooperate in the development of the journal's editorial policy and scope. In addition, ***Statistical Analysis and Data Mining*** is now designated an official journal of the American Statistical Association.

Articles from the second issue:

Controlling the False Discovery Rate for Feature Selection in High-resolution NMR Spectra

ORIGAMI: A Novel and Effective Approach for Representative Orthogonal Graph Patterns

Distributed Decision-Tree Induction in Peer-to-Peer Systems

Data Mining Research: Current Status and Future Opportunities

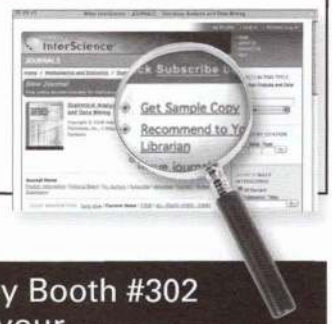
Ask Your Librarian to Register for Complimentary Online Access throughout 2008!

Online submission and peer review, rapid online publication via EarlyView, and more...

www.interscience.wiley.com/SAM

DON'T WANT TO CARRY AN ISSUE AROUND?

Get a free sample issue online! Simply go to the journal's homepage and click on **'FREE SAMPLE ISSUE'** and you can view the first issue of 2008.



Stop by Wiley Booth #302
for your
FREE SAMPLE ISSUES!

WILEY-BLACKWELL

Welcome INFORMS Annual Meeting Attendees!

TUTORIALS IN OPERATIONS RESEARCH

SPECIAL OFFER FOR ATTENDEES AT THE INFORMS BOOKSTORE:

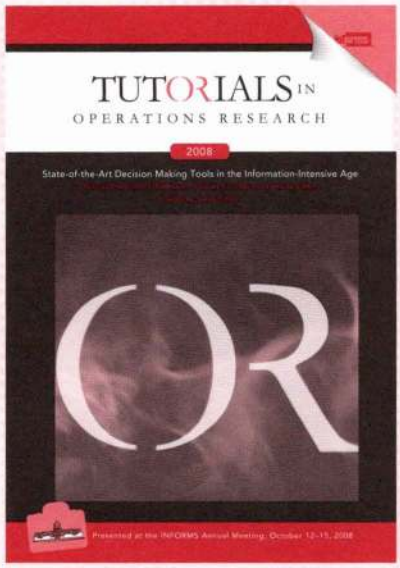
The 2008 *TutORials in Operations Research* book will be available for $25 only through October 14, 2008.

You may purchase additional CDs for $25 each.

INFORMS Bookstore will be open Sunday from 12-5 & 7:30-9pm, Mon-Tues from 9-5.

TutORials CDs will be available at Registration Desk from 7am Saturday through 5pm Wednesday.

Previous years titles of TutORials also available at the INFORMS bookstore, located in the Exhibit Hall.



You will receive your complimentary 2008 *TutORials in Operations Research* CD which includes:

- 15 TutORial presentations out of the 18 presented at this year's annual meeting.
- 350 plus pages of topics in OR: healthcare delivery systems, electronic commerce, simulations and optimization and many more...
- Authors specializing in various areas of operations research covering a broad range of applications and methodologies within OR.
- Searchable full-text articles in each chapter.

Yes! I want my complimentary 2008 TutORials CD!

Pick up your complimentary 2008 *TutORials in Operations Research* CD between October 12-15, 2008

Name: _____

Email: _____

Simply present this card to an INFORMS staff member at one of these two locations:

INFORMS BOOTH #700 Located in the Exhibit Hall **OR** REGISTRATION DESK

INFORMS Special Offer for Annual Meeting Attendees!

PUBLICATIONS INVENTORY SALE

Purchase on-site and save on shipping and handling.

Bookstore Hours:
Sun 12-5 & 7:30-9pm
Mon & Tues: 9-5pm

Visit the INFORMS Booth/Bookstore & Save 50% off select INFORMS titles*
(While Supplies Last)

Topics in Operations Research -
INFORMS series of Research Monographs for OR professionals.

*The Operations Research Center at MIT (2007)
Ingrid Yoerg Larson, ed.
ISBN: 978-1-877640-21-6, Regular Price: $30 Sale Price $15

*Search and Detection, 4th ed. (2002)
Alan R. Washburn
ISBN: 1-877640-17-4, Regular Price: $30 Sale Price: $15

*Predicting Combat Effects (2001)
Dean S. Hartley III CD included
ISBN: 1-877640-16-6, Regular Price: $30 Sale Price:$15

*Statistical Methods for Learning Curves and Cost Analysis (2003)
Matthew S. Goldberg and Anduin E. Touw
ISBN: 1-877640-18-2, Regular Price: $30 Sale Price: $15

*Theory of Optimal Search (1989, reprinted 2004)
Lawrence D. Stone
ISBN: 1-877640-00-X, Regular Price: $30 Sale Price: $15

*Two-Person Zero Sum Games, 3rd ed. (2003)
Alan R. Washburn
ISBN: 1-877640-19-0, Regular Price: $30 Sale Price: $15

*Operations Analysis in the 8th Air Force
1942–1945: Four Contemporary Accounts (1997)
Hugh J. Miser, ed.
ISBN: 1-877640-05-0, Regular Price: $20 Sale Price $10

Tutorial in Operations Research
2007 CD $25; Book $25 Both $50
2006 Book $25

Franz Edelman Award DVDs
2003-2007 Franz Edelman Award DVD Set - $45 Individual $30
*2002-1983 $15 for each individual DVD

informs®

We will accept MasterCard, Visa and American Express. Please bring a photo ID.

■ MC37 - Marshall West, Mezzanine Level
1:30pm-3:00pm

Personalization and Recommender Systems*

Alexander Tuzhilin, New York University; Gediminas Adomavicius, University of Minnesota; Zan Huang, Penn State University

In this tutorial, we present an overview of the personalization field and review different types of personalization. We also discuss the general personalization process and position the field of recommender systems as an integral part of this process. We review the field of recommender systems by describing a number of "traditional" recommendation approaches and their extensions. Finally, we discuss several future research directions for personalization and recommender systems, including integrated personalization process, data acquisition for recommender systems, advanced modeling of user preferences, other model-based techniques for recommendation, evaluation of recommender systems, recommendation flexibility and scalability, and trust and privacy issues in recommender systems.

■ MD37 - Marshall West, Mezzanine Level
4:30pm-6:00pm

Cooperative and Noncooperative Games for Capacity Planning and Scheduling*

Nicholas G. Hall, The Ohio State University; Zhixin Liu, University of Michigan

This tutorial provides an overview of cooperative and noncooperative games for capacity planning and scheduling decisions. For both cooperative and noncooperative games, we present some basic definitions and concepts, review the recent literature, and discuss our own current research. The discussion of the literature of cooperative games includes sequencing games, models of outsourcing operations, and economic lot sizing and schedule planning games. Our research considers a combined capacity planning and scheduling problem where a supplier allocates capacity to distributors, who may then cooperate to share their capacity allocations and resubmit revised orders. The discussion of the literature of noncooperative games includes capacity allocation mechanisms based on order sizes and sales, incentives for truth telling, models of decentralized versus centralized decision making, and auction mechanisms for capacity allocation. Our research develops an auction mechanism to allocate capacity to various agents with jobs that can be scheduled profitably.

■ MD19 - Lincoln 4, Exhibit Level
4:30pm-6:00pm

Recent Developments in Modeling and Solving the Split Delivery Vehicle Routing Problem*

Bruce Golden, Chris Groer and Edward Wasil, University of Maryland

In this tutorial, we discuss some of our recent work in vehicle routing. First, we discuss two multi-period vehicle routing problems. The first arises in the small package shipping industry. The second is important in the utility industry. In addition, we present a cooperative parallel algorithm for generating high quality vehicle routing solutions.

■ MD29 - Washington 2, Exhibit Level
4:30pm-6:00pm

Expressive Commerce and Its Application to Sourcing: Experiences from Conducting over $40 Billion of Generalized Combinatorial Auctions

Tuomas Sandholm, Carnegie Mellon University

I will discuss a generalization of combinatorial and multi-attribute auctions which we call expressive commerce. Here supply and demand are expressed in drastically greater detail than in traditional electronic auctions, and are algorithmically cleared. This creates a Pareto efficiency improvement in the allocation (aka win-win). I will share our experiences from CombineNet, Inc. of hosting over $40 billion of such transactions over the last eight years in the domain of strategic sourcing, yielding over $5 billion in savings. I will tie in very recent pertinent game theory on a few of the topics. For example, any form of added expressiveness can only increase efficiency. Topics include: natural bidding languages that made combinatorial auctions practical here; the ways by which expressive bidding increases efficiency; scalability of state-of-the-art winner determination algorithms; expressiveness by the bid taker, and associated scenario navigation capabilities.

■ TA29 - Washington 2, Exhibit Level
8:00am-9:30am

Closed-Loop Supply Chains with Remanufacturing*

Gilvan C. Souza, University of Maryland

Closed-loop supply chains have flows of products (post-purchase) back to manufacturers, for example, consumer returns and leasing. I define basic terms: differences with respect to forward chains, sources of returns, disposition options, strategic, tactical and operational issues, and regulatory issues. I provide an overview of remanufacturing practices in select industries, and review the academic literature on closed-loop supply chains, focusing on business and management aspects.

■ TA37 - Marshall West, Mezzanine Level
8:00am-9:30am

City Logistics: Advanced Urban Freight Transportation Systems*

Teodor Gabriel Crainic, UQAM

City Logistics aims to reduce the nuisances associated with freight transportation in urban areas while supporting their economic and social development. The main idea is to view individual stakeholders and decisions as components of an integrated logistics system to be optimized, through coordination and consolidation of decisions, loads and movements. The tutorial presents an overview of City Logistics concepts, planning issues and models, and identifies research avenues and challenges.

■ TB37 - Marshall West, Mezzanine Level
11:00am-12:30am

Statistical Challenges in eCommerce: Modeling Dynamic and Networked Data*

Wolfgang Jank, Galit Shmueli, Inbal Yahav, Shu Zhang, University of Maryland; Mayukh Dass, Texas Tech University

Research in electronic commerce is growing due to the availability of rich data originating from different behavioral, social or economic processes and resulting in new dependencies that are not supported by classical statistics. In this tutorial, we discuss three key aspects of eCommerce data: dynamics, competition and user networks. Each aspect raises new challenges for data modeling, and we present three case studies that showcase the various challenges and discuss some solutions.

■ TC37 - Marshall West, Mezzanine Level
1:30pm-3:00pm

Global Supply Chain Finance: Exploiting Opportunities at the Interfaces of Operations and Finance

Panos Kouvelis, Washington University in St. Louis

We will discuss recent research that advocates a tighter integration of the operations and finance functions within and across enterprises for higher value creation and for enterprise risk management purposes. We place emphasis on better understanding of: (a) interfaces of financing and supply chain decisions; and (b) integrated risk management of commodity and currency risks through the combined use of operational flexibilities and financial hedges.

■ TD29 - Washington 2, Exhibit Level
4:30pm-6:00pm
Simulation and Optimization*
Michael C. Fu, University of Maryland; Chun-Hung Chen, George Mason University; Leyuan Shi, University of Wisconsin

We consider the problem of optimizing a performance function from a simulation model. We begin by classifying different types of problems, and then provide an overview of the major approaches, followed by a more in-depth presentation of three specific areas: efficient simulation budget allocation, stochastic gradient estimation and the nested partitions method.

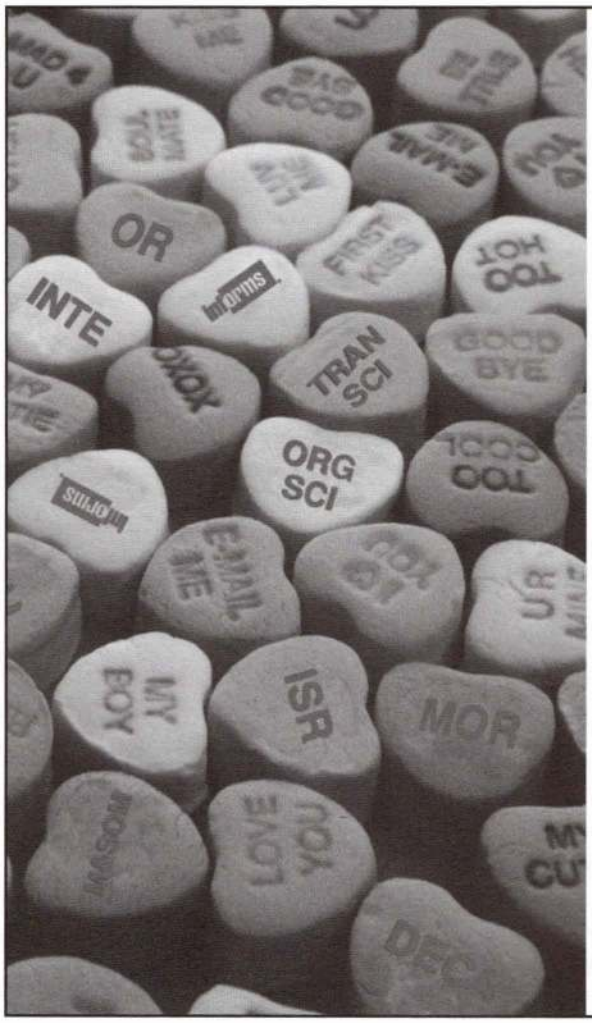
■ TD37 - Marshall West, Mezzanine Level
4:30pm-6:00pm
Metaheuristic Hybridization with GRASP*
Mauricio G.C. Resende, AT&T Labs Research

GRASP, or greedy randomized adaptive search procedure, is a multi-start metaheuristic that repeatedly applies local search starting from solutions constructed by a randomized greedy algorithm. In this tutorial we consider ways to hybridize GRASP to create new and more effective metaheuristics. We consider several types of hybridizations: constructive procedures, enhanced local search, memory structures and cost reformulations.

■ WA37 - Marshall West, Mezzanine Level
8:00am-9:30am
Value-at-Risk vs. Conditional Value at Risk in Risk Management and Optimization*
Stan Uryasev, Sergey Sarykalin, Gaia Serraino, University of Florida

From a mathematical perspective risk management is a procedure for shaping a risk distribution. Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR) are key percentile risk measures. Differences in mathematical properties, stability of estimation, ease of optimization and acceptance by regulators affect the choice between VaR and CVaR. We present our experience with these functions and explain their strong and weak features. We show optimization case studies conducted with Portfolio Safeguard package.

*** These tutorials are included in *TutORials 2008*.**



Are you "suite" on INFORMS?

Visit the INFORMS booth to sign up today!

Subscribe to all 11 INFORMS Journals in our PubsOnLine Suite

- Regular member price $99
- Student member price $50
- 50% more pages in 2008
- Members-only benefit: Access all journal issues back to vol. 1 no. 1- not available in your library

http://pubsonline.informs.org/

Pubs OnLine

SOFTWARE DEMONSTRATIONS

All software demonstrations are located in the Marriott Wardman Park.

SUNDAY, OCTOBER 12

■ SA14 - Room 8218, Lobby Level
8:00am–8:45am
OptiRisk Systems - AMPL Extensions for Stochastic Programming and Embedded Development
Christian Valente, christian@optirisk-systems.com
Cormac Lucas, cormac.lucas@brunel.ac.uk

From AMPL script to AMPLCOM: a genetic algorithm is formulated in AMPL and is embedded in an application using AMPLCOM. SP Modeling extensions: a deterministic planning model is formulated and extended to SP, CCP and ICCP using the enhanced syntax and the new Scenario Generator module of SPInE.

8:45am–9:30am
GAMS Development Corporation - Rapid Application Prototyping with GAMS
Steven Dirkse, sdirkse@gams.com

GAMS Development will demonstrate how an application can be built using GAMS. We'll use both fundamental modeling practices, our state-of-the-art solvers and the latest in data access and application integration tools to quickly produce a working application.

■ SB14 - Room 8218, Lobby Level
11:00am–11:45am
Palisade Corporation - New Risk and Decision Analysis Tools for OR/MS
David Bristol, dbristol@palisade.com

Palisade's DecisionTools Suite 5.0 adds simulation, decision trees, optimization, and a variety of other statistical functions to the Excel spreadsheet to cover all aspects of risk analysis and decision-making. Come explore a case study including demand forecasting, NPV projection, capacity planning, buy vs. build scenarios and credit risk assessment.

11:45am–12:30pm
JMP Division-SAS Institute - Dynamic Visualization of Complex Data with JMP
Curt Hinrichs, curt.hinrichs@jmp.com
Melodie Rush, melodie.rush@jmp.com

JMP is a state-of-the-art statistical package. Designed for the busy professional who wants to quickly and easily analyze their data and needs sophisticated analyses—from classical statistical methods to modern design and exploratory data mining—that only SAS can provide. Intuitive, interactive and graphical, JMP lets you focus on the insight your data can provide. This demo will cover an overview of JMP and analysis designed for business visualization including Bubble Plots, 3D Scatter Plots and the data filter.

■ SC14 - Room 8218, Lobby Level
1:30pm–2:15pm
Salford Systems - Introduction to Data Mining for Absolute Beginners
Mikhail Golovnya, golomi@salford-systems.com

This is a perfect place to start if you are new to data mining, even if you have little-to-no background in statistics. We will discuss: (1) data basics: data types, formats, and preparation steps; (2) what kinds of questions we can answer with data mining; (3) how data mining models work; (4) evaluation criteria–how models can be assessed and their value measured; and (5) specific background knowledge to prepare you to begin a data mining project.

2:15pm–3:00pm
AMPL Optimization LLC - AMPL's Support for Advanced Solver Features
Robert Fourer, 4er@ampl.com
David M. Gay, dmg@ampl.com

The AMPL modeling language's flexibility enables it to support many solver features beyond returning some optimal solution. This tour of such features includes infeasibility diagnosis, convexity detection, multiple solutions, parameter tuning, recognition of complementarity conditions, and logic expressions. Support for several varieties of global optimization will also be touched upon.

■ SD14 - Room 8218, Lobby Level
4:30pm–5:15pm
Syncopation Software - The New DPL 7: Portfolio Analysis and More!
Lori Carswell, lcarswell@syncopation.com

Learn about the powerful new features in DPL 7! See how you can glean more insights with the Initial Decision Alternatives Tornado and Option Value Diagram. Save time in the pre-presentation crunch with the new endpoint replay capability. Go beyond project-level analysis by analyzing a portfolio of opportunities.

5:15pm-6:00pm
Innovative Scheduling - Turning Models into Decision Support Systems
Ravindra K. Ahuja, ravi@innovativescheduling.com

Innovative Scheduling is engaged in building custom decision support systems to solve planning and scheduling problems arising in the field of logistics, distribution, and transportation. In the past few years, we have successfully solved some very difficult optimization problems through cutting-edge network optimization techniques that were considered to be intractable before. In this tutorial, we will give an overview of the decision problems we have solved using decomposition and network-flow based techniques and the methodology we have used. We will also give demonstrations of some of the decision support systems built by us.

■ SD36 – Marshall East, Mezzanine Level
4:30pm–5:15pm
SAS Education Division - Turning Data into Information with SAS Enterprise Miner
Susan Walsh, susan.walsh@sas.com

It has been estimated that the amount of data in the world has been doubling every 18 to 24 months. Multi-gigabyte databases are now commonplace. In order to turn this data into information, data mining is used in industry in a number of areas, including but not limited to credit scoring, customer churn, fraud detection and donations analysis. This presentation will introduce SAS Enterprise Miner with an emphasis on its use for predictive modeling.

5:15pm-6:00pm
Statpoint Technologies
Statgraphics Online: Statistical Analysis Over the Internet
Neil Polhemus, neil@statgraphics.com

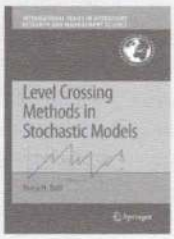
This demonstration will introduce STATGRAPHICS Online, the first comprehensive statistical package designed to be used over the Internet. Using only a web browser, users may enter data and submit to STATGRAPHICS .Net, running as a web service on a remote browser. Output is returned to the browser as HTML within imbedded images.

Springer
the language of science

springer.com

Springer at INFORMS 2008

Over 200 titles 20% off



Level Crossing Methods in Stochastic Models

P. H. Brill, University of Windsor, ON, Canada

This volume traces the evolution of level crossing theory for obtaining probability distributions of state variables and demostrates solution methods in a variety of stochastic models including: queues, inventories, dams, renewal models, counter models, pharmacokinetics, and the natural sciences.

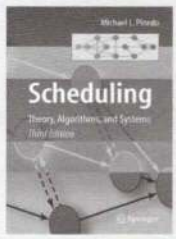
2008. XXVI, 482 p. 106 illus. (International Series in Operations Research & Management Science, Volume 123) Hardcover
ISBN 978-0-387-09420-5 ► **$169.00**

The Vehicle Routing Problem: Latest Advances and New Challenges

B. Golden, **S. Raghavan**, University of Maryland, College Park, MD, USA;
E. Wasil, American University, Washington, DC, USA (Eds.)

New approaches for solving VRPs have been developed from important methodological advances. These developments have resulted in faster solutions algorithms, more accurate techniques, and an improvement in the ability to solve large-scale complex problems. The book reflects the most recent scholarship and the most important scholars in the field.

2008. X, 589 p. 85 illus. (Operations Research/ Computer Science Interfaces Series, Volume 43) Hardcover
ISBN 978-0-387-77777-1 ► **$169.00**



Scheduling

Theory, Algorithms, and Systems

M. L. Pinedo, New York University, New York, NY, USA

This book on scheduling covers theoretical models as well as scheduling problems in the real world. Author Michael Pinedo also includes a CD that contains slide-shows from industry and movies dealing with implementations of scheduling systems. Each chapter contains a series of computational and theoretical exercises.

3rd ed. 2008. XVIII, 678 p. With CD-ROM. Hardcover
ISBN 978-0-387-78934-7 ► **$89.95**

Linear and Nonlinear Programming

Third Edition

D. G. Luenberger, **Y. Ye**, Stanford University, CA, USA

This third edition of the classic textbook in Optimization has been fully revised and updated. It comprehensively covers modern theoretical insights in this crucial computing area, and will be required reading for analysts and operations researchers in a variety of fields. The book connects the purely analytical character of an optimization problem, and the behavior of algorithms used to solve it.

3rd ed. 2008. XIV, 544 p. 93 illus. (International Series in Operations Research & Management Science, Volume 116) Hardcover
ISBN 978-0-387-74502-2 ► **$99.00**

Supply Chain Risk

A Handbook of Assessment, Management & Performance

G. A. Zsidisin, Bowling Green State University, OH, USA; **B. Ritchie**, University of Central Lancashire, Preston, UK (Eds.)

Risk is of fundamental importance in this era of the global economy. Supply chains must take into account the uncertainty of demand. There are a host of strategic, tactical and operational risks to business supply chains. This book will focus on how to assess, evaluate, and control these various risks.

2009. Approx. 360 p. 54 illus. (International Series in Operations Research & Management Science, Volume 124) Hardcover
ISBN 978-0-387-79933-9 ► **$129.00**

Handbook of Marketing Decision Models

B. Wierenga, Erasmus University, Rotterdam, The Netherlands (Ed.)

This book presents the state of the art in marketing decision models. The book deals with new modeling areas, such as customer relationship management, customer value and online marketing, as well as recent developments in other advertising, sales promotions, sales management, and competition.

2008. X, 630 p. 49 illus. (International Series in Operations Research & Management Science, Volume 121) Hardcover
ISBN 978-0-387-78212-6 ► **$169.00**

Easy Ways to Order for the Americas ► Write: Springer Order Department, PO Box 2485, Secaucus, NJ 07096-2485, USA ► **Call: (toll free)** 1-800-SPRINGER ► **Fax:** 1-201-348-4505 ► **Email:** orders-ny@springer.com or **for outside the Americas ► Write:** Springer Distribution Center GmbH, Haberstrasse 7, 69126 Heidelberg, Germany ► **Call:** +49 (0) 6221-345-4301 ► **Fax :** +49 (0) 6221-345-4229 ► **Email:** SDC-bookorder@springer.com
► Prices are subject to change without notice. All prices are net prices.

013923x

Software Demonstrations

MONDAY, OCTOBER 13

■ MA14 - Room 8218, Lobby Level
8:00am–8:45am
Responsive Learning Technologies, Inc. - Online Games to Teach Operations and Supply Chain Management
Sam Wood, wood@responsive.net

Participate in a demonstration of online games that are used in operations management courses and supply chain management courses in more than 100 undergraduate and MBA-level programs to teach topics like capacity management, lead time management, inventory control, and supply chain design and logistics.

8:45am–9:30am
Fair Isaac - Building Optimization Applications in Xpress-MP
Gabriel Tavares, gabrieltavares@fairisaac.com

This tutorial will focus on developing and deploying complete optimization applications using Fair Isaac's array of mathematical modeling and optimization tools. These tools can be used for modeling, solving, analyzing and visualizing optimization problems, and integrating them seamlessly in business applications. We will explain how Xpress-Mosel, Xpress-IVE and Xpress-Application Developer can decrease development time for new optimization applications and enable you and your customers to make smarter decisions. The proven technologies offered by Fair Isaac can be used in a range of applications such as supply chain management, transportation, finance, energy, manufacturing, retail, insurance, manufacturing industries, to name a few.

■ MB14 - Room 8218, Lobby Level
11:00am-11:45am
Imagine That, Inc. - ExtendSim-Power Tools for Simulation
Dave Krahl, davek@extendsim.com

See how quickly you can build robust, intuitive models with the power tool for simulation - ExtendSim. Revolutionary new simulation technology and 3D animation in ExtendSim is paired with core ExtendSim features such as hierarchical model building, user interface creation, and interactive modeling to make it the tool to watch in the simulation industry. Don't miss this demo!

11:45am-12:30pm
XJ Technologies – AnyLogic, Professional Tool for Multi-Method Simulation Modeling
Andrei Borshchev, andrei@xjtek.com

AnyLogic is the first and only simulation tool that supports system dynamics, process-centric (discrete event) and agent-based methods within one modeling language and one model development environment. We will demo several AnyLogic models and show how the user can benefit from using different modeling methods, and from agent-based modeling in particular.

■ MC14 - Room 8218, Lobby Level
1:30pm–2:15pm
LINDO Systems, Inc. - Optimization Modeling Made Easy
Mark Wiley, mwiley@lindo.com

LINDO Systems will demonstrate the latest enhancements to LINDO API, LINGO and What'sBest - their popular linear, integer, quadratic, general nonlinear and global optimization tools. Find out how easy it is to: quickly build complex optimization models; effortlessly access data in Excel and databases; seamlessly embed optimization into your own applications.

2:15pm–3:00pm
Maximal Software, Inc. - New Release of MPL Modeling System for Optimization with New and Enhanced Features
Bjarni Kristjansson, bjarni@maximalsoftware.com

We will be demonstrating the newest release of MPL, one of the fastest and most scalable modeling languages on the market today. The innovative OptiMax 2000 Component Library, which allows MPL models to be easily embedded into end-user applications, has been augmented to include several new objects and methods. The speed and scalability of the model generation has been greatly enhanced, and with the new 64-bit Itanium version capable of solving much larger models than ever before. Several new solvers have been added and existing solvers updated. Data access has been improved with new native drivers and now offers full XML/SOAP support for Internet connectivity.

■ MD14 - Room 8218, Lobby Level
4:30pm–5:15pm
ILOG, Inc. - ILOG CP Optimizer: Model and Automatically Solve Your Detailed Scheduling Problems
Dider Vidal, dvidal@ilog.fr

In this software tutorial we present how ILOG CP Optimizer 2.0 can be used to solve detailed scheduling problems with finite capacity resources and reservoirs, where scheduling decisions must be made over fine-grained time. An interval-based modeling framework, demonstrated from ILOG OPL Development Studio, supports compact and elegant models that do not grow with increasing time granularity, providing excellent performance. We present results comparing ILOG CP Optimizer - run with default settings - against specialized algorithms on several benchmarks found in the scheduling literature.

5:15pm–6:00pm
Lumina Decision Systems, Inc. - Analytica: What It Does That Spreadsheets Can't
Max Henrion, henrion@lumina.com

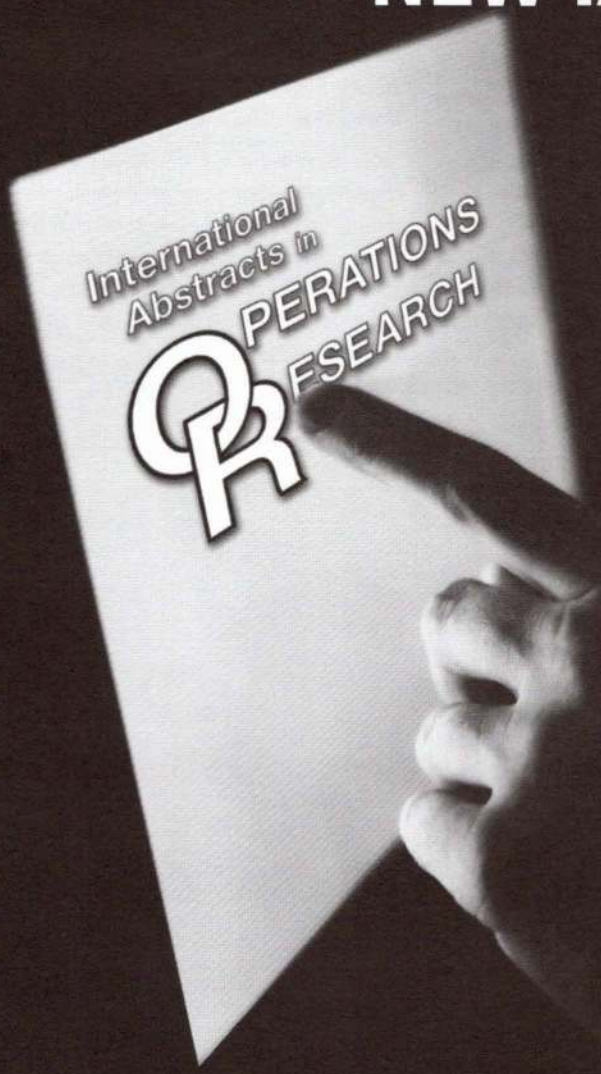
A rare chance to see Analytica demonstrated by its originator: Experienced analysts prefer Analytica to spreadsheets because of its visual influence diagrams, Intelligent Arrays, fast Monte Carlo, and scalability. Users say that they can build, verify, and analyze models in a quarter to half the time it takes with a spreadsheet.

palgrave macmillan

Visit Palgrave Macmillan at BOOTH #408

We will be demonstrating the Beta version of International Abstracts in Operations Research Online at INFORMS 2008.

Preview the **NEW IAOR Online** *(Beta)*



» Full version relaunches in January 2009

» Comprehensive, unparalleled database of abstracts from 1989

» Weekly updates from over 180 of the worlds leading OR/MS journals

» Rich functionality

Come and tell us what you think!

www.palgrave-journals.com/iaor

SOFTWARE DEMONSTRATIONS

TUESDAY, OCTOBER 14

■ TA14 - Room 8218, Lobby Level
8:00am–8:45am
TranSystems - Heuristic Modeling of Complex Decision Logic
Ben Fuqua, jbfuqua@transystems.com
Rainer Dronzek, rwdronzek@transystems.com

This engaging team will demonstrate how simulation and modeling can help illustrate solutions to the complex decisions you as an audience member may face in your daily work. The presentation will be dynamic and centered around your questions and areas of interest. If you want to understand how simulation and modeling can work for you – don't miss this session.

8:45am-9:30am
River Logic, Inc. - Integrated Business Planning with Enterprise Optimizer (EO)
Brian Downs, bdowns@riverlogic.com

This tutorial will provide an introduction to Enterprise Optimizer (EO), the leading platform for Integrated Business Planning (IBP). Using EO's intuitive drag and drop modeling interface, we will demonstrate how models of any business process can be developed without equation management, while simultaneously producing audit-quality financial reports. EO's unique capability to simultaneously model process and financial outcomes allows OR practitioners to quickly deliver an integrated, holistic model of the enterprise that aligns S&OP with the company's financial goals.

■ TB14 - Room 8218, Lobby Level
11:00am–11:45am
AIMMS® (Paragon) - Enhancing Your Modeling Experience by Using AIMMS
Peter Nieuwesteeg, p.nieuwesteeg@aimms.com
Ming Fang, m.fang@aimms.com

The construction of an optimization model is an enjoyable activity; unless the created model produces incorrect results or is too slow. At that time the debugging and analysis start, including the frustration of not having the right tools. Sound familiar? In this demo we show the tools in AIMMS that will help you to complete your model without all the frustration. We start by creating a basic model to give you an overview of the AIMMS capabilities. Followed by, a demonstration of some of the diagnostic tools in AIMMS such as the profiler, the debugger and the math program inspector. Join us to learn how to enhance you modeling experience with new and advanced techniques.
www.aimms.com

11:45am–12:30pm
Ziena Optimization, Inc. - KNITRO® 5.2 in Action: Practical Examples, New Matlab® Interface
Jorge Nocedal, nocedal@ziena.com

The power of KNITRO is demonstrated on various challenging applications arising in financial engineering, power networks and computational economics. The new MATLAB® interface to KNITRO will be demonstrated.

■ TC14 - Room 8218, Lobby Level
1:30pm–2:15pm
Frontline Systems, Inc. - Risk Analysis and Robust Optimal Solutions:y Modeling in Excel
Daniel H. Fylstra, dfylstra@frontsys.com

More than ever today, models for risk analysis and optimal resource allocation in the presence of uncertainty can be built more easily, scaled up to large size, and solved more effectively in Microsoft Excel. Robust optimization and stochastic programming models that once required very scarce expertise and long development cycles are extremely easy to create and solve in Excel. Access to disparate data sources, often a headache with other tools, is surprisingly simple in Excel. This session will demonstrate the tools and open your eyes to new possibilities.

2:15pm–3:00pm
SAS - Versatile, Extensible Optimization Modeling with OPTMODEL
Ed Hughes, ed.hughes@sas.com
Trevor Kearney, trevor.kearney@sas.com

We'll demonstrate how OPTMODEL enables you to build and solve linear, mixed-integer, quadratic, and general nonlinear optimization models via its powerful, accessible modeling language. We'll also illustrate how you can extend OPTMODEL to implement specialized solution methods for more challenging optimization problems, integrating with SAS data handling, analytic, and reporting capabilities as needed.

■ TD14 - Room 8218, Lobby Level
4:30pm–5:15pm
LINKS-simulations.com - Best-Practice Teaching With a Sophisticated Supply Chain Management Simulation
Randall G. Chapman, chapman@chapmanrg.com

Teaching with a sophisticated supply chain management simulation is a daunting instructional endeavor, especially with a full parsing of the adjective "sophisticated." As used here, "sophisticated" includes the implicit descriptors "large-scale," "competitive," "web-based," and "team-based." Drawing on simulation design experience, extensive personal teaching experience in traditional classroom-based and distance-learning modes, and "train-the-trainer" coaching experience with scores of instructors and their 10,000+ students with the LINKS supply chain management simulations over the last nine years, the LINKS author provides and summarizes best-practice insights into the design and execution of successful simulation-based operations management and supply chain management courses. A guided-tour/demo of the LINKS website and associated user resources is provided.

5:15pm–6:00pm
statistics.com – XLMiner: Data Mining Add-In for Excel
Peter Bruce, President
peter.bruce@statistics.com
The demonstration will illustrate common data mining classification and prediction techniques using XLMiner, a comprehensive data mining add-in for Excel.

An International Conference for OR/MS Professionals offering:

- Key OR/MS Research and Applications
- Great Receptions, Social Activities and Excursions
- Spectacular Toronto Attractions

Important Dates

January 15, 2009	Abstract submission deadline
April 15, 2009	Authors' deadline for final abstract changes
May 11, 2009	Early registration deadline Hotel reservation cut-off date

Contact us at

INFORMS Meetings Department
meetings@informs.org
(800) 343-0062 (401) 722-2595

meetings.informs.org/Toronto09

ORGANIZING COMMITTEE

General Chair
Liping Fang
Ryerson University
lfang@ryerson.ca

Program Chair
Saeed Zolfaghari
Ryerson University
zolfaghari@ryerson.ca

Sponsored Sessions Chair
Bernard Gendron
University of Montreal

Invited Sessions Chair
Richard Caron
University of Windsor

Contributed Sessions Chair
Joseph Milner
University of Toronto

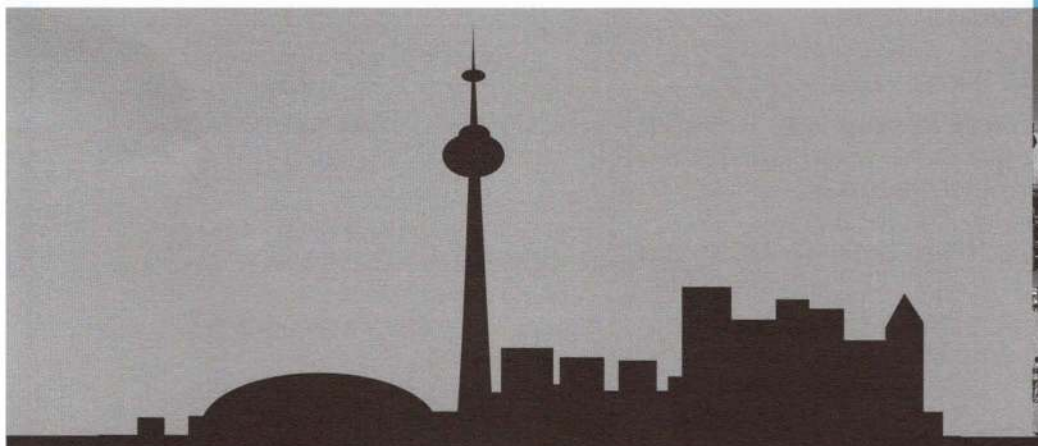
Practice Co-Chairs
Bjarni Kristjansson
Maximal Software, Inc.

Anne Robinson
Cisco Systems, Inc.

Tutorials Chair
Allen Holder
Trinity University

Local Arrangements Chair
Vinh Quan
University of Ontario
Institute of Technology

CORS Liaison
John Blake
Dalhousie University



TORONTO'09
CORS-INFORMS International

Joint International Meeting
Canadian Operational Research Society
Institute for Operations Research & the Management Sciences

June 14-17, 2009 Westin Harbour Castle Toronto, Canada

Canadian Operational Reseach Society
Société Canadienne de Recherche Opérationnelle

informs Institute for Operations Research and the Management Sciences

INTERACTIVE SESSIONS

MONDAY AND TUESDAY

12:30pm-1:30pm
Marriott - Exhibit Hall A

Researchers, practitioners and students share their work in OR/MS in these sessions presented as poster displays, laptop demonstrations or other creative formats. Authors will be on hand to present their work during the 12:30-1:30pm lunch periods on Monday and Tuesday.

Awards will recognize the best Interactive Presentations with a first-place award of $1,000 and second-place award of $500.

Several panels of distinguished OR professionals will review and judge the presentations. Judges include: Karen Smilowitz and Pablo Durango-Cohen of Northwestern University; Ronald Askin of Arizona State University; Jonathan Bard of University of Texas-Austin; James Cochran of Louisiana Tech University; Archis Ghate, University of Washington; and Cem Saydem of University of North Carolina-Charlotte.

MONDAY

A Study on Heuristics Routing and Seed Grouping Algorithm
Omer Faruk Baykoc, Gazi University

Dynamic Discrete Disaster Decision Simulation System
Shengnan Wu, Univ. of Pittsburgh

Center for Innovation in Logistics Systems
Greg Parlier, SAIC

Freight Movement Model for Oklahoma
Sandeep Srivathsan, Oklahoma State University

Competitive Analysis of Online TSP
F. Jordan Srour, Rotterdam School of Management

Contracts and Discounting Decisions
Kiran Panchamgam, Univ. of Maryland

Cournot Competition in Power Markets under Uncertainty
Pavee Siriruk, Auburn University

Transdisciplinarity in Decision Sciences
Orhan Guvenen, Bilkent University

Tolerance Design of Mixture Components with External Variables
Seong-Jun Kim, Kangnung National Univ.

Optimal Replenishment Policies with Inaccurate Information in Newsvendor Models
Lihui Bai, Valparaiso University

Methodology and Implementation of Value-at-Risk Measures in Emerging Fixed-Income Markets
Gonzalo Cortazar, P. Universidad Catolica de Chile

Determining Optimal Schedule Requirements for Green Hotel Renovations
Cara Dienes, Iowa State University

Optimal Multiple Hostages Rescue Problem
Mong Shan Ee, University of Nottingham

Operational Supply Chain Modeling in Disaster Response
Abbas Afshar, University of Maryland

Improving Health Facility Access
Cara Cocking, University of Heidelberg

Scirus Topic Pages: New Publication Possibilities for INFORMS Members
Fred Phillips, Alliant International Univ.

Airport Gate Assignment: New Model and Implementation
Chendong Li, Texas Tech University

Design and Optimization of Runs Rules for Geometric Control Charts
Kamran Paynabar, Univ. of Michigan

DOE-Based Heuristics for Remanufacturing Reconfigurable Storage Requirements
Aysegul Topcu, Northeastern Univ.

Portfolio Optimization: A Scenario Generation Method
Erhan Deniz, Rutgers University

Modeling and Simulation of Business Processes and Applications to IT Service Processes
Genady Grabarnik, IBM Research

Batch Scheduling with Distinct, Assignable Due Dates
Rui Zhang, McMaster University

E-mail Communication as a Paradigm for Quantifying Complex Network Evolution
Dean Malmgren, Northwestern Univ.

Maximizing Advertisements Diffusion
Jiang Wu, Huazhong University of Science and Technology

Multi-Objective Decision Models for INFORMS Issues/Product Roadmaps
Ernest Forman, George Washington Univ.

Draw-Downs Preceding Draw-Ups in a Finite Time Horizon
Hongzhong Zhang, CUNY

Bin Packing Algorithm for Bus Crew Scheduling
Wenxin Qiao, University of Maryland

Approximating Inpatient Census Distributions with Queuing-Based Regression
James Broyles, Arizona State University

How do PMBOK & ICB Approach Projects?
Yasaman Khodadadegan, Arizona State University

Optimal Location of Bluetooth Sensors for Collecting Travel-Time Data
Mona Asudegi, University of Maryland

The Role of TRIZ in Increasing Productivity of Project Risk Management
Moeed Haghnevis, Arizona State Univ.

Discrete Optimization Methods to Curate Metabolic Models
Vinay Satish Kumar, Penn State University

Integer Program Optimization of Train Consisting within a Complex Network
Steven Kolarz, University of Maryland

Multi-Echelon Maintenance and Service Parts Inventory Policy Optimization
Oscar Martinez, Univ. of Central Florida

Online Algorithms for Scheduling Weighted Packets with Deadlines in a Bounded Buffer
Fei Li, George Mason University

MetModel GUI: Software for Building Optimization-Based Models of Cellular Metabolism
Paul Brooks, Virginia Commonwealth University

Role of Trust in the E-Commerce Adoption on Virtual Community
Hyoung-Yong Lee, Hansung University

Current Studies in Kaizen Event Effectiveness, Sustainability and Programs
Wiljeana Glover, Virginia Tech

On the Dynamic Feedback Analysis of Non-Profitable Hospital Promoting Competitive Ability
Xiaoyong Lu, Nanchang University

Online Model Selection Embedded in Product Development for Improving Printer Color Consistency
Chao-Lung Yang, Purdue University

Application of Multi-Criteria Dynamic LP Model to SCM of Crude Oil
Okesola M. Olusola, Oludoy Dynamix Consulting Limited

Dependent Poisson Race Model and Its Application in Conjoint Choice Study
Shiling Ruan, Food And Drug Admin.

Study on the Group-Buying Auction
Jian Chen, Tsinghua University

Simulation-Based Preventive Maintenance Optimization
Dmitriy Belyi, University of Texas at Austin

Optimal Selection of Technology Transferor in Technology Chain Network
Jong-IL Lee, Yonsei University

INTERACTIVE SESSIONS

Risk-Adjusted Scan Statistic for Non-Homogeneous, Non-binomial Dichotomous Populations
Aysun Taseli, Northeastern University

Assessment of Project Management Office Capabilities
Imran Dalwai, University of Pittsburgh

Study on EPR System in Reverse Supply Chain of Cellular Phone Industry in Korea
Kiman Kim, Yonsei University

Real-Time Available to Promise: Solution Quality of a Stochastic Programming Model
Chien-Yu Chen, George Mason University

Portfolio Selection Strategy Using Genetic Algorithms
Miranda Montgomery, Clemson Univ.

Quantum Inspired Genetic Algorithms and Grammatical Evolution
Sean McGarraghy, Univ. College Dublin

Accommodating Transmission Range Uncertainty in Deploying Wireless Ad Hoc Networks
Kangyuan Zhu, Univ. of Virginia

TUESDAY

Quantitative Evaluation of IT Risk and Loss
Bee Yew, Fayetteville State Univ.

Supply Chain Dashboard Pilot-the Oracle Automed Dashboard
Maria Kollberg Thomassen, SINTEF Technology and Society

Hierarchical Systems of Mathematical Physics with Cross Connections
Vladimir Tsurkov, Computing Center of RAS

On Characterizing the Minimum of a Function of Two Discrete Variables
Sara Nourazari, Univ. of Oklahoma

Simulation Optimization for an Emergency Department Healthcare Unit
Talal Alkhamis, Kuwait University

Sustainability Design and Analysis of Light Emitted Diode Lighting Systems
Hsueh-Ming Wang, University of Alaska

Comparison of Constant- and Step-Stress Accelerated Degradation Test Plans
Heonsang Lim, KAIST

Scheduling Jobs with Equal Processing Times Subject to Machine Eligibility Constraints
Kangbok Lee, New York University

Airport Environmental Charge Schemes: Global Policy Review
Cherie Lu, Chang Jung Christian University

Sensitivity Analysis of MSAE Regression Problem
John F Wellington, Indiana Univ.-Purdue Univ. Fort Wayne

Strategic Use of Advertising: A Simulation Model
Malcolm Brady, Dublin City University

Potential Impacts of Plug-In Hybrid Electric Vehicles on Locational Marginal Prices and Regional Air Pollution
Lizhi Wang, Iowa State University

An Ant Colony System for Vehicle Routing Problem with Simultaneous Delivery and Pickup
Yuvraj Gajpal, CIRRELT

Designing Next-Gneration Emergency Medical Service Systems
Laura McLay, Virginia Commonwealth University

Design of Interplanetary Supply Chain Networks
Yosef Tirat-Gefen, Castel Research Inc.

Modeling Dependent Demand Arrivals in an Open-Access System
Husniyah Abdus-Salaam, North Carolina A&T State University

Diverge Bottlenecks, Optimization Formulations, and Optimal Highway Ramp Metering
Mark McDonald, Vanderbilt University

Solving Dynamic Integer Programs Using Wavelets
Kaveh Farokhi-Sadabadi, University of Maryland

New Proposal of the Bidder's Supporting Tool
Tomasz Blaszczyk, Karol Adamiecki University of Economics

Tree-Line Analysis of Populations of Tree Structured Objects
Burcu Aydin, UNC-Chapel Hill

Model and Algorithm for Solving Real Time Dial-A-Ride Problem
Taehyeong Kim, Univ. of Maryland

Stability Analysis of Exchange Networks
Ankur Mani, MIT

Role of Incentives and Coordination Mechanisms in Stability and Equilibrium of Cooperative Networks
Omkar Palsule-Desai, Indian Institute of Management

Technology Readiness and Economic Growth: Rough Sets Based Decision Rule Approach
Gladys Simpson, Florida International University

Evolving Destabilization-Tolerant Key Player Configurations in Social Networks
Ritvik Sahajpal, University of Maryland

Vehicle Routing for Bidding Routes
Pavan Mhasavekar, Lamar University

Capital Renewal as a Real Option
Matthew Reindorp, University of Maryland

Unification of Maintenance Modeling and Optimization
Xiaoyue Jiang, Louisiana State University

An Economic-Statistical Model for Decision Making about Production
Adel Alaeddini, Wayne State University

Risk-Based Rehabilitation Decisions for Network of Pavement Facilities
S. Reza Seyedshohadaie, Texas A&M University

Dynamics of Disaster Relief Resource Allocation, Evacuation Patterns and Victims
Alexandra Medina-Borja, University of Puerto Rico at Mayaguez

Coordinating the Supply Chain System of the Colombian Energy Industry
Diana Ramirez, Universidad del Norte

Real Option on Revenue Optimization Problem in Competitive Markets
Xun Li, Hong Kong Polytechnic University

Leading Supply Chain Management Software Packages
Zhong-Xian Wang, Montclair State University

Optimal Capacity Planning for Home and Community-Based Services
Feng Lin, Purdue University

Inventory Management in Closed-loop Supply Chains under Non-stationary Demand
Ibrahim Dogan, Wayne State University

Maximizing Strategic Value of Product Platforms
Changmuk Kang, Seoul National University

Efficiency in Public Higher Ed Systems
Janet Wagner, Stockton College

DEA Model to Determine the Productivity of High Education Docents
Gredy Garrido, Fort Valley State University

Scheduling MRI Patients for a Radiology Department
David Phillips, College of William & Mary

Design of a Conflict and Error Detection Model
Xin Chen, Purdue University

Dual Behavior of Production Planning Models with Congested Resources
Ali Kefeli, North Carolina State University

Using Dependency Structure Matrix to Evaluate Design
Michelle Xiang Liu, Marymount University

Finding Fraud, Waste and Abuse in Health Care
Rasim Musal, George Washington University

How Non-Economic Project Valuation Criteria Impair Corporate Resource Allocation Decisions
Brendan Bridgford, Xilinx

Optimal Dynamic Pricing and Inventory Policies for Fashion Retailers
Samuel Huang, University of Texas at Austin

Cross-Docking Network Design with Load Balancing and Operational Considerations
Nayoung Cho, Purdue University

Application of Genetic Algorithms to Three-Dimensional Warehouse Retrieval Problems
Patrick Hecht, Clemson University

An Integer Programming Formulation for an Optimal Student Class Assignment Problem
Anand Seshadri, Booz Allen Hamilton

User Centered Approach to Employee Scheduling
Robert Rose, Optimal Decisions

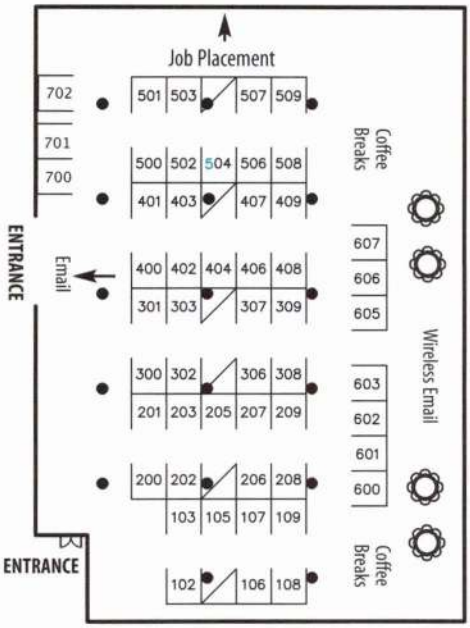
Mathematical Modeling for Selecting Suppliers and Optimal Batch Quantity
Morvarid Rahmani, UCLA

Information Security Investments in the Healthcare Sector
Ajit Appari, Dartmouth College

GUIDE TO EXHIBITORS

MARRIOTT - EXHIBIT HALL A

Exhibit Level



Visit the Exhibit Hall to see innovative software products and the latest technical reference materials from these companies and organizations. Coffee breaks will be held in the Exhibit Hall on Sunday afternoon; Monday and Tuesday, morning and afternoon.

Exhibits Open

Sunday, Oct. 12	12:00pm-5:00pm 7:30pm-9:00pm (Welcome Reception)
Monday, Oct. 13	9:00am-5:00pm
Tuesday, Oct. 14	9:00am-5:00pm

Note: Exhibit Hall is not open on Wednesday

AIMMS® (Paragon) **#307**
5400 Carillon Point
Kirkland, WA 98033
www.aimms.com
Paragon presents its optimization modeling package AIMMS, the most extended package around that is designed to allow you to enable OR successfully in an academic setting or business environment. Stop by our booth and go to the interactive software demo. Allow yourself to learn about AIMMS, get up to date with the latest features, or get tips on how to exploit the existing features to enhance your modeling experience. Free trial available at the meeting, or online at www.aimms.com/try.

AMPL Optimization LLC **#406**
900 Sierra Place SE
Albuquerque, NM 87108-3379
www.ampl.com
AMPL Optimization LLC develops and supports the AMPL modeling language, and distributes large-scale solvers and modeling tools including Ziena's KNITRO, Stanford's MINOS and SNOPT, ARKI's CONOPT, and OptiRisk's FortMP/QP/SP, SAMPL/SPInE, AMPL Studio and Windows COM objects. The AMPL language provides convenient support for the latest methods and features of almost 40 solvers.

Aplia **#500**
959 Skyway Road, Ste. 325
San Carlos, CA 94070
www.aplia.com
Student effort determines student success. Aplia's online homework solution ensures students practice and learn statistics outside the classroom. Our business, behavioral and general introductory statistics systems provide students with interactive, automatically graded assignments with detailed explanations–giving students the knowledge they need for success in the classroom.

Aptech Systems, Inc. **#309**
PO Box 250
Black Diamond, WA 98010
www.aptech.com
The GAUSS Mathematical and Statistical System is a fast matrix programming language widely used for solving mathematical and statistical problems. GAUSS 9.0 supports multi-threaded computationally intensive tasks and suits the researcher who lacks time to develop programs in C or FORTRAN but finds statistical or mathematical packages inflexible and limited.

COIN-OR **#504**
www.coin-or.org
Visit the Computational Infrastructure for Operations Research booth to learn about free, open-source tools for OR professionals and students. COIN-OR is in its eighth year as a community initiative to build an open infrastructure of algorithms, models, data and other digital tools. COIN-OR is hosted online by INFORMS and is a strategic partner of the INFORMS Computing Society.

Dynamic Ideas **#503**
43 Lantern Rd.
Belmont, MA 02478
www.dynamic-ideas.com
Dynamic Ideas, a publisher of books in applied mathematics and operations research, will present its books in our booth. Many of the titles that Dynamic Ideas carries are being used at some of the finest universities and research institutions in the world. For further information, please visit our website.

Elsevier **#206**
360 Park Ave. South
New York, NY 10010
www.elsevier.com
Elsevier publishes leading, high impact OR journals including Journal of Operations Management, Omega, Computers & Operations Research, Decision Support Systems and the European Journal of Operational Research. Elsevier's renowned HORMS series is changing: from 2009 Surveys in Operations Research and Management Science will publish in journal format, accessible online alongside other Elsevier journals at www.sciencedirect.com.

Fair Isaac **#303**
3661 Valley Centre Dr.
San Diego, CA 92130
www.dashoptimization.com
Fair Isaac Corporation's solutions include decision management applications for multiple industries, including the leading systems for credit card fraud and credit card customer management. Xpress-MP–the world's leading mathematical modeling and optimization software developed by Dash Optimization–is now part of Fair Isaac. Xpress-MP gives businesses a new level of analytic precision and power. Stop by and see how Xpress-MP and Fair Isaac's other decision management tools can be used to help you make smarter decisions.

Guide to Exhibitors

Frontline Systems, Inc. **#301**
P.O. Box 4288
Incline Village, NV 89450
www.solver.com
Visit our booth for a first look at easier-than-ever ways to build models, analyze risks and allocate resources optimally using advanced robust optimization and simulation software technology–from Frontline Systems, developer of the Excel Solver. Build models easily in Excel, or in your favorite programming language with our Solver Platform SDK. Solve your largest, most challenging optimization and Monte Carlo simulation problems with less time and effort. Take home a CD with free trial versions of all our products.

GAMS Development Corp. **#208**
1217 Potomac St. NW
Washington, DC 20007
www.gams.com
The General Algebraic Modeling System (GAMS) is a high-level modeling system for mathematical programming and optimization. It consists of a language compiler and a stable of integrated high-performance solvers. GAMS is tailored for complex, large scale modeling applications and allows you to build large maintainable models that can be adapted quickly to new situations.

ILOG, Inc. **#606-607**
1195 W. Fremont Ave.
Sunnyvale, CA 94087
www.ilog.com
ILOG OPL-CPLEX Development System is the most advanced optimization development package for solving the most challenging optimization problems in business or research. Attend our software tutorial on CP Optimizer, or visit our booth to see a demo of OPL-CPLEX Development System to learn more about OPL Development Studio, CPLEX, and other add-ons, including Optimization Decision Manager (ODM). Come and see why OPL and CPLEX are better than ever!

Imagine That, Inc. **#201**
6830 Via Del Oro, Ste. 230
San Jose, CA 95119
www.imaginethatinc.com
Accessible, robust and intuitive, ExtendSim continues to set new standards for simulation software in educational and professional settings. Sneak a peek at future ExtendSim features such as tools for scenario management and design of experiments, which will be added to ExtendSim core features such as its integrated database, realistic 3D animation and intuitive model building capabilities. Choose ExtendSim–Power Tools for Simulation.

INFORMS **#700-702**
7240 Parkway Drive, Ste. 300
Hanover, MD 21076
www.informs.org
This year INFORMS will have a booth and bookstore located in the Exhibit Hall. Visit the booth to talk to INFORMS staff about our journals, membership benefits and services, continuing education, communities and networking opportunities. We will be available at the bookstore to assist you with purchasing print and electronic products and will have the latest information about INFORMS products and services. We look forward to seeing you!

INFORMS Future Meetings **#501**
www.informs.org/Conf/
Come to the booth for a preview of our future meetings.

Innovative Scheduling, Inc. **#407**
2153 SE Hawthorne Rd., Ste. 206
Gainesville, FL 32641
www.innovativescheduling.com
Innovative Scheduling builds custom decision support systems to solve planning and scheduling problems in the field of logistics, distribution and transportation. We (1) develop custom algorithms and software using cutting-edge OR techniques; (2) build fast, robust and scalable methods for very large-scale and highly constrained problems; and (3) package these algorithms in interactive spreadsheet, desktop or web-based DSS including maps. We offer world-class products and services at affordable prices that fit within clients' budgets.

JMP Division-SAS Institute **#601**
100 SAS Campus Dr.
Cary, NC 27513
www.jmp.com
JMP, a division of SAS Institute, develops JMP® software, which brings comprehensive data analysis to the desktop, empowering users to interactively explore, visualize and understand their data. Interactive. Comprehensive. Highly visual. That just begins to describe JMP statistical discovery software. It's the SAS product that dynamically links statistics with graphics right on your desktop, empowering you to explore data interactively and bring understanding to your world.

LINDO Systems, Inc. **#103**
1415 North Dayton St.
Chicago, IL 60622
www.lindo.com
LINDO Systems will highlight recent enhancements to our optimization modeling software including updates to the linear, integer and global solvers. We will be demonstrating LINDO API–our powerful solver engine, LINGO–our integrated modeling language and solvers, and What'sBest!–our large scale Excel solver. Stop by for a free trial CD.

LINKS-simulations.com **#603**
320 Forest Haven Dr.
Winter Garden, FL 34787
chapman@chapmanrg.com
LINKS-simulations.com markets 14 large-scale, competitive, web-based educational simulations for academic courses and corporate ExecEd programs. The LINKS Supply Chain Management Simulation is widely used in leading supply chain management programs (Arizona State, MIT, Ohio State, Penn State and Wisconsin) and prominent corporations (Shell, IBM, ExxonMobil, and Mars).

Lumina Decision Systems, Inc. **#400**
26010 Highland Way
Los Gatos, CA 95033
www.lumina.com
Experienced analysts prefer Analytica to spreadsheets because of its intuitive visual influence diagrams, Intelligent Arrays for managing multiple dimensions, fast Monte Carlo for risk and uncertainty, and scalability to handle large problems. Analytica models are typically 20 to 100 times more compact than equivalent spreadsheets, and correspondingly easier to build and understand.

Guide to Exhibitors

Maximal Software, Inc. **#401**
2111 Wilson Blvd., Ste. 700
Arlington, VA 22201
www.maximalsoftware.com
Maximal Software is the developer of MPL Modeling System, an advanced modeling language for formulating optimization models. We will demonstrate how MPL provides one of the fastest and most scalable modeling languages on the market, and how the OptiMax 2000 Component Library add-on can be used to build customized end-user applications to solve real-world optimization problems.

McGraw-Hill/Irwin **#105**
Two Penn Plaza, 20th Floor
New York, NY 10121
www.mhhe.com
McGraw-Hill is a premier publisher in operations management and decision sciences with leading textbooks and technology for introductory operations management, supply chain management, manufacturing planning and control, service operations, project management and simulation. We are committed to developing author-centered, market-driven texts and innovative educational technology of the highest possible quality.

Now Publishers, Inc. **#402**
146 Pleasant St.
Hanover, MA 02339
www.nowpublishers.com
Now Publishers and its Foundations and Trends journals publish state-of-the-art review articles in business, information and technology written by leading researchers in the field with the references linked to the original articles and allows for updating by the author and community.

OptiRisk Systems **#404**
One Oxford Rd.
UNICOM R&D House
Uxbridge UB9 4DA
United Kingdom
www.optirisk-systems.com
OptiRisk Systems is a UK based company with a global reach. The company has been set up to provide optimization and risk analysis training and solutions. OptiRisk software range includes MP modeling systems based on AMPL, FortMP and FortSP (stochastic) solvers, and stochastic programming modeling environment SPInE.

Palgrave Macmillan **#408**
Houndmills, Basingstoke
Hampshire RG21 6XS
United Kingdom
www.palgrave-journals.com
Palgrave Macmillan is a leading publisher of journals in OR/MS, including IAOR (in connection with IFORS) and the prestigious journal portfolio of The Operational Research Society. Also on display will be the Journal of Revenue and Pricing Management, an associate publication of the INFORMS Revenue Management and Pricing section.

Palisade Corporation **#409**
798 Cascadilla St.
Ithaca, NY 14850
www.palisade.com
Palisade Corporation is a leading global provider of risk management, decision analysis, optimization and statistical analysis software. The all-new DecisionTools® Suite 5.0 is now available. @RISK 5.0 joins Precision Tree 5.0, the decision tree add-in to Excel, and TopRank 5.0 in this major upgrade to the industry standard risk and decision analysis toolkit. The suite has been expanded to include StatTools 5.0 for forecasting and data analysis, NeuralTools 5.0 for neural network prediction and Evolver 5.0 for innovative optimization. Download free trials online.

Responsive Learning Technologies **#108**
10181 Parlett Place
Cupertino, CA 95014
www.responsive.net
Excite and engage your operations and supply chain management students with our award-winning, competitive web-based games. Ensure student readiness for MBA programs with our online assessors and instructors.

River Logic **#403**
8350 N. Central Expressway, Ste. 1500
Dallas, TX 75206
www.riverlogic.com
River Logic's Integrated Business Planning software, Enterprise Optimizer® (EO), helps companies increase financial performance by connecting strategic and operational planning directly to financial outcomes. EO uses advanced constraint-oriented reasoning to holistically model an enterprise with every conceivable constraint, opportunity and interdependency. EO users quickly build integrated models without writing code or managing formulas.

Salford Systems **#102**
4740 Murphy Canyon Rd., Ste. 200
San Diego, CA 92108
www.salford-systems.com
Salford Systems develops advanced statistical and data mining software, including the CART® decision tree, MARS® non-linear automated regression, TreeNet® boosted decision trees and Random Forests®. Salford Systems strives to make the best academic research easily usable by the practicing data analyst and has recently won several distinguished international honors.

SAS Institute Inc. **#602**
SAS Campus Dr.
Cary, NC 27513
www.sas.com
SAS understands that operations research doesn't stand alone, but instead works closely with data handling, broad-based analytics and effective information delivery. That's why SAS provides core operations research methods–including optimization, simulation and scheduling–integrated with these critical capabilities. Stop by to learn more and to see what's coming next.

SAS Higher Education Consulting **#600**
SAS Campus Drive
Cary, NC 27513
www.sas.com/training/us/hec/
SAS is the market leader in providing business intelligence software and services. SAS Higher Education Consulting supports the use of SAS at higher education institutions. The exhibit will include information on SAS software and the support provided for professors using the software in the classroom.

SIAM **#306**
3600 Market St. – 6th Fl.
Philadelphia, PA 19104
www.siam.org
Visit the SIAM booth to check out our new publications, including titles in the MPS-SIAM Series on Optimization and other recently published and bestselling SIAM books, all available at a conference discount. You'll also find sample issues of SIAM's renowned journals, including SIOPT, along with information and applications for anyone interested in becoming a SIAM member. And don't forget to pick up a copy of SIAM News for the road.

Guide to Exhibitors

South-Western Cengage Learning **#200, 202**
5191 Natorp Blvd.
Mason, Ohio 45040
www.cengage.com
South-Western Cengage Learning strives to provide you the material needed to make decision sciences relevant and interesting to your students as they prepare for the world of work. As the top business publisher we can help you with the highest quality print and technology offerings for undergraduate as well as graduate business statistics, management sciences as well as operations and supply chain management courses.

Springer **#107, 109**
101 Philip Dr.
Norwell, MA 02061
www.springeronline.com
Springer is one of the largest scientific publishing companies in the world, with a portfolio of 4,000 new books per year and more than 1,200 journals. Springer's Business & Management program touches upon various subject areas such as applied and scientific management, finance, entrepreneurship, operations research and business information systems.

statistics.com **#203**
612 N. Jackson St.
Arlington, VA 22201
www.statistics.com
We offer the most comprehensive data mining package in Excel (data partitioning, classification and prediction with neural nets, trees, naïve bayes, logistic regression, k-nearest neighbor, clustering, principal components and association rules, and more). In addition, statistics.com offers online courses in data mining as well as supervised methods, unsupervised methods, text mining and trees.

StatPoint Technologies, Inc. **#508**
2325 Dulles Corner Blvd., Ste. 500
Herndon, Virginia 20171
www.statgraphics.com
Since 1982 STATGRAPHICS® has offered groundbreaking advances. Fortune 1000 companies worldwide use STATGRAPHICS© to graphically visualize and uncover meaning in their data. Reveal patterns and trends, gain direction for vital decisions: statistical analysis, SIX SIGMA, modeling, QC, forecasting, DOE, Vista. Go to our website for a free demo.

Syncopation Software, Inc. **#605**
1623 Main St.
Concord, MA 01742
www.syncopationsoftware.com
Syncopation Software is a leading provider of business analytic tools for decision analysis, risk analysis, Monte Carlo simulation and real option valuation. Syncopation's DPL 7, released in March 2008, features a full line of class-leading decision support tools, from the entry level Standard Version to a packaged R&D prioritization solution in the Portfolio Version.

Taylor & Francis Group LLC-CRC Press **#207, 209**
6000 Broken Sound Pkwy. NW Ste. 300
Boca Raton, FL 33487
www.taylorandfrancis.com
Taylor & Francis is a premier publisher of books, journals and electronic databases on operations research and management. Special convention discounts ranging from 15-25% off will be offered. Stop by to peruse our new and bestselling products in this area and pick up a free sample journal. For more information about our company, visit www.crcpress.com.

TranSystems **#106**
2400 Pershing Rd., Ste. 400
Kansas City, MO 64108
www.transystems.com
TranSystems provides best-of-breed architects, engineers, management and supply chain consulting, simulation modeling and facility design under one roof. We deliver on the promise of optimized solutions to the distributors and manufacturers providing a continuum of services ranging from benchmarking corporate goals through designing material handling systems, supply chain optimization, facility operations, and more. Contact us at supplychain@transystems.com.

University of Virginia **#205**
Masters Program
PO Box 400747
Charlottesville, VA 22904
www.virginia.edu
The University of Virginia Accelerated Masters Program in Systems Engineering enables technical professionals to earn their degrees in one year while continuing to work full-time. Classes meet every other Friday and Saturday on the UVA grounds in Charlottesville. The next session begins in May 2009. Apply online at www.sys.virginia.edu/accelerated/.

Wiley-Blackwell **#302**
350 Main St.
Malden, MA 02148
www.wiley.com/wiley-blackwell
Wiley-Blackwell, the scientific, technical, medical and scholarly publishing business of John Wiley & Sons, is the world's leading society publisher. We offer peer-reviewed primary research and evidence-based medicine across thousands of online journals, books, reference works and databases.

XJ Technologies **#308**
Office 410
49 Nepokorennykh pr.
St. Petersburg 195220
Russian Federation
www.xjtek.com
XJ Technologies is a leading provider of dynamic simulation tools, technologies and consulting services for business applications. We design, develop and market AnyLogic - the first and only tool that supports system dynamics, process-centric (discrete event), and agent-based methods within one modeling language and one model development environment. The language of AnyLogic has very high flexibility and enables the modeler to capture the complexity and heterogeneity of business, economic and social systems at any desirable level of detail.

Ziena Optimization, Inc. **#300**
1801 Maple Ave., Ste. 6320
Oak Park, IL 60201
www.ziena.com
KNITRO® Nonlinear Solver introduces its newest interface to MATLAB® R2008a. KNITRO is designed for solving the most difficult large-scale optimization problems. Preferred by Fortune 100 global corporations, KNITRO easily interfaces to all major modeling environments, C/C++, Java and Fortran. Free trial downloads are available at our website.

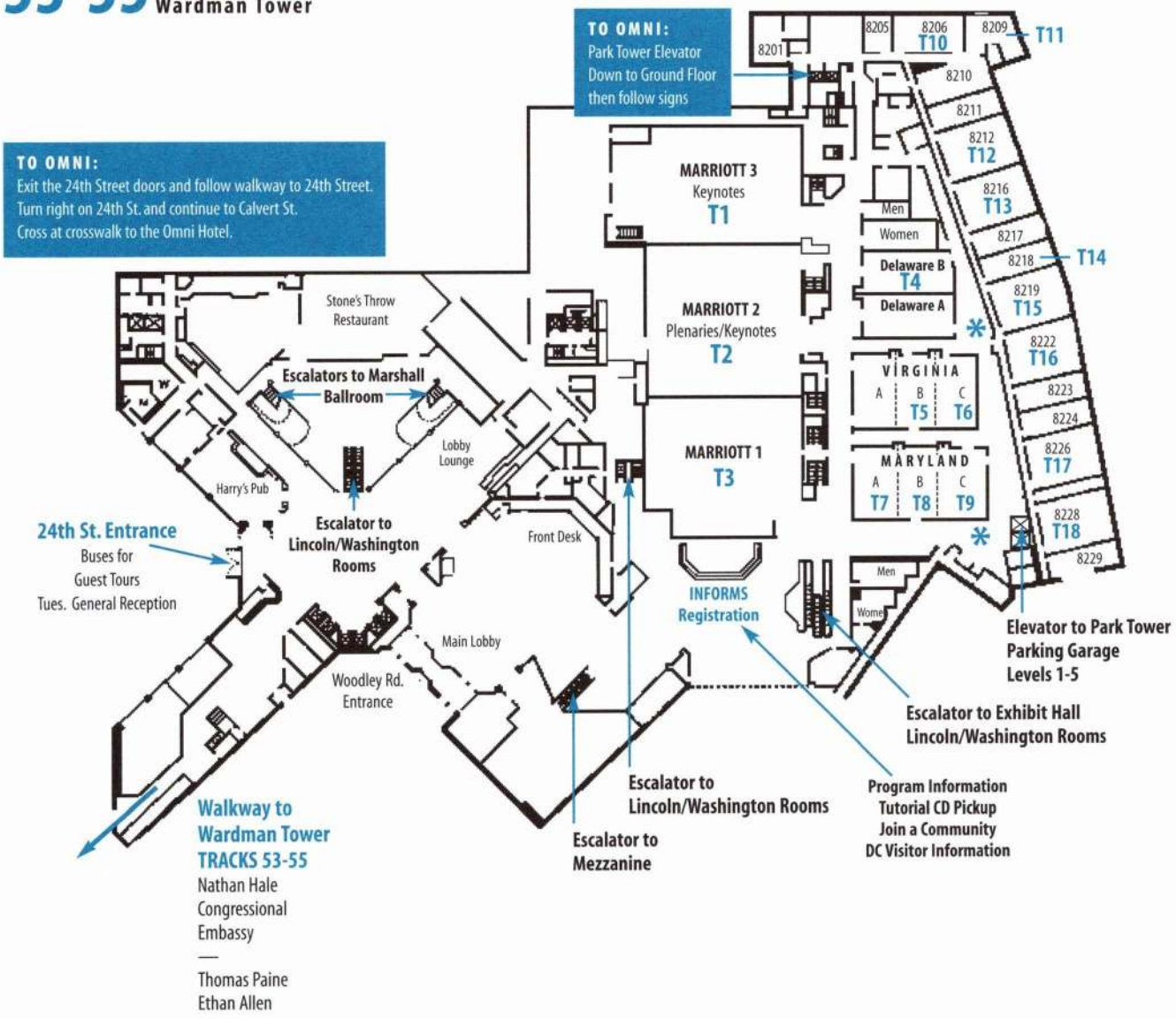
Marriott Wardman Park

✱ Session Monitor Desk

LOBBY LEVEL

Track numbers shown for Technical Session Rooms

TRACKS
1-18
53-55 Wardman Tower



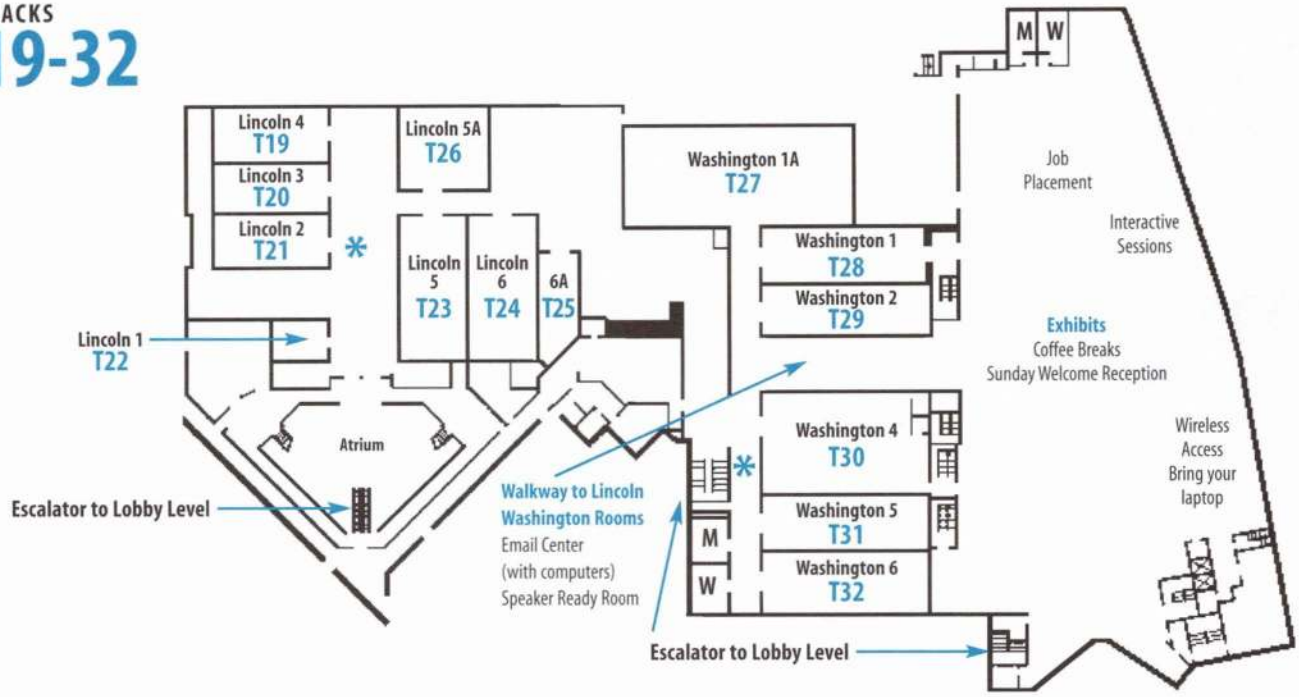
MAPS & FLOOR PLANS

Marriott Wardman Park

* Session Monitor Desk

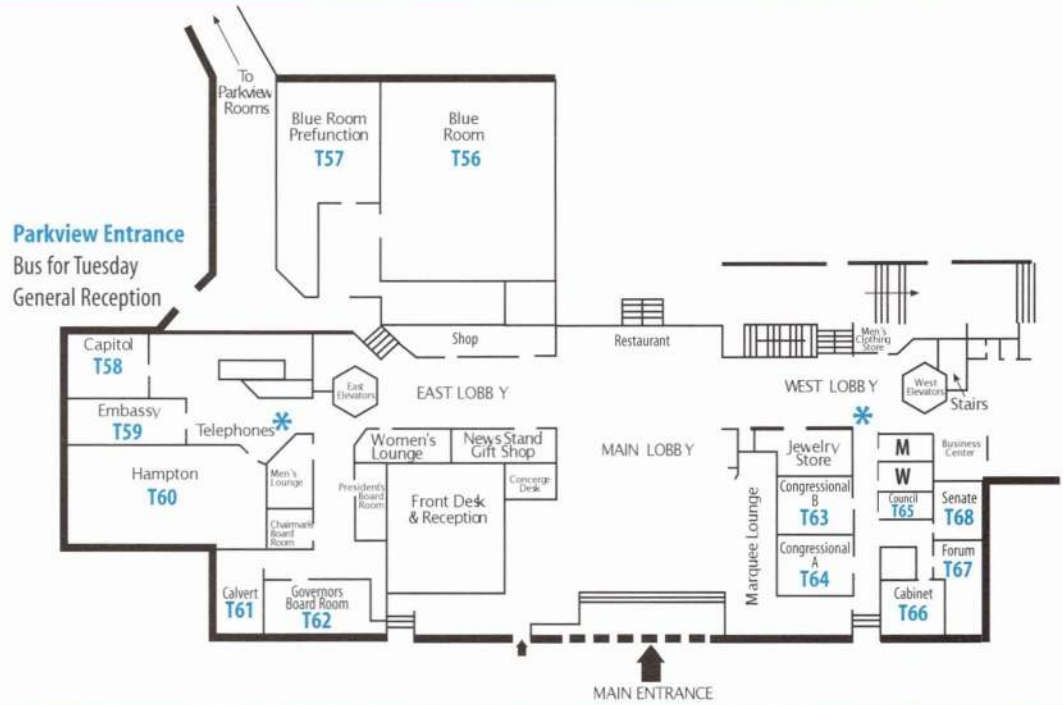
EXHIBIT LEVEL

TRACKS
19-32



Omni Shoreham Hotel

TRACKS
56-68

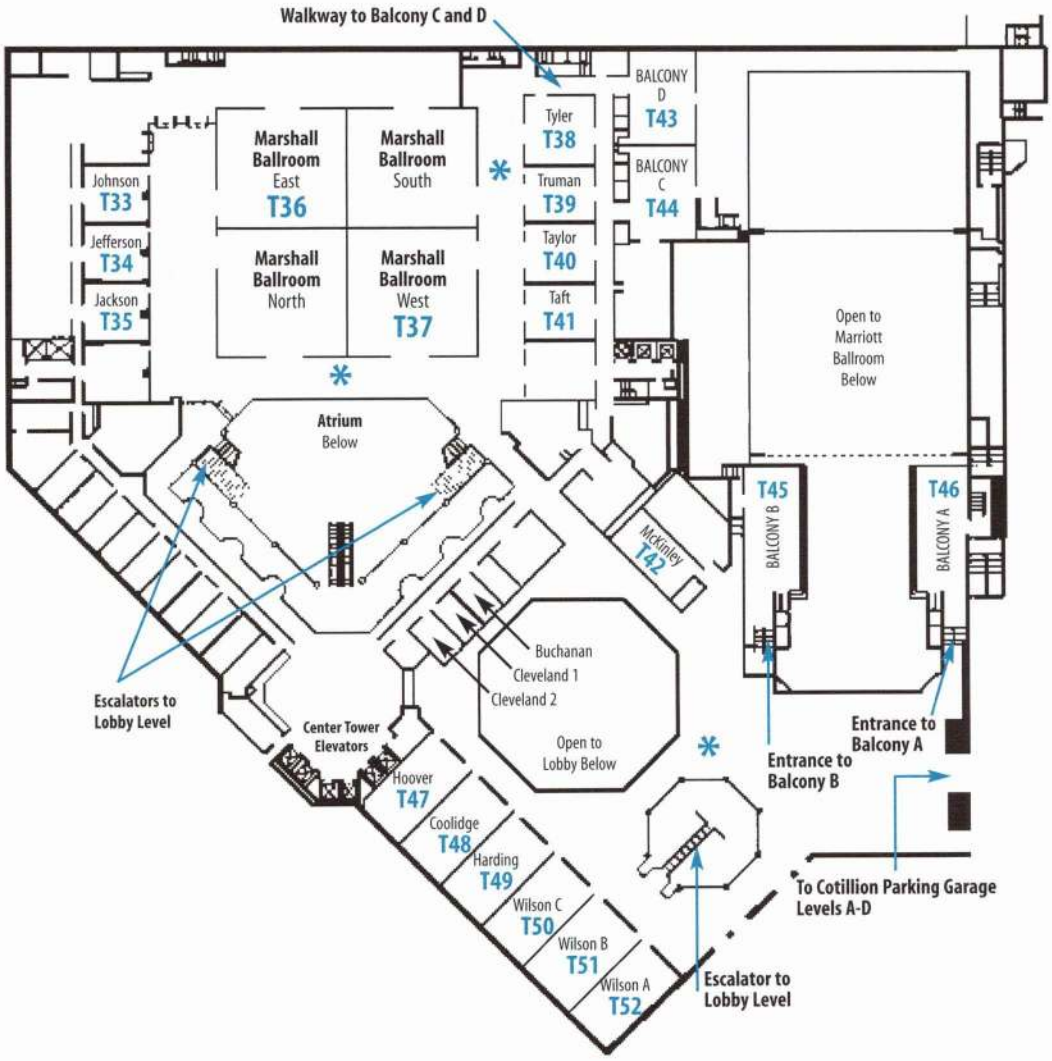


Marriott Wardman Park

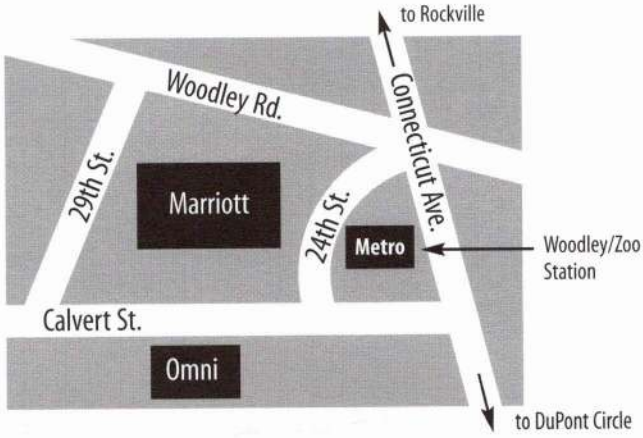
✻ Session Monitor Desk

MEZZANINE LEVEL

TRACKS
33-52



MARRIOTT & OMNI LOCATIONS



MASTER TRACK SCHEDULE–SUNDAY

M-Marriott O-Omni

Track	Room	SA 8:00-9:30	Plenary 10:00–10:50	SB 11:00-12:30	SC 1:30-3:00	Plenary 3:10-4:00	SD 4:30-6:00
1	M-Marriott Ballroom 3	Minority Issues		Minority Issues	Minority Issues		Women in ORMS
2	M-Marriott Ballroom 2	Information Systems		Information Systems	Information Systems		Information Systems
3	M-Marriott Ballroom 1	Public Policy		Homeland Security	Homeland Security		Homeland Security
4	M-Delaware B	No Session		No Session	No Session		No Session
5	M-Virginia B	No Session	Welcome &	No Session	No Session	Omega Rho	No Session
6	M-Virginia C	No Session	Edelman Reprise	No Session	No Session	Karla Hoffman	No Session
7	M-Maryland A	Mftg. & Service Ops. Mgmt.	Cynthia Barnhart	MSOM	MSOM	Auctions: Why are	MSOM
8	M-Maryland B	Mftg. & Service Ops. Mgmt.	INFORMS President	MSOM	MSOM	they proliferating	MSOM
9	M-Maryland C	Quality, Statistics & Reliability		QSR	QSR	and what do you	QSR
10	M-Room 8206	Optimization in Power	2008 Edelman	Pollution Control	ENRE-Energy	need to know	ENRE-Energy
11	M-Room 8209	ENRE-Forestry	Winner	ENRE-Forestry	ENRE-Forestry	to participate?	ENRE-Forestry
12	M-Room 8212	Data Mining	Netherlands	Data Mining	Data Mining	M-Marriott	Data Mining
13	M-Room 8216	Data Mining	Railways	Data Mining	Data Mining	Ballroom 2	Data Mining
14	M-Room 8218	Software Demonstration	The New Dutch	Software Demonstration	Software Demonstration		Software Demonstration
15	M-Room 8219	Service Science	Timetable	Service Science	Service Science		Service Science
16	M-Room 8222	Supply Chain Optimization	The OR Revolution	Supply Chain Optimization	Supply Chain Optimization		MSOM-Management
17	M-Room 8226	Quality, Statistics & Reliability	M-Marriott	QSR	QSR		QSR
18	M-Room 8228	Reliability	Ballroom 2	Reliability	Statistics & Quality Control		Quality Management
19	M-Lincoln 4	Decision Analysis		Decision Support	Decision Analysis		Decision Analysis
20	M-Lincoln 3	Decision Analysis		Decision Analysis	Decision Analysis		Decision Analysis
21	M-Lincoln 2	Dantzig Award		Dantzig Award	Queueing Models		Queueing Models
22	M-Lincoln 1	Applied Probability		CS-Constaint Programming	CS-Constraint Programming		CS-Constraint Programming
23	M-Lincoln 5	Applied Probability		Applied Probability	Applied Probability		Applied Probability
24	M-Lincoln 6	Computing Society		CS	CS		CS
25	M-Lincoln 6A	Computing Society		CS	CS		CS
26	M-Lincoln 5A	CS-Open Source		CS-Open Source	CS-Open Source		CS-Open Source
27	M-Washington 1A	Applied Probability		Applied Probability	Applied Probability		Applied Probability
28	M-Washington 1	Integer Programming		Robust Optimization	Dynamic Optimization		Dynamic Optimization
29	M-Washington 2	Voting & Elections		Tutorial	No Session		INFORMS Korea Chapter
30	M-Washington 4	Military Applications		Military Applications	Military Applications		Military Applications
31	M-Washington 5	Flexible Manufacturing Systems		College on Practice of ORMS	CPMS		CPMS
32	M-Washington 6	College on Practice of ORMS		CPMS	CPMS		CPMS
33	M-Johnson	Healthcare Stategic Planning		Health Applications	Health Applications		Health Applications

SUNDAY *continued*

Track	Room	SA 8:00-9:30	Plenary 10:00–10:50	SB 11:00-12:30	SC 1:30-3:00	Plenary 3:10-4:00	SD 4:30-6:00
34	M-Jefferson	Healthcare Systems		Health Applications	Health Applications		Health Applications
35	M-Jackson	INFORM-ED		INFORM-ED	INFORM-ED		INFORM-ED
36	M-Marshall Ball. East	No Session		OR in Sports	OR in Sports		Software Demonstration
37	M-Marshall Ball. West	Tutorial		Tutorial	Tutorial		Tutorial
38	M-Tyler	Optimization-Discrete Opt.		Optimization-Discrete Opt.	Optimization-Discrete Opt.		Optimization-Discrete Opt.
39	M-Truman	Optimization-Discrete Opt.		Optimization-Discrete Opt.	Optimization-Networks		Optimization-Networks
40	M-Taylor	Optimization-Stochastic Prog.		Optimization-Stochastic Prog.	Optimization-Stochastic Prog.		Optimization-Stochastic Prog.
41	M-Taft	New Product Development		New Product Development	New Product Development		New Product Development
42	M-McKinley	Combinatorial Optimization		Optimization-Computational	Optimization-Gobal		Optimization-Global
43	M-Balcony D	Inventory in Supply Chain		Managing Disruptions in SC	Managing Disruptions in SC		Managing Disruptions in SC
44	M-Balcony C	Behavioral Operations		Managing Disruptions in SC	Managing Disruptions in SC		Managing Disruptions in SC
45	M-Balcony B	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
46	M-Balcony A	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
47	M-Hoover	Health Applications		Health Applications	Health Applications		Health Applications
48	M-Coolidge	Technology Management		Technology Management	Technology Management		Technology Management
49	M-Harding	Simulation		Simulation	Simulation		Simulation
50	M-Wilson C	Optimization-Computational		Optimization-Computational	Optimization-Computational		Optimization-Computational
51	M-Wilson B	Information Systems		Information Systems	Information Systems		Information Systems
52	M-Wilson A	Environmentally Conscious Ops.		Environmentally Conscious Ops.	Environmentally Conscious Ops.		Environmentally Conscious Ops.
53	M-Nathan Hale (Ward Tower)	Financial Services		Financial Services	Financial Services		Financial Services
54	M-Congressional (Ward Tower)	Decision-Making, Planning		Organization Science	Organization Science		Risk Security
55	M-Embassy (Ward Tower)	Telecommunications		Telecommunications	Telecommunications		Telecommunications
56	O-Blue Room	Intelligent Transportation		Transportation Science & Logistics	TSL		TSL
57	O-Blue Room Prefunction	Aviation Applications		Aviation Applications	Nicholson Prize		Nicholson Prize
58	O-Capital	Aviation Applications		Aviation Applications	Aviation Applications		Aviation Applications
59	O-Embassy	Revenue Management		Revenue Management	Revenue Management		Revenue Management
60	O-Hampton	Revenue Management		Revenue Management	Railway Applications		Railroad Applications Section
61	O-Calvert	Transportation Science & Logistics		TSL	TSL		TSL
62	O-Governor's Boadroom	Revenue Management		Revenue Management	Revenue Management		Revenue Management
63	O-Congressional B	Freight Transportation		Transportation Science & Logistics	TSL		TSL
64	O-Congressional A	Transportation Scheduling		Transportation Science & Logistics	TSL		TSL
65	O-Council	Junior Faculty Interest Group		Junior Faculty Interest Group	Service Industry		Service Industry
66	O-Cabinet	Modeling Systems		Governance/Software Develop.	Governance/Software Develop.		Governance/Software Develop.
67	O-Forum	Data Mining		Location Analysis	Location Analysis		Location Analysis
68	O-Senate	Marketing Science		Marketing Science	Marketing Science		Marketing Science

MASTER TRACK SCHEDULE–MONDAY

Interactive Sessions
12:30-1:30, Exhibit Hall

M-Marriott O-Omni

Track	Room	MA 8:00-9:30	Plenary 10:00–10:50	MB 11:00-12:30	MC 1:30-3:00	Keynotes 3:10-4:00	MD 4:30-6:00
1	M-Marriott Ballroom 3	Women in ORMS		eBusiness	eBusiness		eBusiness
2	M-Marriott Ballroom 2	Information Systems		Information Systems	Information Systems		Production Process in SC
3	M-Marriott Ballroom 1	Homeland Security		Tribute to Richard Rosenthal	Inventory Management		Inventory Systems
4	M-Delaware B	No Session		No Session	No Session		No Session
5	M-Virginia B	Network Congestion	**Plenary**	Network Congestion	Network Congestion	**IFORS Lecture**	Network Congestion
6	M-Virginia C	Auctions-Tribute to Michael Rothkopf	**Roger Myerson**	Auctions-Tribute to M. Rothkopf	Auctions-Tribute to M. Rothkopf	**Michel Balinski**	Auctions-Tribute to M. Rothkopf
7	M-Maryland A	Mftg. & Service Ops. Mgmt.	**Perspectives on**	MSOM	MSOM	**One-Vote, One-Value:**	MSOM
8	M-Maryland B	MSOM-Interface	**Mechanism Design**	MSOM-Interface	MSOM-Interface	**The Majority**	MSOM-Interface
9	M-Maryland C	Quality, Statistics & Reliability	**in Economic Theory**	QSR	QSR	**Judgment**	QSR
10	M-Room 8206	ENRE-Energy	**M-Marriott**	ENRE-Energy	ENRE-Energy	**M-Marriott**	ENRE-Energy
11	M-Room 8209	ENRE-Forestry	**Ballroom 2**	ENRE-Forestry	ENRE-Energy	**Ballroom 2**	ENRE-Energy
12	M-Room 8212	Data Mining		Data Mining	Data Mining		Data Mining
13	M-Room 8216	Data Mining		Data Mining	Data Mining		Data Mining
14	M-Room 8218	Software Demonstration		Software Demonstration	Software Demonstration		Software Demonstration
15	M-Room 8219	Service Science		Service Science	Service Science		Service Science
16	M-Room 8222	MSOM-Service Mgmt.		MSOM-Service Mgmt.	MSOM-Service Mgmt.		MSOM-Service Mgmt.
17	M-Room 8226	Quality, Statistics & Reliability		QSR	QSR		QSR
18	M-Room 8228	Quality, Statistics & Reliabilit		QSR	QSR		QSR
19	M-Lincoln 4	Decision Analysis		Decision Analysis	Decision Analysis		Tutorial
20	M-Lincoln 3	Decision Analysis		Decision Analysis	Decision Analysis	**Practice Keynote**	Decision Analysis
21	M-Lincoln 2	Computational Biology		Computational Biology	Computational Biology	**David Halverson**	Computational Biology
22	M-Lincoln 1	CS-Constraint Programming		CS-Constraint Programming	Contracts/Policies in SC	**Innovative Methods:**	Scheduling
23	M-Lincoln 5	Applied Probability		Applied Probability	Applied Probability	**Required for**	Applied Probability
24	M-Lincoln 6	Computing Society		CS	CS	**Future Challenges**	CS
25	M-Lincoln 6A	Computing Society		CS	CS	**M-Marriott**	CS
26	M-Lincoln 5A	CS-Open Source		CS-Open Source	CS-Open Source	**Ballroom 3**	CS-Open Source
27	M-Washington 1A	Applied Probability		Applied Probability	Applied Probability		Applied Probability
28	M-Washington 1	Dynamic Optimization		Applied Optimization	Online Decision Making		Online Decision Making
29	M-Washington 2	INFORMS Outreach		INFORMS Outreach	Job Placement-Industry		Tutorial
30	M-Washington 4	Military Applications		Military Applications	Military Applications		Military Applications
31	M-Washington 5	INFORMS Practice Section-CPMS		CPMS	CPMS		CPMS
32	M-Washington 6	Wagner Prize		Wagner Prize	Wagner Prize		Wagner Prize
33	M-Johnson	Health Applications		Health Applications	Health Applications		Health Applications

MONDAY *continued*

M-Marriott O-Omni

Track	Room	MA 8:00-9:30	Plenary 10:00–10:50	MB 11:00-12:30	MC 1:30-3:00	Keynotes 3:10-4:00	MD 4:30-6:00
34	M-Jefferson	Health Applications		Health Applications	Health Applications		Health Applications
35	M-Jackson	INFORM-ED		INFORM-ED	INFORM-ED		INFORM-ED
36	M-Marshall Ball. East	No Session		No Session	No Session		No Session
37	M-Marshall Ball. West	Tutorial		Tutorial	Tutorial		Tutorial
38	M-Tyler	Optimization-Discrete Opt.		Optimization-Discrete Opt.	Optimization-Discrete Opt.		Optimization-Discrete Opt.
39	M-Truman	Optimization-Networks		Optimization-Networks	Technology Management		Optimization-Networks
40	M-Taylor	Optimization-Stochastic Prog.		Optimization-Stochastic Prog.	Optimization-Stochastic Prog		Optimization-Stochastic Prog.
41	M-Taft	New Product Development		New Product Development	New Product Development		Product Development
42	M-McKinley	Optimization-Global		Optimization in Medicine	CS-Bioinformatics		CS-Bioinformatics
43	M-Balcony D	Managing Disruptions in SC		Managing Disruptions in SC	Managing Disruptions in SC		OR & Strategy
44	M-Balcony C	Managing Disruptions in SC		Managing Disruptions in SC	Managing Disruptions in SC		Managing Disruptions in SC
45	M-Balcony B	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
46	M-Balcony A	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
47	M-Hoover	Health Applications		Health Applications	Health Applications		Health Applications
48	M-Coolidge	Technology Management		Technology Management	Technology Management		Technology Management
49	M-Harding	Simulation		Simulation	Simulation		Simulation
50	M-Wilson C	Optimization-Computational		Optimization-Computational	Optimization-Computational		Optimization-Computational
51	M-Wilson B	Information Systems		Information Systems	Information Systems		Information Systems
52	M-Wilson A	Environmentally Conscious Ops.		Environmentally Conscious Ops.	Environmentally Conscious Ops		Environmentally Conscious Ops.
53	M-Nathan Hale (Ward Tower)	Financial Services		Financial Services	Financial Services		Financial Services
54	M-Congressional (Ward Tower)	Risk Security		Risk Security	Risk Security		Risk Security
55	M-Embassy (Ward Tower)	Telecommunications		Telecommunications	Telecommunications		Telecommunications
56	O-Blue Room	Transportation Science & Logistics		TSL	TSL		TSL
57	O-Blue Room Prefunction	Junior Faculty Interest Group		Junior Faculty Interest Group	Junior Faculty Interest Group		Junior Faculty Interest Group
58	O-Capital	Aviation Applications		Aviation Applications	Aviation Applications		Aviation Applications
59	O-Embassy	Revenue Management		Revenue Management	Revenue Management		Revenue Mangement
60	O-Hampton	Railway Applications		Railway Applications	Railway Applications		Railway Applications
61	O-Calvert	Transportation Science & Logistics		TSL	TSL		TSL
62	O-Governor's Boardroom	Revenue Management		Revenue Management	Revenue Management		Revenue Mangement
63	O-Congressional B	Transportation Science & Logistics		TSL	TSL		TSL
64	O-Congressional A	Transportation Science & Logistics		TSL	TSL		TSL
65	O-Council	Strategic Planning		Scheduling in Service Industry	Scheduling in Service Industry		Scheduling in Service Industry
66	O-Cabinet	Governance of Software Develop.		Real-Time Systems	Real-Time Systems		Real-Time Systems
67	O-Forum	Location Analysis		Location Analysis	Location Analysis		Location Analysis
68	O-Senate	Marketing Science		Marketing Science	Marketing Science		Marketing Science

MASTER TRACK SCHEDULE–TUESDAY

Interactive Sessions
12:30-1:30, Exhibit Hall

M-Marriott O-Omni

Track	Room	TA 8:00-9:30	Keynotes 10:00–10:50	TB 11:00-12:30	TC 1:30-3:00	Plenary 3:10-4:00	TD 4:30-6:00
1	M-Marriott Ballroom 3	E-Business		E-Business	Porfolio & Risk Mngt.		Financial Engineering
2	M-Marriott Ballroom 2	No Session		Doing Good: Energy/Environment	No Session		Doing Good: Health Policy
3	M-Marriott Ballroom 1	Dantzig Memorial		Dantzig Memorial	Dantzig Memorial		Dantzig Memorial
4	M-Delaware B	Public Policy		Public Policy	Oganizational Theory		Public Prog: Tribute to Rick Rosenthal
5	M-Virginia B	Optimization-Nonlinear	Doing Good with	Optimization-Nonlinear	Optimization-Nonlinear	Doing Good with	Optimization-Nonlinear
6	M-Viginia C	Auctions	Good OR	Auctions	Auctions	Good OR	Auctions
7	M-Maryland A	Mftg. & Service Ops. Mgmt.	Energy & The	MSOM	MSOM	Health Policy	MSOM
8	M-Maryland B	MSOM-Interface	Environment	MSOM-Interface	MSOM-Interface	Carolyn M. Clancy	MSOM-Interface
9	M-Maryland C	Quality, Statistics & Reliability	Philip Sharp	QSR	QSR	M-Marriott	QSR
10	M-Room 8206	ENRE-Energy	M-Marriott	ENRE-Energy	ENRE-Energy	Ballroom 2	ENRE-Energy
11	M-Room 8209	ENRE-Energy	Ballroom 2	ENRE-Energy	ENRE-Energy		ENRE-Energy
12	M-Room 8212	Data Mining		Data Mining	Data Mining		Data Mining
13	M-Room 8216	Data Mining		Data Mining	Data Mining		Data Mining
14	M-Room 8218	Software Demonstration		Software Demonstration	Software Demonstration		Software Demonstration
15	M-Room 8219	Service Science		Service Science	Service Science		Service Science
16	M-Room 8222	MSOM-Service Mgmt.		MSOM-Service Mgmt.	MSOM-Service Mgmt.		Supply Chain Mgmt.
17	M-Room 8226	Quality, Statistics & Reliability		QSR	QSR		QSR
18	M-Room 8228	Service Science		Service Science	Service Science		Service Science
19	M-Lincoln 4	Decision Analysis		Decision Analysis	Decision Analysis		Decision Analysis
20	M-Lincoln 3	Decision Analysis	McCord Morse	Decision Analysis	Decision Analysis		Decision Analysis
21	M-Lincoln 2	Healthcare Infomatics	Lecture	Healthcare Infomatics	Healthcare Infomatics		Healthcare Infomatics
22	M-Lincoln 1	Scheduling	Lawrence Wein	Applied Probability	Scheduling		Scheduling
23	M-Lincoln 5	Applied Probability	Operations Research	Applied Probability	Applied Probability		Applied Probability
24	M-Lincoln 6	Computing Society	and Homeland	CS	CS		CS
25	M-Lincoln 6A	CS	Security: From	CS-Metaheuristics	CS-Metaheuristics		CS-Metaheuristics
26	M-Lincoln 5A	CS-Open Source	Models to	CS-Open Source	CS-Open Source		CS-Open Source
27	M-Washington 1A	No Session	Implementation	No Session	No Session		No Session
28	M-Washington 1	Online Decision Making	M-Marriott	Online Decision Making	Online Decision Making		Integer Programming
29	M-Washington 2	Tutorial	Ballroom 3	Job Placement: Academic	Tutorial		Tutorial
30	M-Washington 4	Military Applications		Military Applications	Military Applications		Military Applications
31	M-Washington 5	College on Practice of ORMS		CPMS	CPMS		CPMS
32	M-Washington 6	Wagner Prize		Sloan Foundation	Sloan Foundation		Inventory Management
33	M-Johnson	Health Applications		Health Applications	Health Applications		Health Applications

TUESDAY *continued*

M-Marriott O-Omni

Track	Room	TA 8:00-9:30	Keynotes 10:00–10:50	TB 11:00-12:30	TC 1:30-3:00	Plenary 3:10-4:00	TD 4:30-6:00
34	M-Jefferson	Health Applications		Health Applications	Health Applications		Health Applications
35	M-Jackson	INFORM-ED		INFORM-ED	INFORM-ED		INFORM-ED
36	M-Marshall Ball. East	No Session		No Session	No Session		No Session
37	M-Marshall Ball. West	Tutorial		Tutorial	INFORMS Communities		Tutorial
38	M-Tyler	Optimization-Discete Opt.		Optimization-Discrete Opt.	Optimization-Discrete Opt.		Optimization-Discrete Opt.
39	M-Truman	Optimization-Networks		Optimization-Networks	Optimization-Networks		Optimization-Networks
40	M-Taylor	Optimization-Stochastic Prog.		Optimization-Stochastic Prog.	Optimization-Linear		Optimization-Linear
41	M-Taft	New Product Development		New Product Development	New Product Development		New Product Development
42	M-McKinley	CS-Bioinformatics		CS-Bioinformatics	CS-Bioinformatics		Forecasting-Supply Chain
43	M-Balcony D	OR & Strategy		OR & Strategy	OR & Strategy		OR & Strategy
44	M-Balcony C	Managing Disruptions in SC		Managing Disruptions in SC	Managing Disruptions in SC		Managing Disruptions in SC
45	M-Balcony B	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
46	M-Balcony A	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
47	M-Hoover	Health Applications		Health Applications	Health Applications		Health Applications
48	M-Coolidge	Technology Management		Technology Management	Technology Management		Technology Management
49	M-Harding	Simulation		Simulation	Simulation		Simulation
50	M-Wilson C	Optimization-Computational		Optimization-Computational	Optimization-Computational		Optimization-Computational
51	M-Wilson B	Information Systems		Information Systems	Information Systems		Information Systems
52	M-Wilson A	Humanitarian Logistics		Humanitarian Logistics	Humanitarian Logistics		Humanitarian Logistics
53	M-Nathan Hale (Ward Tower)	Financial Engineering		Financial Engineering	Financial Engineering		Financial Engineering
54	M-Congressional (Ward Tower)	Risk Security		Cost/Performance Analysis	Supply Chain Mgmt.		Supply Chain Mgmt.
55	M-Embassy (Ward Tower)	Telecommunications		Telecommunications	Telecommunications		Networks & Graphs
56	O-Blue Room	Transportation Science & Logistics		TSL	TSL		TSL
57	O-Blue Room Prefunction	Aviation Applications		Aviation Applications	Aviation Applications		Aviation Applications
58	O-Capital	Aviation Applications		Aviation Applications	Aviation Applications		Aviation Applications
59	O-Embassy	Revenue Management		Revenue Management	Revenue Management		Revenue Management
60	O-Hampton	Railway Applications		Revenue Management	Railway Applications		Dynamic Pricing Strategy
61	O-Calvert	Transportation Science & Logistics		TSL	TSL		TSL
62	O-Governor's Boardroom	Revenue Management		Revenue Management	Revenue Management		Revenue Management
63	O-Congressional B	Transportation Science & Logistics		TSL	TSL		TSL
64	O-Congressional A	Transportation Science & Logistics		TSL	TSL		TSL
* 65	M-Virginia A (Marriott)	Workforce Flexibility		Scheduling-Service Industry	Workforce Flexibility		Workforce Flexibility
66	O-Cabinet	Spreadsheet Productivity		Spreadsheet Productivity	Spreadsheet Productivity		Spreadsheet Productivity
67	O-Forum	Location Analysis		Location Analysis	Location Analysis		Location Analysis
68	O-Senate	Marketing Science		Marketing Science	Marketing Science		Marketing Science

***Room change from previous days**

MASTER TRACK SCHEDULE–WEDNESDAY

M-Marriott O-Omni

Track	Room	WA 8:00-9:30	Plenary 10:00–10:50	WB 11:00-12:30	WC 1:30-3:00	Plenary 3:10-4:00	WD 4:30-6:00
1	M-Marriott Ballroom 3	Financial Engineering		Politics & Voting	E-Business		Marketing Interface
2	M-Marriott Ballroom 2	No Session		Doing Good: Aviation Congestion	No Session		No Session
3	M-Marriott Ballroom 1	Military Applications		Military Applications	Forecasting		Forecasting
4	M-Delaware B	Public Programs		Public Progams	Public Programs		Tribute to Richard Rosenthal
5	M-Virginia B	Optimization-Nonlinear	Doing Good	Game Theory	Game Theory	Plenary	Game Theorgy
6	M-Virginia C	Auctions	with Good OR	Auctions	Auctions	Daniel Cook	Economics
7	M-Maryland A	Mftg. & Services Ops. Mgmt.	Aviation Congestion	MSOM	MSOM	Engineering in the	No Session
8	M-Maryland B	MSOM-Interface	Dorothy Robyn	MSOM	MSOM	Entertainment	Supply Chain Mgmt.
9	M-Maryland C	Quality, Statistics & Reliability	M-Marriott	QSR	QSR	Industry	QSR
10	M-Room 8206	ENRE-Energy	Ballroom 2	ENRE-Energy	ENRE-Energy	M-Marriott	ENRE-Energy
11	M-Room 8209	Environment & Energy		Environment & Energy	Facilities Planning/Design	Ballroom 2	Facility Location
12	M-Room 8212	Data Envelopment Analysis		Data Envelopment Analysis	Data Mining		Data Mining
13	M-Room 8216	Data Mining		Data Mining	Data Mining		Data Mining
14	M-Room 8218	Mftg. & Services Ops. Mgmt.		Production Planning	Multicriteria Decision Making		Multicriteria Decision Making
15	M-Room 8219	Service Science		Service Science	Service Science		Service Science
16	M-Room 8222	Supply Chain Mgmt.		Supply Chain Mgmt.	Supply Chain Mgmt.		Supply Chain Mgmt.
17	M-Room 8226	Quality, Statistics & Reliability		QSR	QSR		QSR
18	M-Room 8228	Service Science		Service Science	Novel Opt. Techniques		Novel Opt. Techniques
19	M-Lincoln 4	Decision Analysis		Decision Analysis	Decision Analysis		Decision Analysis
20	M-Lincoln 3	Decision Analysis		Decision Analysis	Decision Analysis		Decision Support
21	M-Lincoln 2	Healthcare Informatics		Healthcare Informatics	Healthcare Informatics		Sustainable Operations
22	M-Lincoln 1	No Session		Queueing Models	Queueing Models		Computer Science Apps.
23	M-Lincoln 5	Applied Probability		Applied Probability	Applied Probability		Applied Probability
24	M-Lincoln 6	Computing Society		CS	CS		CS
25	M-Lincoln 6A	Metaheuristics for Design		Vehicle Routing	Vehicle Routing		Vehicle Routing
26	M-Linconn 5A	CS-Mixed Integer		CS-Mixed Integer	CS-Mixed Integer		CS-Mixed Integer
27	M-Washington 1A	No Session		No Session	No Session		No Session
28	M-Washington 1	Systems Analysis		Deliveries-Logistics	Supply Chain Logistcs		Logistics
29	M-Washington 2	Tutorial		Data Envelopment Analysis	Data Envelopment Analysis		Data Envelopment Analysis
30	M-Washington 4	Military Applications		Military Applications	Military Applications		No Session
31	M-Washington 5	College on Practice of ORMS		CPMS	Project Management		Resource Allocation
32	M-Washington 6	Inventory Management		Inventory Management	Inventory Control		Inventory Control
33	M-Johnson	Health Applications		Healthcare Strategic Planning	OR in Medicine		Emergency Dept. Ops.

WEDNESDAY *continued*

M-Marriott O-Omni

Track	Room	WA 8:00-9:30	Plenary 10:00–10:50	WB 11:00-12:30	WC 1:30-3:00	Plenary 3:10-4:00	WD 4:30-6:00
34	M-Jefferson	Health Applications		Health Applications	Novel OR Applications		Resource Allocation
35	M-Jackson	INFORM-ED:Tribute to M. Rothkopf		INFORM-ED: Tribute to R. Rosenthal	INFORM-ED		OR in Education
36	M-Marshall Ball. East	Information Systems		Information Systems	Stochastic Processes		Stochastic Processes
37	M-Marshall Ball. West	OR in Education		OR Practice & Application	Homeland Security		OR at NSA
38	M-Tyler	Optimization-Discrete Opt.		Optimization-Discrete Opt.	Optimization-Discrete Opt.		Linear Programming
39	M-Truman	Optimization-Networks		Optimization-Networks	Optimization-Networks		Optimization-Networks
40	M-Taylor	Optimization-Linear		Optimization-Linear	Optimization-Linear		Optimization-Linear
41	M-Taft	Innovation/Entrepreneurship		Innovation/Entrepreneurship	Technology Management		Product Development
42	M-McKinley	Supply Chain Mgmt.		Supply Chain Mgmt.	Supply Chain Mgmt.		Supply Chain Mgmt.
43	M-Balcony D	Operations Management		Operations Management	Operations Management		Operations Management
44	M-Balcony C	Managing Disruptions in SC		Managing Disruptions in SC	Manufacturing Systems		Manufacturing Systems
45	M-Balcony B	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		Global Issues in SC
46	M-Balcony A	MSOM-Supply Chain		MSOM-Supply Chain	MSOM-Supply Chain		MSOM-Supply Chain
47	M-Hoover	Health Applications		Health Applications	Hospital Process Improvement		Healthcare Systems
48	M-Coolidge	Technology Management		Technology Management	Technology Management		No Session
49	M-Harding	Stochastic Simulation		Sim.-Based Decision Making	Simulation & Opt.		Decision Support
50	M-Wilson C	Optimization-Computational		Optimization-Computational	Optimization-Computational		Optimization-Computational
51	M-Wilson B	Information Systems		Information Systems	Information Systems		Information Systems
52	M-Wilson A	Humanitarian Logistics		Humanitarian Logistics	Humanitarian Logistics		Humanitarian Logistics
53	M-Nathan Hale (Ward Tower)	Financial Engineering		Financial Engineering	Financial Engineering		Financial Engineering
54	M-Congressional (Ward Tower)	No Session		Production Scheduling	Metaheuristics & Opt.		Queueing Models
* 55	M-Room 8217	Network Optimization		Flight Scheduling	Air Traffic Control		Stochastic Processes
56	O-Blue Room	Transportation Science & Logistics		TSL	TSL		OR in Transportation Ops.
57	O-Blue Room Prefunction	Aviation Applications		Aviation Applications	Aviation-Environment/Safety		Air Space Design
58	O-Capital	Aviation Applications		Aviation Applications	Aviation Applications		Aviation Applications
59	O-Embassy	Revenue Management		Revenue Management	Revenue Management		Revenue Management
60	O-Hampton	Transportation Science & Logistics		Transportation	Revenue Management		Rail Transportation
61	O-Calvert	Transportation Science & Logistics		TSL	TSL		Transportation Planning
62	O-Governor's Boardroom	Revenue Management		Revenue Management	Revenue Management		Revenue Management
63	O-Congressional B	Transportation Science & Logistics		TSL	TSL		Transportation Planning
64	O-Congressional A	Transportation Science & Logistics		TSL	TSL		Transportation Network
* 65	M-Virgina A (Marriott)	Workforce Flexibility		Inventory Policy	Inventory Policy		Inventory Models
* 66	M-Delaware A (Marriott)	Spreadsheet Productivity		Spreadsheet Productivity	Dynamic Programming		Dynamic Programming
67	O-Forum	Decision Analysis		Continuous Optimization	Decision Analysis		Production Scheduling
68	O-Senate	Marketing		Marketing	Marketing		Marketing Interface

***Room change from previous days**

Sponsored Cluster Chairs

Applied Probability
Baris Ata
Northwestern University

Bert Zwart
Georgia Institute of Technology

Aviation Applications
Anne Mercier
ExPretio

COMPUTING
Robin Lougee-Heimer
IBM Research

Bioinformatics & Systems Biology
(Joint with Health Applications)
Nikolaos V. Sahinidis
Camegie Mellon University

Leonardo B. Lopes
University of Arizona

Constraint Programming and OR
Meinolf Sellmann
Brown University

John Hooker
Carnegie Mellon University

Metaheuristics
Mary Beth Kurz
Clemson University

Mixed-integer Nonlinear Optimization
(Joint with Optimization)
Kevin Furman
ExxonMobil

Open Source Software
(Joint with Optimization)
Joao Goncalves
IBM Research

CPMS, The Practice Section of INFORMS
Lawrence D. Stone
Metron, Inc.

Arnold Greenland
IBM

Data Mining
Rong Duan
AT&T

Xiaoming Huo
Georgia Institute of Technology

Decision Analysis
Jack M. Kloeber
Verizon

Erin Baker
University of Massachusetts

eBusiness
Hemant Bhargava
UC Davis

Sulin Ba
University of Connecticut

ENERGY, NATURAL RESOURCES & THE ENVIRONMENT
Energy
Antonio J. Conejo
University of Castilla-La Mancha

Forestry
Robert Haight
USDA Forest Service

Financial Services
Manos Hatzakis
MIT

Health Applications
Brian T. Denton
North Carolina State University

INFORM-ED
David Rader
Rose-Hulman Institute of Technology

Information Systems
H. Raghav Rao
University of New York at Buffalo

Junior Faculty Interest Group
Lawrence V. Snyder
Lehigh University

Eylem Tekin
Texas A&M University

Korea Chapter-INFORMS
Sang Hyung Ahn
Seoul National University

Location Analysis
Max Chen
UC Berkeley

Yupo Chan
University of Arkansas

MANUFACTURING & SERVICE OPERATIONS MGT./SERVICE MGT.
Justin Ren
Boston University

Interface between Finance, Operations & Risk Management
Volodymyr Babich
University of Michigan

Service Management
Francis de Vericourt
ESMT

Supply Chain
Pinar Keskinocak
Georgia Institute of Technology

Marketing Science
B.P.S.Murthy
University of Texas at Dallas

Preyas Desai
Duke University

Military Applications
Patrick Driscoll
United States Military Academy

Minority Issues
Robert Hampshire
Princeton University

OPTIMIZATION
Computational Optimization & Software
(Joint with Computing)
Ted Ralphs
Lehigh University

Discrete Optimization
Alper Atamturk
University of California

Global Optimization
Ignacio Grossmann
Carnegie Mellon University

Linear Programming & Complementarity
Samuel Burer
University of Iowa

Medicine & Healthcare
Eva K. Lee
Georgia Institute of Technology

Networks
Kamal Jain
Microsoft Research

Nonlinear Optimization
Michael Friedlander
University of British Columbia

Stochastic Programming
Shabbir Ahmed
Georgia Institute of Technology

O.R. in Sports
Joel Sokol
Georgia Institute of Technology

Organization Science
Heather Berry
University of Pennsylvania

Public Programs & Processes
Douglas A. Samuelson
Serco-NA

John Hall
National Fire Protection Association

Quality, Statistics and Reliability
Satish Bukkapatnam
Oklahoma State University

Railway Applications
Michael Gorman
University of Dayton

Revenue Management (Sponsored/Invited)
Victor Araman
New York University

Gustavo Vulcano
New York University

Service Science
Ruoyi Zhou
IBM

Simulation
Michael Kuhl
Rochester Institute of Technology

Technology Management
Janice Carrillo
University of Florida

Telecommunications
Timothy Matis
Texas Tech University

Halit Uster
Texas A&M University

Transportation Science & Logistics
David Lovell
University of Maryland

Women in OR/MS
Ann Muriel
University of Massachusetts

INVITED CLUSTER CHAIRS

Applied Dynamic Optimization
Benjamin Van Roy
Stanford University

Auctions
Michael H. Rothkopf
Pennsylvania State University

Wedad Elmaghraby
University of Maryland

Computational Biology
Mona Singh
Princeton University

Daniel H. Wagner Prize for Excellence in Operations Research
Allen Butler
Daniel H. Wagner Associates, Inc.

Dantzig Memorial
Saul I. Gass
University of Maryland

Richard W. Cottle
Stanford University

Data Envelopment Analysis
Lawrence M. Seiford
University of Michigan

Data Mining
Alexander Tuzhilin
New York University

Balaji Padmanabhan
University of South Florida

Environmentally Conscious/Closed-Loop Production Supply Chain
Valerie Thomas
Georgia Institute of Technology

Beril Toktay
Georgia Institute of Technology

Financial Engineering/ Risk Management
Stanislav Uryasev
University of Florida

Pavlo Krokhmal
University of Iowa

George B. Dantzig Dissertation Prize
Yunzeng Wang
University of California

Governance of Software Development
Clay Williams
IBM

Health Care Informatics & Operations
Ritu Agarwal
University of Maryland

Homeland Security
Joseph B. Mazzola
Georgetown University

Humanitarian Logistics & Disaster Preparedness
Elise Miller-Hooks
University of Maryland

Pinar Keskinocak
Georgia Institute of Technology

Julie Swann
Georgia Institute of Technology

Ozlem Ergun
Georgia Institute of Technology

INFORMS Communities/Subdivisions
Gary Bennett
INFORMS

Mary Magrogan
INFORMS

INFORMS Outreach
Barry List
INFORMS

Interactive Sessions
Pablo Durango-Cohen
Northwestern University

Job Placement Service
Talisa Murray
Johns Hopkins University

Managing Disruptions in Supply Chains
Kathryn E. Stecke
University of Texas at Dallas

Thomas G. Schmitt
University of Washington

Sanjay Kumar
University of Texas at Dallas

Network Congestion & Congestion Management
Terry Friesz
Pennsylvania State University

New Product Development
Raul Chao
University of Virginia

Nicholson Student Paper Prize
Georgia Perakis
MIT

Online Decision Making
Paat Rusmevichienton
Cornell University

Huseyin Topalglu
Cornell University

O.R. & Strategy
Peter Bell
University of Western Ontario

Public Policy: O.R. in the Public Sector
Arnold Barnett
MIT

Real-Time Systems
Michel Gendreau
Université de Montréal

Risk Security
Seth Guikema
Johns Hopkins University

Robust Optimization
Dimitri Bertsimas
MIT

Scheduling in the Service Industry
Diego Klabjan
Northwestern University

Sloan Foundation
Amy Cohn
University of Michigan

Spreadsheet Productivity Research
Patrick Noonan
Emory University

To The Memory of Richard Rosenthal
Douglas A. Samuelson
InfoLogix, Inc.

Voting, Elections & Political Institutions
Steven Callender
Northwestern University

Workforce Flexibility/Management
Eylem Tekin
Texas A&M University

FUTURE MEETINGS

INFORMS MEETINGS

2009

April 26-28
INFORMS Practice Conference: Applying Science to the Art of Business
Sheraton Phoenix Downtown
Phoenix, Arizona
Chair: Zahir Balaporia
www.informs.org/Conf/Practice09

June 14-17
CORS/INFORMS International Toronto 2009
Westin Harbour Castle
Toronto, Ontario, Canada
Chair: Liping Fang
www.informs.org/Conf/Toronto09

October 11-14
INFORMS Annual Meeting 2009 San Diego
San Diego Convention Center and Hilton San Diego
San Diego, California
Chair: Soheila Jorjani
sjorjani@csusm.edu

2010

April 18-20
INFORMS Practice Conference: Applying Science to the Art of Business
Hilton Bonnet Creek Resort
Orlando, Florida
Chair: David Leonhardi
david.r.leonhardi@boeing.com

Spring 2010
ALIO-INFORMS International
Buenos Aires, Argentina
Chair: Irene Loiseau
irene@dc.uba.ar

November 7-10
INFORMS Annual Meeting 2010 Austin
Austin Convention Center and Hilton Austin
Austin, Texas
Chair: Jonathan Bard
jbard@mail.utexas.edu

2011

November 13-16
INFORMS Annual Meeting 2011 Charlotte
Charlotte Convention Center
Charlotte, North Carolina
Chair: Cem Saydam
saydam@uncc.edu

2012

October 14-17
INFORMS Annual Meeting 2012 Phoenix
Phoenix Convention Center
Phoenix, Arizona
Chair: Ronald Askin
ron.askin@asu.edu

INFORMS COMMUNITIES MEETINGS

2008

December 7-10
Winter Simulation Conference 2008
InterContinental Hotel
Miami Florida
Chair: Thomas Jefferson
www.wintersim.org

2009

January 11-13
INFORMS Computing Society Conference
Francis Marion Hotel
Charleston, South Carolina
Chair: Matt Saltzman
http://ics09.meetings.informs.org/

April 24-25
INFORMS Western Regional Conference
Arizona State University
Phoenix, Arizona
Chair: John Fowler
john.fowler@asu.edu

June 4-6
INFORMS Marketing Science Conference
University of Michigan
Ann Arbor, Michigan
Chairs: Gene Anderson & Fred Feinberg
feinf@umich.edu

June 22-23
Revenue Management & Pricing Section Conference
Northwestern University, The Kellogg School
Evanston, Illinois
Chair: Martin Lariviere
m-lariviere@northwestern.edu

July 12-15
Applied Probability Society Conference
Cornell University
Ithaca, New York
Chairs: Shane Henderson & Mark Lewis
http://appliedprob.society.informs.org/apsconf09/APS09.html

December 13-16
Winter Simulation Conference 2009
Hilton Austin
Austin, Texas
Chair: Ann Dunkin
ann.dunkin@hp.com

August 23-28, 2009
20th International Symposium on Mathematical Programming
University of Chicago, Gleacher Center
& Marriott Chicago Downtown
Chicago, Illinois
Chair: John Birge
http://www.ismp2009.org/

How to Navigate the Technical Sessions

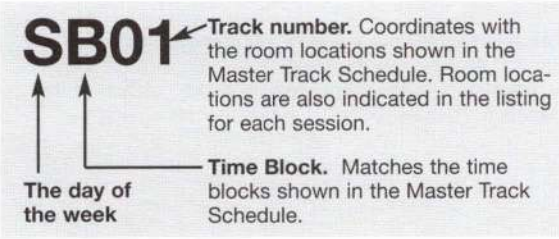
There are four primary resources to help you understand and navigate the Technical Sessions:

- This Technical Session listing, which provides the most detailed information. The listing is presented chronologically by day/time, showing each session and the papers/abstracts/authors within each session.
- The Session Chair, Author, and Session indices provide cross-reference assistance (pages 423-462).
- The map and floor plans on pages 47-49 show you where technical session tracks are located.
- The Master Track Schedule is on pages 50-57. This is an overview of the tracks (general topic areas) and when/where they are scheduled.

Quickest Way to Find Your Own Session

Use the Author Index (pages 427-451) — the session code for your presentation(s) will be shown along with the track number. You can also refer to the full session listing for the room location of your session(s).

The Session Codes



Time Blocks

A — 8:00am - 9:30am
B — 11:00am - 12:30am
C — 1:30pm - 3:00pm
D — 4:30pm - 6:00pm

Plenaries, keynotes and lunch breaks are interspersed among the technical session time blocks. Interactive Sessions are held during the lunch break at 12:30-1:30 on Monday and Tuesday.

Room Locations/Tracks

All tracks and technical sessions are held in the Marriott Wardman Park and Omni Shoreman. Room numbers are shown on the Master Track Schedule and in the technical session listing.

Quick Reference

Don't miss the Quick Reference, a separate flier you received in your registration packet. It includes the Master Track Schedule and floor plans, providing a quick, portable summary of the meeting

Sunday, 8:00am - 9:30am

■ SA01

M- Marriott Ballroom 3

New Methods in Environmental and Economic Statistics

Sponsor: Minority Issues
Sponsored Session

Chair: Kobi Abayomi, Asst. Professor, Georgia Tech, Groseclose Bldg, Atlanta GA 30030, kaa21@duke.edu

1 - Is El Nino Still a Good Predictor for Monsoon Rainfall?: Detecting Changes in Covariance
Lucy Robinson, PhD Candidate, Columbia University, Department of Statistics, Room 1005, 1255 Amsterdam Ave, New York, NY, 10027, United States of America, lfr24@columbia.edu

Historically, the El Nino Southern Oscillation (ENSO), a global climate phenomenon, has been used to predict droughts in India, and is known to be correlated with Monsoon rainfall in other parts of the world. In recent years climatologists have speculated that this relationship is weakening. We use retrospective change point detection techniques to address this issue, attempting to identify shifts in covariance over the last 130 years.

2 - Bayesian Downscaling of Outputs from Numerical Model Output
Veronica Berrocal, Duke University, 920 Clarendon Street, Durham, NC, United States of America, vjb2@duke.edu, Alan Gelfand

In many environmental problems data arise from two sources: numerical models and monitoring networks. The first source provides predictions at the level of grid cells, while the second source gives measurements at points. Accommodating the spatial misalignment between the two types of data is of fundamental importance. In this paper we propose a simple method to downscale the output from numerical models to point level using spatially varying coefficient modeled as correlated Gaussian processes.

3 - Factorizing High Dimensional Distributions via Alpha Complexes
Simon Lunagomez, PhD Candidate, Duke University, Box 90251 Duke University, Durham, NC, 27708, United States of America, simon.lgz@duke.edu, Sayan Mukherhee, Robert Wolpert

We are interested in modeling the dependence structure of multivariate heavy-tailed distributions. By assuming conditional independence, a factorization of the distributions can be represented by a hypergraph. The combinatorial nature and exponential increase in complexity of hypergraph models result in computational problems. As an alternative we couple constructions from computational algebraic topology with copulas to obtain factorizations which are efficient to compute.

4 - Statistics for Sustainably Selective Welfare Functions
Kobi Abayomi, Asst. Professor, Georgia Tech, Groseclose Bldg, Atlanta, GA, 30030, kaa21@duke.edu

Chichilnisky's criteria defines a sustainable welfare function as both purely finitely additive and integrable. Classical welfare optimization yields welfare functions that are singular to infinite time or negligible probability events. I introduce characterizations of statistical estimators for the divergence from a sustainable development path - or utility stream - via a copula similar representation of Kullback-Leibler divergence as a statistical equivalence for the criteria.

■ SA02

M - Marriott Ballroom 2

Technology Acceptance, Usage, and Firm Competitive Advantage

Sponsor: Information Systems
Sponsored Session

Chair: Devaki Rau, Assistant Professor, Northern Illinois University, College of Business, Barsema Hall, De Kalb, IL, 60115, United States of America, drau@niu.edu

Co-Chair: Thorvald Haerem, Norwegian School of Management BI/Copenhagen Business School, Department of Strategy, Norway, thorvald.harem@bi.no

1 - Presence and Productivity in Virtual and Blended Workplaces
Lamar Reinsch, Professor of Management, Georgetown University, Old North Building, Washington, DC, 20057, United States of America, reinschl@georgetown.edu, Jeanine Turner, Rebecca Heino

We offer the concept of interpersonal presence to clarify how persons use CMC and other technologies to project, imply, obscure, and allocate participation across multiple interactions. This concept can facilitate the study of CMC in organizational settings, settings in which participants increasingly use CMC to enhance or restrict accessibility, to unobtrusively monitor and influence interactions, and to participte in multiple simultaneous interactions, that is, to multicommunicate.

2 - Successful and Unsuccessful Episodes of MultiCommunicating

Jeanine Turner, Associate Professor of Communication, Culture, & Technology, Georgetown University, 311 Car Barn, Washington, DC, 20057, United States of America, turnerjw@georgetown.edu, Lamar Reinsch

Critical incident descriptions indicate that flexibility of pace and compartmentalization facilitate multicommunicating. Our analysis also shows that multicommunicating is less successful when persons try to engage in too many interactions or address highly emotional topics. We argue that, while increasingly common, multicommunicating promotes a self-focused orientation, an emphasis on constant availability, and a model of the communication process as "juggling" rather than engaging in dialogue.

3 - Information Systems and Sustained Competitive Advantage: A Resource-based Analysis

Yan Chen, The School of Management, Xian Jiaotong University, PO Box 1647, The School of Management, Xian Jiaotong University, Xian, 710049, China, chenyan02@gmail.com, Bjorn Johansson, Jun Tian

This paper discusses the relationships between information systems and sustained competitive advantages from the resource-based perspective. According to the resource-based analysis, we conclude that Information Systems Flexibility, IT-Business Relationship, and IT-Business Alignment Process are three major sources of sustained competitive advantages.

■ SA03

M - Marriott Ballroom 1

Threats to Life and Limb

Cluster: Public Policy: Operations Research in the Public Sector: Change We Can Believe In!
Invited Session

Chair: Arnie Barnett, Sloan School of Management, E53-379 MIT, Cambridge, MA, 02139, United States of America, abarnett@mit.edu

1 - Understanding Inertia: Inherent Limitations on Evaluating "Upstream" Drug and Violence Prevention Interventions

Jonathan P. Caulkins, Professor, Carnegie Mellon Heinz School, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, caulkins@andrew.cmu.edu, Irmgard Zeiler

Analysts debate whether "an ounce of prevention is really worth a pound of cureî. Some say prevention has registered enough null results to conclude it is not cost-effective. We caution that system inertia can mask benefits of even successful interventions so "no news" may truly be "no news."

2 - The Rise in Violence in the Late 1980s

Alfred Blumstein, H. John Heinz III School of Public Policy and Management, Carnegie Mellon University, Pittsburgh, PA, ab0q@andrew,cmu.edu

Incarceration doesn't reduce drug transactions because the resilient market recruits replacements (Blumstein, 1993). The early 1980s saw major growth in incarceration of drug offenders. This did little about drugs, but the nature of the replacements led to a 25% increase in violence, an unintended consequence of the incarceration growth.

3 - No Room at the Emergency Room: Causes and Consequences

Linda Green, Armand G. Erpf Professor, Columbia Business School, 3022 Broadway, 423 Uris Hall, New York, NY, 10027, United States of America, lvg1@columbia.edu, Sherry Glied, M. Grams, Natalia Yankovic

ER overcrowding is worsening nationwide. Though sometimes dismissed as a minor problem due to more people who use the ER for routine medical problems, this masks potentially fatal consequences for seriously ill patients who do not receive timely care. We describe an NYC-based study which establishes a strong link between ambulance diversions and deaths from heart attacks. We also describe the underlying causes of ED overcrowding and how it is being exacerbated by governmental and payer policies.

■ SA07

M - Maryland A

Behavioral Issues in OM

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Nils Rudi, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, Nils.RUDI@insead.edu

1 - Contracting with Risk-averse Newsvendor

Wenjie Tang, INSEAD, Blvd. de Constance, Fontainebleau, 77305, France, wenjie.tang@insead.edu, Nils Rudi

We find that while risk aversion with price only contracts always results in a smaller equilibrium quantity, the newsvendors expected profit might actually be larger. Furthermore, we find that a two-part tariff under risk aversion can coordinate the supply chain and split the total profit in any proportion.

2 - Bias and Adjustment in Censored and Uncensored Newsvendor Environments

David Drake, INSEAD, Blvd de Constance, Fontainebleau, 77305, France, david.drake@insead.edu, Nils Rudi

We disambiguate the impact of behavioral order bias and order variation, defining the former as the average deviation from the risk-neutral, profit-maximizing solution and the latter as adjustments from this average. We conduct an experiment to explore the impact of these two sources of profit erosion in censored and uncensored newsvendor environments, finding the magnitude of profit erosion attributable to order variation exceeded that due to order bias in three out of four of our conditions.

3 - When Newsvendors Herd: The Impact of Comparison on Ordering Decisions

Buket Avci, PhD Student, INSEAD, Blvd de Constance, Fontainebleau, 77305, France, buket.avci@insead.edu, Steffen Keck, Zeina Loutfi, Kaifu Zhang, Elena Belavina

We propose a model of newsvendor type decision making when agents care not only about individual profit but also about the difference with another agent's profit. Agents alter their decision in order to minimize expected regret versus what is viewed as foregone profit and to maximize corresponding expected rejoice. In equilibrium this leads to herding behavior when regret dominates rejoice. We conduct experiments in order to evaluate the scope of this herding behavior in ordering decisions.

4 - Collusion in Buyer-determined Procurement Auctions

Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu, Achim Wambach

We present a new theory that shows that collusion is sometimes an equilibrium in buyer-determined procurement auctions. We test this theory in the laboratory and find that when buyer use non-price attributes to make their final decisions, and supplier do not know the value of their own non-price attributes, collusive behavior results.

■ SA08

M - Maryland B

Inventory and Capacity Topics

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Joseph Milner, University of Toronto, 105 St. George Street, Toronto, ON, Canada, Milner@Rotman.Utoronto.Ca

1 - DVD Allocation for a Multiple-location Rental Firm

Iman Hajizadeh, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, iman@rotman.utoronto.ca, Opher Baron, Joseph Milner

We study the purchase and allocation of DVDs for a multiple location movie rental firm. Using a newsvendor formulation with multiple rental opportunities and data from a large rental firm, we estimate that our methodology increases profits between 3% and 18%. Implications for revenue sharing contracts are discussed.

2 - Intertemporal Pricing for a Capacity Constrained Just-in-time Supply Chain

Dehui Tong, University of Toronto, 105 St. George St. PhD Program, Toronto, ON, M5S3E6, Canada, dehui.tong@rotman.utoronto.ca, Opher Baron, Joseph Milner

We study a hierarchical planning model for a capacity constrained service system for multiple customer classes with heterogenous schedule preferences. Strategic level prices are determined to regulate customers' preferences. Customers observe posted prices, arrive and are assigned capacity slots dynamically over a planning horizon. Extension to overbooking is discussed.

3 - Rationing Capacity to Signal Product Quality

Man Yu, Ross School of Business, University of Michigan, 701 Tappan, Ann Arbor, MI, United States of America, manyu@umich.edu, Hyun-soo Ahn, Roman Kapuscinski

We consider a seller who offers a product in two periods (advance and spot) and has private information on the quality of the product. Customers are uncertain about valuations and product quality until the spot. We characterize the seller's strategy under two scenarios: (i) the seller can ration capacity in advance and (ii) rationing is not allowed. We find that capacity rationing is an effective signal of quality and characterize when the seller should signal through rationing.

4 - Managing Inventory of Perishable Items

Opher Baron, University of Toronto, 105 St. George Street, Toronto, ON, M5S3E6, Canada, Opher.Baron@Rotman.Utoronto.Ca, David Perry, Oded Berman

We generalize the traditional (s,S) models to include cycle's stopping times that are independent of the content level. This models perishable items that arrive in batches, have the same exponential or deterministic shelflife, and are consumed by a Compound Poisson demand. Assuming zero leadtime, we optimize the order-up-to-level to minimize cost.

■ SA09

M - Maryland C

Joint Session QSR/HAS: Quality and Statistical Decision Making in Healthcare Applications I

Sponsor: Quality, Statistics and Reliability, Health Applications Section

Sponsored Session

Chair: Jing Li, Assistant Professor, Department of Industrial Engineering, Arizona State University, Tempe, AZ, United States of America, jinglz@asu.edu

1 - Measuring the Effect of Improved Forecasting on Detection: An Application to Biosurveillance

Thomas Lotze, University of Maryland, College Park, College Park, MD, 20742, United States of America, lotze@math.umd.edu, Galit Shmueli

Biosurveillance monitors daily health series data, aiming to find early indicators of disease outbreak and alert appropriate health officials. To do this, most modern systems use forecasting to predict the health series' expected value, then monitor residuals from that prediction to provide detection. This talk quantifies the relationship between improved forecasting and increased detection. It also examines cases when improved forecasting does not necessarily improve detection.

2 - Automatic Updating of Times Remaining in Surgical Cases Using Bayesian Analysis of Historical Data

Franklin Dexter, Professor, University of Iowa, Anesthesia 6JCP, Iowa City, IA, 52242, United States of America, franklin-dexter@uiowa.edu

We derived conditional Bayesian lower prediction bounds of surgical cases' durations, conditional on times ongoing. Posterior predictive distributions follow exp(scaled Student t distribution) and depend on scheduled times and parameters from historical data. Every 5 min, Structured Query Language runs on the anesthesia information management system's database server. The operating room whiteboard up-time is >99.3%. There are no interruptions (phone calls) and no potential for gaming estimates.

3 - Time Series Analysis of Laboratory Test Results to Prevent Adverse Patient Outcomes

Alcides Santander-Mercado, Doctoral Student, UniNorte - University of South Florida, 3620 Jefferson Commons Drive, Apt. 302, Tampa, Fl, 33613, United States of America, asantand@mail.usf.edu, Peter Fabri, Jose Zayas-Castro

Currently, patients' diagnostics are usually based on a single data point from the most recent test, ignoring the patient's historical record. No other methods are currently utilized to assist physicians in capturing the dynamic nature of physiologic systems and hidden interactions between test indicators. Timely identification of possible adverse outcomes in patients' health can be improved, by developing integrated patients' profiles and the analysis of laboratory tests over time.

4 - Classification Models for Cardiovascular Disease

Tsung-Lin Wu, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, tlwu@isye.gaetch.edu, Eva Lee

In this talk, we describe an optimization-based predictive model that allows multi-group classification while constraining the inter-group misclassification rate. A feature selection heuristics will be outlined. Applications to cardiovascular disease data and other real-world dataset are provided to illustrate the power of our model.

■ SA10

M - Room 8206

Optimization in Power Systems

Contributed Session

Chair: Bruno Charlier, Electrabel, Avenue Einstein 2A, Louvain-la-Neuve, 1348, Belgium, bruno.charlier@electrabel.com

1 - Optimal Scheduling of Hydroelectric Power Production in Competitive Electricity Markets

Jose Prina, Pontificia Universidad Catolica de Chile, Department of Industrial and Syst. Eng., Vicuna Mackenna 4860, Macul, Santiago, Chile, jprina@ing.puc.cl, Sujin Kim

We consider the hourly scheduling problem for a hydroelectric energy producer in a competitive electricity market. The producer is a price-taker and can sell all its production in the spot market. Uncertainty in spot-prices is modeled. Since the main challenge in large scale versions of this problem is the growth in computational time to solve, we consider solution methodologies based on approximate dynamic programming.

2 - Global Optimization In Hybrid Power System

Siew Fang Woon, Curtin University of Technology, Department of Mathematics and Statistics, Kent Street, Bentley, Perth, WA, 6102, Australia, woonsiewfang@yahoo.com, Ryan Loxton, Volker Rehbock

This paper proposes a new heuristic approach for determining a globally optimal operating schedule for a hybrid power system. This approach is based on a combination of a discrete filled function method and a recently proposed optimal control algorithm. Computational results show this method is very efficient and robust in solving a complex large scale mixed integer programming problem.

3 - Multi-objective Power Generation Expansion Planning Problem with Monte Carlo Simulation

Frank A. Felder, Center for Energy, Economic & Environmental Policy, Edward J. Bloustein School of Planning, and Public Policy, Rutgers, New Brunswick, NJ, 08901, United States of America, ffelder@rci.rutgers.edu, Hatice Tekiner, David Coit

A new approach is proposed to minimize simultaneously multiple objectives over a long term planning horizon.The Pareto front for the multi-objective expansion planning which explicitly consider availability of the system components is found over the planning horizon and operational dispatching decisions.Monte Carlo simulation is used to generate the components availabilities and demand scenarios for each hour and an optimization problem is solved to find optimum solution over these scenarios.

4 - Optimizing the Dispatch of a Thermal Power Plant- A Practical Experience

Bruno Charlier, Electrabel, Avenue Einstein 2A, Louvain-la-Neuve, 1348, Belgium, bruno.charlier@electrabel.com, Olivier Daxhelet, David Laudy

We present a detailed modelisation of a power plant. For maximizing its cash flow while fullfilling several technical constraints, a classical DP is used on top of which a Lagrange relaxation technique is implemented for global constraints bounding electricity production, fuel consumption or pollutant emission. Emphasis will be made on practical implementation (failures management, variable start up costs) and on its interest in risk management via Monte Carlo simultations.

■ SA11

M - Room 8209

Forestry I: Wildfire Management

Sponsor: Energy, Natural Res & the Environment/ Forestry

Sponsored Session

Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Burn, Baby, Burn: The Economics of Fuels Treatments

David Butry, Building and Fire Research Laboratory, National Institute of Standards and Tech, 100 Bureau Drive, Mail Stop 8603, Gaithersburg, MD, 20899, United States of America, david.butry@nist.gov, Geoffrey Donovan

Fuels treatments (the reduction of hazardous forest fuel load) can limit a fire's rate of spread, reduce its intensity, and make initial suppression efforts more effective. We present a model that identifies the reductions in rate of spread, intensity, and suppression success required to equate the costs and benefits of a specified set of fuel treatments. Finally, we demonstrate that unlike fuel breaks≠, which are intended to stop a fire's progress, fuel treatments must burn to be effective.

2 - Simulating the Trade-offs Between Wildfire, Prescribed Fire, and Fire Prevention

Jeffrey Prestemon, Research Forester, USDA Forest Service Southern Research Station, PO Box 12254, Research Triangle Park, NC, 27709, United States of America, jprestemon@fs.fed.us, David Butry

Wildfire can be managed through suppression, fuels management, and fire prevention education efforts. We empirically estimate the statistical trade-offs among these three types of management at the county and fire district scales in Florida using annual and monthly data on wildfire occurrence, area burned, prescribed fire area, and several categories of fire prevention efforts made by the State, 1980-2006. Simulations identify theoretically optimal spending allocations by spatial unit.

3 - A Stochastic Programming Model for Initial Response for Wildfire Containment

Julian Gallego, Department of Industrial and Systems Engineering, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, kamizama77@tamu.edu, Lewis Ntaimo

We present a two-stage stochastic mixed-integer programming model for initial response. We consider minimizing the cost of deploying firefighting resources to multiple bases plus the expected cost plus net value change (C + NVC) of dispatching the resources to multiple fire scenarios. A fire scenario is defined by daily occurrence and fire growth using FARISTE. A computational study using historical data from Texas Forest Service for a planning unit in East Texas will be presented.

4 - Goal Programming Approach for National Analysis of Wildland Fire Management

Tarun Kumar, IBM Research, IBM T.J. Watson Research Center, Yorktown Heights, NY, 10598, United States of America, ktarun@us.ibm.com, Gyana Parija, Steven Carty, Andy Kirsch, Soujanya Soni

We present a new multi-criteria budget allocation model for assigning national budgets across multiple Fire Planning Units (FPU) in the US. Causal relationships between the various effectiveness measures and underlying historical data are learned to devise effective and robust computational approaches to solve the goal programming problems (preemptive and non-preemptive). We also discuss our computational experiences working with representative FPU data instances.

■ SA12

M - Room 8212

Joint Session DM/CS: Mining Highly Complicated Data Sets

Sponsor: Data Mining, Computing Society
Sponsored Session

Chair: Seoung Bum Kim, Assistant Professor, University of Texas at Arlington, 500 W. First Street, Arlington, TX, 76019, United States of America, sbkim@uta.edu

1 - Classification of NIR Spectra from Prostate Cancer Patients

Chivalai Temiyasathit, PhD Candidate, University of Texas at Arlington, Industrial & Manufacturing Systems Engin, PO Box 19017, Arlington, TX, 76013, United States of America, chivalai.temiyasathit@uta.edu, Aditya V. Mathk, Karim Bensalah, Wareef Kabbani, Altug Tuncel, Jeffrey Cadeddu, Hanli Liu, Seoung Bum Kim

Prostate cancer is one of the most threatening types of cancer among elderly males in the Unites States. This study proposes a new classification procedure to discriminate between 82 normal spectra and 15 prostate cancer spectra obtained from near infrared (NIR) spectroscopy. We obtained 90% classification accuracy from leave-one-out cross validation.

2 - Default Prediction Model Using SVM with EDF

Woojin Chang, Assistant Professor, Seoul National University, Seoul, Korea, Republic of, changw@snu.ac.kr, Yong Sik Kim

We propose an default prediction model employing support vector machine (SVM) and Expected default frequency from KMV model, and estimate the default probabilities of Korean manufacturing companies. The sensitivity analysis and a corresponding visualization tool confirm that the solvent and insolvent firms are well classified by our SVM model using EDF.

3 - Unsupervised Feature Selection Using Weighted Principal Components

Panaya Rattakorn, PhD Student, The University of Texas at Arlington, PO Box 19017 Woolf Hall, IMSE Department, Alington, TX, 76010, United States of America, prattakorn@uta.edu, Seoung Bum Kim

Feature selection becomes challenging when ten thousands or more variables are presented in the data sets. We propose the unsupervised feature selection method that combines weighted principal components with a recursive thresholding algorithm. Simulation results demonstrated the proposed method is capable of selecting the subset of features that are important.

4 - A Comparison of Scan and CUSUM Methods for Disease Surveillance with Poisson Data

Kwok-Leung Tsui, Professor, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, ktsui@isye.gatech.edu, Yajun Mei, Sung Won Han

Research on disease and public health surveillance has become very important. Scan and CUSUM methods are commonly used in public health surveillance for detecting an increase in disease occurrence. In this talk we will discuss the design and relationships of the two charting methods. We will compare their performance in terms of conditional expected delay (CED) under different change time and composite change size. Overall, the CUSUM method outperforms the scan method in many situations.

■ SA13

M - Room 8216

Data Mining in Business Analysis

Sponsor: Data Mining
Sponsored Session

Chair: Rong Duan, Principal member of Tech Staff, AT&T, 180 Park Ave, Florham Park, NJ, United States of America, rongduan@research.att.com

1 - Micro-competition Analysis on Retail Small Stores

Xinxin Bai, IBM China Research Lab, Zuanshi Build, Zhongguancun Software, Beijing, 100193, China, baixx@cn.ibm.com, Hairong Lv, Wenjun Yin, Jin Dong

Many retail small store chain operators are eager to know how to quantitatively evaluate new store locations. In this paper, we propose a novel method which can predict the competitions among new/competing stores. We develop a model to estimate different customers' demand and the relationship between customers and multiple stores. A real case on the micro-competition analysis in a China city for one leading retail small store operators shows that our method is more practical and accurate.

2 - Mercado: From Business Customers to Service Providers

Kivanc Ozonat, Hewlett Packard Laboratories, 870 E El Camino Real Apt. 169, Mountain View, CA, 94040, United States of America, kivanc.ozonat@hp.com

The Mercado project at HP Labs aims to provide business customers with the ability to discover, select from, utilize and combine services offered by (online) service providers. Given the large number and variety of service offerings, service providers and customer requirements, it is infeasible to accomplish the Mercado goals through manual processes. Instead, we use machine learning/data mining techniques to automate -as much as possible- discovery, selection and utilization stages of Mercado.

3 - EM Algorithm for Product Mix of Business Customers

Timothy Au, Cornell University, Department of Mathematics, Ithaca, NY, United States of America, tca4@cornell.edu, Wei Jiang

In order to understand the relationship among different products that a customer purchases, this paper proposes a clustering method for the product mix of business customers using linear regression models and the EM Algorithm. By identifying the nature of the product mix, we can pinpoint important customer behaviors and develop appropriate product bundles to improve business.

■ SA14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - OptiRisk Systems - AMPL Extensions for Stochastic Programming and Embedded Development

Christian Valente, Senior Software Engineer, OptiRisk Systems, One Oxford Rd., Uxbridge, UB9 4DA, United Kingdom, christian@optirisk-systems.com, Cormac Lucas

From AMPL script to AMPLCOM: a genetic algorithm is formulated in AMPL and is embedded in an application using AMPLCOM. SP Modeling extensions: a deterministic planning model is formulated and extended to SP, CCP and ICCP using the enhanced syntax and the new Scenario Generator module of SPInE.

2 - GAMS Development Corporation- Rapid Application Prototyping with GAMS

Steven Dirkse, GAMS Development Corp., 1217 Potomac St. NW, Washington, DC, 20007, United States of America, sdirkse@gams.com

GAMS Development will demonstrate how an application can be built using GAMS. We'll use both fundamental modeling practices, our state-of-the-art solvers and the latest in data access and application integration tools to quickly produce a working application.

■ SA15

M - Room 8219

Empirical Foundations for Service Science

Sponsor: Service Science
Sponsored Session

Chair: Scott Sampson, Professor, Brigham Young University, 660 TNRB, Provo, UT, 84602, United States of America, ses3-inf8@sm.byu.edu

1 - Empirical Evaluation of Traditional Service Perspectives: Surprise, Surprise!

Scott Sampson, Professor, Brigham Young University, 660 TNRB, Provo, UT, 84602, United States of America, ses3-inf8@sm.byu.edu

We review recent empirical studies of traditional service perspectives. For example, in academic literature a leading service perspective has been intangibility, which has recently been empirically shown to be inaccurate and misleading. We will discuss other common perspectives on services including product as a process, customer as co-producer, the rental/access paradigm, and others. Some are upheld as empirically valid and useful, yet others are shown to be dangerous misconceptions.

2 - Service-dominant Logic 2.0: Towards a Balanced View of Service Management

Larry Menor, Associate Professor, University of Western Ontario, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6A3K7, Canada, lmenor@ivey.uwo.ca, Scott Sampson

This research critically examines the assumptions and foundational premises underlying the Service-Dominant (S-D) logic and posits a more balanced view (i.e., S-D Logic 2.0) of services management from an OM perspective. We empirically scrutinize how insightful the original and revised logics are for the management of services. We believe our S-D logic 2.0 foundational premises provide greater service science insights on how services are best defined, designed, delivered and diagnosed.

3 - Empirically Derived Service Principles - The Ten Commandments of the Service Management

Annibal Scavarda, Visiting Associate Professor of Business Management, Marriott School of Management/ Brigham Young University, Brigham Young University, 660 TNRB, Provo, UT, 84602-3131, United States of America, annibal@esp.puc-rio.br, Tatiana Bouzdine-Chameeva, Arthur Hill, Susan Meyer Goldstein

Service management is an amorphous field in need of a common structure. The macro view of this field currently relies on practitioners and academics from a wide variety of disciplines, viewpoints, and geographies to develop both practical and theoretical perspectives. A three round service management research study is presented, reflecting collective understanding of collaborators from more around 100 countries. An analysis of Rounds 1 and 2 of this study will be presented here.

■ SA16

M - Room 8222

Supply Chain Optimization I

Contributed Session

Chair: Ismail Capar, Assistant Professor, Texas A&M University, Texas A&M University, 3367 TAMU, College Station, TX, 77843, United States of America, capar@entc.tamu.edu

1 - Port and Modal Allocation of Containerized Imports from Asia to USA

Rob Leachman, Professor, University of Calif. at Berkeley, 4127 Etcheverry Hall, Berkeley, CA, 94720-1777, United States of America, leachman@ieor.berkeley.edu

This economic optimization model allocates imports to alternative ports and logistics channels so as to minimize total transportation and inventory costs for each importer. Logistics channels include direct shipment of marine containers as well as warehousing and trans-loading in the hinterlands of the ports of entry. Calibrated on actual customs data and carrier data, the model has been applied in policy analysis. New extensions to the model account for congestion using queuing calculations.

2 - A Constrained Hierarchical Clustering Heuristic for the Location Routing Problem

Marco Lam, York College of Pennsylvania, 441 Country Club Road, York, PA, 17403, United States of America, mlam@cba.ua.edu, Brian Gray, John Mittenthal

Hierarchical clustering is used to group similar observations. The use of clustering in location routing is based on the assumption that clustering is a reasonable approach to minimizing routing costs. In hierarchical clustering no *a priori* assumptions are made about the final number of clusters, so we investigate the performance of different stopping criteria. Results indicate that considering alternative stopping rules results in significant savings over using the minimum number only.

3 - Optimal Supply Capacity and Location Selection for Products with Short Period of Time

Foad Hassanmirzaei, PhD Student, University of Windsor, Room 236 - Essex Hall, 401 Sunset Avenue, Windsor, ON, N9B 3P4, Canada, hassanmf@uwindsor.ca, Zbigniew J. Pasek

This article presents an analysis of facility location and capacity acquisition for perishable products or products should satisfy demand in short period of time. The focus is comes from an extension of the optimal market area approach in which market area size and facility capacity are determined to minimize the total cost associated with fixed facility opening, variable capacity acquisition, transportation, and shortage.

4 - Shipment Consolidation under Periodic Review (s, S) Policy

Ismail Capar, Assistant Professor, Texas A&M University, Texas A&M University, 3367 TAMU, College Station, TX, 77843, United States of America, capar@entc.tamu.edu, Brijesh Rao

We analyze a two-stage supply chain with a single distribution center and multiple retailers. We design an algorithm to find the optimal replenishment time of inventories at retailers considering that distribution center uses a (s, S) periodic review policy. The objective is to minimize the total cost. A simulation study is performed to illustrate how the proposed algorithm performs under different conditions.

5 - Independent Supply Chains in Dynamic Competition

Fouad El Ouardighi, Associate Professor, Essec Business School, Avenue Bernard Hirsch, B.P. 105, 95021, Cergy Pontoise, Paris, 95, France, elouardighi@essec.fr

This paper analyzes the competitive dynamics between two independent supply chains where one manufacturer and one retailer are involved in each supply chain. Competition between the supply chains is based on mutual substitution effects in final demand due to advertising attractiveness, price competitiveness and product quality dissatisfaction.

■ SA17

M - Room 8226

Recent Operations Research/Management Science Papers

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Dr. Russell Barton, Professor, Penn State, Department of Supply Chain and Informati, 406 Business Building, University Park, PA, 16802, United States of America, rbarton@psu.edu

1 - The Effect of Digital Sharing Technologies on Music Markets: A Survival Analysis of Albums on Ranking Charts

Sudip Bhattacharjee, Associate Professor, University of Connecticut, School of Business, Storrs, CT, 06269-1041, United States of America, sbhattacharjee@business.uconn.edu

Recent technological and market forces have profoundly impacted the music industry. Combining performance data of music albums with file sharing data, we assess the impact on survival of music albums on the charts and evaluate the specific impact of P2P sharing on an album's survival on the charts. We find significantly reduced chart survival for most albums. We also find sharing does have a negative impact on low ranked albums, point to increased risk for all but the "cream of the crop".

2 - Method and Psychological Effects on Learning Behaviors and Knowledge Creation in Quality Improvement Projects

Adrian Choo, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States of America, chooa@rpi.edu

This study investigates two mechanisms of knowledge creation–one that is method-driven and the other psychologically driven. Results show that the two mechanisms have different effects on the learning behaviors and knowledge created in Six Sigma projects. The method mechanism directly influences learning behaviors, while the psychological mechanism directly affects knowledge creation. The effects of both mechanisms on knowledge creation are complementary yet independent. Findings suggest that the value of adhering to a method may lie in modifying the learning behaviors that subsequently create knowledge. When a firm adopts a quality program such as Six Sigma, the method and the degree of its adherence can shape how the firm innovates and creates knowledge.

■ SA18

M - Room 8228

Reliability I

Contributed Session

Chair: Bora Cekyay, PhD Candidate, KOC University, Department of Industrial Engineering, Rumelifeneri Yolu Sariyer, Istanbul, 34450, Turkey, cekyay@gmail.com

1 - Remaining Useful Life Prediction under Time-varying Operating Conditions

Ahmad Niknam, PhD Student, Industrial and Manufacturing Engineering Department, Wichita State University, 1845 Fairmount St., Wichita, KS, 67226, United States of America, saniknam@wichita.edu, Haitao Liao

The propensity of making timely maintenance decisions creates the need for predicting the remaining useful life (RUL) of a single unit. This paper provides an enhanced Bayesian approach for predicting the RUL of a single unit under time-varying operating conditions based on an accelerated degradation testing model and in-situ condition monitoring information.

2 - Reliability, MTTF and Availability Analysis of Systems with Exponential Lifetimes

Bora Cekyay, PhD Candidate, KOC University, Department of Industrial Engineering, Rumelifeneri Yolu Sariyer, Istanbul, 34450, Turkey, cekyay@gmail.com, Suleyman Ozekici

In this study, we analyze reliability, mean time to failure and availability of reliability systems where all lifetimes and repair times are exponentially distributed. It is assumed that all failed components are replaced whenever the system fails. We focus our attention mainly on coherent systems and series connection of standby redundant subsystems. A byproduct of this analysis is a structural characterization of these measures as a function of the component failure rates.

3 - Prioritizing Medical Equipment for Maintenance Decisions

Sharareh Taghipour, Ph.D Candidate, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, sharareh@mie.utoronto.ca, Dragan Banjevic, Andrew K.S Jardine

Nowadays more than 5,000 different types of medical devices can be found in an average sized hospital. Hospitals must ensure that their critical medical devices are safe, accurate, and reliable. So, they must establish and regulate a Medical Equipment Management Program (MEMP). But since resources of hospitals are limited, prioritization of equipment is necessary. This presentation suggests an approach for prioritization of medical devices using Fuzzy Analytic Hierarchy Process (FAHP).

■ SA19

M - Lincoln 4

Axiomatic Foundations of Risk Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Michael Zabarankin, Assistant Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, Michael.Zabarankin@stevens.edu

1 - Dual Characterization of Properties of Risk Measures

Patrick Cheridito, Professor, Princeton University, dito@Princeton.EDU

We give a representation result for risk measures on Orlicz hearts. Then we provide general conditions for Gateaux-differentiability, strict monotonicity with respect to almost sure inequality, strict convexity modulo translation, strict convexity modulo comonotonicity, and monotonicity with respect to different stochastic orders. The theoretical results are applied to analyze various specific examples of risk measures. Some of them have appeared in earlier papers, others are new.

2 - Satisficing Measures for Analysis of Risky Positions

David Brown, Assistant Professor, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States of America, dbbrown@duke.edu, Melvyn Sim

In this work we consider a class of measures for evaluating the quality of financial positions with uncertain payoffs based on their ability to achieve desired financial goals. We call these measures satisficing measures and show that they are dual to classes of corresponding risk measures. We demonstrate the use of these measures in portfolio optimization problems.

3 - Probability Inequalities with General Deviation Measures

Bogdan Grechuk, Stevens Institute of Technology, bgrechuk@stevens.edu

The consistency of law-invariant deviation measures, defined by Rockafellar et al., with concave ordering has been used to develop a new approach for minimization of law-invariant deviation measures. This approach has been applied for constructing Chebyshev's and Kolmogorov's inequalities with general deviation measures. Generalized Chebyshev's inequalities are used for convex approximation of portfolio optimization problem with chance constraint.

■ SA20

M - Lincoln 3

Decision Models and Multiple Attributes

Sponsor: Decision Analysis
Sponsored Session

Chair: Ali Abbas, Assistant Professor, University of Illinois Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61820, United States of America, aliabbas@uiuc.edu

1 - Preferences for Health and Consumption: Putting Your Money Where Your Health Is

Casey Lichtendahl, Assistant Professor, University of Virginia, PO Box 6550, Charlottesville, VA, 22906, United States of America, lichtendahlc@darden.virginia.edu, Samuel Bodily

Lifetime consumption planning requires preferences for health and consumption. Desirable conditions on such preferences, including risk aversion in length of life and well-established notions for values and utilities of health, lead to two new multiplicative utility forms. We apply them to consumption-planning problems with investments in bonds, stocks, and life annuities and show that they may be more desirable than typical additive forms.

2 - Mixex: Mixtures of Exponential Utilities

Ilia Tstelin, INSEAD, 1 Ayer Rajah Ave, Singapore, 138676, Singapore, ilia.tsetlin@insead.edu, Robert L. Winkler

Under simple preference assumptions that may be reasonable in many circumstances, an individual's utility function should be mixex, which is a mixture of exponential utilities. We discuss some characteristics of mixex utility in the single-attribute case. For the multiattribute case, we explore connections of mixex utility to utility and preference independence assumptions, as well as practical issues related to the assessment and modeling of multiattribute utility.

3 - One-switch Utility Independence for Multiattribute Utility Functions

Ali Abbas, Assistant Professor, University of Illinois Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61820, United States of America, aliabbas@uiuc.edu, David Bell

A decision maker with a utility function, U(x,y), faces two uncertain lotteries over attribute X (at a fixed value of attribute Y). For example he may face two uncertain lotteries over wealth at a given health state. If his preferences between the lotteries can change only once as we vary Y, we say he has one-switch utility independence of X on Y, X 1S Y. If, in addition, Y 1S X, we say he has symmetric one-switch independence. We derive the relevant functional forms for U.

4 - Altruistic Utility Functions for Joint Decisions

Ralph Keeney, Research Professor, Duke University, 101 Lombard St., #704W, San Francisco, CA, 94111, United States of America, keeney@duke.edu, David Bell

Altruistic joint decisions occur when individuals each have a preference to please the others involved. We define primitive utility functions and altruistic utility functions for each individual. Given reasonable assumptions, the group altruistic utility function is additive over the individual's altruistic utility functions and multiplicative over their primitive utility functions.

5 - Applying the Power of Transform Theory to Utility Theory

Ronald Howard, Stanford University, 646 Tennyson Ave., Palo Alto, CA, 94301, rhoward@stanford.edu, Ali Abbas, Jim Matheson

Transform theory revolutionized electrical and control engineering but has seen little use in Decision Theory. Exponential transforms convert the convolution into a simple multiplication. The basic operation of calculating certain equivalents can be treated with transform theory. This allows transforms of common probability distributions and utility functions to be used to calculate certain equivalents. We present applications to sensitivity analysis, block diagrams, and multiple attributes.

■ SA21

M - Lincoln 2

2008 Dantzig Dissertation Award Finalists

Cluster: The George B. Dantzig Dissertation Prize
Invited Session

Chair: Yunzeng Wang, University of California, Riverside, 900 University Avenue, Riverside, CA, 92521, United States of America, yunzeng.wang@ucr.edu

The George B. Dantzig Award is given for the best dissertation in any area of operations research and the management sciences that is innovative and relevant to practice. This award has been established by INFORMS to encourage academic research that combines theory and practice and stimulates greater interaction between doctoral students (and their advisors) and the world of practice. Finalists selected for this year's award will present their dissertation works.

1 - Analysis of Path Data in Marketing with Application to Grocery Shopping Behavior

Sam K. Hui, Assistant Professor, New York University, khui@stern.nyu.edu

This dissertation focuses on the analysis of path data, and in particular integrated grocery shopping path and purchasing data obtained from grocery carts affixed with RFID tags, using three different approaches discussed in each of three essays.

2 - An Analysis of Pricing and Leadtime Policies within the Marketing/Operations Interface

Pelin Pekgun-Cakmak, Senior Consultant, Operations Research Affiliation: JDA Software Group, pelin.pekgun@jda.com

In this thesis, we analyze the impact of the decentralization of price and leadtime decisions made by marketing and production, respectively, under monopolistic and duopolistic settings. We also address the challenges encountered in estimating the price elasticity in the passenger travel industry, and empirically show the improvement when endogeneity is accounted for.

3 - Performance-Based Logistics: Incentive Contracting in the Aftermarket

Sang-Hyun Kim, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, sang.kim@yale.edu

Performance-Based Logistics is reshaping after-sales service business in the aerospace and defense industry. In my dissertation, I analyze managerial issues that practitioners face after this new contracting strategy has become standard, providing insights and policy recommendations.

■ SA22

M - Lincoln 1

Applied Probability

Contributed Session

Chair: Lawrence Leemis, Professor, The College of William & Mary, Department of Mathematics, PO Box 8795, Williamsburg, VA, 23187-8795, United States of America, leemis@math.wm.edu

1 - Optimal Stopping Problem with Offers from One of Two Possible Distributions

Yen-Ming Lee, University of Southern California, 3715 McClintock Ave, GER 240, Los Angeles, CA, 90089-0193, United States of America, yenmingl@usc.edu, Sheldon M. Ross

We introduce an optimal stopping problem for selling an asset when the fixed but unknown distribution of successive offers is either F or G. A dynamic programming model and some heuristic optimal policies are presented. Using simulation, the performances of the heuristic methods are evaluated and the upper bound for the optimal expected return is derived.

2 - Some Generalizations on Utility Maximization Problem in Optimal Stopping

Aiko Kurushima, Research Associate, Tokyo University of Science, 1-14-6 Kudan-kita, Chiyoda-ku, Tokyo, 102-0073, Japan, kul@ms.kagu.tus.ac.jp, Katsunori Ano

We consider variations of the utility maximization problem in optimal stopping. One of the generalizations we study is the duration problem. The problem is as follows: Suppose that there are a fixed number of the alternatives and the objective is to maximize the expected duration time owning the relatively best and the relatively second-best. We deal with this problem both in no-information and full-information cases.

3 - Variations on the Discounted Cost: Simple Optimal Policies

Adam Shwartz, Professor, Technion - IIT, Electrical Engineering, Technion - IIT, Haifa, 32000, Israel, adam@ee.technion.ac.il, Yair Carmon

We generalize the (standard) geometric discount of finite discounted cost Markov Decision Processes to "exponentially representable" discount functions. We prove existence of optimal policies which are stationary from some time N onward, and provide an algorithm for their computation. Outside this class, optimal "N-stationary" policies in general do not exist. This provides a characterization of problems for which simple, computable policies exist.

4 - Computational Probability Applications

Lawrence Leemis, Professor, The College of William & Mary, Department of Mathematics, PO Box 8795, Williamsburg, VA, 23187-8795, United States of America, leemis@math.wm.edu

Several applications of the computational probability language APPL (A Probability Programming Language) are surveyed: bootstrapping, goodness-of-fit, stochastic activity networks, system reliability bounds, Benford's law, and random number testing.

■ SA23

M - Lincoln 5

Many-Server Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Mor Armony, Associate Professor, NYU, 44 West 4th Street, New York, NY, 10012, United States of America, marmony@stern.nyu.edu

1 - A Diffusion Regime with Nondegenerate Slowdown

Rami Atar, Assoc. Professor, Technion, Department of Electrical Engineering, Haifa, 32000, Israel, atar@ee.technion.ac.il

In both the conventional and the Halfin-Whitt heavy traffic diffusion regimes, the slowdown (i.e. the sojourn time/ service time ratio) degenerates in the limit, to infinity and 1, respectively. In practice, however, delay and service time are often comparable. We consider a diffusion regime in which delay and service time are of the same order of magnitude and, in a setting with many heterogenous servers, find the limiting joint law of these two processes.

2 - Service Interruptions in Large-scale Service Systems

Guodong Pang, Department of Industrial Engineering and Operations Research, Columbia University, New York, NY, 10027, United States of America, gp2224@columbia.edu, Ward Whitt

Large-scale service systems are appealing because they combine high quality of service with high efficiency, as revealed by many-server heavy-traffic limits in the quality-and-efficiency-driven (QED) regime. However, this confluence of quality and efficiency is not achieved without risk. We quantify the impact of system-wide service interruptions via heavy-traffic limits, some of which require the M_1 topology.

3 - Distribution-Valued Heavy-Traffic Limits for the "G/GI/\infty" Queue

Rishi Talreja, Columbia University, New York, NY, United States of America, rt2146@columbia.edu, Josh Reed

We study the $G/GI/\infty$ queue under some mild restrictions on the hazard rate function of the service time distribution. The dynamics of the system are represented by a tempered-distribution-valued process that tracks the ages of all customers in the system. Using the continuous-mapping approach together with the martingale functional central limit theorem, we obtain fluid and diffusion limits for our tempered-distribution-valued process.

4 - The Erlang A Model, Square-root Staffing and Refined Heavy-traffic Results

Johan Leeuwaarden, Technical University of Eindhoven, Netherlands, j.s.h.v.leeuwaarden@TUE.nl

We present new Gaussian approximations for the incomplete gamma function. In earlier work, these bounds were used to obtain refined heavy-traffic results for the Erlang B and C models in the Halfin-Whitt regime (square-root staffing). We now discuss how refinements can be obtained for the Erlang A model (the M/M/s queue with abandonment/reneging). Joint work with A.J.E.M. Janssen and B. Zwart.

■ SA24

M - Lincoln 6

Portfolio Management

Sponsor: Computing Society
Sponsored Session

Chair: Zack Li, Financial Engineer, FannieMae, 4000 Wisconsin Ave, Washington, DC, 20016, United States of America, zack_z_li@fanniemae.com

1 - Efficient Robust Formulations for Portfolio Optimization

Roy Kwon, Professor, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, rkwon@mie.utoronto.ca, Domnyck Prasad

We consider efficient robust formulations for the classical mean-variance portfolio problem by considering an alternative formulation for which we demonstrate is sensitive to perturbations in the input. We develop a robust version for this alternative formulation and illustrate the advantages over robust quadratic formulations.

2 - Linking Momentum Strategies with Single-period Portfolio Models

Woo Chang Kim, PhD Candidate, ORFE, Princeton University, E312, E-Quad,, Princeton, NJ, 08544, United States of America, wookim@princeton.edu, John Mulvey, Mehmet Bilgili

Several versions of the Markowitz portfolio model are evaluated. The long-only industry-level strategy beats many others and provides a good benchmark for competing optimization models. Simple Markowitz models are quite effective, as long as the proper historical time period is chosen for the stochastic projections. Investment performance of optimal asset allocation models can be improved by considering the momentum effects in the parameter estimation procedures.

3 - Conic Programming Models in Energy Risk Management

Steve Benson, Consultant, Towers Perrin, 335 Madison Avenue, New York, NY, 10017, United States of America, sjb8329@summit.sent.com

Volatile markets and high energy prices have forced many companies to reexamine their models for risk management. Semidefinite and second-order cone programs can model some financial risks more effectively that traditional models. We will present one conic model and compare its features to a more traditional model.

4 - A Log-robust Optimization Approach to Portfolio Management

Aurelie Thiele, P.C. Rossin Asst Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@lehigh.edu, Ban Kawas

We present a robust optimization approach to portfolio management under uncertainty that (i) builds upon the well-established Lognormal model for stock prices while addressing its limitations, and (ii) incorporates the imperfect knowledge on the true distribution of the continuously compounded rates of return, i.e., the increments of the logarithm of the stock prices, in an intuitive manner. We derive theoretical insights into the worst-case uncertainty and the optimal allocation.

■ SA25

M - Lincoln 6A

Approximate Dynamic Programming

Sponsor: Computing Society
Sponsored Session

Chair: Sandjai Bhulai, VU University Amsterdam, Faculty of Sciences, De Boelelaan 1081a, Amsterdam, 1081 HV, Netherlands, sbhulai@few.vu.nl

1 - Approximate Dynamic Programming for Routing Problems

Sandjai Bhulai, VU University Amsterdam, Faculty of Sciences, De Boelelaan 1081a, Amsterdam, 1081 HV, Netherlands, sbhulai@few.vu.nl

We study routing problems for general network topologies. For many practical cases this leads to high-dimensional state spaces making many standard solution algorithms numerically intractable. We provide a unifying approach based on approximate dynamic programming to obtain nearly optimal policies. Extensive numerical experiments, for a variety a network topologies, show that the policies have very good performance.

2 - Session-level Load Balancing for High-dimensional Systems

Dennis Roubos, VU University Amsterdam, De Boelelaan 1081a, 1081 HV, Amsterdam, Netherlands, droubos@few.vu.nl, Sandjai Bhulai

Load balancing is critical for the performance of big server clusters. Recent advances in security and architecture design advocate load balancing on a session level. Due to the high dimensionality of this system, little attention has been paid to this new problem. We use Approximate Dynamic Programming to obtain approximate load balancing policies that are shown to have a nearly optimal performance through extensive numerical experiments.

3 - Approximate Dynamic Programming for Bayesian Partially Observable Reinforcement Learning

Pascal Poupart, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, ppoupart@cs.uwaterloo.ca, Nikos Vlassis

The analytical form of the optimal value function for discrete model-based Bayesian reinforcement learning problems is known to be a set of linear combinations of products of Dirichlets. However, exact dynamic programming is rarely possible since the size of this set and the number of terms in each linear combination can grow exponentially with the planning horizon. We present various approximation techniques to keep the size of the set and each linear combination manageable.

4 - New Error Bounds for Approximations from Projected Linear Equations

Huizhen Yu, Department Computer Science, University of Helsinki, PO Box 68 (Gustaf Hallstromin Katu 2b), Helsinki, Finland, janey.yu@cs.helsinki.fi, Dimitri Bertsekas

We consider linear fixed point equations and their approximations by projection on a low dimensional subspace. We derive new bounds on the approximation error of the solutions for both contraction and non-contraction fixed point mappings. Our bounds are expressed in terms of low dimensional matrices and can be computed by simulation. When the fixed point mapping is a contraction, one of our bounds is always sharper than the standard worst case bounds.

■ SA26

M - Lincoln 5A

Open-Source Cutting Planes and Heuristics

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Robin Lougee-Heimer, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, robinlh@us.ibm.com

1 - Surrogate-Objective MIP Heuristics

Jonathan Eckstein, Professor, Rutgers University, 640 Bartholomew Road, RUTCOR Room 155, Piscataway, NJ, 08854, United States of America, jeckstei@rci.rutgers.edu, Jean-Paul Watson

We describe a class of binary MIP heuristics that replace the original objective by a concave function that favors integrality, and seek a local minimum by a Frank-Wolfe procedure. The well-known feasibility pump is one member of this class, but there are many others. What are the best surrogate objectives to use? How and when should their parameters be chosen or randomized? How should one best escape fractional local minima?

2 - Primal Heuristics in the COIN-OR Mixed Integer Linear Programming Solver Cbc

Joao Goncalves, IBM Research, T. J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, jpgoncal@us.ibm.com, John Forrest, Laszlo Ladanyi

Primal heuristics are one important component of branch-and-bound software for Mixed-Integer Linear programming. In this talk, we will review the heuristics available in the COIN-OR branch and cut solver Cbc and we will describe in detail the diving heuristics recently added. Finally, we present computational results that illustrate the performance of those heuristics.

3 - Implementing Benders Decomposition Using COIN-OR

Ruud Egging, PhD Candidate, University of Maryland, 3401 Chatham Road, Hyattsville, MD, 20783, United States of America, regging@umd.edu

In this presentation a PhD Student shares his experience in using COIN-OR open software libraries CLP - for linear programming - and CBC - for mixed integer programming - to implement a Benders Decomposition approach for a Multi-period Capacitated Coverage Location Problem with Repositioning Costs and Penalties for Unserviced Demand.

4 - Community Library of Cutting Planes for Re-use in Teaching, Research, and Business

Robin Lougee-Heimer, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, robinlh@us.ibm.com

A community library of cutting plane implementations is available for use in teaching, research, and business. We will describe the 8yr old initiative to establish a "cut generation library" (CGL), report on recent progress, and explain how to contribute new cut implementations. More details on CGL can be found at https://projects.coin-or.org/Cgl

■ SA27

M - Washington 1A

Asymptotic Analysis of Queueing Systems and Applications

Sponsor: Applied Probability
Sponsored Session

Chair: Tolga Tezcan, Assistant Professor, University of Illinois at Urbana-Champaign, 117 Transportation Bldg., 104 S. Mathews Ave, Urbana, IL, 61801, United States of America, ttezcan@uiuc.edu

1 - Responding to Unexpected Overloads in Large-Scale Service Systems

Ohad Perry, PhD Student, Columbia University, Department of Industrial Engineering and, Operations Research, New York, NY, 10027, United States of America, op2105@columbia.edu, Ward Whitt

We consider how two large-scale service systems that operate independently can help each other when one encounters an overload, involving a jump in the arrival rate. We propose a queue-ratio control, which activates sharing of customers by the service pools when a threshold is exceeded. This control requires no knowledge of the arrival rates. Our analysis is based on a fluid model, which includes a heavy-traffic averaging principle.

2 - Simplified Control Problems for Multi-class Many-server Queueing Systems

Gennady Shaikhet, Postdoctoral Associate, Carnegie Mellon University, Department of Mathematical Sciences, Pittsburgh, PA, 15213, United States of America, shaikhet@cmu.edu, Rami Atar, Avishai Mandelbaum

Consider parallel queueing model with several customer classes and several many-server pools, in the heavy traffic regime. Service times are exponential. Abandonments are allowed. We address two special cases: service rates are either only pool- or only class-dependent. This implies significant simplifications for the limiting controlled diffusion models, in particular, a reduction to a one dimension in the first case. We then derive asymptotically optimal policies for the queueing model.

3 - Instability of LQF and FIFO in a System with Arbitrarily High Theoretical Capacity

Tolga Tezcan, Assistant Professor, University of Illinois at Urbana-Champaign, 117 Transportation Bldg., 104 S. Mathews Ave, Urbana, IL, 61801, United States of America, ttezcan@uiuc.edu

We study the stability of commonly used scheduling rules Longest-queue-first (LQF) (and more general versions of LQF) and FIFO. We show that in a relatively simple model known as the X-model they can be unstable even when the system can be made stable with other scheduling rules that keep server utilizations arbitrarily low. Our proof is based on the augmented fluid models.

■ SA28

M - Washington 1

Integer Progamming Applications

Contributed Session

Chair: Jeff Kennington, Professor, Southern Methodist University, School of Engineering, PO Box 750123, Dallas, TX, 75275-0123, United States of America, jlk@engr.smu.edu

1 - An Integer Programming for Truck Allocation in Sugarcane Transportation System

Jirawan Niemsakul, Lecturer, Sripathum University Chonburi Campus, 79 Banagna-Trad Rd T.Klongtumru A.Muang, Chonburi, 20000, Thailand, klinsi_07@hotmail.com, Patrica Patanaporn

One of the severe problems in sugar industry in Thailand is too long queuing of sugarcane truck loading, resulting in sugarcane loses weight and high logistics cost. This paper proposed an integer programming model for truck allocation of sugarcane delivery. The objective is to maximize truck efficiency in order to reduce the number of queuing trucks and their waiting time. It can be used effectively in real situations.

2 - An Integer Programming Based Approach to Web Service Composition Problems

John Jung-Woon Yoo, PhD Candidate, The Pennsylvania State University, 304 The 300 Building, University Park, PA, 16802, United States of America, jwyoo@psu.edu, Soundar Kumara, Jose Ventura

We propose an Integer Programming based Web service composition framework that incorporates both functional and non-functional requirements, different from logic based approaches that consider only functional ones. The criteria of Web service composition vary depending on users' objectives, which can be defined by non-functional attributes, such as cost or quality of services. The proposed framework also supports Semantic Web features, such as hierarchy and equivalence relationship in parameter.

3 - A Polyhedral Study of the Time-dependent Traveling Salesman Problem

Hernan Abeledo, Associate Professor, The George Washington University, 1776 G Street NW, Washington, DC, 20052, United States of America, abeledo@gwu.edu, Artur Pessoa, Eduardo Uchoa

The time-dependent traveling salesman problem, where arc costs depend on their position in the tour, is a useful model for routing and job scheduling applications. We study a classical arc-time indexed formulation by Picard and Queyranne that is based on models for the TSP proposed earlier by Hadley and by Houck and Vemuganti. We compute the dimension of the corresponding polytope, investigate the strength of different classes of inequalities, and identify some classes which define facets.

4 - Process and ECU Allocation in an Automobile

Sahar Karimi, University of Waterloo, Combinatorics and Optimization, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, skarimi@ncsu.edu, Kartik Sivaramakrishnan

In this talk, we are proposing a model for solving an allocation problem in the automobile industry. This problem can be considered as a two-stage process; the first phase is locating some Electronic Circuit Units (ECU) in predetermined locations, and the second one is allocating several processes to the located ECUs. We model the problem as a binary quadratic problem and we will discuss optimization techniques to solve it to optimality

5 - A Mixed Integer Linear Program to Optimize Cash Shipments for the Banking Industry

Jeff Kennington, Professor, Southern Methodist University, School of Engineering, PO Box 750123, Dallas, TX, 75275-0123, United States of America, jlk@engr.smu.edu

Large banks manage cash warehouses, called vaults, where cash is counted, sorted, and bundled for delivery to its branches or deposited with a Federal Reserve Bank. Deposits and withdrawals at vaults are made by armored carriers and the cost for transport is modeled using a fixed-cost plus a variable cost. The underlying model is a fixed-charge multi-commodity network flow problem that has been implemented using OPL and CPLEX.

■ SA29

M - Washington 2

Applying OR Techniques to Politics

Cluster: Voting, Elections, and Political Institutions
Invited Session

Chair: Steven Callander, Northwestern University, 2001 Sheridan Rd., Evanston, IL, United States of America, scal@kellogg.northwestern.edu

1 - The Keys to the White House: 2008 Prediction

Allan Lichtman, Professor of History, American University, 4400 Massachusetts Ave., Washington, DC, 20016, United States of America, lichtman@american.edu

The Keys to the White House is a prediction system that has forecast the popular-vote winners of every presidential election since 1984. The Keys give specificity to the theory that presidential election results turn primarily on the performance of the party controlling the White House. The Keys show how changes in the structure of politics will produce a Democratic victory, in a dramatic reversal from 2004.

2 - Optimal Vote Trading

David Hartvigsen, University of Notre Dame, Mendoza College of Business, Notre Dame, IN, 46556-5646, United States of America, dhartvig@nd.edu

Vote trading was used in the 2000 and 2004 US Presidential elections. It is an Internet-based technique that (under the right conditions) allows, for example, Democrats in heavily Republican states (like Texas) to effectively (and legally) vote in swing states (like Florida), where their votes would have more impact. We show how vote trading can be optimally implemented by showing its relationship to a knapsack problem.

3 - Beyond the Revelation Principle: Manipulation-optimal Mechanisms

Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu, Abraham Othman

Conitzer and Sandholm (LOFT-04) constructed an example where a mechanism does better than the revelation principle would allow—-if the agent behaves irrationally in any way. We study how generally this phenomenon can be capitalized on, by proving several possibility/impossibility results. Finally, we show that Google's keyword auction (GSP)—-a mistake in the sense that it is not incentive compatible—-is fortunate in that it has this property (under the usual natural strategy restrictions).

4 - A Prediction Model for the United States Presidential Election

Sheldon Jacobson, Professor, University of Illinois, 201 N. Goodwin Avenue (MC258), urbana, IL, 61821, United States of America, shj@uiuc.edu, Edward Sewell, Steve Rigdon

It has become a popular pastime for political pundits to predict the winner of the United States Presidential election. This presentation discusses a Bayesian approach that incorporates the effect of third-party candidates and undecided voters for predicting the outcome of this election. Predictions for the 2008 election are discussed.

■ SA30

M - Washington 4

Military Modeling, Operations Research, and Decision Analysis I

Sponsor: Military Applications
Sponsored Session

Chair: William Fox, Professor, Naval Postgraduate School, Department of Defense Analysis, Monterey, CA, 93943, United States of America, wpfox@nps.edu

1 - Discrete Combat Models: Investigating the Solutions to Discrete Forms of Lanchester's Combat Models

William Fox, Professor, Naval Postgraduate School, Department of Defense Analysis, Monterey, CA, 93943, United States of America, wpfox@nps.edu

We examine a few historic battles by investigating the use of Lanchester's equation in a discrete version. We use discrete dynamical systems to model these conflicts and gain insights into methods of "directed fire" conflicts. We employ numerical and graphical solutions to be analyzed and that do not require the mathematical rigor of differential equations. We further investigate the analytical form of the "direct fire" solutions to be used in modeling efforts.

2 - Command and Control for Information Age Systems

Gerald Kobylski, Gerald.Kobylski@usma.edu, Gary Smith, David Brown, Daniel Maxwell

Recent command and control experiments indicate that future commanders will have an overwhelming number of decisions to make, just to manage their information resources. One way to help the commander manage these decisions is to automate recurring decisions associated with managing these information collection assets. We will demonstrate Dynamic Decision Networks (DDNs) as an approach for providing this capability to future commanders. DDN's are based on Bayesian Networks and Influence Diagrams and are proven to be very efficient tools for complex problems and a very good alternative for military decision makers. The presentation includes a background of DDNs and the structure of our research effort, as well as a demonstration of a simulation that has been developed to experiment with the concept for UAV command and control.

3 - Value of Information in a Competitive Game

Josh Helms, Probability and Statistics Course Director, Department of Mathematical Sciences, United States Military Academy, 646 Swift Road, West Point, NY, 10996, United States of America, josh.helms@usma.edu, Scott Provan

We develop concepts related to modeling the acquisition and use of information in a simple matrix game. We apply this model to a battlefield game to measure effective game values. The results show that there is value in the information gained by partitioning the matrix game based on information sets and more finely partitioned information sets provide more valuable information. (Game Theory; Two-Person, Zero-Sum Games; Linear Programming; Lanchester Equations)

4 - A Heuristic for Optimized Routing of Unmanned Aerial Systems for the Interdiction of Improvised Explosive Devices

Mike Scioletti, 3102A Patterson Loop, West Point, NY, 10996, United States of America, mssciole@nps.edu

This research develops a routing tool that uses a depth-first search technique to produce routes for a UAS through IED hotspots for the purpose of IED interdiction as the UAS transits to and from missions. The routing tool, which when solving for one UAS route is proven to solve problems up to 75 nodes optimally, but is capable of handling problems up to 125 nodes.

■ SA31

M - Washington 5

Flexible Manufacturing Systems

Contributed Session

Chair: Wei (Mike) Li, University of Calgary, 2500 University Drive NW, Calgary, Canada, liwh@ucalgary.ca

1 - Petri Time Nets of the Materials Flow at the Steel Plant

Piotr Lebkowski, Professor, AGH University of Science and Technology, Mickiewicza 30, Krakow, 30-059, Poland, kamienicxka@poczta.fm

A Petri deterministic time net applied to the modelling of the material flow at the steel plant is a very effective research tool. This paper presents a Petri net expanded with the attribute vectors of places and transitions, as well as the logical rules of transition launching and the procedures that update the attribute values. Owing to such an expansion, we can observe the properties of the streams that flow through the system.

2 - A State Space Heuristic for Hybrid Flow Shop Production Scheduling and Control

Wei (Mike) Li, University of Calgary, 2500 University Drive NW, Calgary, Canada, liwh@ucalgary.ca, Barrie R. Nault, Yiliu (Paul) Tu, Deyi Xue

Compared to traditional production, one-of-a-kind production creates challenges for production scheduling and control. Moreover, heuristics for hybrid flow shop production scheduling are scarce, particularly for production control. We show that our state space heuristic (SS) provides near optimal solutions for hybrid flow shop production, and it is fast and flexible, thus suitable for production control. Our conclusions are based on Taillard's benchmark data comparing SS and CDS heuristics.

3 - Statistical Throughput Control with Parts Quality Combination

Hisaya Ishibashi, Production Engineering Research Laboratory, Hitachi, Ltd, 292, Yoshida-cho, Totsuka-ku, Yokohama-s, Japan, hisaya.ishibashi.fx@hitachi.com, Youichi Nonaka, Stanley Gershwin

In digital consumer products, the component part quality affects the final production yield. To improve the planning accuracy in material flows including the part quality and production yield fluctuation, statistical throughput control method considering the parts quality combination under the production yield fluctuation was developed. This method forecasts the completion volume based on statistical value for production yield and part quality and changes product mix volume for dispatching.

4 - Integration of the Production and Shipping Functions of a Manufacturing Enterprise

Yuqiang Wang, Virginia Tech, ISE Department, Virginia Tech, Blacksburg, VA, 24060, United States of America, billywang@vt.edu, Subhash Sarin

We investigate a supply chain scheduling problem that involves two stages of a supply chain, specifically, a manufacturing enterprise and one or more customers. The objective is to achieve an appropriate coordination between the production and distribution functions of the manufacturing enterprise so as to minimize the sum of the shipping and job tardiness costs, in order to make the manufacturer more competitive.

■ SA32

M - Washington 6

Public Sector Operations Research and Analytics

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Christer Johnson, Partner, IBM, 12902 Federal Systems Park Drive, Fairfax, VA, 22033, United States of America, christer.johnson@us.ibm.com

1 - Supply Chain Network Flow Problems with Step Cost Functions

Hua Ni, Managing Consultant, IBM Global Business Services, 12902 Federal Systems Park Dr., Fairfax, VA, 22033, United States of America, huani@us.ibm.com

Supply chain network flow problems with convex or fixed-charge cost functions have been well studied. But many practical applications, such as in postal transportation, require functions that are neither convex nor fixed-charge. We will examine alternative modeling techniques for problems with step cost functions and report on their computational performance.

2 - Real Data Mining at the Social Security Administration

Thomas P. Hart, Consultant, IBM, 1306 Concourse Dr, Linthicum, MD, United States of America, tphart@us.ibm.com

Every business day, 15,000 disabled workers apply for disability benefits from the Social Security Administration. Managing the workflow for these applicants was substantially improved by implementing data and text mining algorithms. This paper will discuss the business problem, analytic solution and the collaboration with SSA management to bring this modeling effort to completion.

3 - FHA Mortgage Insurance Program- Its Roles and Risks

Gigi Yuen-Reed, Consultant, IBM, 14 Third Street SE, Washington, DC, 20003, United States of America, gigi.yuen@us.ibm.com

The mission of Federal Housing Authority (FHA) is to help borrowers get mortgage amounts they qualify for, and assist lenders by reducing their risks in issuing loans. FHA achieves this mission primarily by providing mortgage insurance. In this paper, we discuss the risk management approach of FHA and its role in alleviating the current mortgage crisis.

4 - Predicting Prospect Quality and Enrollment Propensity

Peter Arena, Founding Principal, ASR Analytics, 1389 Canterbury Way, Potomac, MD, 20854, United States of America, peter.arena@asranalytics.com, Graham Tracey

This paper will explore the use of limited dependent variable models in predicting the likelihood of making students an offer, based on academic characteristics, and their likelihood to enroll. In addition, we will demonstrate the use of decision support tools that allow the extention of these models into "what-if" scenarios using data visualization and reporting techniques.

■ SA33

M - Johnson

Strategic Planning in Healthcare I

Contributed Session

Chair: Kingsley Reeves, Assistant Professor, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, Tampa, FL, 33620, United States of America, reeves@eng.usf.edu

1 - The Effects of Health Care Costs on Financial Retirement Planning

Margret Bjarnadottir, Stanford, 518 Memorial Way, Palo Alto, United States of America, mvilborg@gmail.com, Dimitris Bertsimas

Health care costs can intimately affect one's financial well-being. A big portion of one's lifetime health care costs are incurred during retirement, and therefore taking these costs into account when planning for retirement is critical. We propose a way to model the uncertainty of health care costs, and investigate the effects on financial planning. Finally we propose a new insurance product, currently not in the market that many mid-income retirees will find helpful.

2 - Covering the Uninsured: An Analytic Framework for Use in Health Reform Implementation

George Miller, Altarum Institute, PO Box 134001, Ann Arbor, MI, 48113-4001, United States of America, george.miller@altarum.org, Charles Roehrig

Many proposals for national health reform are designed to achieve universal coverage through an individual mandate combined with federally subsidized premiums to make insurance affordable for all. We present a new analytic framework for characterizing the nature and magnitude of the required subsidies. Illustrative results explore the impact of alternative assumptions regarding future premium costs and the number of uninsured on the federal subsidies needed to cover all uninsured Americans.

3 - Patient Satisfaction and Patient Loyalty in Aesthetic Plastic Surgery

Chung-Yih Yan, Cathay General Hospital, 8F no.6, 266 alley, Ren-Ai Road 4th Sec., Taipei, Taiwan - ROC, johnnyhn@yahoo.com.tw, Neng-Pai Lin

This study attempts to establish an instrument to measure patient satisfaction and loyalty for patients of aesthetic plastic surgery. The results indicate perceived value, curing quality, and caring quality have positive effects on patient satisfaction directly, whereas patient satisfaction, communication, and perceived value have positive effects on patient loyalty directly. Our model is not helpful in understanding the formation of patient satisfaction and loyalty of aesthetic plastic surgery.

4 - Outsourcing Patient Care: A Transaction Cost Economics Analysis

Kingsley Reeves, Assistant Professor, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, Tampa, FL, 33620, United States of America, reeves@eng.usf.edu, Nahush Chandaver

The aim is to provide a model to predict the most cost efficient organizational form for disease management (DM) programs in health plans by using transaction cost theory and switching regression techniques. Regression models will be constructed using survey data and used to determine whether outsourcing or integrating a DM program is more cost efficient for different types of diseases.

■ SA34

M - Jefferson

Tools and Systems in Healthcare

Contributed Session

Chair: Richard Hughes, Associate Professor, University of Michigan, 2019 BSRB, 109 Zina Pitcher Pl., Ann Arbor, MI, 48109, United States of America, rehughes@umich.edu

1 - Optimal Selection of Beam Orientations in Intensity Modulated Radiation Therapy

Ue-Pyng Wen, Professor, National Tsing Hua University, 101, Sec. 2, Kuang Fu Road,, Hsinchu, 300, Taiwan - ROC, upwen@ie.nthu.edu.tw, Ru-Siou Yu

Intensity Modulated Radiation Therapy (IMRT) modulates the intensity of the radiation beam to focus a higher radiation dose on the tumor while minimizing radiation exposure to surrounding normal tissues. This study aims to investigate the optimal selection of beam configuration. Besides limiting the radiation dose to the tumor and the adjacent organs, we also take the dose distribution into consideration and optimize the beam configuration and beam intensity maps simultaneously.

2 - Understanding User Needs in Developing an Autonomous Manipulation Robot to Help the Motor Impaired

Young Sang Choi, PhD Student, Georgia Institute of Technology, 828 West Peachtree Street, Atlanta, GA, 30338, United States of America, ychoi@gatech.edu

We developed a robot to help the motor impaired such as amyotrophic lateral sclerosis (ALS) patients manipulate objects. A user can point an object with a laser pointer for the robot to fetch and return it. To understand their needs, 8 patients took photographs at home when they had difficulty in object manipulation. Following interviews revealed the frequencies and types of objects, preferable return method, etc. Experiments with patients were conducted with the results to validate the robot.

3 - A Model for Linking Health and Lifestyle

Fredrik Odegaard, Ivey School of Business, University of Western Ontario, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, fodegaard@ivey.ca, Pontus Roos

This paper presents a model for linking the changes and effect of health and lifestyle over time. The objective is to analyze how changes in lifestyle affect health. Both health and life style are assumed to be latent, and represented by their own set of manifest variables. The analysis is based on Structural Equation Models and tested using EQ-5D data from a panel of workers at a large Swedish manufacturing plant.

4 - Using Scan Statistics for Quality Control and Program Evaluation

Brian Nathanson, Chief Executive Officer, OptiStatim, LLC, PO Box 60844, Longmeadow, MA, United States of America, brian.h.nathanson@att.net, Thomas Higgins

Scan statistics are concerned with clusters of events over time. For example, given N points over time, the number of points observed in a "moving window" of fixed length can be counted and the maximum cluster value is a scan statistic for which both parametric and exact methods exist to calculate its rarity. Several real world applications of scan statistics for OR/MS practitioners in health care will be presented.

5 - Determining Loadability of N-articular Biomechanical Chains Using Farkas' Lemma

Richard Hughes, Associate Professor, University of Michigan, 2019 BSRB, 109 Zina Pitcher Pl., Ann Arbor, MI, 48109, United States of America, rehughes@umich.edu

Biomechanical systems such as the finger require maintaining mechanical equilibrium about multiple joints. The ability of muscles to maintain equilibrium at these joints in the face of arbitrary externally applied loads is termed loadability. Previous authors have developed conditions for loadability in systems with only two joints. Farkas Lemma is used to extend this concept to systems with N joints.

■ SA35

M - Jackson

Innovative Uses of Technology in the OR/MS Classroom

Sponsor: INFORM-ED
Sponsored Session

Chair: Jill Hardin, Virginia Commonwealth University, 1001 W. Main St., PO Box 843083, Richmond, VA, 23284-3083, jrhardin@vcu.edu

1 - Impact of Digital Whiteboard Notes on Student Perceptions of Learning in a Graduate OR/MS Course

Jill Hardin, Virginia Commonwealth University, 1001 W. Main St., PO Box 843083, Richmond, VA, 23284-3083, jrhardin@vcu.edu, Jeffrey Nugent

We discuss the use of a Tablet PC in a graduate OR/MS course which some students attend virtually through satellite link. The Tablet PC served as a "digital whiteboard" and the resulting notes were posted in PDF format for student reference. We report results of a survey designed to assess the value of these digital whiteboard notes to students. The survey also asked questions about students' self-perceptions of learning. Preliminary results indicate that the impact is positive.

2 - How Interactivity in Tutorials Affects Student Learning: Results from a Spreadsheet Modeling Problem

Linda Leon, Associate Professor, Loyola Marymount, University, One LMU Drive, Los Angeles, CA, 90045, lleon@lmu.edu, Zbigniew Przasnyski, Kala Seal

We describe a controlled experiment to assess the impact of different levels of interactivity in tutorials designed to help students learn how to model the transportation problem in a spreadsheet. Our results indicate that some computer-based interactive tutorial support does improve students' learning but too much interactivity gives rise to cognitive overload and hinders students from consolidating and integrating previous knowledge with new concepts needed to create a meaningful mental model.

3 - Using a Tablet PC in the Statistics and Simulation Classrooms

Kellie Keeling, University of Denver, DCB Department of Statistics, MSC 8952, 2101 S. University Blvd, Denver, CO, 80208-8952, United States of America, kkeeling@du.edu

In this presentation I will share my experiences using a Tablet PC to teach computer simulation and business statistics. The purpose of this demonstration will be threefold. 1) I will discuss the basics of using the Tablet PC in the Microsoft Office Environment. 2) I will explain and demonstrate the uses of the Tablet PC during classroom lectures. 3) I will show how the Tablet PC can also be used outside of the classroom to enhance student learning and to improve instructor efficiency.

4 - BLOSSOMS: Blended Learning Open Source Science or Math Studies

Richard Larson, MIT, E40-231, Cambridge, MA, 02139, United States of America, rclarson@MIT.EDU, Elizabeth Murray

BLOSSOMS is a new educational initiative to co-create with international partners an OER (Open Educational Resource) repository of interactive video modules for science and mathematics classes to enhance high school education worldwide. With the in-class teacher integral to the pedagogy, we wish to encourage critical thinking skills and move away from rewarding rote memorization and to excite young women and men to stay with math and science. Here we show how INFORMS members can contribute.

■ SA37

M - T. Marshall Ballroom West

Tutorial: Retail Category Management and Assortment Planning

Cluster: Tutorials
Invited Session

Chair: Gurhan Kok, Duke University, One Towerview Drive, Durham, NC, United States of America, gurhan.kok@duke.edu

1 - Retail Category Management and Assortment Planning

Gurhan Kok, Duke University, One Towerview Drive, Durham, NC, United States of America, gurhan.kok@duke.edu

The assortment a retailer carries has a significant impact on sales, margins and customer traffic. Therefore, assortment planning has received high priority from retailers, consultants and software providers. The literature on assortment planning from an operations perspective is quickly growing. We discuss the consumer choice models and the optimization based assortment planning studies in the literature. We present a few industry examples by describing the process at prominent retailers.

■ SA38

M - Tyler

Progress in Models and Algorithms for Discrete Optimization Problems

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Miguel Anjos, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, manjos@uwaterloo.ca

1 - The Computational Results on Solving Stochastic Multi-plant Facility

Marshal Wang, cwang@mie.utoronto.ca, Roy Kwon

We propose a novel method combining Dynamic Dual Decomposition(D3) method and Benders' Decomposition(BD) method to solve the stochastic multi-plant facility location problems. The empirical research on randomly generated data and benchmark data are processed. The proposed method can solve large-sized problems whereas traditional BD method or CPLEX MIP solver can not solve them. It also shows that the aggregation method can save the computational time and approximate optimal solution very well.

2 - Solving Max-k-Cut Problems Using Semidefinite Programming

Bissan Ghaddar, PhD Candidate, University of Waterloo, Management Science Department University, of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, bghaddar@uwaterloo.ca, Miguel Anjos, Frauke Liers, Angelika Wiegele

In this talk we present an algorithm for finding exact solutions for the Max-k-Cut problem known to be an NP-hard combinatorial optimization problem. Our main contribution is the design of a branch-and-cut framework based on semidefinite programming combined with polyhedral results. We compare our method with other solution approaches and provide the most recent results for the Max-k-Cut problem.

3 - Cone Programming Relaxations for Complementarity Constraints

Juan Vera, Post Doctoral Fellow, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, jvera@engmail.uwaterloo.ca, Miguel Anjos

We present new theoretical results on new relaxations schemes for complementarity constrains. These relaxations can be casted as second-order cone programming problems or semidefinite programming problems, and are shown to be exact, i.e. to provide the global optimum, in some cases.

■ SA39

M - Truman

Approximation Algorithms

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: James Orlin, Professor, M.I.T., E53-363, Cambridge, MA, 02139, United States of America, jorlin@MIT.EDU

1 - An FPTAS For Dynamic Pricing with Learning

Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu, James Orlin, Georgia Perakis, Retsef Levi

We consider a discrete variant of a classical model of dynamic pricing with learning under uncertain demand that arises in the context of many retailer operations. The problem can be cast as a dynamic program with an intractable state-space. We identify a state-space collapse that along with a novel truncation scheme allows us to develop a fully polynomial time approximation scheme for this problem.

2 - Approximating Functions in Logarithmic Space and Time

Nir Halman, MIT, 1-176, 77 Mass. Ave., Cambridge, MA, 02139, United States of America, halman@mit.edu, James Orlin

We consider several natural problems related to the design and analysis of approximation algorithms. We define a set of sufficient conditions on a nonnegative integer-valued oracle function f, and on its domain D, so that we can construct good approximations for f in space, time, and number of queries, which are all logarithmic in |D| and max f(x). We develop almost optimal solutions for combinatorial optimization problems on several families of directed acyclic graphs.

3 - A Framework for Designing Approximation Schemes for a Class of Combinatorial Optimization Problems

Shashi Mittal, M.I.T, E40-130, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, mshashi@mit.edu, Andreas S. Schulz

We propose a general framework for designing approximation schemes for combinatorial optimization problems, in which more than one objective functions are combined into one using l_p norms. The main idea behind this procedure is exploiting the approximate Pareto-optimal front for multi-objective optimization problems. Using this procedure, we obtain an FPTAS for some resource allocation and scheduling problems when the number of agents/machines is fixed, for any l_p norm,

■ SA40

M - Taylor

Joint Session Optimization/Stochastic Programming /CS: Monte Carlo Sampling Strategies for Stochastic Optimization

Sponsor: Optimization/ Stochastic Programming, Computing Society
Sponsored Session

Chair: Guzin Bayraksan, University of Arizona, 1127 E James E. Rogers Way, Engineering Building #20, Tucson, AZ, 85721, United States of America, guzinb@sie.arizona.edu

1 - Sample Average Approximation of Expected Value Constrained Stochastic Programs

Shabbir Ahmed, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, sahmed@isye.gatech.edu, Wei Wang

We propose a sample average approximation (SAA) method for stochastic programming problems involving an expected value constraint. Such problems arise, for example, in portfolio selection with constraints on conditional value-at-risk (CVaR).

2 - Bootstrapping to Reduce Bias in Stochastic Linear Programs

Doug Thomas, Smeal College of Business, 463 Business Building, University Park, PA, 16802, United States of America, dthomas@psu.edu, Jeff Linderoth, Udom Janjarassuk, Dr. Russell Barton

Using the sample average approximation method for solving a stochastic LP results in a biased estimate of the optimal objective value. In this research, we investigate the use of bootstrapping to reduce this bias. We demonstrate the effectiveness of using bootstrapping to reduce this bias on a set of test problems.

3 - The Most Likely Path Problem (MLPP)

Daniel Reich, PhD Candidate in Applied Mathematics, University of Arizona, 617 North Santa Rita Avenue, PO Box 210089, Tucson, AZ, 85721-0089, United States of America, dreich@math.arizona.edu, Leonardo B. Lopes

We present a stochastic shortest path problem that we refer to as the MLPP, and explain why solving this problem is intractable on general networks. We introduce a dynamic programming algorithm for identifying the Most Likely Path (MLP) on series-parallel networks, and use subpath optimality and sequential sampling in doing so. On this network class, we introduce analytical lower and upper bounds for the probability of the MLP, and explain how and why these bounds can be computed efficiently.

■ SA41

M - Taft

Behavioral Issues in Management of Product Development Projects

Cluster: New Product Development
Invited Session

Chair: Sanjiv Erat, University of California at San Diego, serat@ucsd.edu

1 - Is Diversity Biased? Cross-functional Teams and Project Termination Decisions

Nektarios Oraiopoulos, Georgia Institute of Technology, 800 West Peachtree St., NW, Atlanta, GA, 30308, United States of America, nektarios@gatech.edu, Stylianos Kavadias

Prior research from a variety of research fields spanning from psychology to operations management has revealed that "killing a bad project" is anything but a simple decision. In the majority of these studies escalation of commitment is attributed to either psychological or organizational issues. We undertake a different approach by demonstrating how the interpretive diversity, often encountered in cross-functional teams, can lead to systematic biases and consistent escalation patterns.

2 - Structuring Global Product Development

Anshuman Tripathy, PhD Student, MIT-Sloan School of Management, 77 Massachusetts Avenue, E53-388, Cambridge, MA, 02142, United States of America, atripathy@sloan.mit.edu, Steven Eppinger

Distributed and offshore product development is challenged by product and process architecture constraints and high coordination costs. We propose an evolving Global Product Development (GPD) structure model incorporating the influence of coordination costs and learning effects. Through an example of optimizing an existing GPD organization, we observe that, contrary to conventional literature, offshoring need not increase with modularity of tasks.

3 - Managing Cost Salience and Project Output Quality: A Principal-agent Model

Yaozhong Wu, Assistant Professor, NUS Business School, National University of Singapore, Singapore, 117592, Singapore, bizwyz@nus.edu.sg, Vish Krishnan, Karthik Ramachandran

We develop a principal-agent model in which agents decide how much effort to spend in each period of a two-period project. The agent has an immediacy bias such that the immediate cost is more salient, and future costs are hyperbolically discounted. Unequal effort allocation results in low output quality and incurs a cost to the principal. We study the incentive design problem in this context. We also investigate how the principal should assemble the project team according to agent types.

4 - Working with Cheats: The Role of Deception in Principal Agent Settings

Sanjiv Erat, University of California at San Diego, serat@ucsd.edu

Many principal agent relationships involve information asymmetry of the effort that the agent exerts. While traditional economic theory predicts the sub-optimality of compensations based on unobservable efforts, actual practices, such as the use of billable hours, suggest that compensation mechanisms may be based on agent reported metrics. In this presentation, I shall present evidence of two facets of lying aversion: the agent's aversion to lie, and the principal's aversion to be lied to.

■ SA42

M - McKinley

Combinatorial Optimization

Contributed Session

Chair: Purushothaman Damodaran, Assistant Professor, Florida International University, 10555 W Flagler Street, Miami, FL, 33174, United States of America, damodarp@fiu.edu

1 - A New Approach to Supermodular Independence Problems

Kevin Byrnes, Student, Johns Hopkins University, Whitehead Hall 302, 3400 North Charles St., Baltimore, MD, 21218, United States of America, byrnes@ams.jhu.edu

We consider Generalized Independent Set (GIS) problems, where we wish to find a maximum weight subset subject to satisfying a set of supermodular constraints. Using a multi-stage relaxation, we show that solving a GIS instance is equivalent to finding a maximizer for a certain unconstrained submodular function. Proving several important properties of this submodular function, we derive a parallelizable branch and bound algorithm for the solution of GIS.

2 - A Heuristic Algorithm for Solving Distribution Problems with Set-up Costs

Elizabeth Schott, NMSU, 234 Polaris St, WSMR, NM, 88002, United States of America, libby.schott@gmail.com, Delia Valles-Rosales, Eduardo Quinonez-Rico

Dried chile are important industry in sw US. Competition has driven the industry to find better production practices. In the Army, Route Clearance Teams patrol to find IEDs. RCTs are valuable, but limited. Appearing unrelated both can be modeled as Distribution Problem with Set-up costs. This model takes into account demands over time and centers with inventory/set-up costs. This paper investigates the development of a heuristic algorithm based on cross entropy with local searches.

3 - Minimizing Flow Time in Parallel Machine Schedule Problem Subject to Minimum Makespan

Xiongzhi Wang, South China Agriculture University, Wushan Road 483,Tianhe District,Guangzh, Guangzhou, 510642, China, flyhawkren@163.com

This paper considers the problem of scheduling n independent jobs on m>=1 identical processors, with objective of minimizing the total flow time under the constraint that it must have minimum makespan considered. And an O(nlgn) polynomial time algorithm to find the optimal preemptive scheduling with at most 2m-1 preemptions is given. And the algorithm performance is shown through computational experiments.

4 - Make-to-order Acceptance & Scheduling: A Branch-and-price Implementation

Purushothaman Damodaran, Assistant Professor, Florida International University, 10555 W Flagler Street, Miami, FL, 33174, United States of America, damodarp@fiu.edu, Siddharth Mestry, Chin-Sheng Chen

We propose a mixed integer model to make optimal marketing and production decisions simultaneously in a make-to-order environment. The model prescribes which orders to accept and how to schedule the orders in order to maximize profit. A branch-and-price algorithm is implemented to solve realistic problems in short run time. Computational results and various sub-problem solution strategies are discussed.

■ SA43

M - Balcony D

Inventory in Supply Chain Management

Contributed Session

Chair: Suleyman Ozekici, Professor, Koc University, Department of Industrial Engineering, Rumeli Feneri Yolu Sariyer, Istanbul, 34450, Turkey, sozekici@ku.edu.tr

1 - The Impact of Product Characteristics on the Post- Merger Supply Chain Synergy

Shenghan Xu, Assistant Professor, University of Idaho, College of Business and Economics, Moscow, ID, 83844, United States of America, shenghan@uidaho.edu, Iqbal Agha

In this paper we study how the expected synergistic gain upon merger of two companies is impacted by their product characteristics. The product characteristics, which reflect the physical flow and demand pattern, bring uniqueness to each company's supply chain network. We report the findings of an integer-program-based computational study of 112 supply chain merger scenarios of two companies with up to 2410 stores and 34 distribution centers in the continental United States using U.S. Census Bureau 2005 data.

2 - Multiple Products Integrated LRP-inventory Model under Uncertain Demand

Seyed Reza Sajjadi, Student, Wichita State University, 2330N Oliver, Apt. #101, Wichita, KS, 67220, United States of America, srsajjadi@yahoo.com, S.Hossein Cheraghi

To improve the operation of the supply chain process, it is proposed in this paper to integrate location-routing problem (LRP) with the inventory decisions. The proposed model considers the multi-product network under the fixed- interval inventory policy where stochastic demands represent the customers' requirements. Moreover, the third party logistics allows excess space for selected warehouses if needed. It also presents results from solving the model using a simulated annealing (SA) approach.

3 - Coordination Contracts for Supply Chains with Inventory Financing

Chang Hwan Lee, Professor, Ajou University, San 5, Woncheon-dong, Yeontong-gu, Suwon, 443-749, Korea, Republic of, chlee@ajou.ac.kr, Byong-Duk Rhee

This paper examines inventory financing issue from a supply chain perspective. Following a Newsvendor framework, we consider a supply chain with two risk-neutral participants: a retailer and a supplier. Both of them can obtain credits from a financial institution. We assume that the supply chain members incur unequal interest rates in financing working capital. Our results show that a supply chain can be fully coordinate with the optimal trade credit, quantity discount, and buyback contract

4 - Inventory Management with Random Supply and Imperfect Information: A Hidden Markov Model

Suleyman Ozekici, Professor, Koc University, Department of Industrial Engineering, Rumeli Feneri Yolu Sariyer, Istanbul, 34450, Turkey, sozekici@ku.edu.tr, Kenan Arifoglu

We consider an inventory model with random supply in an unobservable random environment. Two models are analyzed. In the first one, supply is random due to random production capacity and supplier availability. We show that state-dependent base-stock policy is optimal if the capacity and costs are observed. In the second model, we consider a model with random availability only with fixed ordering cost. We show that state-dependent (s,S) policy is optimal if availability is observable.

■ SA44

M - Balcony C

Behavioral Operations Models

Contributed Session

Chair: Jason Niggley, University of Southern California, 400 Bridge Hall, LA, CA, 90017, United States of America, niggley@usc.edu

1 - Aggregation and Stakes in Repeated Newsvendor Decisions

Mirko Kremer, Pennsylvania State University, 460 Business Building, State College, PA, 16803, United States of America, Mirko.Kremer@psu.edu

Industrial applications of the newsvendor problem differ by how often decisions are made as well as what is at stake. The standard solution of the problem is insensitive to such distinctions. In a controlled laboratory environment, we investigate how the subtle interplay of repetition and stakes impacts risk taking (through statistical aggregation) and the propensity to, by now well-documented, decision biases (through the opportunity to learn by repetition, and motivation by increased stakes).

2 - Dynamic Behavior in Inventory Control and Pricing

Kay-Yut Chen, Principal Scientist, Hewlett Packard Laboratories, MS 1U-2, HP Labs, Page Mill Road, Palo Alto, CA, United States of America, kychen@hpl.hp.com, Diana Wu

In the traditional dynamic control theory, decision-makers are assumed to make no errors: optimizing their expected payoffs considering the full time horizon. We used a sequence of experiments, with human subjects, to determine how individuals make pricing and/or ordering decisions over a number of periods. We found participants performed better if freedom of decisions is restricted, which is contrary to simple mathematical principles. We developed a behavioral model to explain the data.

3 - Behavior and Cognition: Individual Differences in the Newsvendor Problem

Brent Moritz, PhD Candidate, University of Minnesota, 3-150 Carlson School of Management, 321 19th Ave. S, Minneapolis, MN, 55455, United States of America, morit022@umn.edu, Arthur Hill

Previous research shows that individuals making supply chain inventory decisions select sub-optimal values. Using research from behavioral economics and cognitive science, this research experimentally tests a model relating individual behavioral characteristics to observed performance. This model may hold promise in explaining behavioral factors in other supply chain problems. Some implications include selection and training of decision makers and design of decision support systems.

4 - Framing and Threshold in Contracting

Diana Wu, Assistant Professor of Decision Sciences, University of Kansas, 1300 Sunnyside Ave., Lawrence, KS, 66045, United States of America, dianawu@ku.edu, Kay-Yut Chen

We use a series of human experiments to study several types of supply chain contracts.We observe behavioral differences even when theoretical solutions are identical. These contracts, for example, the sales target rebate, involve the use of thresholds. We hypothesize that the key factor that drives observed behavior is the framing of these thresholds.

5 - Improving Service Operations by Understanding How Customers Think

Jason Niggley, University of Southern California, 400 Bridge Hall, LA, CA, 90017, United States of America, niggley@usc.edu

Service interactions provide one of the richest settings to study mental processing because they stimulate customers in multiple ways. Although psychology has studied reaction to simple phenomena like pain (Redelmeier and Kahneman 96), service management has yet to apply these results to design operations that take advantage of the way in which customers think to maximize satisfaction. Our research bridges this gap.

■ SA45

M - Balcony B

Empirical Research in Environmental Operations

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management

Sponsored Session

Chair: Brian Jacobs, Georgia Tech, 800 W. Peachtree NW, Atlanta, GA, 30308, United States of America, brian.jacobs@mgt.gatech.edu

1 - Evidence of Biases in the Adoption of Energy Efficiency Initiatives by Small and Medium Sized Firms

Suresh Muthulingam, UCLA, suresh.muthulingam.2010@anderson.ucla.edu, Charles Corbett

We study the adoption of energy efficiency initiatives using a database of over 100,000 recommendations provided to small and medium sized firms. We find that adoption of a recommendation depends not only on its characteristics but also on how it is presented. Adoption rates are higher for those initiatives appearing early on in a list of recommendations. Adoption is also not influenced by the number of options provided to decision makers, contrary to theoretical predictions.

2 - How do Consumers Value the Duration of Retailer Return Policies? Results From a Conjoint Study

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es, Clara Agustin, Sweta Thota

There is little evidence in literature on how consumers value the duration of a retailer's return policy. We conducted a conjoint study to estimate how the consumers' valuation of a return policy changes with its duration. In addition to estimating relative importance of return policies in the choice model, we also analyzed how product price and search cost influence this relative importance.

3 - The Potential for Cannibalization of New Products Sales by Remanufactured Products

V. Daniel R. Guide, Professor, The Pennsylvania State University, Smeal College Business, Department of SC &IS, University Park, PA, 16802, United States of America, drg16@psu.edu, Kate Li

The potential for cannibalization of new product sales by remanufactured versions of the same product is a central issue in the continuing development of closed-loop supply chains. We address the cannibalization issue by using auctions to determine consumers' willingness-to-pay for both new and remanufactured products. Our results indicate that for the consumer and commercial products auctioned, there is a clear difference in willingness-to-pay for new and remanufactured goods.

4 - An Empirical Investigation of Environmental Announcements and the Market Value of the Firm

Brian Jacobs, Georgia Tech, 800 W. Peachtree NW, Atlanta, GA, 30308, United States of America, brian.jacobs@mgt.gatech.edu, Vinod Singhal, Ravi Subramanian

We categorize press announcements related to positive environmental performance into two major types — awards & certifications, and initiatives. We use event study methodology to estimate the average abnormal stock returns. We find that although the stock market does not react to announcements in such broad categorizations, it does react to certain specific announcement types such as ISO14001 certification, voluntary emission reductions, and environmental philanthropy.

■ SA46

M - Balcony A

Flexible Capacity Investment Decisions under Demand Uncertainty

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Damon Williams, PhD Student, University of Michigan, IOE, 1205 Beal Ave, Univ. of Michigan, Ann Arbor, MI, 48109, United States of America, dpwillia@umich.edu

1 - The Role of Flexibility on Product Line Design for Congested Production Systems

Sergio Chayet, Olin Business School, Washington University in St Louis, Saint Louis, MO, 63130, United States of America, chayet@wustl.edu, Dennis Yu, Panos Kouvelis

We study the effect of production flexibility on joint product line and capacity decisions for congested systems. A firm sets capacity levels and number, design quality levels, and prices for vertically differentiated product offerings. Customers have heterogeneous quality valuations. We use queuing systems to model production processes. We characterize the optimal decisions for non-flexible and a continuum of different types of flexible production systems and discuss key variety drivers.

2 - Revenue Management when Supply is Flexible

Douglas Bish, Assistant Professor, Virginia Tech, 221 Durham Hall, drb1@vt.edu, Ebru Bish, Lingrui Liao

In this paper, we study the problem of revenue management for a two fare-class setting when the airline has the flexibility to swap aircraft (with different capacities) between two legs. We determine the structure of the optimal policy and perform a comparative statics analysis.

3 - An Effective Strategy for High Flexibility in Serial Production with Limited Multi-functionality

Damon Williams, PhD Student, University of Michigan, IOE, 1205 Beal Ave, Univ. of Michigan, Ann Arbor, MI, 48109, United States of America, dpwillia@umich.edu, Dimitrios Pandelis, Mark Van Oyen, Jung-hee Lee

A "2-skill chain" has high flexibility for the number of capabilities/skills (cf. Iravani, Van Oyen, and Sims M.S. 2005). We develop an effective approach with even less multifunctionality and provide effective policies and performance bounds. Analytical structural properties are proven for policies of related classes of serial systems.

■ SA47

M - Hoover

Stochastic Models in Health Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Oguzhan Alagoz, Assistant Professor, Department of Industrial and Systems Engineering, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI, 53706, United States of America, alagoz@engr.wisc.edu

1 - A Mathematical Approach to Triage in the Context of Emergency Response Planning

Evin Uzun, University of North Carolina-Chapel Hill, Department of Statistics and Operations Res., Hanes Hall - CB # 3260, Chapel Hill, NC, 27599-3260, United States of America, evin@unc.edu, Serhan Ziya, Nilay Argon

We consider a major emergency event after which resources are overwhelmed by the number of casualties. Our objective is to identify properties of effective triage decisions that categorize patients into different priority classes based on their conditions. We use stochastic models to gain insights into this challenging problem and test the performance of several triage decisions by means of a numerical study.

2 - Determining Case-Mix under a New DRG System: An Application of Mixture Models

Adam C. Powell, PhD Candidate, The Wharton School, Leonard Davis Institute of Health Econ., University of Pennsylvania, Philadelphia, PA, 19104, United States of America, apowell@wharton.upenn.edu, Chris P. Lee

The Diagnosis-Related Group system was revised in 2007 to expand the classification of disease severity levels. Hospitals want to forecast their patients' classification because it significantly impacts their revenue, but historical claims were not always recorded with the information needed. We build a model to forecast classification and hospitals' revenue loss due to the imperfect documentation in patient claims. We also develop a strategy to help hospitals negotiate pricing with insurers.

3 - Optimal Policies for Biopsy or Short Interval Imaging Follow-up Based on Patient Characteristics

Jagpreet Chhatwal, Health Economist, Merck Research Laboratories, North Wales, PA, 19454, United States of America, jchhatwal@wisc.edu, Elizabeth Burnside, Oguzhan Alagoz

Guidelines for patient management after mammography exams do not consider individual patient characteristics. We developed a finite-horizon discrete-time Markov decision process to find the optimal policies for biopsy or short-interval follow-up that maximize patient's expected quality-adjusted life years. We estimated model's parameters from clinical data, and performed sensitivity analyses. We provide optimal decision policies based on patient's demographic factors and mammographic findings.

4 - A POMDP Model for Optimizing Mammography Screening for Breast Cancer

Turgay Ayer, University of Wisconsin-Madison, 1513 University Ave., Mechanical Eng. Building, Madison, WI, United States of America, tayer@wisc.edu, Oguzhan Alagoz

There is strong evidence that current screening policies for early detection of breast cancer, the most common cancer affecting women in the US, are suboptimal. We develop a finite-horizon partially observable Markov decision processes (POMDP) model for mammography screening. We optimally solve this POMDP using real data. Unlike current clinical guidelines, our POMDP model provides a personalized screening strategy for women.

■ SA48

M - Coolidge

Joint Session TMS/OS: KLIC: Team and Organizational Learning and Knowledge Management

Sponsor: Technology Management, Organization Science
Sponsored Session

Chair: Gulru Ozkan, Georgia Institute of Technology, 800 West Peachtree St NW, Atlanta, GA, 30308, United States of America, gulru.ozkan@mgt.gatech.edu

1 - Knowledge Management for New Product Development in a Competitive Environment

Gulru Ozkan, Georgia Institute of Technology, 800 West Peachtree St NW, Atlanta, GA, 30308, United States of America, gulru.ozkan@mgt.gatech.edu, Cheryl Gaimon

We introduce a game theoretic model that explores knowledge management strategies in an NPD domain for two competing firms. Firms' knowledge levels increase via problem solving (PS) and knowledge transfer/sharing (KT). KT mechanisms considered are general licensing, cross licensing, and joint venture. Firms' maximize profit (consists of revenue/cost of KT, cost of PS and revenue earned from new products). Optimal solutions characterize the extent and the mechanism that firms pursue PS and KT.

2 - Learning by Doing or Learning by Don'ting: Organizational Learning from Prior Success and Failure

Peter Madsen, Marrriott School - BYU, 585 TNRB, Provo, UT, 84602, United States of America, petermadsen@byu.edu, Vinit Desai

Using data from the global orbital launch vehicle industry, we examine the relative effects of prior success and prior failure experiences on organizational learning. The results indicate that orbital launch vehicle organizations learn from both prior successes and prior failures, but that they learn much more effectively from prior failures. Furthermore, the knowledge gained from prior failures appears to depreciate at a much slower rate than that learned from prior successes.

3 - Learn-how to Overcome the Challenges to Organizational Learning

Anita Tucker, Assistant Professor, Harvard Business School, Soldiers Field, Morgan Hall 431, Boston, MA, 02163, United States of America, atucker@hbs.edu, Ingrid Nembhard, Jeffrey Horbar, Joseph Carpenter, Richard Bohmer

This paper proposes that learn-how - activities that operationalize new practices in a given setting - helps organizations improve their performance because it is associated with three enablers of organizational learning for new practice implementation: staff buy-in, practice adaptation and interdisciplinary collaboration. We test whether these enablers mediate the relationship between learn-how and performance in a sample of hospital units.

4 - Transactive Memory and Team Performance

Linda Argote, Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, argote@cmu.edu

The presentation will apply the concept of transactive memory to work teams. Predictors of transactive memory will be developed. Consequences of transactive memory for team performance will be described. The presentation concludes with a discussion of future research on transactive memory that is likely to be fruitful.

■ SA49

M - Harding

Joint Session SIM/Financial Eng: Recent Advances in Financial Simulation

Sponsor: Simulation - INFORMS Simulation Society, Financial Engineering/
Sponsored Session

Chair: Sigrun Andradottir, Professor, Georgia Tech, sa@gatech.edu

1 - Pricing CDO under a Conditional Survival (CS) Model through Exact Simulation

Steven Kou, Columbia University, 312 Mudd, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States of America, sk75@columbia.edu, Xianhua Peng

We use exact simulation to price CDO tranches under a new dynamic model, the conditional survival (CS) model, which provides excellent calibration to both iTraxx tranches and underlying single name CDS Spreads on March 14, 2008, the day before the collapse of Bear Stern, when the market was highly volatile. The simulation algorithm is fast and easy to implement due to the structure of the CS model. We also discuss variance reduction and sensitivity analysis for the simulation.

2 - Pathwise Estimation of Probability Sensitivities through Terminating or Steady-state Simulation

Guangwu Liu, Department of Industrial Engineering and Logistics Management, The Hong Kong University of Science and Technology,, Clear Water Bay,, Hong Kong, China, liugw@ust.hk, Jeff Hong

Standard pathwise sensitivity estimation approach can not be applied to probability sensitivity. In this paper we design pathwise sensitivity estimators for probabilities based on a result of Hong (2007). We show that the convergence rate of the estimator is slower than square root n, and further apply importance sampling to accelerate the convergence rate to square root n. The performances of the estimators are demonstrated through several examples.

3 - Efficient Rare-event Simulation for Portfolios of Black-Scholes Assets

Jose Blanchet, Columbia University, ‏500 W 120th St #450, 3rd Floor, New York, NY, 10027, United States of America, jose.blanchet@columbia.edu

We consider the problem of estimating large deviations probabilities of a portfolio of assets driven by correlated lognormals (including calls or basket options). We present several estimators that can be rigorously shown to be asymptotically optimal. Our estimators, based on importance sampling and conditional Monte Carlo, are easy to implement and robust even in the presence of many assets.

4 - A Confidence Interval for Expected Shortfall via Two-level Simulation

Hai Lan, Northwestern University, 2145 Sheridan Rd, IEMS, Evanston, IL, 60208, United States of America, h-lan@northwestern.edu, Jeremy Staum, Barry L Nelson

We develop and evaluate a two-level simulation procedure that produces a confidence interval for expected shortfall, a risk measure. The outer level of simulation generates scenarios and the inner level estimates the portfolio's loss in each scenario. Our procedure uses the statistical theory of empirical likelihood to construct a confidence interval, and it uses tools from the ranking-and-selection literature to make the simulation efficient.

■ SA50

M - Wilson C

Network Robustness and Interdiction

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: H. Ric Blacksten, Senior Analyst, ANSER/Homeland Security Institute, 2900 S. Quincy St., Suite 800, Arlington, VA, 22206, United States of America, Harry.Blacksten@hsi.dhs.gov

1 - Solving Defender-attacker-defender Models for Defending Critical Infrastructure

Kevin Wood, Professor, Naval Postgraduate School, operations research department, monterey, ca, United States of America, kwood@nps.edu, Pablo Alvarez

We describe defender-attacker-defender models (Stackelberg games) to plan the optimal defense of infrastructure from intelligent attack, and describe and compare four decomposition algorithms for their solution: direct, nested, reformulation-based, and reordering-based. Computational tests on a canonical problem, "defending the shortest path," show the second and third algorithms to be fastest.

2 - Mixed Integer Interdiction

Scott DeNegre, Lehigh University, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, sdenegre@Lehigh.EDU, Ted Ralphs

We consider the problem of interdicting a general mixed integer linear program. An MILP representing the system is given and an adversary attempts to disrupt the system by preventing certain variables from appearing in a solution. We formulate this problem as a special case of the mixed integer bilevel linear programming problem, discuss a branch-and-cut algorithm to solve it, and present computational results.

3 - Intelligently Allocating Resources to Interdict a Planar Supply Network

H. Ric Blacksten, Senior Analyst, ANSER/Homeland Security Institute, 2900 S. Quincy St., Suite 800, Arlington, VA, 22206, United States of America, Harry.Blacksten@hsi.dhs.gov

Opponent's supply networks arise for problems ranging from military logistics to narcotics/human/arms smuggling to information security. In many cases these supply networks are planar, or can be decomposed into two or three planar subnetworks. We show how the planar network interdiction problem can be

reformulated and solved as a generalized shortest path problem on a dual network. By "generalized" we mean that the solution will be made a function of interdiction resources available.

■ SA51

M - Wilson B

Research Advances in the IT/IS and Service Science I

Sponsor: Information Systems
Sponsored Session

Chair: Haluk Demirkan, Assistant Professor, W. P. Carey School of Business, Arizona State University, PO Box 874606, Tempe, AZ, 85287-4606, United States of America, Haluk.Demirkan@asu.edu

Co-Chair: Michael Goul, Professor, Arizona State University, PO Box 874606, W.P. Carey School of Business, Tempe, AZ, 85287-4606, United States of America, Michael.Goul@asu.edu

1 - Component Design within Information Technology Service Portfolios: A Risk Management Perspective

Ryan Sougstad, Carlson School of Management, University of Minnesota, 319 19th Ave S., Minneapolis, MN, 55455, United States of America, sougs002@umn.edu, Robert Kauffman

We propose a method to design information technology (IT) services which balances risk and return trade-offs between capabilities and future demand. We apply a technique building on value-at-risk methods from financial economics, IT Services Profit-at-Risk, to design IT service components. We consider the benefits of reuse vs. the quality and market differentiation of the IT services offerings. We present analytical results and simulations to derive optimal design strategies for providers.

2 - Price and Service Competition in an Outsourced Supply Chain

Jennifer Ryan, Senior Lecturer, UCD School of Business, University College Dublin, Belfield, Dublin 4, Ireland, jennifer.ryan@ucd.ie, Yue Jin

We consider a single buyer who outsources the manufacturing of a given product to two competing suppliers. The buyer allocates demand between the two suppliers on the basis of both price and service. Thus, the suppliers compete on both price and service and seek to maximize their respective profits. The buyer chooses an allocation policy, i.e., specifies the relative importance of price vs. service, in order to minimize her own costs. We characterize the equilibrium behavior of the system.

3 - Bailout Forward Contracting for Time-scaleable Dynamic Internet Services

Aparna Gupta, Decision Science & Engineering Department, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States of America, guptaa@rpi.edu, Weini Liu

Upgrades to the Internet are necessary to make it more QoS aware and flexible in spatial and temporal service contracting. Based on a Contract Switching Paradigm, in this paper, we develop a forward contracting mechanism, with a bailout feature that is responsive to congestion states when service delivery is infeasible. The contracting scheme is analyzaed for its economic benefits and robustness. These new contracts can be used as an effective tool for risk management by service providers.

■ SA52

M - Wilson A

Reverse Supply Chain Design

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Daniel Guide, Associate Professor, The Pennsylvania State University, Smeal College of Business, Department of Supply Chain & IS, University Park, PA, 16802, United States of America, dguide@psu.edu

1 - A Dynamic Pricing Model for Hybrid Manufacturing

Baris Ata, Northwestern University, 2001 Sheridan Road, Evanston, IL, United States of America, b-ata@kellogg.northwestern.edu, Canan Savaskan, Mustafa Akan

In this paper, we consider a product over its life cycle and advance a dynamic pricing model to best synchronize used-product returns with demand so as to improve the profits. We characterize the optimal prices and compare it to pricing under pure manufacturing. We show that in some cases, it is optimal to have returns exceed demand. Otherwise, it uses a dual manufacturing mode throughout the product's life cycle. Finally, contrary to the conventional thinking that remanufacturing and product recovery are end of product life activities, we show that it is never optimal to delay investing in product remanufacturing capabilities.

2 - A Transaction Cost Economics Model of Vertical Integration Drivers for Remanufacturing Operations

Pinar Martin, Bocconi University, Milan, Italy, pinarmartin@gmail.com, Daniel Guide

Despite recent attention to closed-loop supply chains, there is scant information about organizational design for OEMs engaging in remanufacturing. Based on literature and six case studies we propose a framework for vertical integration. Results show that brand name and IP are powerful drivers favoring vertical integration. We also find that forward outsourcing activities can have a profound impact on the profitability of OEMs.

3 - Tabu Search and Benders Decomposition for a Capacitated Closed-loop Logistics Network Design Problem

Gopal Easwaran, Graduate Assistant Research, ISE, Texas A&M University, 430 SW Pkwy Apt 1406, College Station, TX, 77840, United States of America, g.easwar@gmail.com, Halit Uster

We consider a network design problem in a multi-product closed-loop supply chain setting consisting of remanufacturing and finite-capacity manufacturing, distribution and collection facilities that serve a set of retailers. We present tabu search heuristics and a Benders Decomposition approach that incorporates the heuristics along with the use of strong cuts. We present computational results illustrating the efficiency of approaches.

4 - Reverse Supply Chain Design for Multiple Channel Product Returns

Aejaz Khan, amkhan4@mail.uh.edu, Daniel Guide

Manufacturers manage a growing volume of product returns, while retailers offer multiple sales channels and convenient return policies to build customer loyalty. The need to design strategies for manufacturer-retailer coordination motivates the discussion in this paper. We consider three reverse supply chain designs and determine parameters that influence the design choice.

■ SA53

M - Nathan Hale- Wardman Tower

Student Paper Competition

Sponsor: Financial Services
Sponsored Session

Chair: Edward Lau, MFS Investment Management, 500 Boylston Street, Boston, MA, United States of America, elau@mfs.com

1 - Employee Stock Options: Accounting for Optimal Hedging, Suboptimal Exercises, and Contractual Restrictions

Siu-Tang (Tim) Leung, Princeton University, Department of OR&FE, Princeton, NJ, 08544, United States of America, siutang@Princeton.EDU

The main difficulty of Employee Stock Options (ESOs) valuation lies in the uncertain timing of exercises, and a number of contractual restrictions of ESOs further complicate the problem. We present a valuation framework that captures the main characteristics of ESOs such as incorporating the holder's risk aversion, and hedging strategies that include both dynamic trading of a correlated asset and static positions in market-traded options.

2 - Markov Chain Models to Estimate the Premium for Extended Hedge Fund Lockups

Kun Soo Park, PhD Student, Columbia University, S.W. Mudd Building, MC 4703, New York, NY, 10027, United States of America, kp2143@columbia.edu, Emanuel Derman, Ward Whitt

A lockup period in a hedge fund is a time period after making the investment during which the investor cannot freely redeem his investment, which has been growing longer recently. We develop a Markov chain model to estimate a premium from this extended lockup period. We fit the Markov chain model to hedge fund data and quantify the way the lockup premium depends on the model parameters.

3 - Connecting the Top-down to the Bottom-up: Pricing CDO under a Conditional Survival (CS) Model

Xianhua Peng, Columbia University, 313A Mudd, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States of America, xp2102@columbia.edu, Steven Kou

The current subprime mortgage crisis showed that prevalent CDO pricing models incorrectly evaluated default risk. We propose a new dynamic model, the conditional survival (CS) model, which provided excellent calibration to both iTraxx tranches and underlying single name CDS on March 14, 2008, the day before the collapse of Bear Sterns. The CS model can generate strong cross-sectional correlation and allows fast pricing and calculation of sensitivity of CDO tranches to underlying single name CDS.

4 - Option Market Making under Inventory Risk

Mehmet Saglam, Columbia Business School, 3022 Broadway 4O, New York, United States of America, ms444@cornell.edu, Sasha Stoikov

We propose a mean-variance framework to analyze the optimal quoting policy of an option market maker. We present two models consistent with our framework. The first one focuses on Delta risk. Since the stock is more liquid than the option, the market maker moves the stock quotes more aggressively than the option quotes. The second model focuses on Vega and Gamma risks. In this setting, the market maker moves the option quotes by an amount proportional to the net Vega and Gamma.

■ SA54

M - Congressional - Wardman Tower

Decision-Making, Planning, and Organizational Behaviour

Contributed Session

Chair: Peter Trkman, University of Ljubljana, Faculty of Economics, Kardeljeva ploscad 17, Ljubljana, Slovenia, peter.trkman@ef.uni-lj.si

1 - "No Go Out – frozen Pizza Today?": Evaluating Impact of Recession on Retailers and Manufacturers

Eugene Roytburg, The Nielsen Company, 150 N Martingale Rd, Shaumburg, IL, 60173, United States of America, eugene.roytburg@nielsen.com, Valery Petrushin, Colin Hare

The economic downturn has forced consumers to alter their purchasing habits. How have these behavioral changes impacted manufactures and retailers? At the Nielsen Company we developed an approach that estimates category vulnerability to recessionary effects and forecasts future performance using macroeconomic and socio-demographic indicators. This approach allows companies to optimally position themselves during a recession and build long-term competitive advantage.

2 - A Two-person Sparing Matrix Game for Investment Decision Making

Lan Li, Graduate Student, NC State University, 509-21 Tartan Circle, Raleigh, NC, 27606, United States of America, lli2@ncsu.edu

We design and study a new game in which two investors, each with an individual budget, bid on a common pool of potential projects. Associated with each project, there is a potential market profit. Both investors act in a selfish manner with best-response to optimize the individual objective by choosing portfolios under the budget restrictions. We investigate the existence conditions of pure Nash equilibrium in this game as well as evaluate them by the price of anarchy.

3 - Courier Manpower Planning at FedEx Express Terminals

Bala Vaidyanathan, Senior Operations Research Analyst, FedEx Express, 3680 Hacks Cross Road, Building H, Memphis, TN, 38125, United States of America, bala.vaidyanathan@fedex.com, Yengfa Soun, Atul Bhatt

Given a set of on-road and in-station tasks, the courier manpower planning problem is to determine (1) Number of couriers of each type to employ; (2) Assignment of couriers to tasks, to minimize the total cost. We formulate the problem as a set partitioning problem. An exact branch-and-bound algorithm takes between several hours and a few days to terminate. We are able to demonstrate major improvements in solution time using a multi-stage integer programming based heuristic.

4 - Job Satisfaction and Organizational Citizenship Behavior for Permanent and Temporary Employees

Chia-Chang Lin, Graduate Student, National Taiwan Normal University, 162,Sec. 1, Ho-Ping E. Rd.,, Taipei, 106, Taiwan - ROC, kenji101@hotmail.com

The study was to compare temporary (TE) and permanent employees (PE) on job satisfaction (JS) and organizational citizenship behavior (OCB). JS and OCB measures was administered to 270 employees (54 TE and 216 PE) working in a germen semiconductor company in Taiwan. Resulting data were analyzed by making correlation and regression analyses between TE and PE on JS and OCB.

5 - Procure-to-pay Process Simulation

Peter Trkman, University of Ljubljana, Faculty of Economics, Kardeljeva ploscad 17, Ljubljana, Slovenia, peter.trkman@ef.uni-lj.si, Kevin McCormack

Despite large investments the estimation of value of technology-enabled procurement process is often lacking. Our paper presents a rigorous methodological approach towards analysis of e-procurement benefits with the use of discrete-event business process simulation. It enables the estimation of both average and distribution of procurement costs and benefits, workload and lead times. Finally, an innovative approach to comparison of Value-at-Risk is shown.

■ SA55

M - Embassy- Wardman Tower

Joint Session TELCOM/CS: Network Design

Sponsor: Telecommunications, Computing Society
Sponsored Session

Chair: Prakash Mirchandani, Professor, University of Pittsburgh, 358 Mervis Hall, Pittsburgh, PA, 15260, United States of America, PMIRCHAN@katz.pitt.edu

1 - On Uncapacitated Fixed-charge Network Design Polyhedron

Simge Kucukyavuz, University of Arizona, Systems and Industrial Engineering, Tucson, AZ, United States of America, simgek@gmail.com

The fiber-optic cables in communications networks have large enough capacity to route the demands that result in uncapacitated network design problems. The linear programming relaxation of the uncapacitated fixed-charge network design model is weak. We propose generalized network inequalities valid for fixed-charge network design polyhedron that contain the known network inequalities as special cases. We implement a branch-and-cut algorithm to show the effectiveness of the proposed inequalities.

2 - Models for the Traveling Purchaser Problem with Side Constraints

Luis Gouveia, University of Lisbon, DEIO-CIO, Campo Grande, Lisbon, Lx, Portugal, legouveia@fc.ul.pt, Ana Paias, Stefan Voss

We propose a dynamic programming approach for a restricted version of the TPP. The variation includes constraints imposing a limit on the number of markets visited as well as number of items bought per market. Due to the excessive number of states of the DP we propose a state space relaxation technique combined with subgradient optimization. Computational results are presented for instances with up to 100 markets.

3 - Dual Based Heuristics for the Connected Facility Location Problem

Gisela Bardossy, University of Maryland, 4342 Van Munching Hall, Smith School of Business, College Park, MD, 20742, United States of America, mbardoss@rhsmith.umd.edu, S. Raghavan

The Connected Facility Location Problem is an NP-complete problem that arises in the design of telecommunication networks where open facilities need to communicate with each other. We propose dual based heuristics that combine dual-ascent and local improvements that together yield lower and upper bounds to the optimal solution. We discuss a wide range of computational experiments, which indicate that our heuristic is a very effective procedure that finds high quality solutions very rapidly.

4 - Network Design with Service Guarantees

Prakash Mirchandani, Professor, University of Pittsburgh, 358 Mervis Hall, Pittsburgh, PA, 15260, United States of America, PMIRCHAN@katz.pitt.edu, Anant Balakrishnan, Bo Zhang, Gang Li

Traditional cost minimization network design models emphasize scale economies and often exhibit solutions that provide poor customer service along dimensions such as delay and reliability. We study the network design problem with end-to-end service guarantees, identify several classes of underlying valid inequalities, and develop a successful cutting-plane approach for the problem.

■ SA56

O - Blue Room

Intelligent Transportation Systems

Contributed Session

Chair: Wei-Hua Lin, Associate Professor, The University of Arizona, 1127 E. James E. Rogers Way, PO Box 210020, Tucson, AZ, 85721, United States of America, weilin@sie.arizona.edu

1 - A Linear Relaxation Solution Approach to Analytical Traffic Signal Control Problems

Qing He, Ph.D, The University of Arizona, 1127 E. James E. Rogers Way, PO Box 210020, Tucson, AZ, 85721, United States of America, heqing@email.arizona.edu, Hongchao Liu, Larry Head, Wei-Hua Lin

The traffic signal control problem formulated with analytical models (e.g. 0-1 MIP) is typically challenging to solve exactly due to the "curse of dimensionality." We show that a combination of a linear relaxation with a heuristic algorithm based on the output from the linear relaxation can lead to near-optimal solutions for large scale networks.

2 - Driver Behavior at Red Light Camera Monitored Intersections

Manoj Jha, Associate Professor, Morgan State University, 1700 East Cold Spring Lane, Baltimore, MD, 21251, United States of America, manoj.jha@morgan.edu, Yohannes Weldegiorgis

If drivers are aware of the presence of Red Light Camera (RLC) their driving behavior is bound to change. This change will influence the yellow intervals and will affect the capacity. Using field data from Baltimore, Maryland, we study how the yellow time is used effectively as well as changes in dilemma zone boundaries at intersections with RLC.

3 - Speed as a Proxy in Travel Time Estimation Using Regression Trees

Rasaratnam Logendran, Professor, Oregon State University, School of Mech., Indust. & Mfgr. Engr., 204 Rogers Hall, Corvallis, OR, 97331-6001, United States of America, Logen.Logendran@oregonstate.edu, Lijuan Wang

The reliable estimation of travel time in stations and road segments is investigated by using regression trees with speed as a proxy. Several explanatory variables are considered to include flow rate and occupancy, along with incidents and weather for non-recurring congestion, and time of day for recurring congestion. Our research is focused on the I5-I205 loop in Portland, Oregon with PORTAL system (http://portal.its.pdx.edu) being the source of data collection.

4 - A Distributed Approach for Origin-destination Demand Table Estimation

Hamideh Etemadnia, PhD Student, Southern Methodist University, 3101 Dyer Street, Suite 203, Dallas, TX, 75205, United States of America, hetemadnia@smu.edu, Khaled Abdelghany

A framework for Origin-Destination (OD) trip demand estimation for large urban transportation networks is presented. The framework adopts a distributed approach in which OD tables for multiple subareas are estimated. These OD tables are then integrated to provide the area-wide demand distribution. An illustrative example and preliminary results are presented.

5 - A Robust Quasi-dynamic Traffic Signal Control Scheme for Queue Management

Wei-Hua Lin, Associate Professor, The University of Arizona, 1127 E. James E. Rogers Way, PO Box 210020, Tucson, AZ, 85721, United States of America, weilin@sie.arizona.edu, Hong K Lo

For actuated traffic signal control, vehicle delays can be minimized if we end a phase when queues served during that phase vanish. We extended this logic to traffic signal control for intersections where fixed cycle lengths are required. The proposed scheme dynamically changes green allocation so as to keep queues from all approaches in such a proportion that they would "vanish" at the same time. The scheme is robust with respect to data requirement and calibration effort.

■ SA57

O - Blue Room Prefunction

Airlines Competition Modeling and Analysis

Sponsor: Aviation Applications
Sponsored Session

Chair: Khaled Abdelghany, Assistant Professor, Southern Methodist University, PO Box 750340, Dallas, TX, United States of America, khaled@engr.smu.edu

1 - A Modeling Framework for Airlines Competition Analysis: Application to the US Domestic Markets

Ahmed Hassan, Student, Southern Methodist University, 12516 Audelia Rd # 1908, Dallas, TX, 75245, United States of America, aehassan@engr.smu.edu, Khaled Abdelghany, Ahmed Abdelghany

We present an equilibrium-based modeling framework for airlines competition analysis at the network level. The framework considers primary factors including demand levels, infrastructure capacity, and airlines resources. The problem formulation and an efficient solution algorithm are described. The results illustrating the framework application in the US domestic markets are presented.

2 - Learning to Price Airline Seats under Competition

Andrew Collins, PhD Student, School of Management, University of Southampton, University Road, Southampton, SO17 1BJ, United Kingdom, bittelsworth@hotmail.com

A simple stochastic dynamic airline pricing game has been constructed for comparison of several reinforcement learning method. Both theoretical and empirical results are presented, for the game and learning models. These include some interesting behaviours observed from the computer agents during the learning process. The presentation concludes the research presented at INFORMS 2006 of the same name.

3 - Analyzing Airlines Market Service Using Panel Data

Ahmed Abdelghany, Assistant Professor, Embry Riddle Aeronautical University, 600 S. Clyde Morris Blvd, Daytona Beach, FL, 32114, United States of America, abdel776@erau.edu, Vitaly Guzhva

A panel data representing market characteristics is utilized to investigate the airlines market entry and exit decisions. The data for the sample is retrieved for the largest 10,000 city-pairs in the domestic U.S. for the recent 38 quarters. Several econometric models were estimated where the dependent variable represents the change in the number of airlines serving in the market. Several independent factors, representing different markets characteristics, are examined.

■ SA58

O - Capital

Robust/Dynamic Optimization in Aviation

Sponsor: Aviation Applications
Sponsored Session

Chair: Senay Solak, Assistant Professor, University of Massachusetts - Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, solak@som.umass.edu

1 - A Solution Methodology for the Stochastic Single-sector Traffic Flow Management Problem

Yu-Heng Chang, yhchang@gatech.edu, John-Paul Clarke, Ellis Johnson, Senay Solak

We study the stochastic single-sector traffic flow management problem, which determines the number of aircraft to send towards a sector and the recourse actions under the uncertainty of weather. The resulting stochastic programming problem is computationally intractable, and we propose a rolling horizon method that decomposes the problem by consecutively solving sub-problems with fewer flights and time periods.

2 - Multi-objective Approaches for Robust Airline Scheduling

Geert De Maere, Research Assistant, School of Computer Science, University of Nottingham, Wollaton Road, Nottingham, NG81BB, United Kingdom, gdm@cs.nott.ac.uk, Edmund Burke, Patrick De Causmaecker

We present a flight re-timing and an integrated flight re-timing and re-routing approach for multi-objective improvement of robustness objectives (ROBs) in airline schedules. The approaches are applied on real world data to investigate interaction between ROBs. Their simultaneous influence is quantified in a large scale simulation study, providing new insights in robustness of airline schedules. We illustrate high performance of our metaheuristic search through comparison with exact methods.

3 - Column Generation Approaches to a Robust Airline Crew Pairing Problem for Managing Extra Flights

Guvenc Sahin, Assistant Professor, Sabanci University, Manufacturing Systems/Industrial Eng., Orhanli, Tuzla, Istanbul, 34956, Turkey, guvencs@sabanciuniv.edu, S. Ilker Birbil, Kerem Bulbul, Ibrahim Muter, Dilek Tuzun Aksu, Husnu Yenigun, Elvin Coban, Duygu Tas

We consider a robust version of the airline crew pairing problem. The selected pairings are not only to cover the regular flights but also to provide solutions to cover some potential extra flights, which may be introduced into the schedule during operation at a later point in time. For this robust model, we propose four column generation approaches along with required modifications to the multi-label shortest path problem for pricing. We conduct numerical experiments on three test instances.

4 - Dynamic Airline Scheduling: An Analysis of the Potentials of Refleeting and Retiming

Allan Larsen, Associate Professor, Technical University of Denmark, DTU, Anker Engelundsvej 1, Kgs. Lyngby, Denmark, ala@transport.dtu.dk

We present a Dynamic Airline Scheduling (DAS) technique which is able to change departure times and reassign aircraft types during the booking process to meet fluctuating passenger demands. The procedure is tested on several different days before departure, resulting in a significant profit increase for a major European airline. The results also indicate that applying DAS close to departure yields the largest potential.

■ SA59

O - Embassy Room

Revenue Management under Customer Choice Behavior

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Gustavo Vulcano, Stern School of Business, New York University, 44 West Fourth St, Suite 8-76, New York, NY, 10012, United States of America, gvulcano@stern.nyu.edu

1 - Product Assortment under Choice Behavior

Juan Jose Miranda Bront, University of Buenos Aires, Pabellòn I - Ciudad Universitaria, Capital Federal, BA, C1428EGA, Argentina, jmiranda@dc.uba.ar, Isabel Méndez-Dìaz, Gustavo Vulcano, Paula Zabala

We consider a revenue management problem with fixed prices and a general model of market segmentation. Consumers within each segment choose according to a multinomial logit model. The seller has to decide the optimal set of products to offer in order to maximize the instantaneous revenue rate. We formulate the problem as a MIP, and develop a branch-and-cut to solve it effectively. Our numerical experiments provide evidence of the potential of our approach.

2 - On Buy Up as a Model of Customer Choice in Revenue Management

Le Li, University of Minnesota, Department of Mechanical Engineering, 111 Church Street SE, Minneapolis, M, 55455, United States of America, leli@me.umn.edu, William Cooper

In a buy-up model, customers are assumed to belong to fare classes. Customers who belong to a low fare class but find the class closed, are assumed to buy up to a higher fare with a certain probability. We discuss the performance of such models in settings where choice behavior is actually more complex. We analyze the evolution of booking limits from a buy-up model, assuming the firm uses a seemingly reasonable method to turn booking records into input to the model.

3 - New Decomposition Methods for the Network Revenue Management Problem with Customer Choice Behavior

Sumit Kunnumkal, Assistant Professor, Indian School of Business, AC 4, Level 1, 4116, Indian School of Business, Hyderabad, AP, 500032, India, sumit_kunnumkal@isb.edu, Huseyin Topaloglu

We propose a new dynamic programming decomposition method for the network revenue management problem with customer choice behavior. The novel aspect of our approach is that it chooses the revenue allocations by solving an auxiliary optimization problem that incorporates the probabilistic nature of the customer choices. Computational experiments indicate that our approach provides significant improvements over two standard benchmark methods.

4 - Monotonicity in Revenue Management under a Discrete Choice Model of Consumer Behavior

Yasushi Masuda, Professor, Keio Univerisity, Faculty of Science & Technology, Yokohama, 223-8522, Japan, masuda@ae.keio.ac.jp, Hideo Miki

We examine monotonicity properties of expected revenue w.r.t. the consumer behavior and the market size. The consumer behavior is described by a general discrete choice model. The control problem is to decide which subset of fare products to offer at each time period. An example shows that a usual stochastic order in consumers' preference over the fare products is not sufficient for the intuitive monotonicity to hold true. We provide sufficient conditions for the monotonicity.

■ SA60

O - Hampton Room

Competitive Models in Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Dan Zhang, Assistant Professor, Desautels Faculty of Management, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A1G5, Canada, dan.zhang@mcgill.ca

1 - Multiple Supplier Competition under Consignment Inventory Programs with Competing Retailers

Ming Hu, Assistant Professor, Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, ming.hu@rotman.utoronto.ca

We investigate the equilibrium behavior of a Stackerlberg game in two-echelon supply chains, where a set of competing suppliers serves a network of competing retailers. In this Stackelberg games, the suppliers first set wholesale prices simultaneously and then the retailers simultaneously set retail prices. We provide sufficient conditions for the existence and uniqueness of Nash equilibrium to the Stackelberg game with deterministic or stochastic demand.

2 - Nonatomic-game Models for Timing Clearance Sales under Competition

Jian Yang, New Jersey Institute of Technology, Department of IME, Newark, 07102, United States of America, yang@njit.edu, Yusen Xia, Xiangtong Qi

We study a problem in which a continuum of sellers try to sell the same product over the same time horizon. Each seller is allowed to lower his price once at the time of his own choosing. For both deterministic and stochastic models, we show the existence of well-behaved equilibria. Computational results verify that our approach is valid when there are only a finite number of competing firms.

3 - Revenue and Response Time Management for Queuing Systems with Partial Demand Information

Philipp Afeche, Assistant Professor, University of Toronto, 105 St.George Street, Toronto, ON, M5S3E6, Canada, Afeche@rotman.utoronto.ca

We consider the design of optimal price-response time menus for service providers facing heterogeneous time-sensitive customers in the absence of complete demand information. We investigate how the distribution of and information about demand attributes impact the structure of the optimal menu.

4 - Price and Quantity Competition in Dynamic Revenue Management

Dan Zhang, Assistant Professor, Desautels Faculty of Management, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A1G5, Canada, dan.zhang@mcgill.ca

To date, most competitive models in the revenue management literature considers price competition where prices are used as the strategic variables. We consider both price and quantity competition in a market with n sellers each offering one substitutable product. We compare and contrast the price and quantity competitions in static and dynamic settings. In particular, we show that equilibrium profits in price competition are dominated by these in the quantity competition in many cases.

■ SA61

O - Calvert Room

Network Pricing and Equilibria

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: James Moore, University of Southern California, Los Angeles, CA, United States of America, jmoore@usc.edu

1 - Simulating Public Involvement in Capacity Expansion Models in Transportation

Aldo Fabregas, PhD Candidate, University of South Florida, 4202 E. Fowler Ave. ENB118, Industrial and Management Systems Engrg, Tampa FL 33620-5350, United States of America, fabregas@cutr.usf.edu, Grisselle Centeno

Potential users of a new transportation facility such as a toll road are simulated. The potential users are not completely honest about their preferences regarding the new facility. Different scenarios are tested to evaluate the strategies of public involvement that will reduce the uncertainty in the planning process.

2 - No More Freeways: Urban System Dynamics Without Freeway Capacity Expansion

Lei Zhang, Assistant Professor, Oregon State University, School of Civil & Construction Engineering, 220 Owen Hall, Corvallis, OR, 97331, United States of America, imleich@yahoo.com

The limits of freeway capacity expansion have resulted in a provocative urban transportation planning and policy question: What if we stop building additional freeway capacity. Using an agent-based simulator of land use-transportation evolution, this paper explores: 1. How urban land use and transportation network evolve under a "No-More-Freeway" policy; 2. What are the implications of such a policy on congestion, land use efficiency, transportation finance, and welfare.

3 - The Distributional Effect of Distance-based Road User Charges

Lei Zhang, Assistant Professor, Oregon State University, School of Civil & Construction Engineering, 220 Owen Hall, Corvallis, OR, 97331, United States of America, imleich@yahoo.com

Distance-based fees have been proposed as viable alternatives to traditional fuel taxes for long-term funding sustainability. The existing vehicle ownership structure, however, has caused concerns that the transition from fuel taxes to distance-based fees may benefit the high-income drivers at the expense of low-income groups. This paper analyzes the distributional effect of distance-based fees by income and residential location with regression and choice models.

■ SA62

O - Governor's Boardroom

Teaching Revenue Management: New Cases

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu

1 - Introductory, Integrative Cases on Airline Revenue Management
Robert Shumsky, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States of America, robert.shumsky@dartmouth.edu

These cases introduce many of the fundamental concepts that underlie the practice of airline revenue management: protection levels, overbooking, buy-up behavior, network controls, bid prices, and the spiral-down effect.
The cases reinforce many of the core concepts taught in business programs.
To download the cases, go to mba.tuck.dartmouth.edu/pages/faculty/robert.shumsky/skyjet/cases.zip, choose 'Save,' and open the zip file.
The file README.txt describes how the files are organized.

2 - Bidding on Priceline
Chris Anderson, Cornell University, School of Hotel Administration, Ithaca, NY, 14850, United States of America, cka9@cornell.edu

The case Bidding on Priceline scheduled to appear in the fall issue of Informs Transactions on Education (ite.pubs.informs.org) will be discussed.

3 - Two New Cases with Data Sets
Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu, Yingjie Lan, Inbal Yahav

We will introduce two new cases with data sets. The first case is related to golf course revenue management. The second case is on group reservations at hotels where the data set can be used to analyze price segments. Copies of the cases can be obtained by contacting the author prior to the conference.

■ SA63

O - Congressional B

Freight Transporation

Contributed Session

Chair: Avijit Maji, Transportation Engineer, MD State Highway Administration, 7491 Connelley Drive, OOTS/TDSD, Hanover, MD, 21076, United States of America, avijit.maji@gmail.com

1 - Location of Intermodal Terminals Incorporating Tactical Planning in Rail
Sourav Basu, Doctoral Student, IIM Calcutta, IIM Calcutta, Diamond Harbour Road, Joka, Kolkata, WB, 700104, India, souravbasu@email.iimcal.ac.in, Manabendra Nath Pal

The strategic problem of identifying locations of Intermodal terminals has been modeled in this paper in a Rail-Road scenario. We combine the Physical Road network with the Rail Service network to capture the tactical planning aspects of the latter and identify the routing of freight through Road and Rail networks.

2 - An Efficient Strategy for Goods Movement from/to a Port in the Los Angeles Metropolitan Area
Hamid Pourmohammadi, Assistant Position, California State University, Dominguez Hills, 1000 E. Victoria Stareet, Carson, CA, 90747, United States of America, hamid@csudh.edu

The Southern California region and specially Los Angeles has faced enormous congestion associated with increase in cargo movement. This growing congestion has elevated the costs of freight transport and also resulted in greater concerns regarding environmental impacts on local communities. More efficient operational management of intermodal transport provides effective cargo movement and maintains environmental justice, which is the goal of this study.

3 - Assessing the Full Impact of S. 509- 100% Air Cargo Screening
David Menachof, Sr. Lecturer in Int'l Logistics, City University, Cass Business School, 106 Bunhill Row, London, EC1Y 8TZ, United Kingdom, d.menachof@city.ac.uk, Giles Russell

S. 509, The Aviation Security Improvement Act, states that by July 2010 all air cargo on passenger planes will have to be 100% screened. The C.B.O. has estimated that implementation of the bill would cost between $3.6b. and $13.1b. The TSA has stated that costs to comply with the new legislation will be borne by the aviation industry but the costs go beyond the airlines and will fall on the entire supply chain. This paper will attempt to calculate the full cost impact of implementing S. 509.

4 - Prospects for Intermodal Containerized Freight Transport in Montana
Michael Cole, MSU - M&IE Department, 220 Roberts Hall, Montana State University, Bozeman, MT, 59717, United States of America, mhcole@mac.com, Jerry Stephens, Libby Ogard

This study investigates the potential for increasing the flow of intermodal containerized freight originating in the state of Montana.

5 - Identification of Potential Yard Locations in a Railroad Network
Avijit Maji, Transportation Engineer, MD State Highway Administration, 7491 Connelley Drive, OOTS/TDSD, Hanover, MD, 21076, United States of America, avijit.maji@gmail.com, Manoj Jha

Freight trains use railroad network to transport goods from origin to destination. Consignments are accumulated and arranged in nearby yard and transported to destination yard for delivery. Strategy to choose these yards plays an important role in freight traffic control, management and economy. Shortest path algorithm combined with genetic algorithm optimization technique is developed to identify the potential yard locations in a given railroad network based on transportation cost minimization.

■ SA64

O - Congressional A

Optimal Scheduling in Transportation

Contributed Session

Chair: Sotiris Theofanis, Director of Strategic Planning, Center for Advanced Infrastructure and Transportation, 100 Brett Road, Piscataway, NJ, 08854, United States of America, stheofan@rci.rutgers.edu

1 - The Multi-objective Berth Scheduling Problem with Customer Differentiation: Single-level vs Bi-level
George Saharidis, Research Associate, Rutgers University, 98 Brett Rd, Piscataway, NJ, 08854, United States of America, saharidis@gmail.com, Maria Boile, Marianthi Ierapetritou, Sotiris Theofanis, Mihalis Golias

The berth scheduling problem (BSP) aims the optimal scheduling vessels to a berthing space along a container terminals' quay. In this paper the BSP problem is formulated and solved with a classical multi-objective approach and also with a hierarchical approach where a multi-objective bi-level model is developed. A number of computational examples are presented using real data in order to compare and evaluate the Pareto solutions obtained by both approaches.

2 - Estimating an Origin-destination Table for U.S. Imports of Waterborne Containerized Freight
Brian Levine, PhD Candidate, Cornell University, 468 Hollister Hall, Ithaca, NY, 14853, United States of America, bl76@cornell.edu, Linda Nozick, Dean Jones

U.S. containerized imports through seaports are growing at about 10% per year. It is therefore important to have an accurate understanding of the flow of containers from their origin country through these ports to their final destination in the U.S., so that informed investments in infrastructure can be made. This paper develops an optimization model to estimate an origin-destination table for the number of containers shipped from foreign countries to aggregations of economic areas in the U.S.

3 - Truck Scheduling at Crossdocking Terminals
Sotiris Theofanis, Director of Strategic Planning, Center for Advanced Infrastructure and Transportation, 100 Brett Road, Piscataway, NJ, 08854, United States of America, stheofan@rci.rutgers.edu, Maria Boile, Mihalis Golias, Ti Zhang

We present the formulation and solution of a crossdocking problem as a bi-objective model. The objectives are to minimize the total service and waiting time of the inbound trucks at the receiving door and to minimize the total distance traveled by the products from the storage blocks to the outbound doors in the crossdocking system.

4 - Dynamic Decision Making for Less-than-truckload Trucking Operations
Behrang Hejazi, PhD Candidate, Department of Civil Eng., University of Maryland, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States of America, behrang@umd.edu, Ali Haghani

This study presents the decision making techniques for LTL carriers in a dynamically changing environment. A decision making procedure and a mathematical model is proposed to deal with the combined shipment and routing problem. Numerical experiments are conducted considering an auto carrier to evaluate the performance of the solutions provided by the proposed heuristic algorithms. Significant reductions in operational costs are expected by using the proposed decision making procedure.

5 - Planning of Maintenance Operations for Equipments/Vehicles via Stochastic Optimization

Carlos Osorio, Professor, Politecnico Grancolombiano, Calle 57 3 00 Este Fac. Ingenieria, Bogota, Colombia, caosorio@poligran.edu.co, Javier Nieto, Camilo Valero, Jesus Velasquez

This paper presents a non-anticipative stochastic optimization model in order to determine the most common maintenance decisions, according to a set of possible scenarios with some feasible sequences of failures.

■ SA65

O - Council Room

JFIG Paper Competition I

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Lawrence V. Snyder, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, lvs2@lehigh.edu

1 - "We Will be Right with You": Managing Customers with Vague Promises

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

Delay announcements informing customers about anticipated service delays are prevalent in service-oriented systems. We examine this problem of information communication by considering a model in which both the firm and the customers act strategically: the firm in choosing announcements, and the customers in interpreting the announcements and in making the decision when to join and when to balk. We characterize the equilibrium language that emerges between the service provider and her customers.

2 - Blockbuster Culture's Next Rise or Fall: The Impact of Recommender Systems on Sales Diversity

Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu

We examine the effect of recommender systems on the diversity of sales. We find that some common recommenders based on collaborative filtering can lead to a net reduction in sales diversity. Further, it is possible for individual-level diversity to increase but aggregate diversity to decrease. We also show how basic design choices affect the outcome.

3 - Parameter Choice in Sample-path Algorithms for Root Finding and Optimization

Raghu Pasupathy, Virginia Tech, 250 Durham Hall, Blacksburg VA, United States of America, pasupath@vt.edu

Retrospective Approximation is a sample-path technique that solves stochastic root-finding and simulation-optimization problems through a sequence of approximate, and increasingly accurate, deterministic problems. In this talk, we provide guidance on choosing sample sizes and error tolerances in such algorithms. Specifically, we characterize a class of parameter sequences that are superior to others in a certain precise sense. We also identify and recommend particular members of this class.

■ SA66

O - Cabinet Room

Modeling Systems and Languages

Contributed Session

Chair: David M. Gay, Sandia National Labs, PO Box 5800, MS 1318, Albuquerque, NM, 87185-1318, United States of America, dmg@acm.org

1 - Ruby as a Domain-specific Language for Math Programming

David Nehme, Abremod, LLC, 2412 W 12th Street, Austin, TX, 78703, United States of America, nehme@abremod.com, Amit Bbandopadhay

We present a Ruby-based domain-specific language (DSL) for math programming. Ruby is a simple but powerful programming language with a fast-growing user community. Its meta-programming features make it an ideal host for DSLs, and users can take advantage of frameworks like Rails and of improvements in the Ruby language itself. We demonstrate its effectiveness by implementing standard math programming problems, including a basic supply-chain planning tool.

2 - VISAGE – The Visual AMPL Genie

Ulrich Derigs, Professor, University of Cologne, Pohligstrasse 1, Cologne, 50969, Germany, derigs@informatik.uni-koeln.de, Shehab Marzban, Emre Alparslan

We introduce VISAGE our new modelling environment for Mathematical Programming with the AMPL modelling language providing modellers with an intelligent User Interface for the formulation, management, execution and manipulation of AMPL models, data and run files in an integrated environment. VISAGE.net our client-server version of VISAGE supports distributed processing with modelling on a client and model execution on a server where the appropriate solvers are installed and hosted.

3 - A Novel Experimental Approach for Localizing Brain Activation Due to Information Systems Variables

Angelika Dimoka, Assistant Professor, University of California, Riverside, 123 S. Figueroa St., 840, Los Angeles, CA, 90012, United States of America, dimoka@ucr.edu

Using fMRI, this study proposes a novel methodology to identify brain areas that correspond to Information Systems (IS) variables. The study protocol helps induce brain activation by asking subjects to respond to measurement items that were shown in the IS literature to measure these variables (usefulness, ease of use, trust, uncertainty, usage intentions). The study's fMRI results will be presented, and implications for enhancing our understanding of IS variables will be discussed.

4 - The Formal Modeling of Affordances in Human-involved Complex Systems Using Finite State Automata

Namhun Kim, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, nhkim@psu.edu, Richard A. Wysk, Ling Rothrock

Control of human-centered systems has become more challenging because of the critical role of humans in complex systems. To address the human in the system, this research provides a modeling vision and presents a formal automata model of a human-involved system that incorporates the ecological concept of affordances. The formalism for affordance is realized by using a finite state automaton (FSA) that includes a juxtaposition function between system affordances and human effectivities.

5 - Specifying and Reading Program Input with NIDR

David M. Gay, Sandia National Labs, PO Box 5800, MS 1318, Albuquerque, NM, 87185-1318, United States of America, dmg@acm.org

NIDR is a facility for processing input to large programs, such as DAKOTA, a program that does uncertainty quantification and optimization. NIDR was written to simplify maintenance of DAKOTA, provide better checking of input, and allow use of aliases in that input. While written to support DAKOTA input conventions, NIDR could easily be used to control other programs. This talk briefly describes DAKOTA and NIDR and explains the algorithm NIDR uses to permit relaxed ordering of its input.

■ SA67

O - Forum Room

Data Mining I

Contributed Session

Chair: Zhe Song, The University of Iowa, 3131 Seamans Center, Iowa City, IA, 52242, United States of America, zhe-song@uiowa.edu

1 - Volatile Correlation Computation for Business Applications

Wenjun Zhou, PhD Student, Rutgers Business School, 180 University Ave, Newark, NJ, 07102, United States of America, wjzhou@pegasus.rutgers.edu, Hui Xiong

Despite the wide use of correlation computing techniques, many business applications nowadays face the challenge that the input data are often dynamic and the correlation computing results must continually be updated. With large and growing data sets, an incremental solution is needed. We propose a CHECK-POINT algorithm that can significantly reduce the correlation computing cost in dynamic environment and boost the practical use of correlation computing techniques.

2 - Analysis of the Socio-cognitive Relations in Processes of Production of Knowledge

Victor Andres Bucheli Guerrero, Doctoral student, Universidad de los Andes, Carrera 1 N∞ 18A 10 Bogotà, Bogotà, Colombia, vbucheli@uniandes.edu.co, Ricardo Bonilla Jiménez, Roberto Zarama Urdaneta, Endwin Andres Bernal Lopez

This article presents an analysis of data from Thomson Scientific database. We study socio-cognitive relations between the network of co-authorship, the network of keywords, and a specific topic search. We use Bayesian Networks to infer about the processes of production of knowledge. This process is analyzed as a complex system and the results are statistical inferences that characterize the structure of the socio-cognitive relations.

3 - Semantic Feature Selection for Composite Object Discovery in Remote Sensing Imagery

Dihua Guo, Rutgers University, 180 University Ave, Newark, NJ, 07032, United States of America, dihua.g@gmail.com

To discover and utilize hidden semantics of images is critical for High-Resolution Remote-Sensing image retrieval. In the paper, we exploit hyperclique pattern discovery method to find complex objects that consist of several co-existing objects that form a unique semantic concept. We consider the identified complex objects as new features to feed into the learning model. Experiments with real-world datasets show that, with new semantic features we can improve the performance of object discovery.

4 - Support Vector Machines for Passenger Name Record-based Cancellation Forecasting in Revenue Management

Dolores Romero Morales, University Reader, University of Oxford, Said Business School, Park End Street, Oxford, OX1 1HP, United Kingdom, dolores.romero-morales@sbs.ox.ac.uk, Jingbo Wang

We present a new Passenger Name Record (PNR) cancellation forecasting model based on Support Vector Machines (SVM). The challenge when applying SVM to PNR based cancellation forecasting is the computational complexity. We propose an algorithm that accelerates the training process by transforming the original dataset into a more compact form. We illustrate with a real-world database how our model outperforms existing methods, such as decision tree and logistic regression.

5 - Data-driven Optimization of Non-stationary Complex Processes

Zhe Song, The University of Iowa, 3131 Seamans Center, Iowa City, IA, 52242, United States of America, zhe-song@uiowa.edu, Andrew Kusiak

Optimizing non-stationary complex processes proposes three challenges. Firstly an accurate process model is hard to get. Secondly the process model may change over time. Thus the model has to be updated to capture the change. The third challenge is how to solve the optimization problem as the process model is usually complex and nonlinear. To tackle these challenges, data mining and evolutionary algorithms are combined.

■ SA68

O - Senate Room

The Wisdom of Crowds: Applications of Online Trading Markets in Marketing Research

Sponsor: Marketing Science
Sponsored Session

Chair: Natasha Foutz, Assistant Professor of Marketing, McIntire School of Commerce, 340 Rouss & Robertson Hall, University of Virginia, Charlottesville, VA, 22904, United States of America, ynf8a@comm.virginia.edu

1 - Securities Trading of Concepts: Is It Marketing or Finance?

Hyun Shin, Assistant Professor of Marketing, Long Island University CW Post, School of Business, Brookville, NY, 11548, United States of America, hyun.shin@anderson.ucla.edu, Ely Dahan

Securities Trading of Concepts (STOC) markets combine elements of market research and finance in order to measure the consensus on the value of new product concepts. Via statistical analyses we show that, due to the lack of new information arrival, STOC prices follow a stationary process unlike real financial securities. We predict the direction of price movements from one trade to the next by using an autoregressive model, and demonstrate external validity of the method in multiple ways.

2 - Preference Markets Vs. Simple Surveys of Expectations of Others' Preferences

Ely Dahan, Assistant Professor of Marketing, UCLA, The Anderson School at UCLA, 110 Westwood Plaza, Office B514, Los Angeles, CA, 90095, United States of America, edahan@ucla.edu

We discuss the predictive accuracy of "Preference Markets," in which product concepts and attributes are traded as stocks. An alternative, a survey of expectations of others' preferences, is also considered. Empirical results in the case of cell phones, vehicles, laptop bags, and student projects show that while both approaches are surprisingly effective, each has its own advantages. Respondents' incentives to be truthful and potential pitfalls for these approaches are also discussed.

3 - The Influence of Social Networks on Prediction Market Behavior

Thomas Gruca, Henry B. Tippie Research Professor of Marketing, University of Iowa, S356 Pappajohn Building, The University of Iowa, Iowa City, IA, 52242-1992, United States of America, thomas-gruca@uiowa.edu, Sheila Goins

Prediction market participants are embedded in a network of social relations that may affect the information they bring to the market and trading behavior. Using data from the IEM movie market, we model the influence of social networks on the private information (e.g., set of comparable products and key attributes) traders used to determine the values of contracts in the market. We also model the influence of social networks on trading behavior as well as individual and market outcomes.

4 - Forecasting Movie Demand Decay Via Functional Models of Prediction Markets

Natasha Foutz, Assistant Professor of Marketing, McIntire School of Commerce, 340 Rouss & Robertson Hall, University of Virginia, Charlottesville, VA, 22904, United States of America, ynf8a@comm.virginia.edu, Wolfgang Jank, Gareth James

We propose a novel functional data-mining approach applied to early and dynamically evolving trading prices of a prediction market to forecast demand during not only the release week but also the decay rate in subsequent weeks. We illustrate our approach in the context of pre-release forecasting of release-weekend revenues of Hollywood motion pictures

Sunday, 11:00am - 12:30pm

■ SB01

M - Marriott Ballroom 3

Joint Session Minority Issues/Location Analysis/PPP: Public-Sector Facility Location

Sponsor: Minority Issues, Location Analysis, and Public Programs and Processes
Sponsored Session

Chair: Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu

1 - The Stop-and-drop Problem for Nonprofit Distribution

Christina Scherrer, Assistant Professor, Southern Polytechnic State University, Department of Industrial Engineering Tec, 1100 S. Marietta Parkway, Marietta, GA, 30060, United States of America, cscherre@spsu.edu, Senay Solak

We introduce the stop-and-drop problem (SD), a new version of the Location-Routing Problem. Suppose donated food is delivered from a central warehouse to multiple sites. Organizations travel to these sites to pick up their food and make deliveries. After making drop-offs, trucks pick up donations at other locations and return to the warehouse. We solve SD using an exact method, a sequential heuristic, and an integrated heuristic approach, and compare computational results.

2 - What Foreclosed Homes Should a Municipality Purchase to Stabilize Vulnerable Neighborhoods?

Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu, Felicia Sullivan, David Turcotte

The large increase in residential mortgage foreclosures has hurt homeowners, renters and communities. In response, government and nonprofits have considered purchasing such properties for resale to stabilize affected neighborhoods. However, there are few guidelines by which this might be done. We present multi-criteria and optimization-based decision models for property acquisition and demonstrate significant tradeoffs between ease of use and social impact through testing with practitioners.

3 - Optimization Models for Policy Evaluation of Sex Offender Laws

Tony Grubesic, Assistant Professor, Indiana University, Department of Geography, 701 E Kirkwood Ave, Bloomington, IN, 47405, United States of America, tgrubesi@indiana.edu, Alan Murray

Effective management of convicted sex offenders is a challenging problem. Recent legislation uses geographic constraints to limit the residential options of convicted sex offenders. Critics suggest that communities with less rigorous ordinances absorb a disproportionately high number of offenders, putting sensitive populations at risk. This paper uses spatial optimization to evaluate spatial risk and the geographic distribution of sex offenders within a community in relation to public policy.

4 - Decent Work and Fair Globalization: Ranking Nations Using Multiplicative Two-stage DEA

Ruzanna Tarverdyan, Yerevan State University, 13/1 Arabkir 29 Street, Yerevan, Armenia, Ruzanna.Tarverdyan@gmail.com, Sten Thore

Globalization has had differential impacts across countries, social classes and gender categories. Data Envelopment Analysis (DEA) has been previously used to rate the performance of countries according to economic opportunity and social justice. We extend this work to in two ways: generalized social preference function allow us to interpret efficiency ratings as effectiveness ratings; nested social preference functions using two-stage DEA allow more subtle representations of social objectives.

■ SB02

M - Marriott Ballroom 2

Incentives and Contract Design in IS

Sponsor: Information Systems
Sponsored Session

Chair: Anjana Susarla, Assistant Professor, University of Washington, 336 Mackenzie, Box 353200, Seattle, WA, 98195, United States of America, asusarla@u.washington.edu

1 - Versioning of Information Goods under Usage-resource and Capacity Constraints

Ramnath Chellappa, Associate Professor, Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, ram@bus.emory.edu, Amit Mehra

Research in information systems has studied pricing and bundling of information goods and has demonstrated the need for unique price schedules that are different from those of physical goods. We examine a special class of information goods where consumers' utility in product features is not strictly increasing as they suffer from usage related constraints. We conclude with specific recommendations for software vendors who may also suffer production constraints for these goods.

2 - Relational Contracts and Reputation Capital in Information Technology Outsourcing

Anjana Susarla, Assistant Professor, University of Washington, 336 Mackenzie, Box 353200, Seattle, WA, 98195, United States of America, asusarla@u.washington.edu, Lan Shi

We develop a model of relational contracting to establish that the form of explicit contract affects the parties' reneging temptation on a given relational contract, and thus the sustainability of a relational contract. Using data on information technology outsourcing contracts, we quantify different types of reputation capital in outsourcing relationships. Our results support a model of vendor and client using relational as well as explicit contracts to manage their transactions.

3 - Performance-based Contract Design for Software Outsourcing

Ming Fan, Assistant Professor, University of Washington, Foster School of Business, Seattle, WA, 98195, United States of America, mfan@u.washington.edu, Debabrata Dey

We develop a contract-theoretic model to examine how optimal software outsourcing contracts can be designed. We tie contract payment with the software performance and find a first-best solution can be reached with the performance-based contract. We extend this contract to a two period setting and derive conditions that the client prefers staged development. We also analyze profit-sharing contracts which are useful in situations where the software developer has more market power.

■ SB03

M - Marriott Ballroom 1

Joint Session Homeland/Humanitarian: Hurricanes and Decision Makers

Cluster: Homeland Security, Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Robin Dillon-Merrill, Georgetown University, 418 Old North, Washington, DC, 20057, United States of America, rld9@georgetown.edu

1 - Bellman Equations Applied to Hurricane Decision Making

Richard Larson, MIT, E40-231, Cambridge, MA, 02139, United States of America, rclarson@MIT.EDU, Michael Metzger

As a hurricane approaches the coastline, its state variables are updated periodically via satellite, airplane and other reconnaissance. Each update represents a stage, a decision making epoch, in Bellman's parlance. Stage-to-stage updates are uncertain, reflecting the probabilistic behavior of hurricanes. We characterize on-shore decision-making within such a stochastic dynamic programming framework, and replay old hurricanes to demonstrate the utility of the approach.

2 - Communicating Uncertainty for Public Evacuation Decisions

Eva Regnier, Associate Professor, Naval Postgraduate School, 699 Dyer Road, Monterey, CA, 93940, United States of America, eregnier@nps.edu

Hurricane forecasts include uncertainty about the size, intensity, path, and timing of the storm, all of which affect preparation and evacuation decisions. This research investigates what is known about human perception and response to uncertainty about the timing of events, as it applies to methods for communicating hurricane forecast uncertainty.

3 - Managing Resource Allocation Post-disaster: Opportunities and Risks of Geographic Visualization

Quintus Jett, Dartmouth College, Tuck School of Business, 100 Tuck Hall, Hanover, NH, 03755-9000, United States of America, quintus.r.jett@dartmouth.edu

The most catastrophic disasters will surpass the capacity of government agencies and official responders. Yet, the widespread public awareness of such a disaster will draw the attention of others who are without formal responsibility but have the capacity to lend assistance. This paper examines the opportunities and risks of providing visual displays of disaster zones to manage needed private allocations of resources for catastrophic disaster recovery.

4 - The Effect of Near-miss Events on Future Hurricane Evacuation Decisions

Robin Dillon-Merrill, Georgetown University, 418 Old North, Washington, DC, 20057, United States of America, rld9@georgetown.edu, Cathy Tinsley, Matthew Cronin

We formalize the concept of near-misses and consider the impact of such events on hurricane evacuation decisions. We show that near-misses with no evidence of "almost failure" make people feel safer about the situation. This lower level of perceived risk encourages people with near-miss information to make riskier subsequent decisions.

■ SB07

M - Maryland A

Product Line and Capacity Strategies

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Sergio Chayet, Olin Business School, Washington University in St Louis, Saint Louis, MO, 63130, United States of America, chayet@wustl.edu

1 - Assortment Planning for a General Model of Consumer Preferences

Dorothee Honhon, McCombs School of Business, The University of Texas at Austin, Austin, TX, 78712, United States of America, dorothee.honhon@mccombs.utexas.edu

We consider the problem of a retailer managing a product category. Products have different prices, costs and salvage value. We consider various models of consumer choice: locational, one-step substitution as well as a very general model based on utilization maximization. For cases in which we do not obtain the optimal solution we suggest efficient heuristics and test their performance numerically.

2 - Locational Tying of Complementary Retail Items

Ebru Bish, Associate Professor, Virginia Tech, Department of Industrial and Systems Engg., Blacksburg, VA, 24061-0118, United States of America, ebru@vt.edu, Bacel Maddah

We study the benefits of "locational tying" (LT), a cross-category selling strategy involving two complementary items: a primary item and a secondary item. The retailer stimulates demand for the primary item by offering the secondary item in close proximity to it. We characterize the structure of the optimal prices and inventory decisions under LT, compare it to the traditional selling strategy, where the two items are sold independently, and derive managerial insights.

3 - Product Line Design in a Supply Chain Network

Nan Xia, Sheldon B. Lubar School of Business, University of Wisconsin-Milwaukee, Milwaukee, WI, 53201, United States of America, xian@uwm.edu, Sampath (Raj) Rajagopalan

We investigate product line decisions for a monopoly producer who sells goods to multiple retailers. Retailers have incentives for offering more variety to attract customers, but whether the producer who incurs most of the associated costs could benefit from increased variety is unclear. We derive the producer's optimal strategies of product variety/complexity and pricing using a framework that captures retailers' strategic behaviors.

4 - Product Line Design and Capacity Planning under Demand Uncertainty

Sergio Chayet, Olin Business School, Washington University in St Louis, Saint Louis, MO, 63130, United States of America, chayet@wustl.edu, Panos Kouvelis, Dennis Yu

We analyze product line and capacity decisions faced by a firm selling vertically differentiated products to customers who are heterogeneous in their design quality valuations. We consider two sources of aggregate demand uncertainty: Market potential and market size. The firm commits to capacity and design quality decisions before demand is realized and sets prices ex post. We generate analytical results for optimal decisions and study the effect of each type of market uncertainty.

■ SB08

M - Maryland B

New Trends in Scheduling

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Marc E. Posner, Professor of Operations Research, The Ohio State University, Department of Integrated Systems Engineering, 1971 Neil Avenue, Columbus, OH, 43210, United States of America, posner.1@osu.edu

1 - Minimizing Total Completion Time in Two-Machine Flow Shops With Exact Delays

Hairong Zhao, Assistant Professor, Purdue University Calumet, Department of Mathematics, Computer Science, Hammond, IN, 46323, United States of America, hairong@calumet.purdue.edu, Yumei Huo, Haibing Li

We study the problem of minimizing total completion time in the two-machine flow shop with exact delay. This problem is a generalization of the no-wait flow shop problem which is known to be strongly NP-hard. We focus on permutation schedules. We first prove that some simple algorithms can find the optimal schedules for some special cases. Then for the general case, we design some heuristics as well as meta-heuristics whose performances are shown to be very well by computational experiments.

2 - Level Workforce Schedules for 2-stage Transfer Lines

George Vairaktarakis, Case Western Reserve University, Weatherhead School of Managament, Department of Operations, Cleveland, OH, 44106, United States of America, gxv5@case.edu

We define two workforce leveling objectives for serial transfer-lines where the workers required per operation is such that the operation completes in precisely c periods. For both objectives we develop efficient algorithms for 2-stages and examine the trade-off between the maximum workforce size and the fluctuations from cycle to cycle.

3 - Stochastic Scheduling Subject to Preemptive-Repeat Breakdowns with Incomplete Information

Xiaoqiang Cai, Professor, The Chinese University of Hong Kong, Department of SEEM, Hong Kong, China, xqcai@se.cuhk.edu.hk, Xianyi Wu, Xian Zhou

We study the problem of scheduling a set of jobs on a single machine subject to stochastic breakdowns with incomplete information involved in the decision process. We derive optimal static and dynmaic policies represented by the posterior distributions, which are updated adaptively based on processing histories. We highlight the sharp differences of the optimal policies between the complete and incomplete information models.

4 - Integrated Production and Delivery Scheduling with Disjoint Windows

Yumei Huo, Assistant Professor, CUNY at Staten Island, Department of Computer Science, Staten Island, NY, 10314, United States of America, huo@mail.csi.cuny.edu, Joseph Y-T. Leung, Xin Wang

Consider a company that manufactures perishable goods. There is a small time window that the product can be produced before its delivery. Given a set of jobs with each job specifying its delivery time, processing time and profit, we want to schedule a subset of jobs so as to maximize the total profit. We consider both the single machine case and the parallel machines case. Polynomial-time algorithms, pseudo-polynomial algorithms, and fully polynomial time approximation schemes are given.

■ SB09

M - Maryland C

QSR International Session

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Yu Ding, Associate Professor, Texas A&M University, Industrial and Systems Engineering, 3131 TAMU, College Station, TX, 77843, United States of America, yuding@iemail.tamu.edu

1 - Robust QFD Methodology under the Uncertainty in Input Information

Deok-Hwan Kim, Kwang-Jae Kim

In practice, the uncertainty in the input information of QFD is inevitable. This paper proposes an extended QFD methodology, called robust QFD, which considers the uncertainty of the input information and the resulting variability of the QFD output. The methodology consists of four phases - uncertainty modeling, variability derivation, EC prioritization, Robustness evaluation and improvement. The methodology is demonstrated via a case study.

2 - Multivariate Statistical Control of Unsynchronized Batch Processes

Flavio Fogliatto, Professor, UFRGS, Av Osvaldo Aranha, 99/5o Andar, Porto Alegre, 90040-120, Brazil, ffogliatto@producao.ufrgs.br, Ndeye Niang

We present a new quality control strategy for unsynchronized batch processes. In our proposition, data arising from such batch processes are completed using a straightforward scheme to preserve all information on the variability in batch profiles along the time axis. The completed data set is reduced using a three-way method and monitoring of batch performance is accomplished directly on principal plane graphs, from which non-parametric off-line and on-line control charts are derived.

3 - Multivariate Analysis on Flexible Manufacturing System

N. Venkatachalapathi, Research Scholar, Department of Mechanical Engg., SVU College of Engineering, TIRUPATI-517502, chalapathi_nynaru@rediffmail.com, A. Ramakrisharao

This paper attempts to the problem of predicting and controlling the performance of FMS. The FMS operations comprising of Pallet station, Machining Centers and Unloading station with an AGV system is simulated under dynamic environment. The dynamism in the system is created by assuming stochastic arrival rate for parts, uniform processing times at machining centers, AGVs for handling materials. This environment is simulated using ARENA 10.0. The results of an hypothetical FMS simulation are utilized as inputs and output parameters such as AGV utilization and Resource utilization and multivariate analysis were conducted and establishing the control limits for performance measures. The results indicate a significant relationship between the global decision rules and the output indicators.

■ SB10

M - Room 8206

Pollution Control

Contributed Session

Chair: Christopher Hertzler, Graduate Student, Mississippi State University, 1595 LA ROSSA CIRCLE, San Jose, CA, 95125, United States of America, ch484@msstate.edu

1 - Minimizing Waste Disposal Costs in the Semiconductor Pollution Control Equipment Supply Chain

Vivian Hui, Graduate Student, Mississippi State University, 4500 The Woods Drive, Apt 3237, San Jose, CA, 95136, United States of America, vwh9@msstate.edu

In this presentation I set forth a network model for the minimization of costs and environmental impact of semiconductor pollution control equipment dry scrub canisters. I will present a model that compares the cost of single use adsorbent canisters vs. refillable adsorbent canisters and examine the environmental impact of various strategies for abating semiconductor reactor effluent streams.

2 - Integer Programming Approach for Design of Cost-effective Torrent Control Measures

Jochen Breschan, ETH Zurich, CHN K73.1, Zurich, 8092, Switzerland, breschan@env.ethz.ch

Densely populated areas in mountainous regions have always been facing the problem of risks caused by natural hazards. We address the challenge of how to design a bundle of control measures that minimizes cost for limiting run off in a torrent catchment to a specified threshold. An integer programming approach was used to identify spatial patterns of control measures in order to fulfill the run off restriction and to consider reduced construction cost when doing spatial clustering of measures.

3 - Substitution in the Pollution Control Supply Chain to Minimize Costs of Green Environmental Policies

Christopher Hertzler, Graduate Student, Mississippi State University, 1595 LA ROSSA CIRCLE, San Jose, CA, 95125, United States of America, ch484@msstate.edu

One of the most effective methods for cleaning industrial discharge streams is the utilization of dry scrub media. Unfortunately the cost of maintaining this equipment can be high due to uncertainty as to the exact composition of the waste stream. An effective substitution policy can minimize the risk associated with this uncertainty. In this presentation I share a model that uses substation in order to reduce these costs and to increase the uptime of semiconductor environmental equipment.

4 - An Agent Based Model for the Evolving Supply Chain of Jatropha Biofuel

Ahu Soylu, PhD Student, London Business School, Regent's Park, London, NW1 4SA, United Kingdom, asoylu.phd2006@london.edu, Derek Bunn

This paper examines the operational risks in the dynamic and emergent nature of an emerging biofuel's supply chain: Jatropha curcas L. This plant is able to grow in extreme conditions which might create opportunities as well as risks. In this paper, the supply chain is modelled from plantations to refineries and different economic models are compared. The model is run with different scenarios to observe the possible risk factors on investment decisions.

■ SB11

M - Room 8209

Forestry II: Sustaining Urban Forests

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Estimating the Value of Street Trees in Portland, Oregon

Geoffrey Donovan, USDA Forest Service Pacific Northwest Research Station, 620 SW Main St. Suite 400, Portland, OR, 97205, United States of America, gdonovan@fs.fed.us, David Butry

We use a hedonic price model to estimate the effects of street trees on the sales price and the time-on-market of houses in Portland Oregon. On average, street trees add $7,020 to sales price and reduce time on the market by 1.9 days. The benefits of street trees spill over to neighboring houses, which implies that if the provision and maintenance of street trees is left solely to homeowners then there will probably be too few street trees in Portland from a community perspective.

2 - Spatial Analysis of the Economic Impacts of Sudden Oak Death

Thomas Holmes, USDA Forest Service Southern Research Station, PO Box 12254, Research Triangle Park, NC, 27709, United States of America, tholmes@fs.fed.us, Ross Meentemeyer

Sudden oak death (SOD), caused by the pathogen Phytophthora ramorum, is having a dramatic impact on urban forests in California. To estimate the economic impacts of SOD, we link a spatially-explicit model of pathogen spread with spatially referenced estimates of economic value. The invasion model integrates the influence of ecological heterogeneity with the spatial force of infection. Damages are the product of the number of economic units infected and the economic damage per unit.

3 - Optimal Reserve Selection Subject to Contiguous Habitat Requirements

Sandor Toth, College of Forest Resources, University of Washington, Box 352100, Seattle, WA, 98195, United States of America, toths@u.washington.edu, Adam Skibbe, Robert Haight, Stephanie Snyder, Mark Gregory, James Miller

Conservation efforts often require site selection strategies that lead to spatially cohesive reserves. Although habitat contiguity is thought to be conducive to the reproductive success of many threatened species, availability of funding and suitable land may restrict the extent to which this spatial attribute can be pursued in reserve design. Using optimization, we explore the economic and spatial tradeoffs of retaining grassland habitat in contiguous patches near the Chicago metropolitan area.

4 - Optimizing Land Use within a Military Installation for Military and Ecological Conservation

Hayri Onal, Department of Agricultural and Consumer Economics, University of Illinois at Champaign-Urba, Urbana, IL, 61801, United States of America, h-onal@uiuc.edu, Sahan Dissanayake, James Westervelt

We present a MIP approach for designing an optimal conservation reserve network within the boundaries of a military installation while satisfying specified military training and conservation requirements. The reserves are desired to be compact, sufficiently large, and close to each other, and must provide habitat services to designated species. Empirical results will also be presented.

■ SB12

M - Room 8212

Data Mining for Streaming and Networked Data

Cluster: Data Mining
Invited Session

Chair: Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu

1 - Broadband Video- Challenges for O.R. and Statistics

V Ramaswami, Principal Member of Technical Staff, AT&T Labs, 180 Park Avenue, E 233, Florham park, NJ, 07932, United States of America, vramaswami@att.com

Comparing methods of content distribution, bandwidth management and congestion control for video services, the emerging "killer" application, requires models of customer usage and preferences. This talk, based on work at AT&T Research, will explore key needs, available data, some interesting findings, and most importantly some of the technical challenges.

2 - Dynamic Price Forecasting in Simultaneous Online Art Auctions

Mayukh Dass, Assistant Professor of Marketing, Texas Tech University, Rawls College of Business, MS2101, Lubbock, TX, 79409, United States of America, dass@terry.uga.edu, Wolfgang Jank, Galit Shmueli

In this paper we present a novel dynamic forecasting approach for predicting price in ongoing simultaneous online art auctions for Indian contemporary art. Our model forecasts the price from the time of prediction until auction close and updates its prediction in real-time as the auction progresses based on newly arriving information and price dynamics. We also investigate the source of the predictive power of price dynamics and find it to capture bidder competition within and across auctions.

3 - Forward-Lasso Adaptive Shrinkage

Gareth James, Associate Professor, University of Southern California, 401R Bridge Hall, Los Angeles, CA, 90089-0809, United States of America, gareth@marshall.usc.edu, Peter Radchenko

The Lasso is a popular method to perform variable selection and coefficient shrinkage in linear regression problems. We discuss a new method, FLASH, which is capable of selecting sparse models while avoiding over shrinkage problems. FLASH is computationally efficient and we show through extensive simulations that it significantly outperforms the Lasso and also provides improvements over other standard methods.

4 - Predicting Delays in the Operating Room

Igor Nakshin, University of Maryland, RH Smith School of Business, College Park, MD, 20742, United States of America, nakshin@gmail.com, Galit Shmueli

On-time performance of ambulatory surgery is a key factor in achieving higher levels of patient and surgeon satisfaction. Surgery delays occur due to many reasons; scheduled appointment duration being under direct control of hospital administrators. With the goal of reducing operating room over-scheduling, we develop a model that predicts under-scheduled surgery appointments using historic appointment data in the MEDITECH Data Repository with 84% accuracy 17% improvement over naïve rule.

■ SB13

M - Room 8216

Panel Discussion: Challenges Facing Data & Text Miners in 2008 and Beyond

Sponsor: Data Mining
Sponsored Session

Moderator: Mary Crissey, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States of America, MaryGrace.Crissey@sas.com

1 - Text Technologies in the Mainstream: Text Analytics Solutions, Applications, and Trends

Panelist: Seth Grimes, Intelligent Enterprise,B-eye network, grimes@altaplana.com

Adoption of text analytics are growing at rates over twice that of BI-market growth, resulting in a $250 million global market. Text analytics continue to be in demand for the media & publishing, competitive intelligence, Voice of the Customer CRM, product management, and marketing sectors. Domains of practice are expanding into the future - to include monitoring social networks, online media channels, semantically enhanced search in the legal, tax & regulatory (LTR) sector.

2 - Top 5 Data Mining Mistakes

Panelist: John Elder, Chief Scientist, Elder Research, Inc., 300 West Main St., Suite 301, Charlottesville, VA, 22903, United States of America, elder@datamininglab.com

Discovering useful models from data can provide enormous returns. But, it is easy to analyze too far and "torture the data until it confesses", dooming new situations to failure. A key to quality is to avoid "worst practices". Dr. Elder will share his (often humorous) stories from real-world applications highlighting common, but deadly, mistakes. Come learn how to achieve success via stories of barely averted disaster. (Though the analytics are technical, the lessons have broad appeal.)

3 - CPMS Co-sponsored Panel Discussion with Experts from KDD, IIE, and JSM

Panelist: Mary Crissey, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States of America, MaryGrace.Crissey@sas.com

Here is your opportunity to interact with experienced practitioners in the field of structured and unstructured data analysis. DM skills are increasingly in demand as more executives seek fact based decision support.Come learn how professional societies (JSM, IIE, KDD)can respond. During these 30 minutes computational, political, and ad-hoc challenges will be discussed as well as web 2.0 social media impacts.

4 - Data and More Data - The Challenge of Data Mining with More Data

Panelist: Tom Au, AT&T, sau@att.com

Corporations now capture more and more data from their operation and want to use them to improve their business. We will discuss the challenge of data mining with more data, the increasing difficulties in data management, integration, quality and privacy issues. We will then discuss a number of business problems that corporations are interested to solve in using data mining, and how the increasing volume of data affect the development of learning algorithms and models.

■ SB14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Palisade Corporation - New Risk and Decision Analysis Tools for OR/MS

David Bristol, Palisade Corporation, 798 Cascadilla St., Ithaca, NY, 14850, dbristol@palisade.com

All programs in Palisade's new DecisionTools Suite 5.0 have been rewritten to work together better than ever before. Each component of the DecisionTools Suite can perform a powerful analysis. When you combine these products, you can achieve more complete results than any single program can provide.

2 - JMP Division – SAS Institute - Dynamic Vsualization of Complex Data with JMP

Curt Hinrichs, JMP Division-SAS, 100 SAS Campus Dr., Cary, NC, 27513, curt.hinrichs@jmp.com, Melodie Rush

JMP is a state of the art statistical package. Designed for the busy professional who wants to quickly and easily analyze their data and needs sophisticated analyses—from classical statistical methods to modern design and exploratory data mining—that only SAS can provide. Intuitive, interactive and graphical, JMP lets you focus on the insight your data can provide. This demo will cover an overview of JMP and analysis designed for business visualization including Bubble Plots, 3D Scatter Plots and the data filter.

■ SB15

M - Room 8219

Panel Discussion: Services Definition and First Principles

Sponsor: Service Science
Sponsored Session

Moderator: Victor W. Tang, Scientist, MIT, 55 Deerfield Lane South, Pleasantville, 10570, United States of America, victor.w.tang@gmail.com

1 - Services at Xerox: A Corporate Perspective

Panelist: Bill Stumbo, Member Research Staff, Xerox Corporation, 800 Phillips Road, MS 128-30E, Webster, NY, 14450, United States of America, William.Stumbo@xerox.com

A brief overview of how Services are viewed within Xerox.

2 - First Principles of Service Science

Panelist: Victor W. Tang, Scientist, MIT, 55 Deerfield Lane South, Pleasantville, 10570, United States of America, victor.w.tang@gmail.com, Fugee Tsung, Ruoyi Zhou, Robin Qiu

We propose a derived set of first principles for service. We argue the importance and necessity for first principles. For lack of a coherent corpus of first principles, the promise of service as a science has yet to be fulfilled. We begin with the question: What is a service? The literature reports a very wide range of diverse definitions for "service". We reason from this work of scholars and distill our own definition, which we will present at this session. We follow with the question: What is service science? We define "science" and identify its fundamental objective, which is understanding. We define "engineering" and discuss its fundamental objective, which is creating physical or intangible artifacts. Engineering science is defined as the domain specific sciences used in the engineering practice, e.g. chemistry for chemical engineering, classical mechanics for mechanical engineering. Service is an act of creation. It follows that service is engineering. Service engineering is analogous to electrical engineering, or aeronautical engineering.

3 - Service Satisfaction: What Matters Most?

Panelist: Robin Qiu, Penn State, Division of Engineering, Malvern, PA, 19355, United States of America, RobinQiu@psu.edu

Service Science: 1) Satisfaction is what matters most in service. 2) How to understand what matters most in a service system? 3) How to make the service system more competitive? 4) What matters most under circumstance?

4 - The Core Principle of Services: 1964-2008

Panelist: Scott Sampson, Professor, Brigham Young University, 660 TNRB, Provo, UT, 84602, United States of America, ses3-inf8@sm.byu.edu

An initial academic recitation of defining service principles occurred in the 1960s in two Journal of Marketing articles. In the late 1970s Dick Chase published articles espousing an operational delineation of services. In 2004, articles came out refuting long-held marketing perspectives on services, authored by marketing professors themselves. A 2007 empirical study showed that the most valid service basis was the model presented by Chase in 1978. Where does this leave our understanding today?

■ SB16

M - Room 8222

Supply Chain Optimization II

Contributed Session

Chair: Ananth Krishnamurthy, University of Wisconsin-Madison, ME 3258 Department of ISyE, 1513 University Avenue, Madison, WI, 53706, United States of America, ananth@engr.wisc.edu

1 - Dual Supply Order Policies with Expediting and Cancelling Inside a Fixed Time Fence

Gregory DeYong, Doctoral Candidate, Indiana University, 1309 E. 10th Street, Bloomington, IN, 47405, United States of America, gdeyong@indiana.edu

We examine an order scheduling policy in the presence of a time fence. We extend existing literature examining order policies with two supply options (interpreted as inside and outside a time fence) by incorporating the option to cancelóat extra cost-orders inside the time fence. We compare the resulting policy and inventory targets to results obtained without the cancellation option.

2 - Impact of Information Errors on Supply Chain Performance

Jin Kyung Kwak, PhD Student, Johnson School, Cornell University, Ithaca, NY, 14853, United States of America, jkk37@cornell.edu, Srinagesh Gavirneni

This study illustrates how information errors affect supply chain performance when supply chain members share demand information. We compare, both analytically and via simulation, the supplier cost when there is no shared information vs. when there is shared information with errors. As the magnitude of errors increases, the benefit of information sharing decreases in a concave manner. The errors have a bigger impact when the demand is less variable or the supplier takes less frequent orders.

3 - Multi-echelon Supply Chain Network Design Problem

Feng Pan, University at Buffalo (SUNY), Bell 308B, North Campus, Amherst, NY, 14260, United States of America, fengpan@buffalo.edu, Rakesh Nagi

We consider supply chain design with multiple echelons, integrating strategic and tactical decisions. Two versions of this problem are studied. The first one considers stochastic demand of a new market opportunity for the unique final customer, with an assumption that only one member can be selected at each echelon. The second one considers a deterministic demand of multiple products for multiple final customers. One or more members can be selected at each echelon.

4 - Dynamic Supply Chain Design for LED Manufacturing System

Viji Krishnamurthy, Product Engg - Scientist, Philips Lumileds Lighting Company, 370 W Trimble Road, Blg 91, San Jose, CA, 95131, United States of America, viji.krishnamurthy@philips.com

A vertically integrated Light Emitting Diode (LED) manufacturing system is a multi-echelon inventory system where each stage is characterized by stochastic process, input and output parameters. In this paper, we discuss the network of stochastic and deterministic optimization modules that are implemented at different stages of supply chain to match the stochastic supply to customer demand.

5 - Using Demand Information Aggregation to Improve Order Fulfillment in Supply Chains

Ananth Krishnamurthy, University of Wisconsin-Madison, ME 3258 Department of ISyE, 1513 University Avenue, Madison, WI, 53706, United States of America, ananth@engr.wisc.edu

Information aggregation, a service that collects relevant information from multiple sources, has become a vital component of order fulfillment processes. In this paper, we consider two-stage flexible supply contracts in supply chains and investigate the impact of demand information aggregation on decision making for different forms of contracts.

■ SB17

M - Room 8226

Joint Session QSR/CS: Monitoring and Diagnosis of Complex Engineering Systems

Sponsor: Quality, Statistics and Reliability, Computing Society Sponsored Session

Chair: Shiyu Zhou, Associate Professor, University of Wisconsin - Madison, 1513 University Ave., Madison, WI, 53706, United States of America, szhou@engr.wisc.edu

1 - Performance and Properties of Q-statistic Monitoring Schemes

Scott Nestler, U.S. Military Academy, West Point, NY, 10996, United States of America, scott.nestler@us.army.mil, Paul Zantek

We study the Shewhart chart of Q statistics proposed for the detection of process mean shifts in start-up processes and short runs. Exact expressions for the run-length distribution of this chart are derived and evaluated using an efficient procedure. Operational guidelines for practitioners implementing the chart are discussed, including interpreting point patterns on the chart and requiring multiple signals from the chart before responding, a practice sometimes followed with Shewhart charts.

2 - Fault Diagnosis for Partially Diagnosable Assembly Processes

Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu, Wenzhen Huang

The identification of process related faults that cause large variations of KPC is one of the most critical research topics in dimensional control. Most of methods in literature assume that the process is fully diagnosable. However, in real applications, this assumption may not hold. To tackle this challenge, this paper proposes a clustering method for process diagnosability study, based on which a method is developed to conduct fault diagnosis for partially diagnosable assembly processes.

3 - Statistical Detection of Spatial Defect Patterns Using Hough Transform

Qiang Zhou, Department of Industrial and Systems Engineering, University of Wisconsin Madison, ISyE Department, 1513 University Avenue, Madison, WI, 53706, United States of America, qzhou3@wisc.edu, Shiyu Zhou

Spatial patterns on wafer defect maps contain valuable information of the manufacturing processes. In this paper, we proposed a method to construct control chart for spatial pattern detection based on Hough Transform. Properties of the monitored statistic have been analyzed and the impact of Hough quantization parameters on Type II error rates has been studied.

4 - Recursive Parameter Estimation for Categorical Process Control

Kaibo Wang, Assistant Professor, Tsinghua University, Department of Industrial Engineering, Tsinghua University, Beijing, China, kbwang@tsinghua.edu.cn, Fugee Tsung

This research proposes an online Bayesian framework for parameter estimation when only categorical observations are available for Run-to-Run process adjustment. Low-resolution observations are assumed to become available at the end of each run; the proposed method works in a recursive manner to incorporate new information for parameter estimation. Simulations results are also presented to evaluate the performance of the proposed scheme.

■ SB18

M - Room 8228

Reliability II

Contributed Session

Chair: Zhigang (Will) Tian, Concordia University, 1515 Ste-Catherine Street West, EV-7.637, Montreal, QC, H3X2P6, Canada, tian@ciise.concordia.ca

1 - System Reliability Optimization with Uncertainity: Minimization of a Coefficient of Variation Measure

Hatice Tekiner, Graduate Student, Rutgers University, Rutgers University, Industrial and Systems Engineering, Piscataway, NJ, 08854, United States of America, htekiner@eden.rutgers.edu, David Coit

A new heuristic is proposed to minimize the coefficient of variation of the system reliability estimate.We propose a heuristic to minimize the coefficient of variation of the system reliability estimate with respect to a minimum system reliability constraint and other system related constraints.Heuristic starts with the solution of problems where mixing component is not allowed and searches the neighborhood of this solution to find better solution for the problems where mixing is allowed.

2 - Optimal Inspection Policies for Protection Systems

Zeynep Erkin, PhD Student, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, zeyneperkin@yahoo.com, Lisa Maillart

We consider a system comprised of two subsystems: a primary system that executes the main function and a protector which monitors the primal system. In the literature, such systems are analyzed using availability measures. In this study, we examine the cost-optimal inspection policy for the protector. Despite the simplifying assumption of exponential lifetimes, the analysis is non-trivial and lends valuable insights. We present numerical results to show the relationships between the parameters.

3 - Cost Optimal Maintenance and Replacement Scheduling

Kamran Moghaddam, PhD Student, University of Louisville, Department of Industrial Engineering, University of Louisville, Louisville, KY, 40292, United States of America, ksmogh01@louisville.edu, John Usher

We present a method for predicting a cost-optimal preventive maintenance policy for a repairable and maintainable series system of components, each with an increasing rate of occurrence of failure (ROCOF). For each period, we decide three possible actions for each component, (maintain it, replace it, or do nothing). We consider the cases of minimizing total cost subject to a constraint on system reliability, and maximizing system reliability subject to a budget constraint on overall cost.

4 - Multicriteria Equivalent Accelerated Life Testing Plans

Haitao Liao, Assistant Professor, Department of Nuclear Engineering/Department of Industrial and Information Engineering, University of Tennessee, 211 Pasqua Engineering Building, Knoxville, TN, 37996, United States of America, hliao4@utk.edu

We investigate the equivalency of accelerated life testing (ALT) plans under a multi-objective framework. Unlike the widely used utility function approach, a Pareto optimum solution set is obtained based on the definition of equivalency of ALT plans as well as multiple statistical performance indices. To prune the Pareto solution set, data mining technique and multiple objective selection optimization approach are integrated. The effectiveness is demonstrated numerically.

5 - Multi-objective Condition Based Maintenance Optimization Using Physical Programming

Zhigang (Will) Tian, Concordia University, 1515 Ste-Catherine Street West, EV-7.637, Montreal, QC, H3X2P6, Canada, tian@ciise.concordia.ca

In condition based maintenance (CBM) optimization, major objectives include maximizing equipment up-time, minimizing time to repair, and optimizing maintenance costs, which are conflicting objectives. In this work, we investigate the application of the physical programming approach to this problem. Physical programming presents two major advantages: it is an efficient approach to capture the decision makers' preferences on the objectives, and it is very easy to use.

■ SB19

M - Lincoln 4

Advances in Decision Support Systems I

Contributed Session

Chair: Michael Erwin, Booz Allen Hamilton, 6703 Odyssey Drive, Suite 200, Huntsville, AL, 35806, United States of America, erwin_michael@bah.com

1 - A Multi-objective DSS for Workforce Training

Brandon Elmes, Student, University of Louisville, Department of Industrial Engineering, Louisville, KY, 40292, United States of America, belmes@gmail.com, Gerald Evans, Gail DePuy

This presentation describes an interactive decision support system for determining workforce training and job assignments for a large governmental facility. The system addresses three objectives: Minimization of training costs, Maximization of worker preferences with respect to desired training, and Maximization of achievement of required skills for workers. The system allows for the input of preference information from the decision maker/manager involving his tradeoffs among the objectives.

2 - An Optimization-based Decision Support System for Strategic Planning in an Aluminum Company in India

Goutam Dutta, Professor, IIM Ahmedabad, W-3, IIM Campus, Vastrapur, Ahmedabad, GU, 380015, India, goutam@iimahd.ernet.in, Narain Gupta, Robert Fourer

We describe how a generic multi-period optimization-based decision support system (DSS) can be used for strategic planning in process industries. The DSS is built on five fundamental elements - materials, facilities, activities, storage areas and time periods. It requires little direct knowledge of optimization techniques to be used effectively. Results based on real data from an aluminum company in India demonstrate significant potential for improvement in profits.

3 - Plan4Safety – A Powerful Tool for Safety Professionals

Muhammad Dayhim, Graduate Assistant, Rutgers State University, 23725 BPO Way, Piscataway, NJ, 08854, United States of America, dayhim@rci.rutgers.edu, Evan Bosset, Nadereh Moeini, Mohsen Jafari, Ali Rezvani, Sarah Weissman

Plan4Safety is a multi-layer decision support tool for transportation engineers, planners, enforcement, and decision makers in New Jersey's transportation and safety agencies to analyze crash data in tabular & geospatial forms. This tool identifies crash hot spots which merit further investigation and prioritizes them for potential safety improvements. It determines the most promising alternative to maximize safety benefits given a budgetary constraint.

4 - Using System Dynamics Modeling to Aid Personnel Policy Decisions for a Transitioning Workforce

Michael Erwin, Booz Allen Hamilton, 6703 Odyssey Drive, Suite 200, Huntsville, AL, 35806, United States of America, erwin_michael@bah.com

NASA's Michoud Assembly Facility (MAF) faces many challenging issues as it prepares for the impending transition from Shuttle to Constellation work. We utilize System Dynamics Modeling methods to provide insight into personnel management issues to include re-training/hiring delays, new manpower requirements, and changes in funding. Implementation of the model allows us to conduct "what-if" analysis and determine the system variables which can be leveraged to achieve MAF's organizational goals.

■ SB20

M - Lincoln 3

Improving MCDA Practice

Sponsor: Decision Analysis

Sponsored Session

Chair: Cornelius Schaub, Director, Decision Institute / LSE, Karl-Liebknecht-Strafle 5, Berlin, 10178, Germany, c.schaub@decisioninstitute.eu

Co-Chair: Gilberto Montibeller, Dr, London School of Economics, Houghton Street, London, WC2 2AE, United Kingdom, G.Montibeller@lse.ac.uk

1 - Success Factors from Major Decision Analysis Studies

Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Department of Systems Engineering, West Point, NY, 10996, United States of America, gregory.parnell@usma.edu, Terry Bresnick

One of the best ways to improve decision analysis practice is to learn from successes and failures. We describe a decision analysis framework that includes the major techniques of the field. Next, we identify lessons learned from several major decision analysis studies that span the decision analysis techniques included in the framework.

2 - The Search for Indicators of Future Performance

Jason Merrick, Virginia Commonwealth University, PO Box 843083, 1001 West Main Street, Richmond, 23284, United States of America, jrmerric@vcu.edu

Organizations involved in safety-critical activities measure their performance using the number of problems or accidents that they have already experienced. We describe a framework for developing leading indicators of safety. We use Value Focused Thinking to understand the objectives that frame a particular decision context within an organization and to relate the objectives for different decision contexts. We test our approach with data from two Fortune 100 companies.

3 - Learning from MCDA Interventions with Action-research

Gilberto Montibeller, Dr, London School of Economics, Houghton Street, London, WC2 2AE, United Kingdom, G.Montibeller@lse.ac.uk

Despite an increasing number of real-world MCDA applications in recent years, systematic research on such practical interventions has been rarely conducted. That is a shame, as they are a rich source of data about the process of preference modelling & facilitating groups with MCDA. In this paper I suggest that Action-Research provides an adequate framework for researching such processes and could be employed as a tool for learning systematically about them, in order to improve the MCDA practice.

4 - Success Factors when Applying Decision Analyses- Lessons from the MARA Projects

Cornelius Schaub, Director, Decision Institute / LSE, Karl-Liebknecht-Strafle 5, Berlin, 10178, Germany, c.schaub@decisioninstitute.eu, Nadine Oeser, Martin Schilling

In this talk, we explore success factors when applying MCDA in practice. Using the ten decision analyses carried out during the applied research project MARA in Argentina and Germany, we analyze the degree of relative success of each of the case studies and identify success factors which may account for these results.

■ SB21

M - Lincoln 2

2008 Dantzig Dissertation Award Finalists

Cluster: The George B. Dantzig Dissertation Prize

Invited Session

Chair: Yunzeng Wang, University of California, Riverside, 900 University Avenue, Riverside, CA, 92521, United States of America, yunzeng.wang@ucr.edu

The George B. Dantzig Award is given for the best dissertation in any area of operations research and the management sciences that is innovative and relevant to practice. This award has been established by INFORMS to encourage academic research that combines theory and practice and stimulates greater interaction between doctoral students (and their advisors) and the world of practice. Finalists selected for this year's award will present their dissertation works.

1 - Cancer Treatment Optimization

Kyungduck Cha, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, chacha2000@isye.gatech.edu, Eva Lee

We will present a Mixed Integer Quadratic Programming approach for treatment planning optimization in radiation therapy. Two significant computational advances will be highlighted: 1) drastic improvement of solution time to previously intractable large-scale and dense QP instances; and 2) rapid column-generation approach where candidate beams are selected adaptively and dynamically.

2 - Constraint Integer Programming

Tobias Achterberg, Ilog, Germany, tachterberg@ilog.de

We introduce the concept of constraint integer programming and our solver framework SCIP. Our applications, namely mixed integer programming and chip design verification, provide examples of how SCIP can be used to solve practical problems.

■ SB22

M - Lincoln 1

CP/OR Interface I

Sponsor: Computing Society: Constraint Programming and Operations Research

Sponsored Session

Chair: Tallys Yunes, Assistant Professor, University of Miami, 5250 University Drive, Room KE 405, Coral Gables, FL, 33146, United States of America, tallys@miami.edu

1 - Hybrid Models for Scheduling a Real Oil Pipeline Network

Andre Augusto Cire, University of Campinas, Av. Albert Einstein, 1251, Campinas, SP, 13083970, Brazil, andre.cire@gmail.com, Tony M. T. Lopes, Arnaldo Vieira Moura, Cid Carvalho de Souza

Brazilian PETROBRAS, one of the world's largest oil companies, confronts a very difficult planning and scheduling problem: how different products should be transported in a pipeline network to supply market demands and to accommodate the daily production outflows of the refineries, while also satisfying hard operational constraints. We propose a two-phase decomposition strategy, in which a Constraint Programming model plays a key role to produce adequate results to large real-world instances.

2 - Polyhedral Analysis of an Alldifferent System

Dimitrios Magos, Technological Educational Institute of Athens, Ag. Spyridonos, Egaleo, 12210, Greece, dmagos@teiath.gr, Ioannis Mourtos

We investigate the Integer Programming (IP) representation of a system of alldifferent predicates. We identify several classes of facet defining inequalities for such a system. Further, we provide a necessary and sufficient condition for some of these classes to describe the convex hull of such a system. Given also that these inequalities can be separated in polynomial time, this condition signifies a class of alldifferent systems for which the optimization problem is polynomially solvable.

3 - Decomposition based Methods for Allocation and Scheduling Problems Arising in System Design

Michele Lombardi, DEIS, University of Bologna, via Risorgimento 2, Bologna, BO, 40136, Italy, mlombardi@deis.unibo.it, Michela Milano

Allocation and scheduling problems commonly arise in the design flow of MPSoC systems. Due to the complexity of platform resources pure OR/AI/CP approaches do not perform well, thus the need for hybrid methods: Logic based Benders Decomposition (LBD) provides a way to integrate different techniques into a single solver. We present a number of LBD based approaches for allocation and scheduling problems; as a practical case the optimization of applications for the IBM Cell BE engine is considered.

4 - Submodular Valued Constraints

Stanislav Zivny, PhD Student, Oxford University Computing Laboratory, Wolfson Building, Parks Road, Oxford, OX1 3QD, United Kingdom, Stanislav.Zivny@comlab.ox.ac.uk

Instances of valued CSPs with submodular constraints can be minimised in polynomial time. We identify broad classes of submodular constraints over a Boolean domain which are expressible using binary submodular constraints, and hence can be minimised more efficiently, in cubic time. We also discuss the question of whether all submodular constraints of bounded arity over a Boolean domain are expressible using only binary submodular constraints, and can hence be minimised efficiently.

■ SB23

M - Lincoln 5

Revenue Management Applications

Sponsor: Applied Probability
Sponsored Session

Chair: Omar Besbes, Assistant Professor, The Wharton School, University of Pennsylvania, 3730 Walnut Street, 545 JMHH, Philadelphia, PA, 19104, United States of America, obesbes@wharton.upenn.edu

Co-Chair: Mustafa Akan, Assistant Professor of Operations and Manufacturing Management, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, m-akan@kellogg.northwestern.edu

1 - A Refined Linear Program for Network Revenue Management

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

We present a refined deterministic linear program for the network revenue management problem. The standard deterministic program keeps the capacity availability in aggregate fashion, whereas our linear program keeps the capacity availability on a time period-by-time period basis. From a computational viewpoint, our refinement appears to translate into increased revenues.

2 - Congestion-based Leadtime Quotation and Pricing for Revenue Maximization with Heterogeneous Customer

Baris Ata, Northwestern University, 2001 Sheridan Road, Evanston, IL, United States of America, b-ata@kellogg.northwestern.edu, Mustafa Akan, Tava Olsen

We consider a make-to-order system with two customer classes, where customers are sensitive to production leadtime. Upon arrival, customers are quoted a menu of leadtimes as a function of the backlog of work in the system. Customers' leadtime cost functions are assumed to be convex-concave. We combine leadtime quotation, dynamic pricing, and customer scheduling to maximize expected revenue for the firm in a large-capacity asymptotic regime.

3 - Dynamic Pricing in e-Services under Demand Uncertainty

Cathy Xia, IBM, cathyx@us.ibm.com, Parijat Dube

High volatility of the e-Services market, due to increasing competition, low life cycle of products, and easy availability of information, makes the demand for service offerings quite uncertain. Revenue management in such markets calls for real-time techniques to learn the demand and its dependence on both the price and the offered service level. We propose a novel learning approach that is guaranteed to converge to the optimal offering and meanwhile near Bayesian optimal.

4 - Minimax Complexity of Pricing in a Changing Environment

Omar Besbes, Assistant Professor, The Wharton School, University of Pennsylvania, 3730 Walnut Street, 545 JMHH, Philadelphia, PA, 19104, United States of America, obesbes@wharton.upenn.edu, Assaf Zeevi

We consider a pricing problem in an environment where the customers' willingness-to-pay distribution changes at a time that is unknown to the decision-maker. We characterize the best possible profit loss, as measured relative to an oracle, and articulate mathematically the role of dynamic pricing policies in such settings.

■ SB24

M - Lincoln 6

Numerical Optimization and Financial Applications

Sponsor: Computing Society
Sponsored Session

Chair: Zack Li, Financial Engineer, FannieMae, 4000 Wisconsin Ave, Washington, DC, 20016, United States of America, zack_z_li@fanniemae.com

1 - Portfolio Optimization Using Stochastic Semi-definite Programming

Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu, Gang Li

We present a two stage stochastic semi-definite programming formulation of the portfolio optimization problem. Using a GARCH model for return and co-variance scenario generation we present numerical results using a interior decomposition algorithm for this model. The performance of the portfolio thus obtained is compared with portfolios from alternative models of portfolio risk using standard data sets.

2 - Portfolio Seletion with VaR Constriant

Siming Huang, Professor, Inst. of Policy and Management, Chinese Academy of Science, Beijing, 100190, China, simhua@casipm.ac.cn

We introduce the portfolio selection models with VaR constriant. We show that they can be transformed into a quadratic programming problem or quadraticlly constrined quadratic programming problem under very general probability distribution assumption. We will propose interior point algorithms for solving them.

3 - Multi-objective Optimization Via Parametric Programming: Models, Algorithms and Challenges

Oleksandr Romanko, McMaster University, ITB-116, 1280 Main Street West, Hamilton, ON, Canada, romanko@mcmaster.ca, Tamas Terlaky, Alireza Ghaffari-Hadigheh

We highlight relationships between multi-objective optimization, where several conflicting objectives are simultaneously optimized subject to constraints, and parametric programming that is used to solve such problems. We present our Interior Point Method and optimal partition based algorithmic and implementation results for solving linear, convex quadratic and second-order cone parametric problems. We illustrate how to solve multi-objective problems and outline their applications in finance.

4 - The Robust Ranking Problems with an Application in Portfolio Optimization

Dung Nguyen, PhD Student, MIT, 90 Day Street. Apt. 2, Fitchburg, MA 01420, United States of America, nguyendt@mit.edu

The mean-variance portfolio optimization requires the estimation of the expected return and the covariance matrix. Since this estimation is very hard while the estimation error could lead to unstable portfolios, we study the non-parametric framework where assets' ranking is used instead of their estimated return. The corresponding robust model (where the uncertainty set is very large & discrete) can be solved efficiently using the constraint generation method together with a network flow model.

■ SB25

M - Lincoln 6A

Making use of Multiple Solutions for MIPs

Sponsor: Computing Society
Sponsored Session

Chair: John Gregory, CPLEX Product Manager, ILOG, Inc., 889 Alder, Suite 200, Incline Village, NV, 89451, United States of America, jgregory@ilog.com

1 - Efficient Frontier in Investment Portfolio

Peter Nieuwesteeg, Senior AIMMS specialist, AIMMS (Paragon Decision Technology), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, Peter.Nieuwesteeg@aimms.com, Sriram Vasantharajan

"The optimal solution" is not always the right choice when making an investment decision. Therefore, it is crucial to analyze multiple "optimal" solutions. We will show how the AIMMS modeling system uses the CPLEX solution pool to obtain multiple solutions in this oil investment portfolio example from Optimal Decisions. Besides obtaining these solutions, we will also demonstrate AIMMS functionality to show an efficient frontier, as well as the case comparison functionality.

2 - Multiple Solutions for Two-phases MIP Decompositions

Diego Olivier Fernandez Pons, Optimization consultant, ILOG, 1195 West Fremont Avenue, Sunnyvale, CA, United States of America, dofpons@ilog.com, Emilie Danna

We use the solution pool feature of CPLEX 11 to solve two industrial problems by decomposition. For a quadratic packing application, we use a column generation approach to remove the quadratic constraints. For a large-scale timetabling problem, we solve an approximation of smaller size then the detailed allocation. By generating alternate solutions in the first phase, we can focus on promising solutions and still recover from an infeasibility if the first phase was too optimistic.

3 - The use of VRP Solution Distance Measures in Various DSS Applications

Arne Lökketangen, Professor, Molde University College, Britveien 2, Molde, 6411, Norway, Arne.Lokketangen@hiMolde.no, Jarl Korsvik, Kjetil Fagerholt, Johan Oppen, David Woodruff

We describe structurally based solution distance measures developed for rich VRP-like problems, to be used in decision support systems. Our measures have been tested on a set of real-life problems from land and sea, and it provides valuable decision support flexibility for the planner.

4 - Making Use of All Solutions to Measure to Progress of Formal Chip Design Verification

Stefan Heinz, ZIB, Division Scientific Computing Department Optimization, heinz@zib.de

We present an application in the field of formal chip design verification for which it is essential to count all solutions of a constraint integer program (CIP) model. The CIP model is a MIP enriched by additional non-linear constraints. For this task we extended the CIP framework SCIP (http://scip.zib.de) and developed problem specific techniques to speed-up the counting process. Some of these methods are generalized to be applicable for arbitrary CIPs.

■ SB26

M - Lincoln 5A

Optimization Frameworks

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: William Hart, Sandia National Laboratories, PO Box 5800, MS 1318, Albuquerque, NM, 87185, United States of America, wehart@sandia.gov

1 - The Templatized Metaheuristics Framework

Jean-Paul Watson, Sandia National Laboratories, PO Box 5800, MS 1318, Albuquerque, NM, 87185-1318, United States of America, jwatson@sandia.gov

Analysis capabilities are lacking in most widely available metaheuristic class libraries. We introduce the Templatized Metaheuristics Framework or TMF, to close this capabilities gap. TMF supports features such as text-based algorithm initialization, population of solution-attribute databases to facilitate behavioral queries, and numerous functions to observe and quantify metaheuristic algorithm behavior. Issues relating to open-source metaheuristic library adoption will also be discussed.

2 - Gaussian Processes in Trust-Region Optimization Methods

Patricia Hough, Sandia National Laboratories, PO Box 969, MS 9159, Livermore, CA, United States of America, pdhough@sandia.gov

Surrogate-based optimization methods have become popular choices for solving simulation-based optimization problems. We describe an interface between two open open source software packages, OPT++ and tgp, that allows the use Gaussian processes as surrogates in a trust-region method. We consider multiple sampling methods to guide surrogate construction at each iteration and examine the effects on computational efficiency of the algorithm for test functions and a mechanical deformation problem.

3 - Leveraging a Flexible Framework for Agent-based Optimization

John Siirola, Sandia National Laboratories, PO Box 5800 MS 0370, Albuquerque, NM, 87109-0370, United States of America, jdsiiro@sandia.gov

We describe ABO, an Agent-Based Optimization metaheuristic for asynchronous, parallel, hybrid optimization. ABO leverages the open source Common Optimization Library INterface (COLIN) to integrate multiple, independent optimization algorithms into a single cohesive system for non-convex multi-objective optimization. We will present some of the unique capabilities within COLIN that enable the rapid development of hybrid algorithms and the impact that flexible interfaces have on ABO development.

4 - Acro: A Common Respository for Optimizers

William Hart, Sandia National Laboratories, PO Box 5800, MS 1318, Albuquerque, NM, 87185, United States of America, wehart@sandia.gov

We describe Acro, a collection of optimization-related software libraries. The Acro Project is an effort to facilitate the design, development, integration and support of optimization software libraries. Acro includes both individual optimization solvers as well as optimization frameworks that provide abstract interfaces for flexible interoperability of solver components. We will survey the capabilities of Acro and compare it to the COIN-OR software effort.

■ SB27

M - Washington 1A

Heavy Traffic, Large Deviations and Power Laws

Sponsor: Applied Probability
Sponsored Session

Chair: Mariana Olvera-Cravioto, Columbia University, 500 W. 120th Street, Rm. 306, New York, NY, United States of America, molvera@ieor.columbia.edu

1 - On Many Server Queues in Heavy Traffic

Josh Reed, New York University, Stern School of Business, New York, NY, United States of America, jreed@stern.nyu.edu, Anatolii Puhalskii

We establish heavy traffic limit theorems on convergence in distribution for the G/GI/N queue in the Halfin-Whitt regime. Our results generalize previously known results by allowing for arbitrary initial conditions.

2 - Tail Probabilities for Infinite Server Queues in Heavy Traffic

Hernan Awad, University of Miami, Department of Management Science, Coral Gables, FL, 33124-6544, United States of America, h.awad@miami.edu, Peter W. Glynn, Yuqing Sun

We consider an infinite server queue in heavy traffic, and derive asymptotic expressions for the tail probabilities of the steady state distribution. In particular, we are interested in the left tail, as it represents the probability of failure in situations where occupancy must remain above a critical threshold for a system to be operational.

3 - Steady State Characteristics of ALOHA with Variable Size Packets

Predrag Jelenkovic, Associate Professor, Columbia University, 1300 S. W. Mudd, 500 West 120 Street, New York, NY, 10027, United States of America, predrag@ee.columbia.edu, Jian Tan

We study the distributional properties of packet transmission delays in a finite population ALOHA channel with variable size packets of an exponential type. Our recent work has shown that this model results in power law delays, possibly with infinite mean and variance. In this study, we further characterize this phenomenon by describing a bifurcation of the delay distribution from a single power law, after finitely many transmissions, to multiple power law distributions in steady state.

4 - On the Distribution of the Nearly Nonstationary AR(1) Process with Heavy Tails

Mariana Olvera-Cravioto, Columbia University, 500 W. 120th Street, Rm. 306, New York, NY, United States of America, molvera@ieor.columbia.edu

We analyze the distribution of an AR(1) process when the regression coefficient is close to one. It is known that an Ornstein-Uhlenbeck process can be used to approximate its steady-state distribution, which provides a Gaussian limit for moderate tail values. On the other hand, when the errors have a regularly-varying distribution so does the steady-state distribution of the AR(1) process. We combine these two facts to obtain approximations that hold uniformly on the positive axis.

■ SB28

M - Washington 1

Robust Optimization and its Applications

Cluster: Robust Optimization
Invited Session

Chair: Omid Nohadani, MIT, 77 Mass. Ave., Cambridge, MA, 02139, nohadani@mit.edu

1 - On the Equivalence of Robust Optimization and Regularization in Statistics
Apostolos Fertis, MIT, 77 Mass. Ave., Cambridge, MA, 02139, afertis@mit.edu, Dimitris Bertsimas

Regularization has been proposed as an effective idea in Statistics. Robust optimization has been proposed as an effective idea to immunize solutions against data uncertainty. We prove that the application of the robust optimization paradigm leads to regularized and sparse solutions in regression and classification. We demonstrate in experiments on both artificial and real data that the robust optimization solutions have improved out-of-sample performance.

2 - Optimality of Affine Policies in Multi-stage Robust Optimization
Dan Iancu, MIT, 77 Mass. Ave., Cambridge, MA, 02139, daniancu@mit.edu, Dimitris Bertsimas, Pablo Parrilo

In this paper, we prove the optimality of a certain class of affine control policies in the context of one-dimensional, constrained, multi-stage robust optimization. Our results cover the finite horizon case, with minimax (worst-case) objective, convex state costs and linear control costs. Our approach introduces an elegant proof technique, and entails fast algorithms for the case of piece-wise affine state costs, which we explore in connection with a classical inventory management application.

3 - A Robust and Data-driven Approach to Call Centers
Xuan Vinh Doan, MIT, 77 Mass. Ave., Cambridge, MA, 02139, vanxuan@mit.edu, Dimitris Bertsimas

We propose a tractable robust approach to a fluid model of call centers that incorporate random arrival rates with abandonment to determine staff levels and dynamic routing policies. We compare our approach with risk-averse data-driven approach using different validation and testing data models. Computational results show that the robust fluid model provides strong and highly tractable solutions to call centers.

4 - Robust Optimization for Simulation-based Problems
Omid Nohadani, MIT, 77 Mass. Ave., Cambridge, MA, 02139, nohadani@mit.edu, Dimitris Bertsimas

Most robust optimization techniques assume that underlying cost functions are given explicitly. We present a robust optimization method for problems with nonconvex cost functions and problems based on simulations such as PDE solvers and kriging metamodels. This technique can be employed for most real-world problems. With an actual engineering problem in nano-photonic design, we demonstrate a significant improvement of the robustness in a high-dimensional design space with a nonconvex objective function.

■ SB29

M - Washington 2

Tutorial: Project MINDSET: High School Mathematics and Operations Research

Cluster: Tutorials
Invited Session

Chair: Ken Chelst, Wayne State University, Detroit, MI, kchelst@wayne.edu

1 - Project MINDSET: High School Mathematics and Operations Research
Ken Chelst, Wayne State University, Detroit, MI, kchelst@wayne.edu, Thomas Edwards, Robert Young, Karen Keane, David Royster

Can you imagine a more exciting high school math course than one driven by OR and IE principles and applications? Project MINDSET (Mathematics Instruction using Decision Science and Engineering Tools) is a $3 million NSF funded project designed to develop, implement, and evaluate a two-semester course for high school seniors based on the mathematics of operations research and industrial engineering. In this tutorial we will discuss two forces driving efforts to raise mathematics proficiency at the high school level: (1) minimum state standards for a high school diploma and (2) state university admission standards or expectations to be competitive. We will describe how the course we are developing is ideally designed to meet this growing need as well as address widely recognized US deficiencies in mathematics education. The primary goal of this tutorial is to motivate you to take on the challenge of bringing Project MINDSET to your local school district or possibly statewide. We will provide you with the skills and support services that will enable you to make it happen. The two major elements of the tutorial will be (a) Project MINDSET course content and how it is aligned with trends in high school mathematics education and (b) strategies for building a social network of influence to deliver a Project MINDSET course into local high schools.

■ SB30

M - Washington 4

Military Modeling, Operations Research, and Decision Analysis II

Sponsor: Military Applications
Sponsored Session

Chair: William Fox, Professor, Naval Postgraduate School, Department of Defense Analysis, Monterey, CA, 93943, United States of America, wpfox@nps.edu

1 - Indicators of Force Multipliers (INFORM) Model on the Iraq War
William Fox, Professor, Naval Postgraduate School, Department of Defense Analysis, Monterey, CA, 93943, United States of America, wpfox@nps.edu

This model is based upon a Homeland Sercurity's System Modeling Infrastructure Resiliency created by Driscoll and Goerger. The small example considers 6 variables (3 in each layer) while the big model consdier 30 variables (15 in each layer). We hit the dynamical system with a shock effect and analyze the effect on the Iraqi system.

2 - Global Sensor Management: Real-time Reallocation of Military Assets among Competing Tasks
John Dulin, North Carolina State University, 844 Seastone St, Raleigh, NC, 27603, United States of America, jldulin@ncsu.edu, Thom Hodgson, Kristin Arney, Ben Lobo

The United States military maintains a network of sensor assets for detecting threats, collecting intelligence and monitoring space. We are developing a tool for real-time reallocation of these sensors in response to events around the globe. We consider an integer programming formulation and heuristic approaches to find good solutions that maximize the probabilities of accomplishing certain tasks, while meeting threshold, capacity, and other network-imposed sensor functionality constraints.

3 - Applying Crime Mapping and Analysis Techniques to Forecast Insurgent Attacks in Iraq
Joseph Mlakar, Operations Research Analyst, United States Marine Corps, 3300 Russell Road, Quantico, VA, 22554, United States of America, joseph.mlakar@usmc.mil

We begin by finding series of attacks that are linked to the same insurgent or insurgent group. Each series is analyzed spatially and temporally in order to identify patterns in (1) static factors such as location, time of day, and day of the week and (2) dynamic factors such as the time between events, distance between events, and movement pattern. We demonstrate how these novel techniques have been tremendously successful in forecasting the location and timing of insurgent attacks in Iraq.

■ SB31

M - Washington 5

OR Applications in the Automotive Industry

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Erica Klampfl, Technical Leader, Ford Research & Advanced Engineering, Systems Analytics & Env. Sciences Department, RIC Bldg, MD #2122, 2101 Village Rd., Dearborn, MI, 48124, United States of America, eklampfl@ford.com

1 - Algorithms for Leveraging a Flexible Workforce in Automotive Planning
Ada Barlatt, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, United States of America, abarlatt@umich.edu, Craig Morford, Oleg Gusikhin, Amy Cohn, Yakov Fradkin

We consider the problem of simultaneously deciding the workforce size and allocation of laborers in a facility. We present an example from automotive stamping to illustrate a new algorithm, "Test-and-Prune", which ensures tractability, and discuss how this approach extends to other hierarchical planning problems.

2 - Refueling Advisory System

Kacie Theisen, Ford Research & Advanced Engineering, 2101 Village Road, Dearborn, MI, 48121, United States of America, KTHEISE1@ford.com, Oleg Gusikhin, Yimin Liu, Erica Klampfl

Increasing fuel costs are causing growing popularity of services that provide gasoline information to drivers. We will present a refueling advisory system that utilizes vehicle information, current and forecasted gas prices, and driver preferences as inputs to a Mixed Integer Program which minimizes fuel costs over routes and time.

3 - Optimal Scheduling of Automotive Glass Furnaces

Yakov Fradkin, Research Scientist, Ford Motor Company, 2101 Village Rd, MD 2122, Dearborn, MI, 48121, United States of America, yfradkin@ford.com, Giuseppe Rossi

Glass furnaces are continuous operations producing glass of different colors and thicknesses for automotive and other applications. Changeover times are sequence dependent. We consider the problem of devising an optimal schedule given the level of available product storage and given patterns of demand and demand variability. We develop both analytical and computational models: the latter use composite variables, that encapsulate a number of business rules into a single modeling object.

■ SB32

M - Washington 6

Searching for Distressed Persons I

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: John Frost, Information/Search Planning Specialist, U. S. Coast Guard, Office of Search and Rescue, Suite 3106, 2100 Second St. SW, Washington, DC, 20593-0001, United States of America, John.R.Frost@uscg.mil

1 - Advances in Land Search and Rescue Theory Applications

Robert Koester, CEO, DBS Productions, PO Box 1894, Charlottesville, VA, 22903, United States of America, robert@dbs-sar.com

The cornerstone of search theory is the correct use of Probability of Containment and Probability of Detection. Using the recently established International Search and Rescue Incident Database, new models capable of detailed allocation of Probability of Containment within the search area have been developed. In addition, on going experiments are establshing effective sweep width values in the highly variable ground environment.

2 - Successful Application of Search Theory in Northern Minnesota Missing Person Searches

Richard Slatten, St. Louis County Rescue, 3389 Midway Road, Proctor, MN, 55810, United States of America, Rick.Slatten@newpagecorp.com

Valid Search Theory provides a critical advantage in the planning and management of searches for missing persons in order to save lives and bring closure to families. The author will present a case study illustrating the use of Search Theory to solve land search problems, as well as summarize the evolution of a Northern Minnesota Search and Rescue (SAR) unit from "seat of the pants" search planning, to "pseudo-science" to solid operational footing.

3 - Optimal Survivor Search for Distressed Persons

Lawrence Stone, CEO, Metron Inc, 11911 Freedom Dr, Suite 800, Reston, VA, 20190, United States of America, stone@metsci.com

Traditional search plans seek to maximize probability of detection. When searching for a distressed person in adverse circumstances, a more appropriate goal is to maximize the probability of detecting the person alive. This is called optimal survivor search. If the search is for a person who may be in cold water or on a life raft, it is important to search the person-in-the-water scenario first without ignoring the life-raft scenario. Optimal survivor search tells us where to search and for how long to maximize probability of detecting the person alive.

■ SB33

M - Johnson

Health Policy Analysis

Sponsor: Health Applications Section
Sponsored Session

Chair: David Hutton, Stanford University, 380 Panama St, Stanford, CA, 94305, United States of America, billdave@stanford.edu

1 - So You Want to Save the World? Opportunities in HIV Prevention and Treatment Policy Modeling

Margaret Brandeau, Professor, Stanford University, MS&E Department, Terman Building, Stanford, CA, 94305, United States of America, brandeau@stanford.edu

We provide an overview of important current challenges in HIV prevention and treatment, and we outline promising areas where OR modeling can have an impact on policy. These include treatment and control of coepidemics; determining the appropriate allocation of limited resources between HIV prevention versus treatment; evaluating HIV interventions tailored to specific regions of the world; and addressing logistical issues that arise in the scaleup of prevention and treatment programs.

2 - Contact Tracing for Chronic Viral Diseases

Benjamin Armbruster, IEMS, Northwestern, Evanston, IL, United States of America, armbrusterb@fastmail.fm, Margaret Brandeau

We develop a compartmental model of a chronic infectious disease to evaluate the cost and effectiveness of different levels of screening and contact tracing. We determine the optimal level of control to identify infected individuals for treatment (screening plus contact tracing), and we determine the optimal mix of screening and contact tracing for any level of control. We apply our model to an example of Hepatitis B virus.

3 - Mathematical Modeling to Evaluate the Cost-Effectiveness of Hepatitis B Vaccination in China

David Hutton, Stanford University, 380 Panama St, Stanford, CA, 94305, United States of America, billdave@stanford.edu, Margaret Brandeau, Samuel So

Hepatitis B virus (HBV) is a major public health problem in China. Newborn vaccination rates have increased significantly in recent years, yet many children still remain unprotected from HBV. We used a mathematical model to evaluate the cost-effectiveness of catch-up vaccination programs for children in China. We found that catch-up vaccination is cost-effective. We also examined the drivers for the cost-effectiveness of this program to determine when the intervention could be discontinued.

4 - A Nonparametric Method for Patient-specific Forecasting of Kidney Transplant and Waitlist Survival

David Lowsky, PhD Candidate, Stanford Graduate School of Business, 518 Memorial Way, Stanford, CA, 94305, United States of America, Lowsky_Dave@GSB.Stanford.EDU, Stefanos Zenios, Donald Lee, Lainie Ross, J. Richard Thistlethwaite, Charles E. McCulloch

We present a new nonparametric method for generating patient-specific survival distributions at the time of kidney transplantation or addition to the transplant waitlist, based on a K-nearest neighbors approach. Separate forecasts are generated for each donor scenario (living, SCD, ECD). The method can be used by patients and physicians as a decision-support tool to compare treatment options. Predictive accuracy results are presented.

■ SB34

M - Jefferson

Joint Session HAS/Homeland/Humanitarian: Infectious Diseases and Humanitarian Crises

Sponsor: Health Applications Section, Humanitarian Logistics and Disaster Preparedness
Sponsored Session

Chair: Julie Swann, Associate Professor, Georgia Institute of Technology, Atlanta, GA, 30318, United States of America, jswann@isye.gatech.edu

Co-Chair: Eser Kirkizlar, Assistant Professor, SUNY-Binghamton, School of Management (AA 272), PO Box 6000, Binghamton, NY, 13902, United States of America, eser@binghamton.edu

1 - Pricing Strategies for Combination Pediatric Vaccine and Their Impact on Market Share

Sheldon Jacobson, Professor, University of Illinois, 201 N. Goodwin Avenue (MC258), urbana, IL, 61821, United States of America, shj@uiuc.edu, Edward Sewell, Matthew (JD) Robbins

Combination vaccines are becoming the backbone of the US Childhood Immunization Schedule. As more combination vaccines gain FDA approval and become available, vaccine manufacturers are strategically pricing such products to suppress competition. This presentation shows how optimization models can be used to reveal such predatory pricing strategies. Results with new and existing combination vaccines are reported. Approaches to counter such strategies are also discussed.

2 - Impact of Multiple First-line Therapies on Resistance and Supply Chain in Resource Poor Settings

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es

The adoption of multiple first line therapies for infectious diseases delays the emergence of drug resistance but leads to significant additional costs of variety in the supply chain. In resource poor environments, the benefits from delayed drug resistance are not internalized by decision makers. This results in socially sub-optimal selection of drug variety in the system. We explore models that incentivize the decision maker in resource poor settings to adopt multiple first line therapies.

3 - Planning Navy Humanitarian Medical Missions

Anke Richter, Associate Professor, DRMI Naval Postgraduate School, 699 Dyer Rd., Bldg. 234, Monterey, CA, 93943, United States of America, arichter@nps.edu, Kathleen Cooperman, Linda Houde

The Navy provides humanitarian medical assistance throughout the world. To anticipate the demand for manpower specialties, we need to capture country-centric health care requirements using standard health statistical indicators. The majority of the need is focused on prevention of infectious diseases such as TB, malaria, and yellow fever. Once a medical manpower workload is established, delivery can be discussed among NGOs, volunteer organizations and military medical personnel.

4 - Pandemic Influenza Modeling and Food Distribution Logistics

Ali Ekici, PhD Student, Georgia Tech, aekici@isye.gatech.edu, Randeep Ramamurthy, Julie Swann, Pinar Keskinocak

Given the recent incidents of the avian flu and the pandemic influenza cases in the history, many experts believe that a pandemic influenza is likely to happen; hence, governments and NGOs develop response plans. Supplies and transportation services may be interrupted. To aid with planning, we model the disease spread. We then combine this with an optimization model to identify and dynamically update the locations for food distribution facilities, and test our models using data from Georgia.

■ SB35

M - Jackson

Improving Upon the Traditional OR Course

Sponsor: INFORM-ED
Sponsored Session

Chair: Richard Forrester, Associate Professor of Mathematics, Dickinson College, College and Louther Streets, Carlisle, PA, 17013, United States of America, forrestr@dickinson.edu

1 - Generating Interest in OR among Undergraduate Mathematics Majors

Kevin Hutson, Furman University, Greenville, SC, United States of America, kevin.hutson@furman.edu

Undergraduate mathematics students sometime get frustrated by an abstract major and long to use their mathematical skills in some applied setting. Often, though, the mathematics major allows for a very limited coverage of OR concepts. Here I talk about introducing OR to students in a variety of courses and through undergraduate research. I will discuss success stories of projects as well as finding appropriate projects for these undergraduate students.

2 - OR and the MCM

Michael Spivey, University of Puget Sound, CMB 1043, Tacoma, WA, 98416, United States of America, mspivey@ups.edu

The Mathematical Contest in Modeling is an annual competition that requires teams of students to spend four days constructing a solution to an ill-constrained, real-world problem. Recent problems have included designing an efficient airline boarding method and modeling the effects of global warming on the Florida coast. In this talk I will discuss how the MCM can be used to teach operations research, and I will describe some of how we approach the MCM at the University of Puget Sound.

3 - Incorporating OR Practice in an Intro Course

Susan Martonosi, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, martonosi@hmc.edu

One role of an intro OR course is to excite students about the vast applicability of OR methods. In student-chosen "case studies", teams of students find a problem of interest to them and work on it through the semester. They must discuss the project objectives with relevant stakeholders, collect data, and construct and interpret a model. Incorporated into the project are peer review panels and technical writing.

4 - Introducing Operations Research to Liberal Arts Students

Richard Forrester, Associate Professor of Mathematics, Dickinson College, College and Louther Streets, Carlisle, PA, 17013, United States of America, forrestr@dickinson.edu

In this interactive talk we will discuss the challenges of designing an introductory course in operations research for liberal arts students majoring in mathematics.

■ SB36

M - T. Marshall Ballroom East

Sports Management

Sponsor: O.R. in SpORts
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Voting Theory and the MLB Draft

Joel Sokol, Associate Professor, Georgia Tech, Stewart School of ISyE, Georgia Tech, Atlanta, GA, 30332-0205, United States of America, jsokol@isye.gatech.edu

Preparing for baseball's annual amateur draft leads to several interesting questions in voting theory. We describe our work with a Major League Baseball team, and discuss some of the relevant questions and results.

2 - Field Size Management on the PGA Tour

Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Chris Potts

The PGA Tour faces a critical decision in setting field sizes for the third and fourth rounds of tournaments. Fairness to players and enjoyment for spectators must be balanced against speed of play and TV time constraints. Rule changes were implemented in January and March 2008. We study the performance of various cut rules, include those recently used and proposed by the players and the Tour management. Unlike the current rule, our proposed rule is sensitive to the distribution of scores.

3 - Whom Do You Root For? Favorites and Biases in College Football

Eric Huggins, Associate Professor of Management, Fort Lewis College, 1000 Rim Drive, Durango, CO, 81301, United States of America, huggins_e@fortlewis.edu

Sports fans have teams that they love and teams that they love to hate. In NCAA football, fans have strong feelings about a handful of teams. Interestingly, most college football fans can watch any game and easily determine a favorite (in the sense of which team that they want to win, not which team is more likely to win.) The choice of a favorite is complex, and we develop a theoretical framework for how fans make this choice and then test the framework against empirical data.

■ SB37

M - T. Marshall Ballroom West

Tutorial: Solving Chance-Constrained Stochastic Programs

Cluster: Tutorials
Invited Session

Chair: Shabbir Ahmed, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, sahmed@isye.gatech.edu

1 - Solving Chance-constrained Stochastic Programs Via Sampling and Integer Programming

Shabbir Ahmed, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, sahmed@isye.gatech.edu, Alex Shapiro

We discuss sampling based approximations of chance constraint optimization problems, wherein we replace the distribution of the underlying uncertain parameters by an empirical distribution corresponding to a Monte Carlo sample. The sampled approximation serves to provide good quality feasible solutions and optimality gap estimates for the true problem. Since the approximate problem is an NP-hard combinatorial problem, we adopt integer programming based methods for its solution.

■ SB38

M - Tyler

MIP Methodologies for Non-Convex Optimization

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Anureet Saxena, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, anureets@andrew.cmu.edu

1 - Disjunctive Cuts for Non-convex Mixed Integer Quadratically Constrained Programs

Anureet Saxena, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, anureets@andrew.cmu.edu

This talks addresses the problem of generating strong convex relaxations of Mixed Integer Quadratically Constrained Quadratic Programs (MIQQP). We use ideas from disjunctive programming, lift-and-project and eigenvalue computations to generate convex quadratic and linear cuts for MIQQP, and discuss computational results on a battery of test-problems from the literature. Joint work with J. Lee and P. Bonami.

2 - Disjunctive Cuts for Non-convex MINLP

Pietro Belotti, Tepper S. of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, United States of America, belotti@andrew.cmu.edu, Francois Margot

Lower bounds in Global Optimization are obtained by reformulation techniques, where a subset variables are associated with non-linear expressions. The associated non-convex equality constraints are commonly handled by branching on continuous variables. Disjunctive cuts can help improve the linear relaxation. We implement a separation routine for these cuts within an Open-Source branch&bound algorithm for Global Optimization. Preliminary results are presented on a set of MINLP instances.

3 - Heuristics for Mixed Integer Nonlinear Programs

Kumar Abhishek, Department of Industrial and Systems Engineering, Lehigh University, Bethlehem, PA, United States of America, kua3@Lehigh.EDU, Jeff Linderoth, Sven Leyffer, Annick Sartenaer

We explore three heuristics for finding feasible points for MINLPs based on the feasibility pump. The first approach alternates between rounding and solving an NLP. The second approach extends the feasibility pump of Bonami et. al., and solves an MILP iteratively instead of rounding. Finally, our third approach integrates the feasibility pump within an LP/NLP-based branch-and-cut framework. We present detailed numerical results to demonstrate the effectiveness of these heuristics.

■ SB39

M - Truman

Approximation Schemes

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Andreas S. Schulz, Massachusetts Institute of Technology, E53-361, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, schulz@mit.edu

1 - A PTAS for Minimizing the Product of Two Non-negative Linear Costs

Vineet Goyal, Tepper School of Business, CMU, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, vgoyal@andrew.cmu.edu, R. Ravi, Latife Genc Kaya

We consider a quadratic programming (QP) problem where the objective is to minimize the product of two non-negative linear cost functions over a given polytope. We present a PTAS by reformulating the QP as a parameterized LP and rounding the optimal solution. Our algorithm returns an extreme point solution and thus applies directly to combinatorial 0-1 problems for which the convex hull of feasible integer solutions or its dominant is known such as spanning tree, shortest path and min-cut.

2 - Scheduling Meets Random Graphs: A Probabilistic Analysis of Precedence-Constrained Scheduling

Nelson Uhan, School of Industrial Engineering, Purdue University, 315 N. Grant Street, Grissom Hall 262, West Lafayette, IN, 47907, United States of America, nuhan@purdue.edu, Andreas S. Schulz

We study the classic precedence-constrained single-machine scheduling problem with the weighted sum of completion times objective. In particular, we study so-called 0-1 bipartite instances of this problem, whose approximability is virtually identical to the approximability of arbitrary instances (Woeginger 2003). We use random graph models to show various "almost all"-type results for these instances, including that almost always, all feasible schedules are arbitrarily close to optimal.

3 - Monotone Covering Problems with an Additional Covering Constraint

Jose Rafael Correa, Universidad de Chile, Santiago, Chile, joser.correa@gmail.com, Asaf Levin

We provide preliminary results regarding the existence of a polynomial time approximation scheme for minimizing a linear function over a 0/1 covering polytope which is integral, with one additional covering constraint. Our algorithm is based on extending the methods of Goemans and Ravi for the constrained minimum spanning tree problem and implies the existence of a PTAS for a variety of integer programming problems with a totally unimodular constraint matrix.

■ SB40

M - Taylor

Applications of Robust Optimization

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: David Brown, Assistant Professor, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States of America, dbbrown@duke.edu

1 - Robust Optimization and Support Vector Machines

Constantine Caramanis, Assistant Professor, The University of Texas at Austin, Electrical and Computer Engineering Dept, Austin, TX, United States of America, cmcaram@ece.utexas.edu, Shie Mannor, Huan Xu

We consider new formulations for classification problems in machine learning, in the spirit of support vector machines, with the goal of building in protection to noise and controlling overfitting. We show that robustness properties are crucial for consistency. Our methods build on techniques from robust optimization, and also draw connections to risk theory. We show that robust optimization formulations generalize well-known and much-studied regularization methods.

2 - Distributionally Robust Optimization under Moment Uncertainty

Erick Delage, Stanford University, Packard 069, Stanford, CA, United States of America, edelage@stanford.edu, Yinyu Ye

Solutions to stochastic programs can be misleading when there is ambiguity about the distribution of random parameters. We propose a model which accounts for uncertainty in both the form and the moments of this distribution while remaining tractable for a wide range of objective functions. In fact, frequentist arguments, which rely on new confidence regions for covariance matrices, provide statistical guarantees when the model is applied to data-driven problems (e.g. portfolio optimization).

3 - Tractable Robust Expected Utility and Risk Models for Portfolio Optimization

Melvyn Sim, Professor, NUS Business School, Singapore-MIT Alliance, 1 Business Link, Singapore, 117592, Singapore, dscsimm@nus.edu.sg, Joline Uichanco, Karthik Natarajan

We derive exact and approximate optimal trading strategies for a robust or maximin expected utility model where the distributions of the random returns are practially characterized. The investor's utility is modeled as a piecewise-linear concave function. We also provide connections of our results with robust or ambiguous convex risk measures, in which the investor minimizes his worst case risk under distributional ambiguity.

4 - A Soft Robust Model for Optimization under Ambiguity

David Brown, Assistant Professor, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States of America, dbbrown@duke.edu, Aharon Ben-Tal, Dimitris Bertsimas

We propose a framework for robust optimization which relaxes the standard notion of robustness by allowing the decision-maker to vary the protection level in a smooth way across the uncertainty set. We apply our approach to the problem of maximizing the expected value of a payoff function when the underlying distribution is ambiguous. We show some complexity and conservatism results, and establish probability guarantees for soft robust solutions under arbitrary distributions.

■ SB41

M - Taft

Incentives in New Product Development

Cluster: New Product Development
Invited Session

Chair: Jurgen Mihm, Assisstant Professor, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, jurgen.mihm@insead.edu

1 - Functional Coordination, Incentives and Decentralized Decision Processes in New Product Development

Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu, Jeremy Hutchison-Krupat

The NPD project selection process involves specialized knowledge regarding consumer needs and technological capabilities. Very often the team members responsible for technology development lack the necessary expertise to make accurate market assessments, and resources responsible for 'shaping' the market lack understanding of the technology. We investigate the impact of the firm's incentive structure on the decisions of the functions and contrast these with the centralized decision.

2 - Incentives in Multifunctional Teams- Design and Manufacturing

Jurgen Mihm, Assisstant Professor, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, jurgen.mihm@insead.edu, Zhijian Cui

Current research in NPD has largely ignored the role of incentives in NPD projects. Multifunctional teams have been assumed to function by virtue of their existence. Using a game theoretic approach we study the design-manufacturing interface in multifunctional teams. We demonstrate that the setup of decision rights in such teams may influence team functioning and more importantly project outcomes. We show how companies can design these rights to ensure project success.

3 - The Influence of Career Concerns on Task Choice: Experimental Evidence

Enno Siemsen, Assistant Professor, University of Illinois, 350 Wohler Hall, 1206 S. Sixth Street, Champaign, IL, 61820, United States of America, siemsen@uiuc.edu, Elena Katok

We use an experiment to test how people with career concerns select the difficulty of their organizational tasks. We subject participants to a context in which they act as agents for a principal. They have to convince this principal of their capability. To do so, they can increase the difficulty of their assigned task. The data from the experiment supports the notion that people can have a tendency to choose a more difficult solution as this choice increases their expected reputation.

■ SB42

M - McKinley

Computational Game Theory

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Javier Pena, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, jfp@andrew.cmu.edu

1 - Algorithmic Generation of Strategies for Huge Imperfect-information Games- Applied to Texas Hold'em

Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu, Javier Pena, Andrew Gilpin

I will overview the recent developments in my group's multi-year research agenda of automatically creating game-theoretic strategies for huge sequential imperfect-information games. I will cover our newest automated abstraction techniques and equilibrium-finding techniques, among other component technologies. Applications to Heads-Up Limit and No-Limit Texas Hold'em will be presented.

2 - Smoothing Techniques for the Computation of Nash Equilibria of Sequential Games

Javier Pena, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, jfp@andrew.cmu.edu, Samid Hoda, Tuomas Sandholm, Andrew Gilpin

The Nash equilibrium problem for a two-person, zero-sum sequential game can be formulated as a saddle-point problem over a pair of polytopes that encode the sequential nature of the game. We show that modern smoothing techniques can be successfully applied to this problem. The heart of our approach is a general scheme that constructs prox-functions for the polytopes in the saddle-point formulation.

3 - First-order Algorithm with O(log 1/epsilon) Convergence for Epsilon-equilibrium in Zero-sum Games

Andrew Gilpin, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, gilpin@cs.cmu.edu, Tuomas Sandholm, Javier Pena

We propose an iterated version of Nesterov's first-order smoothing method for the two-person zero-sum game equilibrium problem. Our algorithmic scheme computes an epsilon-equilibrium in O(kappa(A) log 1/epsilon) first-order iterations, where kappa(A) is a certain condition measure of the game's payoff matrix A. This improves upon the previous first-order methods which required O(1/epsilon) iterations, and it matches interior-point methods in terms of the algorithm's dependence on epsilon.

4 - Algorithms for Computing Nash Equilibria in Multiplayer Stochastic Games of Imperfect Information

Sam Ganzfried, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, sganzfri@cs.cmu.edu

There often exists a large complexity gap between the difficulty of solving two and three-player zero-sum games. For example, two-player zero-sum matrix games can be solved in polynomial time by linear programming while solving three-player zero-sum matrix games is PPAD-complete. In this talk I will discuss several new algorithms for computing an equilibrium in multiplayer stochastic games of imperfect information and present experimental results on a three-player poker tournament.

■ SB43

M - Balcony D

Disruptions Mitigation

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Rajesh Krishnamurthy, PhD Candidate, Oklahoma State University, EN 322, School of Industrial Engineering & Mgmt, Stillwater, OK, 74078, United States of America, rajesh.krishnamurthy@okstate.edu

1 - Control Strategy for Mitigating Supplier Disruption Effects on a Manufacturing System

Rajesh Krishnamurthy, PhD Candidate, Oklahoma State University, EN 322, School of Industrial Engineering & Mgmt, Stillwater, OK, 74078, United States of America, rajesh.krishnamurthy@okstate.edu, Charlene Yauch

Suppliers can create disruptive effects on a manufacturing system, for example through diminishing deliveries over time or in the extreme case going out of business. In this study, simulation model experiments are used to analyze these disruptions and how they can be managed through multi-sourcing.

2 - Knowledge Discovery from Heterogeneous Data for Risk-informed Decisions to Facilitate Rapid Response

Olufemi Omitaomu, Research Associate, Oak Ridge National Laboratory, 1 Bethel Valley Road, MS 6017, Oak Ridge, TN, 37831, United States of America, omitaomuoa@ornl.gov, Auroop Ganguly

Heterogeneous data from wide-area sensor infrastructures are processed through innovative knowledge discovery methodologies to develop multivariate characterizations of normal behavior, which in turn produces risk-based delineation of unusual behavior. The approach is illustrated in the context of transportation safety and security. A risk-based assessment is developed to categorize commercial trucks into safety or security hazards based on their weight profiles and radioactive signatures.

3 - Dynamic Model under Uncertainty for Vendor Selection Using Fuzzy AHP

Dr. Rakesh Verma, Assistant Professor, Operations Management Group, NITIE, National Inst. of Industrial Engineering, Mumbai, 400087, India, rverma01@rediffmail.com, Saroj Koul

In the ever-changing world, vendor selection is useful in supply chain management. Dynamic model supporting vendors with time axis are not always crisp rather involve a high degree of fuzziness and uncertainty in the real life situation. This paper proposes a dynamic model with uncertainty based on Fuzzy AHP for long-term strategic vendor selection problems. The selection of partnership supplier is thus illustrated by our methodology.

■ SB44

M - Balcony C

Supply Chain Decisions Under Risk

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Emmett Lodree, Auburn University, Industrial and Systems Engineering, Auburn, AL, United States of America, elodree@auburn.edu

1 - Humanitarian Relief Organization Procurement Needs in Light of Donor Forecasting

Luther Brock, Doctoral Student, North Carolina A&T State University Department of Industrial and Systems Eng., 1401 East Market Street, Greensboro, NC, United States of America, lbrock@ncat.edu, Lauren Davis

This presentation will provide guidance for humanitarian relief organizations in regards to procurement decisions for field operations in light of expected donations. It highlights a mathematical model developed to determine the capital investment necessary to satisfy field requirements for supplies during each of three phases of relief operations.

2 - Vendor Selection Problem with Inventory Decisions under Disruptions

Sharif Melouk, Assistant Professor, University of Alabama, Operations Management, Tuscaloosa, AL, 35487-0226, United States of America, smelouk@cba.ua.edu, Burcu Keskin

Evaluation and selection of vendors to lower costs has become a key element in supply chain management due to increasingly competitive global markets. Furthermore, companies strive for resiliency so as to minimize the effect when supply chain disruptions occur. In this research, we develop a simulation-optimization approach to identify the set of vendors that minimizes the total costs and achieves desired service and reliability levels. Numerical tests provide managerial insights.

3 - Inventory Decisions for Emergency Supplies Based on Hurricane Count Predictions

Emmett Lodree, Auburn University, Industrial and Systems Engineering, Auburn, AL, United States of America, elodree@auburn.edu, Selda Taskin

We introduce a multi-period inventory planning problem characterized by uncertain demand during each period prior to the ensuing hurricane season, that also accounts for a target inventory level at the beginning of the season. The problem is formulated as a stochastic programming model. Scenario reduction and stability are discussed.

4 - Hybrid Protection and Inventory Decisions for Academic Journals

Candace Yano, University of California, IEOR Department, Berkeley, CA, 94720-1777, United States of America, yano@ieor.berkeley.edu, Max Shen, Stephen Chan

Academic libraries are reducing their holdings of print journals as more of this material becomes available electronically, but researchers are concerned that some copies remain available, especially for journals with graphical materials. We seek to minimize the cost of ensuring, with a high probability, survival of at least one copy for a specified time horizon considering risks in a hybrid storage arrangement with some tightly secured copies and additional circulating copies.

■ SB45

M - Balcony B

Managing Supply Chains of Perishable Goods

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu

1 - FIFO versus LIFO Issuing Policies for Stochastic Perishable Inventory Systems

David Perry, Professor, University of Haifa, Department of Statistics, Haifa, 31905, Israel, dperry@stat.haifa.ac.il, Mahmut Parlar, Wolfgang Stadje

We consider an inventory system for perishable items in which the arrival times of the items to be stored and the ones of the demands for those items form independent Poisson processes. The aim of this paper is to compare two issuing policies: FIFO and LIFO. We determine the long-run net average profit as a function of the system parameters under each of the two policies.

2 - Joint Pricing and Replenishment for an Inventory Problem with Perishable Items

Ulku Gurler, Bilkent University, Ankara, Turkey, ulku@bilkent.edu.tr

In this work we jointly consider pricing and replenishment for an inventory problem with perishable items under a (Q,r) model with at most one order outstanding at any time. The shelflife of perishable items are assumed constant and replenishment leadtime is positive. Price reduction is offered for the items in the older batch if there are two batches of items are present. The operating characteristics are derived and some numerical results are provided.

3 - The Perishable (Q,r) Model with Fixed Shelf-lives and Lead Times: Renewal Demands

Emre Berk, Bilkent University, Department of Management, Bilkent, Ankara, Turkey, eberk@bilkent.edu.tr, Ulku Gurler

We consider a perishable inventory system with a single product having a constant shelflife. External demands are generated by a compound renewal process with inter-arrival times having a generalized Erlang distribution. Lead times are constant and excess demand is lost. We employ the (Q,r) control policy where $r > mQ$ for $m > 1$. We develop the operating characteristics of the model, establish its certain analytical properties, and present some numerical results.

4 - New Results on Inventory Management of Perishables

Ismail Civelek, icivelek@andrew.cmu.edu, Itir Karaesmen, Alan Scheller-Wolf

We present a new model that subsumes many of the inventory issuance models in the literature on inventory management of perishables. We analyze properties of optimal replenishment policies and optimal issuance rules for this model.

■ SB46

M - Balcony A

Selected Topics in Inventory Management - Algorithms and Structural Results

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Retsef Levi, Professor, Sloan School, MIT, 50 Memorial Drive, Building E53-389, Cambridge, MA, 02142, United States of America, retsef@mit.edu

1 - Approximation Algorithms for Stochastic Lot-sizing Inventory Control

Cong Shi, Student, MIT Operations Research Center, 77 Massachusetts Avenue, E40-135, Cambridge, MA, 02139, United States of America, shicong@mit.edu, Retsef Levi

We develop an algorithmic approach to compute provably near-optimal policies for multiperiod stochastic lot-sizing inventory models with stochastic, non-stationary and correlated demands that evolve over time. The approach can be extended to serial network topology with fixed costs, for which very little is known about the optimal policies.

2 - Simple and Asymptotically Optimal Policies for Capacitated Serial Systems with High Service Levels

Ganesh Janakiraman, N.Y.U., gjanakir@stern.nyu.edu, Woonghee Tim Huh, Mahesh Nagarajan

We study a multi-echelon inventory system in series with capacity constraints at all stages. The optimal policy for this system is unknown. We propose three intuitive, echelon order-up-to policies and show that these policies are asymptotically optimal as the backorder cost parameter grows infinitely large.

3 - Adaptive Data-driven Inventory Control Policies Based on Kaplan-meier Estimator

Woonghee Tim Huh, Columbia University, 500W 120th Street, MC 4704, New York, NY, 10027, United States of America, th2113@columbia.edu, Retsef Levi, Paat Rusmevichientong, James Orlin

Using the well-known Kaplan-Meier estimator from statistics, we propose a new class of non-parametric adaptive data-driven policies for stochastic inventory control problems. We focus on the distribution-free newsvendor model with censored demands. We show that for discrete demand distributions they converge almost surely to the set of optimal solutions. Extensive computational experiments suggest that the new policies converge for general demand distributions, and perform well.

4 - Inventory Management with Unobservable Partially Lost Sales

Wenjing Shen, University of Michigan, 701 Tappan St, Ann Arbor, MI, 48105, United States of America, wenjings@bus.umich.edu, Retsef Levi, Roman Kapuscinski

Some customers facing sold out product return in future to purchase the desired out of stock. In this paper we study a multi-period inventory management problem where retailer knowing that product is sold out, needs to decide how much to order in the next periods. We show that for special cases the problem can be solve. This solution inspires a heuristic that is tested in general setting.

■ SB47

M - Hoover

Joint Session Health Care/QSR: Optimization Tools for Improving Medical Diagnosis

Sponsor: Health Applications Section, Quality, Statistics and Reliability

Sponsored Session

Chair: Art Chaovaitwongse, Assistant Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, 08854, United States of America, wchaoval@rci.rutgers.edu

1 - A Clustering Technique for Selecting Optimal Beam Angles for IMRT

Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston TX 77204, United States of America, ginolim@uh.edu, Allen Holder, Josh Reese

The beam selection problem in radiotherapy is to select the best n gantry angles which treat the tumor while minimizing damage to healthy tissues. We propose a new approach that utilizes the p-median problem. First, a linear programming model is solved to collect various dosimetry based statistics. Partial Least Squares is applied to eliminate insignificant attributes as a pre-processing technique. The p-median problem finds n-clusters and selects n representative angles from each cluster. Some examples demonstrate potential of this method for the beam selection problem.

2 - Myocardial Infarction Identification Using Recurrence Quantification Analysis of Vectorcardiogram

Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu, Hui Yang

Myocardial infarction (MI) is one of the leading causes of death in the world. Vectorcardiogram (VCG) signals monitor the spatiotemporal cardiac electrical activity along three orthogonal planes. This paper presents the recurrence quantification analysis of VCG signals for detecting the myocardial infarction. Myocardial Infarction classification accuracies based on the recurrence features were found to be as high as 97% for neural network and linear regression classification model.

3 - Analysis of High-resolution of NMR Spectra in the Complex Wavelet Transform Domain

Seoung Bum Kim, Assistant Professor, University of Texas at Arlington, 500 W. First Street, Arlington, TX, 76019, United States of America, sbkim@uta.edu

Successful identification of the important metabolite features in high-resolution nuclear magnetic resonance (NMR) spectra is a crucial task for the discovery of biomarkers that have the potential for early diagnosis of disease and subsequent monitoring of its progression. In the present study we have proposed to use a complex wavelet transform combined with the false discovery rate-based feature selection method to improve feature selection and classification of high-resolution NMR spectra.

4 - Medical Data Classification Via Optimizing Feature Selection

Ya-Ju Fan, PhD Student, Rutgers University, Department of Industrial and Systems Eng, Piscataway, NJ, 08854, United States of America, yjfan@eden.rutgers.edu, Art Chaovaitwongse

Support Feature Machine (SFM) is proposed as a new optimization method for feature selection, whose objective is to find the optimal set of features with good class separability based on the concept of intra-class and inter-class distances and the nearest neighbor rule. The empirical study shows that SFM achieves very high classification accuracies on real medical data classification. SFM's performance is comparable to that of Support Vector Machines while using a lesser number of features.

■ SB48

M - Coolidge

Products, Processes and Innovation

Sponsor: Technology Management

Sponsored Session

Chair: Janice Carrillo, Associate Professor, University of Florida, PO Box 117169, Gainesville, FL, 32611, United States of America, janice.carrillo@cba.ufl.edu

1 - Modes of Experimentation to Facilitate NPD Knowledge Management

Janice Carrillo, Associate Professor, University of Florida, PO Box 117169, Gainesville, FL, 32611, United States of America, janice.carrillo@cba.ufl.edu, Cheryl Gaimon

We introduce an analytic model to assess the dynamic investments in prototyping, pilot line experimentation, and on-line experimentation as well as the time to release a new product to the market. We obtain insights concerning the interactions between these knowledge generating activities and the value of that knowledge for future products.

2 - Process Development and Survival of Startup Firms

Fehmi Tanrisever, The University of Texas at Austin, Austin, TX, Fehmi.Tanrisever@phd.mccombs.utexas.edu, Sinan Erzurumlu, Nitin Joglekar

Whether to invest in process development that can reduce unit cost and thereby raise future profits or conserve cash and reduce the likelihood of bankruptcy is a dilemma faced by many startups. We explore this dilemma by examining the production quantity and process development investment in a two period model. Our analysis establishes conditions for creating operational hedges through investment, either aggressive or conservative, under stochastic demand and allied survival constraint.

3 - Modeling the Relationships between Quality, Time, and Cost in Project Management Decision Making

Bruce Polack-Johnson, Villanova University, Department of Math. Sci., 800 Lancaster Ave, Villanova, PA, United States of America, bruce.polack-johnson@villanova.edu, Matthew Liberatore

We present a mathematical programming model that considers quality explicitly in project planning and scheduling, while addressing the tradeoffs between quality, time, and cost. Using a construction example we show how this model can generate quality level curves to illustrate the trade-offs among time, cost, and quality.

4 - Managing Innovation and Improvement - A Multi-level Investigation

Aravind Chandrasekaran, University of Minnesota, Carlson School of Managment, Minneapolis, United States of America, chan0614@umn.edu, Kevin Linderman, Roger Schroeder

Organizations functioning in high technology environments have to both innovate and improve to maintain a sustainable competitive advantage. Using data collected from over 40 product lines, this study empirically investigates a multi-level theory on balancing Innovation and Improvement. Evidence from this research indicate three complementing solutions to balancing that exists at three different levels within an organization.

■ SB49

M - Harding

Efficient Simulation and Optimization I

Sponsor: Simulation - INFORMS Simulation Society

Sponsored Session

Chair: Chun-Hung Chen, Professor, George Mason University, 4400 University Drive, MS 4A6, SEOR Dept, GMU, Fairfax, VA, 22030, United States of America, cchen9@gmu.edu

Co-Chair: Loo Hay Lee, Associate Professor, National University of Singapore, 10 Kent Ridge Crescent, Singapore, 119260, Singapore, iseleelh@nus.edu.sg

1 - The Knowledge-gradient Policy for Ranking and Selection with Correlated Normal Beliefs

Peter Frazier, Princeton University, Princeton, NJ, 08544, United States of America, pfrazier@princeton.edu, Warren Powell, Savas Dayanik

We consider a Bayesian ranking and selection problem with normal rewards and a correlated normal prior. Because this formulation of the ranking and selection problem models dependence in the belief between alternatives, algorithms within it may perform efficiently even when the number of alternatives is very large. We propose a fully sequential policy called the correlated knowledge-gradient policy, which is provably optimal in some special cases and has bounded suboptimality in all others.

2 - Ordinal Optimization: Soft Optimization for Hard Problems

Qianchuan Zhao, Professor, Center for Intelligent and Networked Systems, Department of Automation, Tsinghua University, Beijing, 100084, China, zhaoqc@mail.tsinghua.edu.cn, Yu-Chi Ho, Qing-Shan Jia

Performance evaluation of increasingly complex human-made systems requires the use of simulation models, which are difficult to describe and capture by succinct mathematical models. Ordinal optimization is developed to address the difficulties of the optimization of complex systems via simulation models or other computation-intensive models involving possible stochastic effects and discrete choices. We review this approach, the ordinal comparison and goal softening ideas involved, in this talk.

3 - Characterization of Demand Using Leading Indicators

S. David Wu, Dean of Engineering, Lehigh University, 19 Memorial Drive West, Bethlehem, PA, 18015, United States of America, sdw1@lehigh.edu, Berrin Aytac

We developed a methodology that identifies leading indicators of demand trends. The core technique is a statistical method that examines the demand pattern of a given group of products and identify leading indicators that demonstrate patterns that predict the demand characteristics for the entire group. In this talk, we will discuss the use of multiple leading indicators as a variance reduction technique that improves the accuracy of existing forecasting methods.

4 - Model-based Computing Budget Allocation for Queuing System Simulation

Argon Chen, Professor, National Taiwan University, 1 Sec. 4 Roosevelt Rd., Taipei, 106, Taiwan - ROC, achen@ntu.edu.tw, Ling-Cheng Chang, Chun-Hung Chen

The objective of queuing system simulation is to select a system setting minimizing the average waiting time. OCBA approach allocates the simulation budget to possible settings by maximizing the probability of correction selection (PCS). In this study, we use an empirical model to estimate the average waiting time. Computing budget is then allocated to settings that maximize the information matrix. It is shown that the proposed approach can achieve higher PCS than the conventional OCBA approach.

5 - Improving Optimum Estimates in Large-scale Stochastic Optimization Problems

John Birge, Professor, Chicago Graduate School of Business, University of Chicago, Chicago, 60637, United States of America, john.birge@chicagogsb.edu

Large-scale optimization models involve estimates of many parameters that inherently lead to erroneous solutions. This talk presents new development on improving optimum estimates in large-scale stochastic optimization problems using optimal solutions of multiple batches.

■ SB50

M - Wilson C

Advances in Network Programming

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Doug Altner, Assistant Professor, United States Naval Academy, 572C Holloway Road, Annapolis, MD, 21401, United States of America, altner@usna.edu

1 - New Approaches to Solve Curfew Planning Problem

Ashish Nemani, Research Assistant, University of Florida, 303 Weil Hall, University of Floriday, Gainesville, FL, 32611, United States of America, aknemani@ufl.edu, Ravindra Ahuja, Suat Bog

In this paper, we study the Curfew Planning Problem (CPP) arising for the maintenance of the railway network of a railroad. The CPP is to design an optimal annual timetable to complete a given set of repairs and replacement jobs(rail and tie-work) on the tracks for the teams specialized in rail or tie-work such that the disruptions of the trains caused by station-curfews is minimized. We give three formulations for the CPP:(i)Time-space network, (ii)Duty-Generation, and (iii)Column-generation.

2 - Integrated Facility Location and Production Planning Problems

Thomas Sharkey, Assistant Professor, Rensselaer Polytechnic Institute, Troy, NY, 12180, sharkt@rpi.edu, Edwin Romeijn, Joseph Geunes, Max Shen

We consider facility location problems where we must assign each customer to a facility and meet the demand of the customer through production and inventory decisions at the facility. We discuss algorithms to solve this class of problems including an exact branch and price algorithm. The pricing problem that arises in this branch and price algorithm takes the form of an interesting class of production planning problems with customer selection.

3 - New Valid Inequalities for the Cardinality Maximum Flow Network Interdiction Problem

Doug Altner, Assistant Professor, United States Naval Academy, 572C Holloway Road, Annapolis, MD, 21401, United States of America, altner@usna.edu, Ozlem Ergun, Nelson Uhan

The Cardinality Maximum Flow Network Interdiction Problem (CMFNIP) is a Stackelberg game where an interdictor removes R arcs from a network so as to minimize the maximum flow in the network on the remaining arcs. In this talk, we introduce two new classes of valid inequalities for the standard ILP for CMFNIP, we provide polynomial-time separation algorithms for each class and we prove that the integrality gap for this strengthened ILP is contained in the set Omega(|V|^(1-epsilon)).

■ SB51

M - Wilson B

Research Advances in the IT/IS and Service Science II

Sponsor: Information Systems
Sponsored Session

Chair: Haluk Demirkan, Assistant Professor, W. P. Carey School of Business, Arizona State University, PO Box 874606, Tempe, AZ, 85287-4606, United States of America, Haluk.Demirkan@asu.edu

Co-Chair: Michael Goul, Professor, Arizona State University, PO Box 874606, W.P. Carey School of Business, Tempe, AZ, 85287-4606, United States of America, Michael.Goul@asu.edu

1 - On the Development of a Fraud Rate Estimation Method

Jing Ai, The University of Hawaii at Manoa, FEI Dept, Shidler College of Business, 2404 Maile Way, Honolulu, HI, 96815, United States of America, jing.ai@hawaii.edu, Patrick Brockett

This paper proposes a method for insurance fraud rate estimation, which contributes to solving the current controversy in assessing the amount of fraud in the market place. The proposed estimation method can be used in a host of applications and is shown to produce accurate results in a cost-effective manner.

2 - Value-based Pricing for Emerging IT Services

Robert Harmon, Professor of Marketing and Technology Management, School of Business Administration, Portland State University, PO Box 751, Portland, OR, 97207, United States of America, harmonr@pdx.edu, Haluk Demirkan, Bill Hefley, Nora Auseklis

Pricing strategies for IT services have traditionally focused on the service provider's internal business value objectives such as ROI and meeting the competition. Conversely, value-based pricing methods recognize that pricing strategy needs to consider the customer's perceived value when setting prices. This paper surveys the literature on IT services pricing and presents a value-based approach that offers insights on how to effectively price emerging network-based IT service solutions.

3 - How Knowledge-sharing Relationships Form in Service-oriented Project Environments

Mark Keith, Arizona State University, 889 N. Cofco Center Crt. #1209, Phoenix, AZ, 85008, United States of America, Mark.Keith@asu.edu, Haluk Demirkan, Michael Goul

Informal knowledge sharing is one of the critical factors to the success of service-oriented software development environments. However, little is known about how and why informal knowledge sharing relationships form in project-based environments. Using a social network analysis, this study seeks to understand how the structure of informal knowledge sharing networks form as the result of individual knowledge, transactive memory, group structure, and task environment characteristics.

■ SB52

M - Wilson A

Product Returns and Acquisition

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Canan Savaskan, Assistant Professor of Operations Management, Northwestern University, 2001 Sheridan Road, Evanston, IL, 60208, United States of America, r-savaskan@kellogg.northwestern.edu

1 - Secondary and Tertiary Markets for Durable Products in Decentralized Channels

Shuya Yin, Assistant Professor, Paul Merage School of Business, University of California, Irvine, syin@merage.uci.edu, Haresh Gurnani, Ray Saibal

We study the joint effects of secondary market (retail buybacks) and tertiary markets on new product introduction and retail pricing strategies of durable products in a two-period decentralized channel framework. We show that frequent new product releases and high prices for durable products are actually due to interaction between the two markets.

2 - Optimal Order Policy for a Remanufacturer with Different Acquisition Costs

Aejaz Khan, amkhan4@mail.uh.edu, Daniel Guide

We consider the optimal product acquisition decision for a remanufacturer that must acquire the right quality and quantity of used products to maximize profits. We determine the optimal order quantity for the case when used products must be graded into different quality levels before remanufacturing. Next, we determine the optimal order quantity for the case when used product is already graded into nominal quality levels.

3 - Functional Returns: Analyzing LPG Cylinders Closed-loop Supply Chain

Ruth Carrasco-Gallego, Lecturer, Universidad Politecnica de Madrid, Cl. Jose Gutierrez Abascal, 2, Madrid, 28030, Spain, ruth.carrasco@upm.es, E va Ponce-Cueto

In this paper we explore the supply network of Liquid Petroleum Gases (i.e. butane) bottled in cylinders. These constitute a high value packaging item that the company recovers and reintroduces in the filling process for economic reasons. Cylinder management poses several questions, including how to plan and control filling. A case study on the Spanish LPG supply chain illustrates this. (Research supported by Spanish Science Dep. (MEC), Project Code DPI2007-65524 and by Repsol YPF Foundation).

4 - The Impact of Intermediation on Returns Management

Canan Savaskan, Assistant Professor of Operations Management, Northwestern University, 2001 Sheridan Road, Evanston, IL, 60208, United States of America, r-savaskan@kellogg.northwestern.edu, Anne Coughlan, Jeff Shulman

While researchers have examined various aspects of optimal product returns management, both from an operations and a marketing perspective, little attention has been paid to the impact of intermediation - the existence of a channel - on the returns management process. In this research, we examine how pricing and restocking fee decisions made at both the manufacturing and retail levels in a channel influence product return rates and channel profitability.

■ SB53

M - Nathan Hale- Wardman Tower

Statistical Techniques in Financial Services

Sponsor: Financial Services
Sponsored Session

Chair: Dessislava Pachamanova, Associate Professor of Operations Research, Babson College, Mathematics and Science Division, 319 Babson Hall, Babson Park, MA, 02457, United States of America, dpachamanova@babson.edu

1 - Evaluating Style Investment

Woo Chang Kim, PhD Candidate, ORFE, Princeton University, E312, E-Quad,, Princeton, NJ, 08544, United States of America, wookim@princeton.edu, John Mulvey

Within the institutional investment domain, style investing has been employed as the dominant scheme for equity diversification. This paper evaluates characteristics of the equity style segmentation for the end users' perspectives rather than intermediaries'. We construct sub-indices corresponding to style-size and industry segmentations from all U.S stocks traded in three major stock markets, and analyze them along with the historical data from actual indices.

2 - Recent Developments on Financial Greeks Computation for Models with Pure-Jump Levy Processes

Reiichiro Kawai, reiichiro_kawai@ybb.ne.jp

We present new approaches to derive consistent Monte Carlo estimators of price sensitivities for models with some classes of pure-jump Levy processes. Key techniques are the probability measure transformation and the conditional expectation. Numerical results illustrate the effectiveness of our formulae in terms of the Monte Carlo variance compared to the standard finite difference method.

3 - Improving Portfolio Performance via VaR/CVaR Minimization: A Statistical Learning Approach

Jun-ya Gotoh, Associate Professor, Chuo University, 1-13-27 Kasuga, Bunkyo-ku, Tokyo, 112-8551, Japan, jgoto@indsys.chuo-u.ac.jp, Akiko Takeda

A new portfolio optimization approach is proposed for improving the out-of-sample performance. Based on some nonparametric upper and lower bounds of the loss probability, two fractional functions are minimized where the numerator includes VaR or CVaR while the denominator is a norm of the portfolio vector. This also implies that the short-sale constraint brings a theoretical underpinning to the ordinary VaR and CVaR minimizations. Some computational results demonstrate its promising performance.

4 - Probabilistic Distribution Analysis of Stock Portfolios

Robert Harrison, raha888@cox.net

A methodology the author has termed "probabilistic distribution analysis" may be used for the prediction of short-term and long-term future prices and dividends of stocks and was applied to a self-managed individual retirement account from 2000 through 2006. The average annual yield was 26.5 percent; the seven-year return was 401.91 percent. The initial investment was $144,500; withdrawals for living expenses exceeded deposits over the years by $279,216; and the final balance was $1,066,115.

■ SB54

M - Congressional - Wardman Tower

Joint Session OS/TM: Location

Sponsor: Organization Science, Technology Management
Sponsored Session

Chair: Heather Berry, Wharton School, Management Department. 2000 Steinberg Hall- Dietrich Hall, Philadelphia, PA, berryh@wharton.upenn.edu

1 - Location Strategy of R&D investment to China: The Comparison of Japanese and U.S. Multinationals

Simon Liu, The University of Tokyo, Baba-ken, Bldg. 14, Komaba Campus II, 4-6-1 Komaba, Meguro-ku, Tokyo, 153-8904, Japan, simonliujp@gmail.com, Naohiro Shichijo, Yasunori Baba

This research takes patent data to examine possible factors which affect multinational enterprises øf(MNEøf) selection of investing destination in China concerning research and development (R&D) investment in comparison with Japanese and U.S. MNEs. In the paper, the linkage of FDI, knowledge spillovers, and location choices through patent data is also identified, which explains how patent data imply øf(MNEøf) decision-making of location choices on international R&D investment.

2 - Intra-firm Networks of Industrial Units: Acquisitions and the Impact of Proximity and Similarity

Santiago Mingo, Harvard University, Wyss House, 24 Harvard Way, Boston, MA, 02163, United States of America, smingo@hbs.edu

How do acquisition events impact the performance of a firm's existing network of industrial units? Using a unique dataset from a Brazilian agribusiness company, I find that an existing unit that is geographically close to a recently acquired unit experiences a decrease in its performance after the acquisition occurs. In contrast, a unit that is operationally similar to an aquiree experiences an increase in its performance. The size of the incumbent unit buffers these effects.

3 - The Conditional Environment for Venture Capital Investment in Emerging Economies

Marc Junkunc, Assistant Professor, University of Miami, School of Business, Mgmt Dept, 414 Jenkins Building, Coral Gables, FL, 33124, United States of America, mjunkunc@miami.edu, Theodore Khoury

We explore economic and institutional conditions that facilitate or inhibit venture capital investments in emerging economies. Leveraging longitudinal data on over 500 venture capital transactions in Latin America, we examine how different conditions and sources of country risk - based on specific political, legal and economic aspects - inform such risky investments.

■ SB55

M - Embassy- Wardman Tower

Joint Session TELCOM/CS: Network Facility Location Problems

Sponsor: Telecommunications, Computing Society
Sponsored Session

Chair: Sadan Kulturel-Konak, Associate Professor, Penn State Berks, Tulpehocken Rd., PO Box 7009, Reading, PA, 19610, United States of America, sadan@psu.edu

1 - Server Assignment Problem on Unreliable Networks

Abdullah Konak, Associate Professor, Penn State Berks, Tulpehocken Road PO Box 7009, Reading, PA, 19609, United States of America, konak@psu.edu

This paper addresses the problem of server deployment on a network with unreliable edges and nodes. A new measure of service availability is developed, and it is used within a search algorithm to find good solutions to the problem.

2 - Generalized Regenerator Location Problem

Si Chen, Assistant Professor, Murray State University, College of Business and Public Affairs, Murray, KY, 42071, United States of America, si.chen@murraystate.edu, S. Raghavan, Ivana Ljubic

In the generalized regenerator location problem (in optical networks) we are given a set of terminal nodes T that need to communicate. It is necessary to install regenerators if the distance between a pair of nodes in T is greater than L. Regenerators can only be installed at a subset of nodes S in the network. We wish to minimize the number of regenerators (or a weighted combination). We describe heuristics for the problem, and an MIP model, and our computational experiences with both.

3 - Network Design Problem with Relay Stations Considering Survivability

Sadan Kulturel-Konak, Associate Professor, Penn State Berks, Tulpehocken Rd., PO Box 7009, Reading, PA, 19610, United States of America, sadan@psu.edu, Abdullah Konak

In this research, the design problem copes with selecting network links and determining the relay stations' locations to minimize the design cost. In addition to the distance constraint on the path that a signal can travel without visiting a relay station, the survivability of the paths is also considered. A metaheuristics approach is designed to solve the problem, and its efficiency is shown on different problems.

4 - Stochastic Communication Network Interdiction as a Reliability Problem

Jose Ramirez-Marquez, School of Systems & Enterprises, Stevens Institute of Technology, Babbio Bldg. #537, Castle Point on Hudson, Hoboken, NJ, 07030, Jose.Ramirez-Marquez@stevens.edu, Claudio M. Rocco S.

This paper introduces an evolutionary optimization approach that can be readily applied to solve stochastic network interdiction problems. The network interdiction problem solved considers the minimization of the cost associated with an interdiction strategy such that the maximum flow that can be transmitted between a source node and a sink node for a fixed network design is greater than or equal to a given reliability requirement. Furthermore, the model assumes that the nominal capacity of each network link and the cost associated with their interdiction can change from link to link and that such interdiction has a probability of being successful.

■ SB56

O - Blue Room

Joint Session TSL/RM: Inland Ports and Container Terminals I

Sponsor: Transportation Science & Logistics, Revenue Management & Pricing
Sponsored Session

Chair: Ardavan Asef-Vaziri, Associate Professor, California State University, Northridge, 18111 Nordhoff Street, Northridge, CA, 91330-8378, United States of America, ardavan.asef-vaziri@csun.edu

1 - Modeling Port-of-entry Through Multi-resolution Traffic Simulation and Remote Sensing Techniques

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Debora Anjos, Young-Jun Son, Pitu Mirchandani, Mark Hickman, Brenda Bustillos, Yunemi Jang

This talk presents a recent study on a multi-resolution traffic simulation assignment approach that integrates the regional mesoscopic, microscopic traffic simulation and discrete event simulation models. Model calibration and validation were conducted through various data synthesis techniques such as license plate and remote sensing data. Preliminary analysis results on the POE operational reliability and policy scenarios are presented.

2 - Analyzing Demand Uncertainty in an 'Inland Depot for Empty Containers' System and Solving a Large-Scale Facility Location Problem

Maria Boile, Associate Professor, Rutgers University, Civil and Environmental Engineering, 100 Brett Road, Piscataway, NJ, 08854, United States of America, boile@rci.rutgers.edu, Neha Mittal, Alok Baveja, Sotiris Theofanis

In this paper we analyze the stochasticity in the container trade volumes and perform a two-stage stochastic analysis with recourse to determine an optimal set of inland depots. The work builds on our previous effort that introduced the concept of an 'Inland-Depots-for-Empty-Containers' (IDEC) System for effective regional repositioning of empty containers. This work also develops a randomized rounding search heuristic to solve large-size MIP IDEC problems.

3 - Inland Logistics Management with Inland Ports

Ted L. Gifford, Schneider National Inc., 3101 S. Packerland Drive, Green Bay, WI, 54301, giffordt@schneider.com

This talk will review the business case for establishing an inland logistics management capability within an integrated international transportation channel with particular focus on the value and function of inland port facilities. We will review revenue opportunities and cost models for this capability, and discuss how traditional domestic supply chain and transportation services can be leveraged and enhanced to provide competitive advantage. We also address engineering and optimization considerations which arise in the implementation of these business services.

4 - Structural and Geographic Shifts in WarehoUsing

Anne Goodchild, Assistant Professor, University of Washington, Department of Civil and Environmental Eng., 121E More Hall, Seattle, WA, 98195-2700, United States of America, annegood@u.washington.edu, Derik Andreoli

The warehousing industry has experienced rapid growth and structural change over the last decade. In this paper we describe this change within the United States and compare this growth to geographic and industry factors. We discuss the transportation consequences of the rapid rise of super-warehouses or inland ports.

■ SB57

O - Blue Room Prefunction

Airline Schedule Reliability

Sponsor: Aviation Applications
Sponsored Session

Chair: Milind Sohoni, Indian School of Business, Gachibowli, Hyderabad, AP, 500032, India, Milind_Sohoni@isb.edu

1 - Are Airlines Newsvendors? Or, An Empirical Investigation of Airline Flight Schedules

Vinayak Deshpande, Purdue University, 4024 Rawls Hall, West Lafayette, IN, United States of America, vinayak@exchange.purdue.edu, Mazhar Arikan

Airline flight delays have come under increased scrutiny lately, with on-time performance at its worst level in 13 years in June 2007. We combine flight data published by BTS, with the Newsvendor framework from the Operations literature to examine the impact of the scheduled block time on on-time arrival performance. Results show that airlines systematically under-schedule flights, and do not adjust service levels based on the time of the day, month, or origin and destination airport congestion

2 - An Empirical Investigation into the Tradeoffs that Impact On-Time Performance

Kamalini Ramdas, Associate Professor, University of Virginia, 189 FOB, 100 DArden Blvd, Charlottesville, VA, 22902, United States of America, RamdasK@Darden.virginia.edu, Jonathan Williams

We investigate whether airlines that are close to their productivity or asset frontiers face steeper tradeoffs between aircraft utilization and performance, than those that are further away, using ten years of data, and controlling for variability in travel time, capacity flexibility, load factor, and other key variables. Our analysis enables us to explain differences in on-time performance across airlines as a function of key operational variables, and provide insight on how to manage delays.

3 - The Roles of Capacity and Competition on Airline Scheduled Time and Delay

Yan Dong, Assistant Professor, University of Maryland, R. H. Smith School of Business, 3425 Van Munching Hall, College Park, MD, 20742-1815, United States of America, yandong@rhsmith.umd.edu, Kefeng Xu, Robert Windle

From operations management and competition perspectives, this paper examines the relationships among operating environment (capacities and market competitiveness), operating decisions (scheduled time) and customer service (delay) in airline industry. After controlling for factors such as distance, hub, and financial position, our study finds that the observed scheduled times and increasing delays are a result of both competition and capacity constraints, signifying their importance in services.

4 - Schedule Robustness, Block-times, and Turn-times

Milind Sohoni, Indian School of Business, Gachibowli, Hyderabad, AP, 500032, India, Milind_Sohoni@isb.edu, Vinayak Deshpande

In this paper we analyze airline schedule data with respect to flight block-times and aircraft turn-times. We study how these decisions affect the schedule's robustness.

■ SB58

O - Capital

Joint Session AAP/Scheduling in Servive/Sloan: Robustness and Airline Planning - Lessons From and For the Airline Industry

Sponsor: Aviation Applications, Scheduling in Servive, and Sloan Foundation
Sponsored Session

Chair: Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu

1 - Industry Studies and Robustness in Airline Planning
Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu, Peter Belobaba

What is Industry Studies? And what role does it play in helping to design more robust airline plans? In this talk, we address these questions, focusing on our experience with carriers working to address the following key questions: How is robustness defined? How can it be measured? How should it be valued? How do we achieve it?

2 - Virtual Spares
John-Paul Clarke, Associate Professor, Georgia Institute of Technology, 270 Ferst Drive NW, Atlanta, GA, 30332-0150, United States of America, johnpaul@gatech.edu

Recent studies have shown that more robust schedules can be developed by correlating the ground-times of aircraft with the expected delay "upstream" of connections. However, the resulting schedules are not necessarily amenable to the swapping of aircraft, a commonly used strategy for dealing with the realized (as opposed to expected) disruptions. I present a novel aircraft-scheduling concept that leverages the beneficial features of both approaches to mitigating the effects of disruptions.

3 - An Empirical Analysis of Delay Propagations in the Airline Plans
Shervin AhmadBeygi, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, United States of America, Shervin@umich.edu

Passenger airline delays have received increasing attention over the past several years. In this presentation, we study the impact of delay propagation on the airline plans. We also show how the disruptive consequences of delay propagation can be reduced by redistributing existing slack in the planning process. The computational results based on data from a major U.S. carrier are presented to support the effectiveness of this approach.

4 - Fleeting with Robust Scheduling Design
Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, Yu-Ching Lee, Milind Sohoni

We study the problem of capacity planning and schedule design. In particular, we focus on block times and passenger connections. These decisions are integrated with capacity planning. The underlying concept is under production consideration at a major software vendor.

■ SB59

O - Embassy Room

Revenue Management with Incentives

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu

1 - Salesforce Incentives in Revenue Management
Ayse Kocabiyikoglu, Bilkent University, aysekoca@bilkent.edu.tr, Ioana Popescu

We investigate a revenue management setting where capacity allocation decisions are delegated to an agent, incentivized on salary plus commission. We compare the agent's allocation decision with the firm optimum, and suggest how the firm can design salesforce incentives to better match objectives. We study the effect of agent's preferences, contract parameters and market forces on the agent's decision.

2 - Competitive Dynamic Pricing with Guarantees in the Presence of Strategic Consumers
Yuri Levin, Queen's School of Business, 143 Union Street, Kingston, ON, K7L 3N6, Canada, YLevin@business.queensu.ca, Yossi Aviv, Mikhail Nediak

We consider a two-period model of duopolistic capacitated dynamic pricing competition when each firm's strategy can include price matching, and consumer response is strategic. The products offered by the firms are differentiated, and consumer choice is described using a random utility model that takes expected product availability into account. We study the properties of equilibrium strategies, and whether price matching can be an effective tool in countering strategic consumer behavior.

3 - Selling with Reservations in the Presence of Strategic Consumers
Nikolay Osadchiy, PhD Student, NYU Stern School of Business, 44 West 4th St, 8-154 KMC, New York, NY, 10012, United States of America, nosadchi@stern.nyu.edu, Gustavo Vulcano

We consider a model in which a seller facing strategic consumers operates a pricing with reservations scheme. Upon arrival, each utility-maximizer consumer must decide either to buy at the full price, or to place a non-withdrawable reservation at a discount price and wait until the end of the sales season where the leftover units are allocated according to an "earlier reservations first" priority. We characterize cases where this scheme provides benefits over the usual markdown practice.

4 - Revenue Management with Price Bargaining
Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu, Atul Bhandari

We consider the revenue management problem of a seller who owns a finite inventory of a single product that can be sold during an infinite horizon when demand is Bernoulli. We study the seller's performance when (1) the seller has all the price bargaining ability, the typical dynamic pricing case studied in the literature, (2) this ability resides entirely with the buyers, (3) it is equally shared by the seller and the buyers, and (4) price negotiations are structured.

■ SB60

O - Hampton Room

Dynamic Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Serhan Ziya, University of North Carolina, 213 Smith Building, CB# 3260, Chapel Hill, NC, United States of America, ziya@email.unc.edu

1 - Product Quality Selection: Contractual Agreements in One Manufacturer Multiple Supplier Environment
Mehmet Sekip Altug, PhD Candidate, Columbia University, maltug10@gsb.columbia.edu, Garrett van Ryzin

We consider a model with one manufacturer who makes an end product using multiple components, each provided by a different supplier. Suppliers sell components at a wholesale price that depends on component quality. The quality of the end product is determined by the quality of the individual components. The manufacturer seeks to maximize profits by trading off quality and component cost. This creates competition among the suppliers. We analyze possible contractual agreements in the channel.

2 - Dynamic Pricing with Behavioral Considerations
Javad Nasiry, PhD Student, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, Javad.NASIRY@insead.edu, Ioana Popescu

We study a dynamic pricing problem where consumers purchase decisions are anchored on a reference price, derived from past prices. We focus on asymmetric reference price formation mechanisms, behaviourally motivated by the peak-end rule and loss aversion. The firm's optimal pricing strategies are characterized and compared to the literature.

3 - Personalized Dynamic Pricing of Limited Inventories
Goker Aydin, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, ayding@umich.edu, Serhan Ziya

We consider the possibility of charging prices that are adjusted according to customer-specific information (a customer signal) as well as time and inventory. Such customization is effective as long as the seller can identify the customer as belonging to a certain market segment, an identification that is not always perfect. We find conditions under which a signal is a meaningful input to pricing decisions. We investigate how the benefits from price customization depend on inventory and time.

■ SB61

O - Calvert Room

Uncertainty and Infrastructure

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: James Moore, University of Southern California, Los Angeles, CA, United States of America, jmoore@usc.edu

1 - Multifaceted Transition Dynamics for Alternative Fuel Vehicles and Transportation Systems

Jeroen Struben, MIT, E53-364A, 50 Memorial Drive, Cambridge, 02142, United States of America, jjrs@mit.edu

This paper investigates the factors that condition the formation of AFV and transportation fuel markets. AFV diffusion is both enabled and constrained by powerful positive feedbacks and complementary resources such as fueling infrastructure and fuel supply chains. We analyze the patterns of retrospective AFV failures and successes, through a behavioral dynamic simulation model. Findings provide the groundwork for a framework to analyze diffusion of complex technologies and markets.

2 - A Frequency-Domain Approach to Traffic Oscillation Measurements

Xiaopeng Li, The University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, li28@uiuc.edu, Fan Peng, Yanfeng Ouyang

This paper discusses traditional traffic oscillation estimation methods and proposes a new quantification method based on frequency domain approaches. Applications to real-world traffic data show that the proposed approach effectively identifies important oscillation properties and reveals insights. This method is also extended to estimate oscillation periods that vehicles experience.

3 - Day-to-day Traffic Equilibration Process under Network Disruption

Xiaozheng He, PhD Candidate, University of Minnesota at Twin Cities, Department of Civil Engineering, Minneapolis, MN, 55455, United States of America, hexxx069@umn.edu, Henry Liu, Saif Jabari

Existing day-to-day traffic equilibration processes assume that travelers' behavior adjustments are based on their experiences. This assumption fails when the network is unexpectedly disrupted. We assume travelers' choices are based on their projected traffic states. Perception change is formulated as an individual dynamical system. The proposed framework offers a good estimation of traffic equilibration process, demonstrated by traffic pattern evolution after the I-35W bridge collapse.

■ SB62

O - Governor's Boardroom

Revenue Management and Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Srinivas Krishnamoorthy, Assistant Professor, Ivey School of Business, University of Western Ontario, 1151 Richmond Street N., London, ON, N6A 3K7, Canada, skrishnamoorthy@ivey.ca

1 - Analytical and Empirical Models of Bidding in Online Auctions

Fredrik Odegaard, Ivey School of Business, University of Western Ontario, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, fodegaard@ivey.ca, Martin Puterman

The bidding behavior in online auctions has some unique features not shared with the bidding in traditional auctions. This paper discusses analytical and empirical models regarding online bidding. The objective of the analysis is to present a framework for how auctions progress, and to characterize the conditional final price as auctions evolve. Data validation includes analysis of 40,000 bids from 4,000 laptop and desktop auctions from a large PC manufacturer.

2 - Setting Prices on Priceline

Chris Anderson, Cornell University, School of Hotel Administration, Ithaca, NY, 14850, United States of America, cka9@cornell.edu

Priceline.com is the original name your own price auction mechanism for service provision. A brief introduction into how Priceline works as well as how service firms are selected is provided. An illustration of the data provided to service firms e.g. consumer bids is provided. Lastly we detail how this data can be used to set optimal prices and inventory levels.

3 - Competitive Pricing Strategies for Low-cost Providers

Ben Marcus, Suffolk University, Sawyer Business School, Boston, MA, United States of America, bmarcus@suffolk.edu, Chris Anderson

Low-cost providers have emerged as effective and resilient players in many service industries. In this work we develop competitive pricing strategies for low-cost providers operating in oligopolistic markets. In particular, we examine the pricing dynamics in markets with discount and full-service firms present, to better understand their respective competitive advantages and competitive challenges.

4 - Competitive Pricing with Reference Effects

Srinivas Krishnamoorthy, Assistant Professor, Ivey School of Business, University of Western Ontario, 1151 Richmond Street N., London, ON, N6A 3K7, Canada, skrishnamoorthy@ivey.ca, Brian Coulter

This study examines the effect of reference prices on the pricing strategies of two competing firms - an entrant and an incumbent. The analogy drawn within the paper is to the MP3-Player market, wherein incumbents have large reference price advantages over effectively equivalent new entrants.

■ SB63

O - Congressional B

Inventory Logistics

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Sunderesh Heragu, Professor, University of Louisville, 309, JB Speed Bldg, Industrial Engineering department, Louisville, KY, 40292, United States of America, s.heragu@louisville.edu

1 - An ADP Approach to Joint Inventory Control of Multiple Warehouses with Transshipment

Yanzhi Li, Assitant Professor, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong, China, yanzhili@cityu.edu.hk

We study the joint inventory control problem for multiple warehouses with transshipment, where each replenishment incurs a fixed ordering cost. We propose an approximate dynamic programming(ADP) approach to solve the problem. Several special cases are particularly investigated and numerical comparisons with existing literature are conducted. Our work provides new insights into managing such multi-warehouse inventory systems effectively.

2 - Modeling Make-to-stock and Make-to-order Systems with Multi-server Queues

Zhe George Zhang, Professor, Western Washington University, Department of Decision Sciences, 516 High Street, Bellingham, WA, 98225, United States of America, george.zhang@wwu.edu, Ilhyung Kim, Gangshu Cai

In this research, we investigate a manufacturing system combining "make-to-order" and "make-to-stock" operations with random demand by utilizing multi-server queueing model with server vacations. With such a model, the issue of capacity allocation and inventory control is addressed. Using approximations and bounds, we develop some closed form solutions to the optimal policy parameters. Numerical examples are presented to show the accuracy of these formulas.

3 - Simulation Based Optimization of Multi-Location Inventory Problems with Capacitated Transhipments

Banu Ekren, Doctoral student, University of Louisville, 209, Speed Building, Dept of Industrial Engineering, Louisville, KY, 40059, United States of America, b0ekre01@louisville.edu, Sunderesh Heragu

In this paper, an (s, S) inventory system in which the items can be stored at any of N stocking locations and shipped to the others is optimized using simulation. We consider fixed and variable ordering costs, stochastic replenishment lead times and assume that the transportation capacities at the stocking locations are bounded by transshipment policies. An ARENA 10.0 simulation model and near-optimal policies developed using the OptQuest tool in ARENA are presented.

■ SB64

O - Congressional A

Joint Session TSL/AAS: Economic Analysis and Valuation Methods for Aviation

Sponsor: Transportation Science & Logistics, Aviation Applications
Sponsored Session

Chair: Mark Hansen, Professor, U.C. Berkeley, 114 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, mhansen@ce.berkeley.edu

1 - Estimating Airport Hub Potential in the Context of a Network Model

Gene Lin, The MITRE Corporation, 7515 Colshire Drive, McLean, VA, 22102, United States of America, gclin@mitre.org, Michael Wells

Discrete choice models are used to estimate the demand for travel over a set of competing itineraries, often including connections at a hub airport. As a practical matter, the set of possible hubs (and thus itineraries) is usually treated as exogenous. Unfortunately, this precludes changes to the set of hubs over time. Our research attempts to endogenize whether or not an airport may be used as a connecting hub. The model will be tested against actual data.

2 - Monetarized Effects of Runway Capacity Constraints on Airlines Schedules

Stephane Cohen, Graduate Student Researcher, NEXTOR, 107 McLaughlin Hall, University of California, Berkeley, CA, 94705, United States of America, stephane.cohen@berkeley.edu

Runway capacity constraints at US airports are likely to change airlines schedules pattern. Flights may be rescheduled to the off-peak period, inducing a cost for both airlines and passengers. The goal of this paper is to study the extend to which airline schedules are affected by runway capacity constraints and to monetarize these effects.

3 - A Route Demand Model for Air Passenger Transportation: Implications and Applications

Chieh-Yu Hsiao, University of California at Berkeley, 107D McLaughlin Hall, University of California at Berkeley, Berkeley, CA, 94720, United States of America, cyhsiao@berkeley.edu, Mark Hansen

This research proposes a route demand model, which simultaneously deals with city-pair trip generation and route choice, for air passenger transportation in hub-and-spoke network. The empirical findings, including implications of estimated results and applications for policy experiments are discussed based on the case study of the National Airspace System of the United States.

■ SB65

O - Council Room

JFIG Paper Competition II

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Gal Raz, Associate Professor of Business Administration, Darden School of Business, University of Virginia, 100 Darden Blvd., Charlottesville, VA, 22903, RazG@darden.virginia.edu

1 - Optimal Breast Biopsy Decision-Making Based on Mammographic Features and Demographic Factors

Oguzhan Alagoz, Assistant Professor, Department of Industrial and Systems Engineering, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI, 53706, United States of America, alagoz@engr.wisc.edu, Jagpreet Chhatwal, Elizabeth Burnside

While diagnosing breast caner, 55-85% of the breast biopsies turn out to be benign, resulting in anxiety for the patients and unnecessary treatments. We develop a Markov Decision Process (MDP) model to find the optimal timing of the biopsy that maximizes the total quality-adjusted expected life of each patient. We perform a structural analysis and use clinical data to solve the MDP model. Our results show that optimal biopsy decisions are age-dependent.

2 - Inventory Centralization Games with Price-dependent Demand and Quantity Discount

Xin Chen, University of Illinois at Urbana-Champaign, 104 S. Mathews Ave., Urbana, IL, 61801, United States of America, xinchen@illinois.edu

Consider a distribution system consisting of a set of retailers each of which is facing a single period price dependent demand of a single product. The retailers may place joint orders and share inventory to reduce their operating costs. Under general assumptions on ordering costs, we prove that the resulting inventory centralization game has a nonempty core. We also show how to compute an allocation in the core.

3 - Make Today the Best It Can Be: Channel Dynamics in Durable Product Pricing and Distribution

Wei-yu Kevin Chiang, City University of Hong Kong, Department of Management Sciences, Tat Chee Avenue, Kowloon, Hong Kong - China, wchiang@cityu.edu.hk

When a manufacturer and its retailer are involved in setting prices in distributing a product over time, not only do they inter-temporally compete against themselves, but they also compete against each other to maximize their benefits. This study develops a dynamic game to investigate the traditional channel interaction problem in an inter-temporal setting. Surprisingly, both channel members can be more profitable when they are myopic, rather than forward-looking, in setting prices.

■ SB66

O - Cabinet Room

Processes and Policies

Cluster: Governance of Software Development
Invited Session

Chair: Peri Tarr, IBM Thomas J. Watson Research Center, 19 Skyline Drive, Hawthorne, NY, 10510, United States of America, tarr@us.ibm.com

1 - Modeling and Simulating an Adaptive Development Process

Tyson Browning, Assistant Professor of Enterprise Operations, Texas Christian University, TCU Box 298530, Fort Worth, TX, 76129, United States of America, T.Browning@tcu.edu

We model a development project as a complex adaptive system. Instead of prescribing a specific project schedule, we provide a "primordial soup" of activities and simple rules for their self-organization. We simulate thousands of adaptive cases and let the highest-value process emerge. Analyzing these cases leads to several insights. We provide a decision support capability for managers and a basis for new research on agile and adaptive processes.

2 - Artifact-centric RACI Specification for Development Governance

Murray Cantor, Distinguished Engineer, IBM, 209 Burgess Ave, Westwood, MA, 02090, United States of America, mcantor@us.ibm.com

I will present an artifact-centric approach to specifying roles, decision rights, and policies to support decision making across software and system development teams. I show how the artifact-centric approach provide a clear advantages by allowing both explicit specification and auditability while providing better support for process evolution for novel projects and for replicating the success of open source development communities.

■ SB67

O - Forum Room

Location Models and Algorithms

Sponsor: Location Analysis
Sponsored Session

Chair: Oded Berman, Professor, University of Toronto, 105 St. George Street, Toronto, ON, L4J 3B7, Canada, Berman@Rotman.Utoronto.Ca

1 - Covering Continuous Demand in the Plane

Zvi Drezner, Professor, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, zdrezner@Fullerton.edu, Atsuo Suzuki

Continuous demand is generated in a convex polygon. A facility located in the area covers demand within a given radius. The objective is to find the locations for p facilities that cover the maximum demand in the area. A procedure that calculates the total area covered by a set of facilities is developed. A multi start heuristic approach for solving this problem is proposed and tested by applying a gradient search.

2 - Median and Minimax Unreliable Facility Location Problems: Impact of Correlation

Mozart Menezes, Professor, MIT-Zaragoza Program, Zaragoza Logistics Center, Avda. Gomez Laguna 25 1a Planta, Zaragoza, 50009, Spain, mmenezes@zlc.edu.es, Oded Berman, Dmitry Krass

We investigate the effect of disruption in the location of facilities in a unit line. We provide closed form solution and develop a framework for studying the impact of correlation on the state of facilities. We discuss the case when customers have information about the state of all facilities at all times and the case when that information is not available and customers have to travel to a facility to learn its availability.

3 - The Probabilistic Gradual Covering Problem on a Network with Discrete Demand Weights

Jiamin Wang, Professor, Long Island University, Department of Management, 720 Northern Blvd, Brookville, NY, 11548-1300, United States of America, jiamin.wang@liu.edu, Oded Berman, Dmitry Krass

We investigate the covering problem on a network with uncertain demand. Instead of assuming that demand points are either covered or not covered at all, we allow partial coverage where the coverage level is a function of distance. The objective of the problem is to locate a facility so as to maximize the probability that the total covered demand weight is beyond a pre-selected threshold value. The problem is shown to be NP-hard and an exact solution procedure and a heuristic are suggested.

4 - A Periodic-review Location-inventory Model

M. Mahdi Tajbakhsh, Dr., Rotman School of Management, University of Toronto, 105 St. George St., Toronto, ON, M5S 3E6, Canada, Mahdi.Tajbakhsh@Rotman.Utoronto.Ca, Dmitry Krass, Oded Berman

We consider a supply chain design problem in which facility location and inventory management decisions are integrated. We assume a periodic-review, order-up-to-level (R, S) inventory policy at distribution centers. We propose a Lagrangian-relaxation algorithm and present our computational results.

■ SB68

O - Senate Room

Marketing Channels

Sponsor: Marketing Science
Sponsored Session

Chair: Anthony Dukes, Assistant Professor, University of Southern California, Marshall School of Business, Los Angeles, CA, 90089, United States of America, dukes@marshall.usc.edu

1 - Forward Buying in Competitive Market

Oded Koenigsberg, Columbia University, ok2018@columbia.edu, Devavrat Purohit, Preyas Desai

Forward buying is a practice in which retailers purchase units during a particular period, hold these units in inventory and then sell them in subsequent periods. Retailer forward buying tends to be correlated with trade promotions which (the consensus views are) from a theoretical standpoint persist because of the intense competition. In this research we study the effect of competition either in the manufacturer or the retailer levels on the forward buying decision.

2 - Role of Quality in an Asymmetric Retail Channel

Tansev Geylani, Assistant Professor, University of Pittsburgh, 320 Mervis Hall, Pittsburgh, PA, 15238, United States of America, tgeylani@katz.pitt.edu, Anthony Dukes, Yunchuan Liu

In this paper, we illustrate diverging incentives for product quality in a channel with two asymmetric retailers and a common supplier. We show, in particular, that if the retailers are asymmetric with respect to the level of service, while the low service retailer benefits from a reduction in product quality, this hurts the supplier and the rival high service retailer.

3 - A Larger Slice or a Larger Pie? Investigating Bargaining Power in the Distribution Channel

Michaela Draganska, Stanford University, Graduate School of Business, Stanford, CA, United States of America, draganska_michaela@gsb.stanford.edu, Sofia Villas-Boas, Daniel Klapper

We investigate the determinants of channel profitability and the relative power in the channel by considering consumer demand and the interactions between manufacturers and retailers in an equilibrium model. In a departure from the standard literature, which assumes that manufacturers set wholesale prices unilaterally, we model the negotiations between manufacturers and retailers using a Nash bargaining game. The model is estimated using data for the German ground coffee industry.

4 - In-store Media and Channel Management

Anthony Dukes, Assistant Professor, University of Southern California, Marshall School of Business, Los Angeles, CA, 90089, United States of America, dukes@marshall.usc.edu

Retailers open in-store media in stores allowing manufacturers to advertise in-store. We show ISM coordinates a distribution channel on ad volume and sales. A retailer may strategically subsidize manufacturers' ads through ISM to better coordinate the channel. With competition a retailer strategically uses a competitive premium to ration excessive ads among competing suppliers. If manufacturers differ in brand awareness, a retailer charges lower prices to manufacturers with high brand awareness.

Sunday, 1:30pm - 3:00pm

■ SC01

M - Marriott Ballroom 3

Joint Session Minority Issues/Optimization: Clustering and Partitioning

Sponsor: Minority Issues, Optimization
Sponsored Session

Chair: Illya Hicks, Associate Professor, Rice University, Computational and Applied Mathematics, Houston, United States of America, ivhicks@rice.edu

1 - Degree-bounded Vertex Partitions

Benjamin McClosky, Postdoc, Columbia University, 500 W. 120th Street, New York, NY, 10027, United States of America, bjm4@rice.edu, Illya Hicks

We introduce co-k-plex coloring as an extension of traditional graph coloring and discuss some preliminary results.

2 - The Sectoring-Arc Routing Problem (SARP): Models and Lower Bounds

Ana Catarina Nunes, IBS - ISCTE Business School / Centro IO, Av. Forcas Armadas, Lisboa, 1649-026, Portugal, catarina.nunes@iscte.pt, M C,ndida Mourão

The Sectoring-Arc Routing Problem (SARP) seeks to partition a mixed graph into a given number of smaller sub-graphs (sectors) and to build a set of trips in each sector, such that the total duration of the trips is minimized. The SARP models activities associated with the streets of large urban areas, such as household waste collection. Linear mixed integer programming models and lower bounds are presented. Computational results over a set of benchmark problems are reported and analyzed.

3 - On the Maximum 2-club Problem

Baski Balasundaram, Assistant Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74078, United States of America, baski.balasundaram@okstate.edu, Sergiy Butenko

A k-club is a set vertices that induce a subgraph of diameter at most k. k-clubs were originally introduced in social network analysis as clique relaxations that model cohesive subgroups. We focus on the special case of 2-clubs. Its unique properties, complexity results and preliminary polyhedral results will be discussed.

■ SC02

M - Marriott Ballroom 2

Contemporary Issues in IT Infrastructure Design

Sponsor: Information Systems
Sponsored Session

Chair: Saby Mitra, Associate Professor, Georgia Tech, 800 West Peachtree Street, Atlanta, GA, 30332, United States of America, saby.mitra@mgt.gatech.edu

1 - Software Design Strategies in Markets with Open Source Competitors

Sri Narasimhan, Senior Associate Dean, Georgia Tech, 800 West Peachtree Street, Atlanta, GA, 30332, United States of America, sri.narasimhan@mgt.gatech.edu, Zhe Qu

We model one aspect of the strategic interaction between proprietary software vendors (PRVs) and their open source software(OSS) counterparts. Specifically, we study how the availability of an OSS shapes a PRV's software design strategy. The findings imply that in software markets characterized by high demand for service, PRVs could introduce more basic versions of their software in response to the growth of their OSS counterparts.

2 - Grid Computing as an Exchange Economy

Giri Tayi, Professor, SUNY Albany, 1400 Washington Avenue, Albany, NY, United States of America, GTayi@uamail.albany.edu, Gireesh Shrimali

In this paper, we consider grid computing as a pure exchange economy, using a finite discrete model that captures interaction among agents over time. We then derive some necessary conditions based on the requirements of individual agents. We finally establish, if these necessary conditions are met, the existence of an exchange economy as a competitive equilibrium, when the agents' utility functions satisfy some minimal requirements.

3 - Management of Human Resources for Software Development Projects with Soft Deadlines

Ishwar Murthy, Professor, Indian Institute of Management Bangalore, 103 NF, IIM Bangalore, Bannerghatta Rd, Bangalore, 560076, India, ishwar@iimb.ernet.in, Sri Narasimhan, Kaushik Dutta

We develop a model that enables software development companies to manage software engineers at their disposal to complete their projects with minimal violation of the project deadlines. We model the problem as a multi-commodity path problem on an acyclic graph, with side constraints. We examine the properties of the integer programming model and develop strong inequalities to "strengthen" the formulation.

4 - Models for Sequential Grid Computing

Saby Mitra, Associate Professor, Georgia Tech, 800 West Peachtree Street, Atlanta, GA, 30332, United States of America, saby.mitra@mgt.gatech.edu, Sam Ransbotham, Ishwar Murthy, Sri Narasimhan

We develop a model and solution algorithm for routing a large computational job through a sequence of processors that have different peak usage times to maximize the probability of job completion within a time limit. Computational results provide insights on situations where such processing provides maximum benefits over the single processor case.

■ SC03

M - Marriott Ballroom 1

New Challenges and Metrics in Homeland Security

Cluster: Homeland Security
Invited Session

Chair: Laura McLay, Virginia Commonwealth University, PO Box 843083, 1001 W. Main Street, Richmond, VA, 23284, United States of America, lamclay@vcu.edu

1 - Predictive Stream Mining Challenges at NSA

Kevin Drummey, Technical Director, National Security Agency/Enterprise Operations Research, Modeling & Simulation Group, 7923 Severn Hills Way, Severn, MD, 21144, United States of America, kwdrumm@nsa.gov

In this presentation, we describe some of the unique challenges faced by the National Security Agency when mining raw data in a near-real-time environment for "items of interest." We consider items based on metadata associated with particular events, where the metadata is generated from multiple, multimedia, raw data sources. We are motivated by our customers' limited time, resources, and data storage. Our main goal is near-real-time automation of the predictive modeling process.

2 - Image Registration with Mutual Information

Derek Armstrong, Technical Staff Member, Los Alamos National Laboratory, PO Box 1663, MS F605, Los Alamos, NM, 87545, United States of America, dearmstr@lanl.gov

Image registration is the problem of finding a geometric transformation between two images of the same area that preserves the spatial correspondence of image objects. Mutual information (MI) provides a method for measuring the mutual dependence of two random variables and it can be used as a similarity metric in image registration problems. The MI metric is studied and applied to the problem of registering infrared images to visible images.

3 - Expert Judgment Based Risk Ranking in Port Security

Jason Merrick, Virginia Commonwealth University, PO Box 843083, 1001 West Main Street, Richmond, 23284, United States of America, jrmerric@vcu.edu

Which incoming vessels should be boarded and inspected? Which containers should be scanned for nuclear or biological threats? These are critical questions in the area of port security. We propose and expert judgment technique involving pairwise comparisons of vessels or containers that leads to relative rankings of risk for use in inspection or screening decisions.

4 - Screening Cargo Containers for Nuclear Material

Laura McLay, Virginia Commonwealth University, PO Box 843083, 1001 W. Main Street, Richmond, VA, 23284, United States of America, lamclay@vcu.edu

Screening cargo containers for nuclear material at foreign and domestic ports is a challenging problem. We present and analyze discrete optimization models for risk-based cargo screening problems when cargo containers are screened with current and next generation screening devices.

■ SC07

M - Maryland A

New Perspectives in Inventory Management and Assortment Planning

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States of America, fcaro@anderson.ucla.edu

Co-Chair: Michael Wagner, California State University East Bay, 25800 Carlos Bee Blvd, Hayward, CA, United States of America, michael.wagner@csueastbay.edu

1 - Fully Distribution-free Inventory Management

Michael Wagner, California State University East Bay, 25800 Carlos Bee Blvd, Hayward, CA, United States of America, michael.wagner@csueastbay.edu

We consider a multiple period inventory management problem with period-dependent fixed and variable ordering costs, holding costs and shortage costs. Demands are unknown and probabilistic forecasts are "not" available. We design robust inventory procurement policies with provable worst-case performance guarantees. Furthermore, these policies are flexible without sacrificing the performance guarantee.

2 - Optimal Dynamic Assortment Planning

Denis Saure, Columbia University, 3022 Broadway, New York, NY, United States of America, dsaure05@gsb.columbia.edu, Assaf Zeevi

We consider a dynamic assortment planning problem under the framework of utility maximizing customers. We develop efficient algorithms that balance exploration—exploitation trade offs in a suitable manner, and prove that in certain instances the performance of said algorithms is best possible.

3 - Strategic Assortment Rotation

Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States of America, fcaro@anderson.ucla.edu, Victor Martinez de Albeniz

Fast fashion retailers are known for their quick response to market changes. This allows them to change the assortment more frequently, which induces repeated visits to the store, which in turn increases sales. We propose a customer consumption model with satiation and multiple competing retailers. The model implies that consumers will spend more at retailers that revise their assortment more often. We then determine the competitive equilibrium and the optimal assortment duration.

4 - Competing for Scarce Capacity with Advance Purchasing Orders

Nicolas Stier-Moses, Columbia Business School, Uris 418, New York, NY, 10027, United States of America, ns2224@columbia.edu, Alp Muharremoglu, Denis Saure

We study a supply chain with a single supplier and two retailers. The supplier has a fixed capacity that is shared by both retailers' orders. Retailers have the option to place an advance order. Later, after uncertainty is resolved, they can increase their order size if they wish. At both ordering points, the supplier applies the uniform allocation rule to distribute capacity to retailers. We characterize the equilibrium behavior of this supply chain game.

■ SC08

M - Maryland B

Innovative Empirical Methodologies

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: M. Johnny Rungtusanatham, Associate Professor, University of Minnesota, 3-150 CSOM, 321 19th Ave S, Minneapolis, MN, 55455, United States of America, rung0002@umn.edu

1 - Experiential Experimentation: Studying Customer Perceptions of a Contrived Service Encounter

Scott Sampson, Professor, Brigham Young University, 660 TNRB, Provo, UT, 84602, United States of America, ses3-inf8@sm.byu.edu

Empirical research can take different forms. Observational research has the advantage of practical realism but the disadvantage of difficulty controlling for confounding factors. Contrived experiments allow control of confounding factors, but are often weak in terms of practical realism. In our empirical research we used video technology to develop a more realistic contrived experiment, thus realizing advantages of both approaches. Execution issues will be discussed.

2 - Understanding Process Variability Following Enterprise System Performance

Mark Cotteleer, Marquette University, College of Business Administration, mark.cotteleer@marquette.edu

This study extends our understanding of the time-sensitivity of intent and usage following large-scale IT implementation. It focuses on perceived system misfit with organizational processes and the availability of system circumvention opportunities. The study combines case studies and controlled experiments are used to support the theoretical unpacking of organizational and technical contingencies and their relationship to shifts in user intentions and variation in work-processing tactics over time.

3 - The Impact of Work Load on Productivity: An Econometric Analysis of Hospital Operations

Diwas Kc, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104, United States of America, diwas@wharton.upenn.edu, Christian Terwiesch

Prior work in the area of service operations management has assumed service rates to be exogenous to the level of system load. Using operational data from patient transport services and cardiothoracic surgery - we show that service worker productivity is influenced by the system load and cumulative overwork: workers accelerate as load increases and cumulative overwork decreases. In the case of cardiothoracic surgery, we also provide evidence that workload can have quality implications.

4 - Inventory Ownership and Placement Decisions within Buyer-supplier Dyads

M. Johnny Rungtusanatham, Associate Professor, University of Minnesota, 3-150 CSOM, 321 19th Ave S, Minneapolis, MN, 55455, United States of America, rung0002@umn.edu, Cynthia Wallin, Elliot Rabinovich, Yuhchang Hwang

Drawing on classical Transaction Cost Economics, we develop and test hypotheses relating asset specificity, uncertainty, and frequency to the inventory ownership and the inventory placement decisions within a buyer-supplier dyad. These decisions, when decoupled, correspond to speculation, postponement, forward consignment, and reverse consignment. Data were collected by means of a passive role-playing experiment and analyzed via binomial and multinomial logistic regression.

■ SC09

M - Maryland C

IIE Transactions Sponsored Session

Sponsor: Quality, Statistics and Reliability Sponsored Session

Chair: Susan Albin, Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, United States of America, salbin@rci.rutgers.edu

1 - Detecting Improvement with Shewhart Attribute Control Charts when the Lower Control Limit is Zero

Erwin Saniga, Professor, University of Delaware, Department of Business Administration, Newark, 19716, United States of America, sanigae@lerner.udel.edu, James M. Lucas, Darwin J. Davis

In this paper, we present a method for monitoring count data so as to be able to detect improvement when the counts are low enough to cause the lower limit to be zero. The method consists of counting the number of samples in which zero defectives or zero defects per unit occur and signaling an increase in quality if k in a row or 2 in t samples have zero counts of defectives or zero defects per unit. This method enjoys some similarities to the very popular Shewhart control chart.

2 - Multivariate Statistical Process Control with Artificial Contrasts

George Runger, Professor, Arizona State University, runger@asu.edu, Eugene Tuv, Wookyeon Hwang

A multivariate control region is a pattern that represents the normal operating conditions of a process. Reference data is generated and used to learn the difference between this region and random noise. Multivariate SPC is transformed to supervised learning. Such a computational approach is easily accomplished with modern computing resources.

3 - Identifying and Visualizing Nonlinear Variation Patterns in Multivariate Manufacturing Data

Feng Zhang, Fairchild Semiconductor, 333 Western Avenue, MS 10-29, South Portland, ME, 04106, United States of America, feng.zhang@fairchildsemi.com, Dan Apley

We propose a model for representing nonlinear variation patterns and a method for blindly identifying the patterns, based on a sample of multivariate measurement data, with no prior knowledge of the nature of the patterns. The identification method is based on principal curve estimation, in conjunction with a suitable data preprocessing step for high dimensional data. Experimental results show that interactive visualization of identified variation patterns is effective in diagnosing the root causes that contribute to process variability.

4 - Failure Event Prediction Using the Cox PH Model Driven by Frequent Failure Signatures

Zhiguo Li, Zhiguo.Li@xerox.com, Crispian Sievenpiper, Suresh Choubey, Shiyu Zhou

The analysis of event sequence data that contains failure events is becoming increasingly important in the design of service and maintenance policies. This paper presents a systematic methodology to construct a statistical prediction model for failure event based on event sequence data by combining the frequent failure signature and Cox model approaches. The proposed method can help proactively diagnose machine faults with a sufficient lead time before actual system failures.

■ SC10

M - Room 8206

Real Options in the Energy Sector

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Afzal Siddiqui, University College London, Department of Statistical Science, London, WC1E 6BT, United Kingdom, afzal@stats.ucl.ac.uk

1 - Transmission Investment under Uncertainty: The Case of Germany-Norway

Stein-Erik Fleten, Associate Professor, Norwegian U of Sci and Tech, Dept Industrial Economics and Tech Mgm, Trondheim, MI, NO-7491, Norway, stein-erik.fleten@iot.ntnu.no, Afzal Siddiqui, Ane Marte Heggedal

Price differences between neighboring regions and countries motivate in part the construction of large transmission lines. Analysis of such investment is complicated by the fact that the electricity can flow in both directions, by uncertainty in exchange rates and prices, and not least by the fact that the price differences become smaller after the transmission line has been put into operation. We perform a real options analysis of a merchant investor holding an exclusive license to build.

2 - Evaluation of Hydropower Upgrade Projects under Uncertainty

Ane Marte Heggedal, PhD Student, Norwegian U of Sci and Tech, Dept Industrial Economics and Tech Mgm, Trondheim, MI, 7050, Norway, ane.m.heggedal@iot.ntnu.no, Stein-Erik Fleten, Morten Elverhöi, Ole Christian Troland

Upgrading of hydro power stations rise questions regarding what technology, size and location of the power station to choose when the investment is taken under uncertainty. The option of rehabilitating existing facilities does not exclude the option to invest in new facilities while the option to build a new power plant excludes the option to rehabilitate. By performing a real option analysis we hope to find the optimal solution of when to invest, and which investment alternative to undertake.

3 - Optimal Investment and Location under Uncertainty

Ryuta Takashima, Assistant Professor, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-8656, Japan, takashima@n.t.u-tokyo.ac.jp, Kyoko Yagi

We consider an investment problem of power plants under uncertainties of the cash flows and the catastrophic event such as earthquake. The effect of the catastrophic event on the flexibility is shown by comparing the option values of a single investment and a multistage one. Additionally, in a case that both a cost associated with the construction and the catastrophic event are dependent on the location, we determine simultaneously the optimal investment timing and location of the power plant.

4 - Real Options Analysis of Investment in Carbon Capture and Sequestration Technology

Afzal Siddiqui, University College London, Department of Statistical Science, London, WC1E 6BT, United Kingdom, afzal@stats.ucl.ac.uk, Somayeh Heydari, Nick Ovenden

We take the perspective of a coal-fired power plant owner that can either invest in carbon capture and sequestration technology or carry out more modest energy-conversion efficiency upgrades. Both mitigation measures have irreversible fixed costs, and the prices for coal and carbon dioxide are stochastic and correlated. Given the two perpetual, mutually exclusive mitigation options, we find the optimal decision rule and the value of the option to reduce carbon dioxide emissions.

■ SC11

M - Room 8209

Forestry III: Harvest Scheduling

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Harvest Scheduling under Uncertainty

Cristian Palma, PhD Student, University of British Columbia, Department of Forest Resources Management, 2045-2424 Main Mall, Vancouver, BC, V6T 1Z4, Canada, cpalmai@interchange.ubc.ca, John Nelson

Harvest scheduling decisions are made in an uncertain framework and current techniques that consider uncertainty impose difficulties when solving real problems. We developed a robust optimization model to schedule harvest decisions when timber yield and demand of two products are uncertain, and described its application to a 245,090 ha forest. With small reductions in the objective function, decisions were less sensitive to uncertainties and protected from occurrences of infeasibility.

2 - Are Smaller Cutting Components Worth It?

Marc McDill, Department of Forest Resources, Pennsylvania State University, University Park, PA, 16802, United States of America, mmcdill@psu.edu, Joseph Petroski, Andrea Arratia

Spatially-explicit forest planning models can be extremely difficult to solve. We look at one factor that is expected to contribute to the difficulty of solving these models: the relative size of management units compared to the maximum harvest opening size. The study evaluates, in the context of actual harvest scheduling problems from the PA State Forests, the trade-off between better solution quality versus the added difficulty of solving problems with more, smaller management units.

3 - Imposing Old-growth Patch Constraints in Forest Harvest Scheduling Models

Marcos Goycoolea, Assistant Professor, Universidad Adolfo Ibanez, Diagonal Las Torres 2640, Oficina 534 C., Santiago, Chile, marcos.goycoolea@uai.cl, Rodolfo Carvajal, Miguel Constantino, Juan Pablo Vielma, Andres Weintraub

A major challenge in harvest scheduling is to balance economic gain with preservation of wildlife habitat. One way of addressing wildlife preservation is to require large contiguous patches of mature forest. These requirements are very difficult to impose in planning models due to their complex combinatorial structure. We propose a new integer programming approach to integrating these constraints in existing revenue-maximizing harvest scheduling models. Computational results are presented.

4 - Multi-criteria Optimization to Auction Forest Ecosystem Services

Sandor Toth, College of Forest Resources, University of Washington, Box 352100, Seattle, WA, 98195, United States of America, toths@u.washington.edu, Greg Ettl, Luke Rogers

Multi-objective optimization is combined with a novel auction mechanism in this research to evaluate and sell forest ecosystem services. I will discuss the special features of this auction format and illustrate the bidding process using examples where the production of mature forest habitat, carbon sequestration and viewshed services are considered. I will present preliminary results about a pilot auctioning experiment.

■ SC12

M - Room 8212

Data and Text Mining: Theory and Practice

Cluster: Data Mining
Invited Session

Chair: Ram Akella, UC Santa Cruz, 1848 Emerson St., Palo Alto, CA, 94301, United States of America, akella@soe.ucsc.edu

1 - Scalable Methods for Extracting Named Entities from the Web

Lyle Ungar, University of Pennsylvania, Philadelphia, PA, United States of America, ungar@cis.upenn.edu, Luis Sarmento, Casey Whitelaw, Alex Kehlenbeck

Recognizing and labeling named entities such as people, places, and movies across the entire web requires highly scalable data mining methods. We use an unsupervised method to automatically extract hundreds of millions of entity mentions from the web with type labels. The extracted data is used to train a supervised model for labeling all entity mentions on the web. We present regression and clustering methods that use a "map-reduce" environment to address these web-scale problems.

2 - Dirichlet Compound Multinomial (DCM) Models in Text Analytics and Search

Ram Akella, UC Santa Cruz, 1848 Emerson St., Palo Alto, CA, 94301, United States of America, akella@soe.ucsc.edu, Zuobing Xu

We describe a text-analytics problem occurring in CRM, search engines, and service center support, based on our work with Cisco. We discuss our novel use of DCM models in place of traditional multinomial models. We demonstrate significant improvement in search efficiency with enterprise-level-data and discuss the underlying analytic reasons.

3 - Opinion Mining from Weblogs and Consumer Generated Content

Rohini Srihari, Assoc Professor, State University of Nw York, CEDAR/ UB Commons, 520 Lee Entrance, Amherst, NY, 14228, United States of America, rohini@cedar.buffalo.edu

Weblogs exemplify the trend towards more consumer generated content on the web. Weblogs (or blogs) can be mined for valuable content leading to business intelligence, social phenomena analysis, and even counterterrorism activities. We will examine both technical challenges in deriving useful content from weblogs as well as business interest in such technology. Sample applications of sentiment or opinion analysis will be demonstrated.

4 - Roles of Collective Classification for Data Mining Tasks

David Aha, Head, Adaptive Systems Section, Naval Research Laboratory, Code 5514, 4555 Overlook Ave., SW, Washington, DC, 20375, United States of America, david.aha@nrl.navy.mil

One approach for mining entity and event relations is to use collective classification, a learning method that does not assume data are drawn independently from an identical distribution. I will summarize recent research on this topic and its application in our projects concerning maritime vessel activity analysis and chat room message highlighting.

5 - Integrating Data Modeling and Optimization Via Constrained Reinforcement Learning

Naoki Abe, Research Staff Member, IBM Yorktown Heights, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, nabe@us.ibm.com, Cezar Pendus, Chandan Reddy, David Jensen, Prem Melville

We address the problem of tightly integrating data modeling and decision optimization, particularly when the optimization involves sequential decisions to be made over time. We propose a novel approach based on the framework of constrained Markov Decision Processes, and establish some properties concerning modeling/optimization methods within this formulation. We also demonstrate the effectiveness of the proposed approach via empirical evaluation using real world data in business optimization.

■ SC13

M - Room 8216

Joint Session DM/CS: Recent Advances in Data Mining and Machine Learning

Sponsor: Data Mining, Computing Society
Sponsored Session

Chair: Sijian Wang, University of Michigan, Department of Biostatistics, University of Michigan, Ann Arbor, MI, 48109, United States of America, sijwang@umich.edu

1 - Discrete Choice Models for User-centric Search Engines

Nilgun Ferhatosmanoglu, Research Scientist, Sagata Ltd., 1580 Cardiff Road, Columbus, OH, 43221, United States of America, nferhat@sagata.com, Theodore Allen, Guadalupe Canahuate

General LSI based search engines are innately non-optimal as the search process is based on the current query and the database w/o considering information from users.This paper outputs development of OR tools to enhance the search process integrating user feedback.Discrete choice analysis weighting (DCAW) is proposed relating the weights of the distance function to the parameters of the user utility function.The test-bed evaluation of DCAW conducted on 10,000 news items offers promising results.

2 - Integration of Causal Models and Set-covering Algorithms for Optimal Sensor Allocation

Jing Li, Assistant Professor, Department of Industrial Engineering, Arizona State University, Tempe, AZ, United States of America, jinglz@asu.edu, Judy Jin

This paper develops a method to transfer optimal sensor allocation in Distributed Sensor Networks into a set-covering optimization problem. An algorithm is developed to find the optimal solution by integrating causal Bayesian networks with a greedy search. Case studies are presented.

3 - Efficient Global Approximation of Generalized Nonlinear l1 Regularized Solution Paths

Ming Yuan, Georgia Institute of Technology, School of ISyE, Gatech, 755 Ferst Dr NW, Atlanta, GA, United States of America, myuan@isye.gatech.edu

We consider efficient construction of nonlinear solution paths for general l1 regularization. Unlike the existing methods that incrementally build the solution path through a combination of local linear piecewise approximation and re-calibration, we propose an efficient global approximation to the whole solution path. The proposed methodology avoids high dimensional numerical optimization and is therefore faster and more stable in computation.

4 - Data Mining Using Topic Models and Supervision

Ning Zheng, Principle Systems Engineer, Cardinal Health Inc., 400 Vestavia Pkwy #310, Birmingham, AL, 35216, United States of America, ning.zheng@medmined.com, Theodore Allen

Bayesian "topic models" often provide surprisingly interpretable descriptions of text/image corpora, yet can fail to capture all subtle/rare topics interesting to users. This can result in irrelevant information retrieval or intelligence not actionable. In this talk, diagnostics for measuring accuracy of topic model involving rare topics are proposed. Supervisions on latent variables are proposed and demonstrated to enhance topic accuracy. Methods are illustrated using a real world application.

■ SC14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Salford Systems - Introduction to Data Mining for Absolute Beginners

Mikhail Golovnya, Senior Scientist, Salford Systems, 4740 Murphy Canyon Rd. #200, San Diego, CA, 92108, golomi@salford-systems.com

This is a perfect place to start if you are new to data mining, even if you have little-to-no background in statistics. We will discuss: (1) data basics: data types, formats, and preparation steps; (2) what kinds of questions we can answer with data mining; (3) how data mining models work; (4) evaluation criteria—how models can be assessed and their value measured; and (5) Specific background knowledge to prepare you to begin a data mining project.

2 - AMPL Optimization LLC - AMPL's Support for Advanced Solver Features

Robert Fourer, Northwestern University, Department of Industrial Engineering and Mgt. Science, Evanston, IL, United States of America, 4er@iems.northwestern.edu, David M. Gay

The AMPL modeling language's flexibility enables it to support many solver features beyond returning some optimal solution. This tour of such features includes infeasibility diagnosis, convexity detection, multiple solutions, parameter tuning, recognition of complementarity conditions, and logic expressions. Support for several varieties of global optimization will also be touched upon.

■ SC15

M - Room 8219

Service Systems: Theory, Design, and Applications

Sponsor: Service Science
Sponsored Session

Chair: Robin Qiu, Penn State, Division of Engineering, Malvern, PA, 19355, United States of America, RobinQiu@psu.edu

1 - Assessing Project Management Competences in the Globalized Environments

Constanta-N Bodea, Professor, Academy of Economic Studies, 6, Piata Romana Street, Bucharest, Ro, 010374, Romania, bodea@pm.org.ro, Cristina Mihaila, Sergiu Jecan

The paper presents a competence assessment approach based on the semantic networks. The approach is implemented in a web based learning environment capable of building and conducting a complete and personalized training cycle, from the definition of the learning objectives to the assessment of the learning results for each learner. The testing and evaluation facilities of the system are based on the ontological approach. The educational ontology is mapped on a semantic network. Further, the semantic network is projected into a concept space graph. The semantic computability of the concept space graph is used for test design.

2 - Next Generation Workforce Management Analytics for the Globally Integrated Enterprise

Aleksandra Mojsilovic, Mathematical Sciences, IBM Research, Route 134, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, aleksand@us.ibm.com, Yingdong Lu, Mark Squillante, Jianying Hu, Moninder Singh

Advanced workforce management (WFM) is becoming critical factor in company's ability to address cost pressures and challenges of global integration. Besides forecasting and planning, next generation WFM systems will require novel analytics that will tap into the "human" aspects of the workforce and leverage the interaction patterns to further enhance service delivery. This session addresses key problems in the next generation WFM and methodologies that will be required to address them

3 - An Agile Approach to Building Business Process Application

Jie Cui, Staff Researcher, IBM Beijing Research Lab, Building 19, Zhongguancun Software Park, 8 Dongbeiwang West Road, Haidian Distric, Beijing, 100193, China, cuijie@cn.ibm.com, Jing Min Xu, Xiao Xi Liu, Hai Qi Liang

The increasing complexity of application and integration middle-wares has made the development of business process solutions more expensive and inflexible than ever. This paper presents an agile approach which aims to significantly simplify the runtime and tools through heuristically identifying the most essential components for business process execution from both human task and business artifact lifecycle management perspectives. A case study is also presented in the paper.

4 - A Systemic Approach to Assess Service Effectiveness within a Respiratory Care Department

Dr. Robert Frie, Systems Analyst, Mayo Clinic, 200 1st Street SW, Rochester, MN, 55905, United States of America, zahrob@charter.net

The research study purpose was to assess, through systems analysis, service effectiveness within a large medical institution respiratory care team. The assumption was any service gaps in effectiveness would justify future patient service improvement programs for a large medical institution respiratory care team. The research design used the mixed methods design. The mix methods design consisted of a cross sections survey (quantitative design) and a case study (quantitative design.

5 - Improving Operating Room Utilization

Steven Thompson, Assistant Professor, University of Richmond, 28 Westhampton Way, Richmond, VA, 23173, United States of America, sthomps3@richmond.edu, Robert Garfinkel, Bob Day

For most hospitals the operating room (OR) is the largest revenue and cost center. Managers must balance the need for high levels of utilization with the surgeon's need for predictable, reliable access. Many hospitals employ a mechanism known as "blocking" where a given surgeon is granted OR privileges on a certain day for a specific time period. We develop an optimality based tool that helps a hospital manage block time allocations in order to improve utilization and quality of service.

■ SC16

M - Room 8222

Supply Chain Optimization III

Contributed Session

Chair: Guoquan(George) Liu, Intel, No.999 Ying Lun, Free Trade Zone, Pudong, Shanghai, China, george.liu@intel.com

1 - MINLP Models and Algorithms for Joint Supply Chain Design and Inventory Management Problem

Fengqi You, Carnegie Mellon Unviersity, 5000 Forbes Ave., Pittsburgh, Pa, 15213, United States of America, yfq@cmu.edu, Ignacio Grossmann

We study the design of a three-echelon supply chain and the associated inventory system under stochastic demand. Supply chain design and inventory management decisions are jointly optimized using a mixed-integer nonlinear program (MINLP) by assuming that each node in the network operates with a base-stock policy for a bounded normally distributed demand and quotes a guarantee service time to its customers. We will discuss the model formulation, solution algorithm and computational results.

2 - Event-time Models for Procurement Planning and Scheduling in Supply Chains

Omer S. Benli, Professor, California State University, Long Beach, Department of Information Systems, 1250 Bellflower Boulevard, Long Beach, CA, 90840-8506, United States of America, obenli@csulb.edu

An event-time modeling approach is proposed for procurement decisions in a supply chain. In this paradigm, the exogenous events, whose times are known, and the endogenous events, whose times of occurrence are decision variables, are handled in the same model. Formulation and computational examples using constraint programming are presented.

3 - Level of Repair Analysis (LORA): Which Parts to Repair and Where to Do It?

Marco Schutten, University of Twente, Faculty of Management and Governance, PO Box 217, Enschede, 7500 AE, Netherlands, j.m.j.schutten@utwente.nl, Rob Basten, Matthieu Van der Heijden

For capital goods (e.g. radars, MRI-scanners), an OEM chooses the most cost effective maintenance strategy. The goods consist of multiple indentures (subsystems, modules etc.) for which a repair/discard decision has to be made. Repairs can be performed on multiple echelons in the repair network (local, central etc.). We formulate an IP-model that generalizes the 2 LORA models in literature. We extend it, based on a case study in the defense industry, and solve large instances to optimality.

4 - A Linear Programming Based Hybrid Algorithm for Supply Demand Optimization

Guoquan(George) Liu, Intel, No.999 Ying Lun, Free Trade Zone, Pudong, Shanghai, China, george.liu@intel.com

Supply demand alignment optimization is very important for companies to increase customer satisfaction. Linear programming (LP) is very popular tool to optimize the demand supply alignment. However LP is not able to model some complicated business rule. The paper will present a LP based hybrid algorithm to model some non-linear and complicated business rules to optimize the supply demand alignment.

■ SC17

M - Room 8226

Joint Session QSR/Simulation Society

Sponsor: Quality, Statistics and Reliability, Simulation Society
Sponsored Session

Chair: Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

1 - Evaluating the Transient Behavior of Queueing Systems via Simulation and Transfer Function Modeling

Feng Yang, Assistant Professor, West Virginia University, PO Box 6070, Morgantown, WV, 26505, United States of America, feng.yang@mail.wvu.edu

Characterizing the transient behavior of queueing systems is a difficult problem, which has been addressed by either simplified analytical models or simulation. We seek to capture the transient performance of systems from a new perspective: based on high-fidelity simulation experiments, we estimate a number of transfer function models (the discrete approximations of those ODEs provided by an analytical approach) which characterizes the evolution of the system's dynamic behavior.

2 - Response Surface Metholodgy for Simulating Hedging and Trading Strategies

Evern Baysal, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, e-baysal@northwestern.edu, Barry L Nelson, Jeremy Staum

The distribution of profit and loss resulting from a dynamic trading strategy can be evaluated by nested simulation: at every time step on every simulated path of the relevant financial variables, portfolio weights are estimated by simulation. We use kriging to model portfolio weights as a function of underlying financial variables and show that it provides accuracy comparable to nested simulation with much less computational effort.

3 - Wavelet-Based Distribution-Free Tabular CUSUM Chart

Joongsup (Jay) Lee, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, jlee@gatech.edu, Youngmi Hur, Seong-Hee Kim, James Wilson

We propose two wavelet-based distribution-free tabular CUSUM procedures for detecting shifts in the mean of a multivariate process. Each procedure uses a reduced vector of components derived from the discrete wavelet transform; from Phase I, each procedure estimates the required parameters of a CUSUM chart to be used for monitoring in Phase II. Preliminary experimentation shows that both charts outperform multivariate Shewhart-type charts in various types of test processes.

4 - Issues in Simulation of Process Execution Monitoring and Adjustment Schemes

Dr. Russell Barton, Professor, Penn State, Department of Supply Chain and Informati, 406 Business Building, University Park, PA, 16802, United States of America, rbarton@psu.edu, Jun Shu

SPC methods can be applied to monitor the timeliness and correctness of the movement of physical or virtual entities through a process. Comparison of process execution statistical monitoring methods with each other, or with traditional process execution management rules, can require sophisticated discrete-event simulation models. We discuss the practical issues in building and using simulation models to study process execution monitoring schemes.

■ SC18

M - Room 8228

Statistics and Quality Control

Contributed Session

Chair: Kellie Keeling, University of Denver, DCB Department of Statistics, MSC 8952, 2101 S. University Blvd, Denver, CO, 80208-8952, United States of America, kkeeling@du.edu

1 - A Generic Numerical Look at the Optimality of Control Charts

Chang-Ho Chin, Assistant Professor, Kyung Hee University, 1 Seocheon-dong, Giheung-gu, Yongin-si, Korea, Republic of, chin@khu.ac.kr, Dan Apley

We consider as a control chart a generic nonparametric nonlinear function that maps process observations to a control chart statistic. We develop a procedure for numerically optimizing the nonlinear map so as to minimize the average run length for detecting shifts of interest. We relate the optimized nonlinear maps to control charts such as the EWMA and CUSUM, which are known to possess certain optimality properties under restricted scenarios.

2 - An Ordinal Alternative to Demerits

Qilu Wang, University of Arkansas, 4207 Bell Engineering, Fayetteville, United States of America, qxw001@uark.edu, Justin Chimka

A demerit control chart is the traditional tool for monitoring different types of defects in a single chart while accounting for different levels of severity. However demerit control charts require the assignment of arbitrary numerical values to ordinal variables and proceed as though their scales were interval or ratio. Consequently the analyses are theoretically flawed. Here we introduce a theoretically appropriate alternative to demerits, based on the proportional odds model.

3 - Developing Three-Class Acceptance Sampling Plans Based On Process Capability Indices (PCIs)

Qing Xie, PhD Student, Department of Industrial Engineering, Texas Tech University, 2500 Broadway, Box 43061, Lubbock, TX, 79409, United States of America, qing.xie@ttu.edu, John Kobza

The methodologies for three-class acceptance sampling plans by variables and two-class sampling plans based on some PCIs have been developed, both assuming a normal distribution. This paper extends the two-class sampling plans based on PCIs to three-class, for both normal and non-normal data. The Type I/II errors and AQL/RQL are defined, and the OC functions are developed, which turns out to be a joint distribution of two non-central t distributions.

4 - Comparing Statistical and Mathematical Approaches to the Problem of Tabular Data Protection

Paul Massell, U.S. Census Bureau, 4600 Silver Hill Road, Rm. 5K114A, Washington, DC, United States of America, paul.b.massell@census.gov

At the U.S. Census Bureau, business data are released as tables in which cell values are the sum of contributed values of some magnitude variable (e.g., sales($) for 2006). The confidentiality of the contributed values must be protected. This requires either suppressing or modifying some of the cells. We discuss two ways to do this. The mathematical approach uses a Linear (or Integer) Programming model. The statistical approach adds noise to the contributed values.

5 - Cronbach's Reliability Alpha: 20 Years of Information Systems, Marketing, and Management Literature

Kellie Keeling, University of Denver, DCB Department of Statistics, MSC 8952, 2101 S. University Blvd, Denver, CO, 80208-8952, United States of America, kkeeling@du.edu, Robert Pavur

This presentation will be a meta-analysis of survey research in three disciplines: Management Information Systems, Marketing, and Management. This research analyzes reported Cronbach's alpha reliability measures from 1988 - 2007 to create guidelines for acceptable levels for survey research in these areas.

■ SC19

M - Lincoln 4

Decision Analysis and Strategy Development

Sponsor: Decision Analysis
Sponsored Session

Chair: Martin Schilling, London School of Economics, Houghton Street, London, WC2A 2AE, United Kingdom, m.schilling@lse.ac.uk

1 - Decision Analysis and Strategy Development – Some Unexplored Research Opportunities?

Martin Schilling, London School of Economics, Houghton Street, London, WC2A 2AE, United Kingdom, m.schilling@decisioninstitute.eu

Internal resources of a firm as a source for organizational performance has been received considerable attention in the area of strategic management in the last decades. Based on this "resource-based view", this introduction serves to explore possible research opportunities at the interface of strategic management and decision analysis.

2 - A Socio-technical Perspective to Strategy Development

Lawrence Phillips, Visiting Professor of Decision Sciences, London School of Economics, Houghton Street, London, WC2A 2AE, United Kingdom, larry_phillips@msn.com

Many years ago a client taught me the subtle beauty and usefulness of a simple approach to strategy. I've used this, with some elaboration, to help clients develop and maintain a 'big-picture' view of complex decision situations. The model is used in multi-criteria decision analysis to connect strategy to effective action, leading one client to observe, "This shows how we can live the strategy." A case study will illustrate this blend of strategy and MCDA.

3 - A System's Perspective on Strategic Decisions

Dennis Buede, Innovative Decisions, 2139 Golf Course Drive, Reston, VA, 20191, United States of America, dbuede@innovativedecisions.com

The analogy of developing a system is used to highlight some important aspects of a strategic decision. The strategic decision is the product. The life cycle of a system (lust to dust) is used to highlight related decisions that need to be addressed to ensure the "product" is feasible and truly preferred. The traditional product trade space of cost, schedule, and performance with associated risks is also used to make some key points.

4 - A Value-based Perspective on Strategy Development

Jim Matheson, Consulting Professor, Stanford University, Management Science & Engineering, Stanford, CA 94305-4026, SmartOrg, Inc., 855 Oak Grove Avenue, Suite 202, Menlo Park, CA, 94025, United States of America, jmatheson@smartorg.com

Strategy Development deals with less structured but very important decisions. A value-based approach keeps the whole strategy-development process focused on the aspects of the situation that most impact value. The most valuable strategy emerges after multiple cycles of synthesis and analysis. This talk will give a perspective on how to move from high ambiguity to clear strategy.

■ SC20

M - Lincoln 3

DA Practice Award Finalists

Sponsor: Decision Analysis

Sponsored Session

Chair: Karen Jenni, karen.jenni@stanfordalumni.org

1 - Think Clearly, Act Decisively, and Feel Confident: The Story of How Unilever has Embedded Decision Analysis Techniques into its Organizational

Andrea Dickens, Unilever, Andrea.Dickens@unilever.com, Sven Roden

Abstract not available at this time.

2 - Applying Crime Mapping and Analysis Techniques to Forecast Insurgent Attacks in Iraq

Joseph Mlakar, Operations Research Analyst, United States Marine Corps, 3300 Russell Road, Quantico VA 22554, United States of America, joseph.mlakar@usmc.mil

We begin by finding series of attacks that are linked to the same insurgent or insurgent group. Each series is analyzed spatially and temporally in order to identify patterns in (1) static factors such as location, time of day, and day of the week and (2) dynamic factors such as the time between events, distance between events, and movement pattern. We demonstrate how these novel techniques have been tremendously successful in forecasting the location and timing of insurgent attacks in Iraq.

3 - Using Decision Analysis to Develop Policies that Matter: Global Management of Poliomyelitis and Beyond

Kimberly M. Thompson, Harvard School of Public Health, kimt@hsph.harvard.edu, Radboud J. Duintjer Tebbens

Abstract not available at this time.

4 - Should We Protect Commercial Airplanes Against Surface-to-Air Missile Attacks by Terrorists

Detlof von Winterfeldt, CREATE, University of Southern California, detlof@aol.com, Michael O'Sullivan

Abstract not available at this time.

■ SC21

M - Lincoln 2

Queueing Models I

Contributed Session

Chair: Bin Hu, PhD Student, University of Michigan, Ross School of Business, Ann Arbor, United States of America, hub@umich.edu

1 - Performance Analysis of Manufacturing Systems from Histograms

Jean Sebastien Tancrez, PhD Student, Louvain School of Management, 34, Voie du Roman Pays, Louvain-la-Neuve, 1348, Belgium, js.tancrez@uclouvain.be, Philippe Chevalier, Pierre Semal

We are interested in the modelling of stochastic manufacturing systems with finite buffers. The processing time distributions are supposed to be given in the form of histograms, the most common form in practice. From them, using "probability masses fitting", we derive discrete phase-type distributions, which allow to model the system behavior by a Markov chain. Then, bounds and estimations of the performance measures, as well as realistic distributions of the cycle time, can be computed.

2 - Stabilizing Performance in Many-server Queues with Time-varying Arrivals

Yunan Liu, Phd Student, Columbia University, Department of Industrial Engineering and, Operations Research, New York, 10027, United States of America, yl2342@columbia.edu, Ward Whitt

We consider the limiting deterministic fluid approximation for the general many-server G_t/GI/s_t+GI queueing model, having time varying arrivals (the G_t) and allowing customer abandonment (the +GI). We show how important performance measures can be stabilized (made constant after an initial transient) by an appropriate choice of the time-varying number of servers, s_t.

3 - Forced Balking and its Elimination/Minimization in GDS

Junfang Yu, Asst. Professor, Southern Methodist University, PO Box 750123, Department of EMIS, Dallas, TX, 75275-0123, United States of America, yuj@engr.smu.edu, Dasaradh Mallampati

Sabre, a global leader in travel industry, hosts a Computerized Reservation Systems (CRS) that hosts travel content and sells travel products to individual and corporate customers all over the World. It deployed both legacy and open systems to handle millions of reservation/booking transactions daily. This paper is aimed to study and model the queueing phenomenon incurred in CRS, discuss the options of minimizing or eliminating the usage of legacy systems and the balking of transactions.

4 - An Algorithmic Analysis of Multi-server Vacation Model with Service Interruptions

Zhe George Zhang, Professor, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada, gzhang@sfu.ca, Chuen-Horng Lin, Hsin-I Huang, Jau-Chuan Ke

As an extension of the multi-server vacation model, we considers a Markovian multi-server queueing system with unreliable servers. In such a system, some servers may not be available due to either planned stoppage (vacations) or unplanned service interruptions (server failures).Some practical logistic systems can be analyzed by this multi-server vacation model. Numerical examples are presented to show the performance evaluation and optimization of such a system.

5 - Server Partitioning in Queueing Systems during Rush Hour

Bin Hu, PhD Student, University of Michigan, Ross School of Business, Ann Arbor, United States of America, hub@umich.edu, Saif Benjaafar

We analyze a system with multiple parallel servers and multiple customer classes. The servers can be partitioned into server groups, each dedicated to a single customer class. The system operates under a rush hour regime with a large number of customers arriving at the beginning of the rush hour period. We characterize the optimal partitioning of servers among customer classes and study the benefit of partitioning under varying conditions.

■ SC22

M - Lincoln 1

Solution Counting

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session

Chair: Willem-Jan van Hoeve, Asst. Professor Operations Research, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, vanhoeve@andrew.cmu.edu

1 - Constraint-centered Search Heuristics to Solve Constraint Satisfaction Problems

Gilles Pesant, University of Montreal, CRT, CP 6128, Quebec, Canada, pesant@crt.umontreal.ca, Claude-Guy Quimper, Alessandro Zanarini

Constraints have played a central role in constraint programming because they capture key substructures of a problem and efficiently exploit them to boost inference. This talk proposes to do the same thing for search. We introduce new search heuristics based on solution counting information at the level of individual constraints and describe efficient algorithms to compute such information for the alldifferent, regular, and knapsack constraints.

2 - Counting Solutions of Constraint Integer Programs

Stefan Heinz, ZIB, Division Scientific Computing Department Optimization, heinz@zib.de, Thorsten Koch, Tobias Achterberg

In this talk, we discuss how to extend branch-and-cut constraint integer programming frameworks to support the generation of all solutions. We propose a method to detect so-called unrestricted subtrees, which allows us to prune the constraint integer program search tree and to collect several solutions simultaneously. We present computational results of this branch-and-count paradigm which show the potential of the unrestricted subtree detection.

3 - Solution Counting Methods for Combinatorial Problems

Ashish Sabharwal, Research Associate, Cornell University, Department of Computer Science, 5160 Upson Hall, Ithaca, NY, 14853-7501, United States of America, sabhar@cs.cornell.edu, Carla P. Gomes, Lukas Kroc, Bart Selman, Willem-Jan van Hoeve

Our work in the past few years has led to several effective techniques for counting the number of solutions of hard combinatorial problems. These include local search sampling methods, the use of special XOR constraints and their generalization, ideas from belief propagation and probabilistic inference, and statistical methods. This talk will compare and contrast these approaches, focusing on their relative strengths and limitations.

4 - Counting CSP Solutions Using Generalized XOR Constraints

Willem-Jan van Hoeve, Asst. Professor Operations Research, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, vanhoeve@andrew.cmu.edu, Bart Selman, Ashish Sabharwal, Carla P. Gomes

We present a general framework for determining the number of solutions to constraint satisfaction problems (CSPs) with a high precision. It is based on a method introduced previously for Boolean satisfiability problems, using XOR constraints. We first extend this method to CSPs by defining the XOR constraints on additional binary variables. Then we show how to group the XOR constraints together in a global constraint. Finally, we apply generalized XOR constraints directly to the CSP variables.

■ SC23

M - Lincoln 5

Joint Session AP/Minority Issues: Asymptotic Analysis of Stochastic Systems

Sponsor: Applied Probability, Minority Issues
Sponsored Session

Chair: Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu

1 - A Little Flexibility is All You Need: Optimality of Tailored Chaining and Pairing

Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu, Jan Van Mieghem, Ramandeep Randhawa

We introduce tailored pairing that merges and extends the concepts of chaining and tailoring in dynamic processing systems. We optimize the type and amount of flexibility using a Brownian approximation that is asymptotically correct. We show analytically that for most practical flexibility cost structures the optimal flexibility configuration invests a lot in dedicated resources, a little in bi-level flexibility, but nothing in level-k>2 flexibility, let alone full flexibility.

2 - Overflow Models with Many-servers: Transient and Steady-state Analysis

Itay Gurvich, Columbia University, New York, NY, 10027, United States of America, ig2126@columbia.edu

Motivated by call-center outsourcing problems, we consider large-scale service systems with multiple customer classes and multiple agent pools operating under an overflow mechanism. We establish transient and steady-state approximations in the Quality and Efficiency Driven (QED) heavy-traffic regime. In particular, we prove an asymptotic independence result that leads to simplified expressions for the waiting time distribution and can be used in the design of outsourcing contracts.

3 - Event Horizon for a Processor Sharing Queue

Robert Hampshire, Carnegie Mellon University, 4800 Forbes Ave, 2102B Hamburg Hall, Pittsburgh, PA, United States of America, hamp@cmu.edu, William Massey

We identify a phenomenon for processor sharing queues that is unique to ones with time-varying rates. If the arrival rate for processor sharing queue has unbounded growth over time, then it is possible for the number of customers in a processor sharing queue to grow so quickly that a newly entering job never finishes. We define the minimum size for such a job to be the event horizon for a processor sharing queue. We discuss the use of such a concept and develop some of its properties.

■ SC24

M - Lincoln 6

Computational Issues in Mathematical Finance

Sponsor: Computing Society
Sponsored Session

Chair: Robert Vanderbei, Professor, Princeton University, E-226 E-Quad, Princeton, NJ, 08544, United States of America, rvdb@Princeton.EDU

1 - Patterns of Dependence in Financial Data

Alexandre D'aspremont, Asst. Professor, Princeton University, Olden St, Princeton, NJ, 08544, United States of America, aspremon@princeton.edu

We use covariance selection to explore dependence patterns in financial time series with a particular focus on interest rates and hedge fund returns. We discuss cross validation procedures and study the impact of these correlation graphs on CAPM and mean reverting portfolios.

2 - Hedging under Convex Risk Measures

Ronnie Sircar, Professor, Princeton University, Department of ORFE, Princeton, NJ, 08544, United States of America, sircar@princeton.edu

The study of convex measures of financial risk has a rich history in a short number of years. The axioms specify sensible properties that measures of risk should possess (and which the industry's favourite, VaR, does not). We discuss static-dynamic hedging of exotic options under convex risk measures, and specifically the existence and uniqueness of an optimal position. We illustrate the computational challenge when we move away from the risk measure associated with exponential utility.

3 - Equity Default Swaps under the Jump to Default extended Constant Elasticity of Variance (JDCEV)

Rafael Mendoza, PhD Student, Northwestern University, 2145 Sheridan Rd. Room C151, Evanston, IL, 60208-3119, United States of America, rafaelmendoza2008@u.northwestern.edu, Vadim Linetsky

An Equity Default Swap (EDS) provides protection in case of default and in case of a large drop in the stock price of the reference firm. The credit event of an EDS is better defined and provides higher spreads than a CDS. We price the EDS as a contingent claim written on a defaultable stock using the JDCEV process, where default occurs either by diffusion or by a jump to default. We solve the first passage time problem to compute the EDS spreads and compare them to the equivalent CDS spreads.

4 - Limit Theorems and Robustness for BSDEs

Mitja Stadje, Graduate Student, Princeton University, Lawrence Drive 11, Ap. 402, Princeton, NJ, 08540, United States of America, mstadje@Princeton.EDU, Patrick Cheridito

We consider Backward Stochastic Differential Equations (BSDEs) in discrete time. After obtaining stability results we prove convergence of BSDEs in discrete time to their counterparts in continuous time for drivers that grow less than quadratically. We also consider BSDEs with convex driver functions. In this case we obtain strong robustness results. This is joint work with Patrick Cheridito.

■ SC25

M - Lincoln 6A

Computational Advertising

Sponsor: Computing Society
Sponsored Session

Chair: John Tomlin, Principal Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, tomlin@yahoo-inc.com

1 - Computational Advertising: An Introduction and Overview
Andrei Broder, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, broder@yahoo-inc.com, John Tomlin

This talk will give a brief introduction to, and overview of, the topic we have come to call "computational advertising", by which we mean the algorithmic techniques useful for the optimal placement, scheduling and context of on-line advertisements. Such advertisements encompass a large and growing fraction of the advertising industry, and, in the forms of display advertising, content match, and search marketing, bring in a large fraction of the income derived from the web.

2 - A Brief Survey of Some Applications in Computational Advertising
Vanja Josifovski, Principal Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, vanjaj@yahoo-inc.com

We briefly describe four specific applications in computational advertising. We first present three problems in the domain of the Contextual Advertising where ads are placed on web pages. The challenges addressed here are how to select the features of the web pages and the ads that are used in the page-to-ad matching and how to produce a viable match scoring formulas. Next, we will overview an approach to ad selection in Sponsored Search based on query expansion using web results.

3 - A Combinatorial Allocation Mechanism with Penalties for Banner Advertising
Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu, Uri Feige, Nicole Immorlica, Hamid Nazerzadeh

We propose a new system for selling display advertising satisfying a guaranteed delivery property. In this system, we guarantee that advertisers receive at least as many advertising opportunities as they requested or else receive ample compensation in the form of monetary payment. We show that the revenue maximization problem is inapproximable and thus present three greedy heuristics for this problem, a bicriteria approximation and two algorithms with guaranteed structural approximation.

4 - A Log-linear Model for Allocating Overlapping Inventory to On-line Advertisers
John Tomlin, Principal Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, tomlin@yahoo-inc.com, Deepak Agarwal, Jimmy Yang

We discuss the allocation of inventory, defined by pools of users possessing multiple characteristics, e.g. age-range, goegraphical location, etc., to on-line advertisers who may seek some or all of these characteristics. Since the pools may overlap, some form of optimization model is called for. We consider a log-linear, i.e. maximum entropy model, and several variants with desirable properties.

■ SC26

M - Lincoln 5A

Using COIN-OR via GAMS

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Stefan Vigerske, Humboldt University Berlin, Department of Mathematics, Unter den Linden 6, Berlin, 10099, Germany, stefan@math.hu-berlin.de

1 - Open-source Quality Assurance and Performance Analysis Tools
Armin Pruessner, GAMS Development Corporation, 1217 Potomac St NW, Washington, DC, 20007, United States of America, apruessner@gams.com, Michael Bussieck, Steven Dirkse, Stefan Vigerske

Until recently, much of the math programming community has focused primarily on performance testing and benchmarking, while the general commercial environment has emphasized reliability over performance. We introduce a suite of tools to aid in both QA and performance analysis of solver software. We show how users can effectively use our tools to quality control their solver using a variety of quality metrics. In addition, we show how one can obtain benchmarking and performance information.

2 - GAMS Branch-and-Cut & Heuristic Facility
Michael Bussieck, GAMS Development Corporation, GAMS Development Corporation, 1217 Potomac Street, NW, Washington,, DC, 20007, United States of America, mbussieck@gams.com

MIP problems can significantly benefit from user supplied routines that generate cutting planes and good integer feasible solutions. The GAMS Branch-and-Cut & Heuristic (BCH) facility introduced in 2004 automates all major steps necessary to define, execute, and control user defined routines within general purpose MIP codes. Recent development of BCH resulted in more BCH aware solvers including Cbc and SCIP. New BCH features include solution filters and support for banch-and-price.

3 - Hooking Your Solver to GAMS
Stefan Vigerske, Humboldt University Berlin, Department of Mathematics, Unter den Linden 6, Berlin, 10099, Germany, stefan@math.hu-berlin.de, Michael Bussieck, Steven Dirkse

The GAMSlinks project at COIN-OR is dedicated to the development of links between GAMS and open source solvers. We present recent developments in the project, highlight non-standard features of the present interfaces, give a short introduction on how to link your own solver to GAMS, and present benchmarks comparing COIN-OR solvers with other commercial and academic solvers.

■ SC27

M - Washington 1A

Stability, Approximation, and Control of Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu

1 - Expert Users and the Case for Endogenous Abandonment Distributions
Otis Jennings, Associate Professor, Duke University, Durham, NC, 27708, United States of America, otisj@duke.edu

Most queueing models that incorporate customer abandonment assume that abandonment propensity, while context- or industry-specific, does not adjust to subtle changes in system design. We argue and provide empirical evidence that expert users - i.e. those who access the system often - will eventually notice changes in quality of service and, hence, will adjust their tolerance for delay, expressed through patterns of abandonment. We consider implications for contact center design and incentives.

2 - Approximations for the Waiting Time Distribution in an M/G/1 Queue
Mariana Olvera-Cravioto, Columbia University, 500 W. 120th Street, Rm. 306, New York, NY, United States of America, molvera@ieor.columbia.edu, Peter W. Glynn, Jose Blanchet

We consider an M/G/1 queue with heavy-tailed processing times. Our results provide new approximations for the steady-state waiting time that are uniform in the traffic intensity, and from which one can easily recover both the heavy-traffic and heavy-tailed approximations by looking at appropriate combinations of the traffic intensity and tail values. These approximations also explain the transition from an exponentially decaying tail (heavy-traffic) to a subexponential one (heavy-tail).

3 - Dynamic Scheduling of an N-System with Impatient Customers
Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu, Samim Ghamami

We consider a parallel server system known as an N system, in which there are two customer classes and two servers. Customers in both classes are impatient. Our objective is to schedule waiting jobs onto available servers so as to minimize the sum of holding and abandonment costs. We propose a control policy (which differs from Bell-Williams), and show that it is asymptotically optimal in the heavy traffic regime in Bell-Williams.

4 - Stability of Load-balancing Policies in Stochastic Networks
John Hasenbein, University of Texas, Austin, TX, United States of America, jhas@mail.utexas.edu, Jim Dai, Bara Kim

We investigate the stability of load-balancing policies based on join-the-shortest queue principles. In our model, jobs may revisit stations, thus the networks we study are more general structurally than so-called "supermarket" models. Using fluid model techniques we prove two conjectures appearing in Suhov and Vvedenskaya (2002). As part of the proof, we develop an augemented fluid model which is able to resolve the stability characterization on the boundary of the stability region.

■ SC28

M - Washington 1

Dynamic Optimization for Revenue Management

Cluster: Applied Dynamic Optimization
Invited Session

Chair: Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu

1 - A Structured Multiarmed Bandit Problem and the Greedy Policy
Paat Rusmevichientong, paatrus@cornell.edu, Adam Mersereau, John Tsitsiklis

We consider a multiarmed bandit problem where the rewards of the arms are correlated through an unknown random variable with a prior distribution. The objective is to choose a sequence of arms that maximizes the expected total or discounted total reward. We demonstrate the effectiveness of a greedy policy that takes advantage of the known statistical correlation structure among the arms.

2 - A Product-focused Approach to Pricing Optimization on a Network
Darius Walczak, PROS Revenue Managment, 3100 Main Street, Suite 900, Houston, TX, 77382, United States of America, dwalczak@prosrm.com

We briefly review existing approximations to solve the dynamic pricing optimization problem on a network where different products consume different bundles of resources. These methods often rely on a decomposition of the network into a collection of single-resource subproblems. We contrast that with another approach built upon a product-based decomposition. We present new insights and some numerical examples.

3 - Nonlinear Approximate Dynamic Programming for Revenue Management
Dan Adelman, Professor of Operations Management, University of Chicago, Graduate School of Business, 5807 South Woodlawn Avenue, Chicago, IL, 60422, United States of America, dan.adelman@chicagogsb.edu, Canan Uckun

For a revenue management problem, we explore a strong functional form to approximate the optimal dynamic programming value function. Whereas most of the ADP literature employs weighted combinations of non-parametric basis functions, our basis functions are nonlinearly parameterized. We provide a solution methodology to solve the resulting non-linear program.

4 - The Linear Programming Approach for Markov Perfect Industry Dynamics
Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu, Gabriel Weintraub, Denis Saure

Dynamic models of imperfect competition are used in applied economics to analyze diverse dynamic phenomena. The computational complexity of solving for the equilibrium has severely limited the applicability of these models. We introduce approximation methods based on the LP approach to approximate dynamic programming that dramatically reduce the computational complexity. Our methods greatly increase the set of dynamic models of imperfect competition that can be analyzed computationally.

■ SC30

M - Washington 4

Search and Detection

Sponsor: Military Applications
Sponsored Session

Chair: Johannes Royset, Assistant Professor, Naval Postgraduate School, 1411 Cunningham Rd, Monterey, CA, 93943, United States of America, joroyset@nps.edu

1 - Efficient Employment of Reactive and Non-Reactive Sensors
Roberto Szechtman, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93940, United States of America, rszechtm@nps.edu, Moshe Kress

We consider sensors which are subject to false-positive and false-negative errors. The sensors search for threat objects that are located in a certain area of interest, which is divided into a grid of area-cells. An area-cell is said to be "determined" if the searcher can ascertain with a given high probability the presence or absence of at least one object. We develop models, rooted in stochastic approximation theory, that maximize the expected number of determined area-cells.

2 - Information Collection With A Physical State
Ilya Ryzhov, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08544, United States of America, iryzhov@Princeton.EDU, Warren Powell

Suppose that we have a graph whose edges have unknown rewards (or costs) that are independent of one another. We use sequential, noisy measurements of the rewards to refine Bayesian estimates of the true, unknown rewards. Our overall objective is to find the path with the highest total reward. The graph structure makes the problem fundamentally different from the well-known bandit problem. We must use the physical state to allocate measurements without enumerating all possible paths.

3 - Spatio-temporal Optimization for Multi-object Search and Identification
Timothy Chung, Naval Postgraduate School, Operations Research Department, 1411 Cunningham Road, Gl-261, Monterey, CA, 93943, United States of America, thchung@nps.edu, Moshe Kress, Johannes Royset

Consider a spatial region in which many dynamic agents (both true targets and neutral objects) are present and undergoing different stochastic motion models, respectively. Uncertain observations from multiple sensing modalities are fused to provide different levels and types of information. This work proposes an algorithm for optimal allocation of sensing resources in the presence of uncertainty and dynamic constraints which yields maximal probability of identification of true targets.

4 - Cooperative Autonomous Unmanned Systems for Air, Sea, and Ground Operations in Urban Environments
Jack Keane, Johns Hopkins University Applied Physics Laboratory, Laurel, MD, United States of America, jack.keane@jhuapl.edu

The Johns Hopkins University Applied Physics Lab (JHU/APL) has developed and demonstrated an innovative and scaleable autonomy and communications architecture for controlling swarms of heterogeneous, distributed vehicle systems, including UAV's, USV's, and UGV's. This presentation will highlight the enhancements of JHU/APL's mission-level autonomy over traditional unmanned vehicle control through a review of recently accomplished multi-UAV demonstrations.

■ SC31

M - Washington 5

Defense Logistics

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Charles H. Shaw, III, Vice President, Metron, Incorporated, 11911 Freedom Drive, Tower One, Suite 800, Reston, VA, 20190, United States of America, shaw@metsci.com

1 - A Multi-agent Framework for Collaborative Airlift Planning Using Commercial Air Assets
Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com, Aren Knutsen, Tom Mifflin

The Air Mobility Command (AMC) uses commercial air assets from the Civil Reserve Air Fleet (CRAF) to support strategic airlift. However, CRAF is a voluntary program and the support is expensive and disruptive for the carriers. We investigate a market-based approach, called the Virtual Transportation Company (VTC), that uses autonomous software agents representing the interests of each party to plan the airlift collaboratively.

2 - Enterprise Life Cycle Logistics Modeling and Visualization
Thomas Turner, Principal Operations Research Analyst, Concurrent Technologies Corporation, 100 CTC Drive, Johnstown, PA, United States of America, turnert@ctc.com, Norman Reitter

In support of U. S. Army G4 Dashboard efforts the Army Logistics Innovation Agency (LIA) is pursuing a project to improve visualization and analysis of "Cost of Readiness" (COR). LIA desires the ability to visualize readiness from both the unit and the weapon system perspective and the ability to analyze the implication of various policy decision. This presentation will examine the architecture and techniques used to provide visualization and analysis of COR.

3 - Reverse Logistics: Three New Case Studies and a Decision Making Framework
Theresa Barker, PhD Student, Industrial Engineering, University of Washington, Box 352650, Seattle, WA, 98195, United States of America, barkertj@u.washington.edu, Zelda Zabinsky

We will describe three new case studies in reverse logistics: 1) a medical manufacturer's machine refurbishing system, 2) a municipal e-waste curbside recycling system, and 3) a major carpet manufacturer's carpet recycling system. We will then illustrate a proposed decision making framework for reverse logistics using these new case studies.

4 - Gaining Insights & Improving Outcomes through Analysis, Modeling & Experimentation

Philip Fahringer, Ops Analyst, Lockheed Martin IS&GS, 8000 Harbour View Blvd, Suffolk, VA, 23435, United States of America, philip.fahringer@lmco.com

The focus elements of the presentation are: 1. Emphasis on analysis; modeling and experimentation are methods to support analysis, analysis does not always require modeling or experimentation in order to yield important insights. 2. Emphasis on gaining insights, primarily through appreciating uncertainty and complexity; not determining precise answers but improving understanding. 3. Emphasis on applying analysis to gaining insights regarding impacts to the most relevant outcomes.

■ SC32

M - Washington 6

Use of Simulation Modeling in the U.S. Federal Tax Administration and Analysis

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: John Guyton, Branch Chief, Office of Research, IRS, 500 N. Capitol Street, NW, Washington, DC, 20001, United States of America, John.Guyton@irs.gov

1 - Process Modeling and Business Rule Simulation: Experience at the Internal Revenue Service

Michael Stavrianos, Principal, ASR Analytics, LLC, 1389 Canterbury Way, Potomac, MD, 20854, United States of America, michael.stavrianos@asranalytics.com, Sean Hennessy

The IRS is responsible for the administration of a tax code whose rules span more than 10,000 pages - and for accurately applying these rules to the diverse situations of more than 100 million taxpaying entities. The IRS Office of Business Rules and Requirements Management is using process and rule modeling methodologies to optimize tax administration processes, and simulate alternative strategies. This paper will detail some of the tools, techniques, and recent accomplishments in this area.

2 - Integrating Micro- and Macro-level Models to Analyze Effects of Extending the 2001 & 2003 Tax Cuts

Ralph Rector, Financial Economist, US Treasury Office of Tax Analysis, 1500 Pennsylvania Ave., NW, 1045B, Washington, DC, 20220, United States of America, ralph.rector@do.treas.gov, Tracy Foretsch

We simulate the effects of extending select provisions of the 2001 and 2003 tax acts by integrating a microsimulation model of the federal individual income tax with a US macroeconomic model. We first calibrate both models to a common baseline forecast. We then iterate between the models so that both are calibrated to an alternative forecast that includes the effects of tax cut extensions on incomes. This income-adjusted forecast is used to estimate economic, revenue and distributional outcomes.

3 - A Discrete Event Simulation Approach to Post-filing Process Modeling

Erica Layne Morrison, Managing Consultant, IBM, 12902 Federal Systems Parkway Drive, Fairfax, VA, 22033, United States of America, elaynemorrison@us.ibm.com, David Brann, Sandy Lin, David Teale

Over the last 2 years, IRS Research has used discrete event simulation (DES) to model reengineering recommendations with operating divisions. In evaluating process changes, tax administrators consider revenue impacts, internal costs, and external taxpayer impacts. It is desirable, though challenging, to consider these impacts from within an integrated decision framework. We evaluate the success of the DES approach in providing such a framework.

4 - Provision of Services and Information to the Tax Payer

Kathleen Carley, Professor, School of Computer Science, Carnegie Mellon University, 5000 Forbes Avenue, 1323 Wean Hall, Pittsburgh, PA, 15213-3890, United States of America, kathleen.carley@cs.cmu.edu, Patricia McGuire

Service related resource and operational decisions are often made by taking a regional approach or by doing a minor variation on what was done in the past. Making these resource and operational decisions is exceeding difficult due to the complexity of the situation and the limitations of available data. We explore how computational reasoning can be used to support this process.

■ SC33

M - Johnson

Healthcare Flow: Uncertainty In Clinics

Sponsor: Health Applications Section
Sponsored Session

Chair: Mike Magazine, University of Cincinnati, Department of QAOM, College of Business, Cincinnati, OH, 45221, United States of America, mike.magazine@uc.edu

1 - Adaptive Appointment Systems Design

Wen-Ya Wang, University of Minnesota, Industrial and Systems Engineering, 111 Church St., Minneapolis, MN, 55455, United States of America, wenya@me.umn.edu, Diwakar Gupta

We describe an approach that utilizes time-stamp data in an adaptive learning algorithm to determine which combination of appointment times and service providers to make available to each patient who calls for an appointment. The objective is to maximize clinic's revenues and each patient's chance of booking an appointment.

2 - Optimization of Outpatient Appointment Scheduling Systems with Uncertainty in Patient Demand

S. Ayca Erdogan, North Carolina State University, Graduate Program in Operations Research, 375 Daniels Hall, Campus Box 7906, Raleigh, NC, 27695, United States of America, saerdoga@ncsu.edu, Brian Denton

In this talk, we focus on finding optimal appointment schedules when there is uncertainty in the load on a stochastic server. This has important applications to healthcare delivery systems with uncertainty in patient no-shows and short notice demand from urgent or emergent patients. We describe a two-stage Stochastic Linear Programming formulation, decomposition methods for solving it, and numerical results based on real data.

3 - Sequencing Patients in a Surgical Day-care Center: A Software Application

Brecht Cardoen, Katholieke Universiteit Leuven - Faculty of Business and Economics, Naamsestraat 69, Leuven, BE-3000, Belgium, Brecht.Cardoen@econ.kuleuven.be, Erik Demeulemeester

We present an application that visualizes the impact of patient sequencing on the availability of critical resources, such as recovery beds or medical instruments. The tool also incorporates diverse integer programming algorithms to optimize a multi-objective function, which includes amongst other the leveling of the recovery's bed occupation. Next to the development phase of the software application, we discuss both its implementation in a Belgian hospital and the resulting contributions.

4 - Outpatient Appointment Scheduling with Uncertainty in Patient Arrivals

Denise White, University of Cincinnati, Department of QAOM, Cincinnati, OH, 45221, United States of America, whited5@email.uc.edu, Michael Magazine

The efficiency and profitability of outpatient clinical operations is often seriously affected by patient arrival variability. The response of the outpatient clinic to early and late arrivals as well as no-show appointments is studied through an empirical simulation of a clinic with extreme variability in patient arrivals. The study examines the effect of various queue disciplines and service prioritizations on patient flow and clinical performance in order to meet operational service targets.

■ SC34

M - Jefferson

Planning and Scheduling Issues in Primary Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Nan Kong, Assistatnt Professor, Purdue University, 206 S. Martin Jischke Dr., West Lafayette, IN, United States of America, nkong@purdue.edu

1 - How Should We Design Primary Care Physician Panels?

Hari Balasubramanian, Mayo Clinic, Rochester, 200 First St. SW, Rochester, MN, United States of America, Balasubramanian.Hari@mayo.edu

We present a conceptual framework to help determine the optimal size and composition of physician panels in primary care. Our objectives are two key but conflicting measures for any practice: timely access, which provides patients with appointments whenever they need care; and continuity of care, which tries to have patients see their own assigned physician and develop a long-term patient-physician relationship. We analyze results using data from the primary care practice at the Mayo Clinic.

2 - Sequential Scheduling under General Service Time for Outpatient Clinics

Santanu Chakraborty, Purdue University, 203 Martin Jischke Drive, Mann Hall, Suite 225, West Lafayette, IN, 47907, United States of America, chakrabs@purdue.edu, Mark Lawley, Kumar Muthuraman

In this paper we develop a sequential scheduling algorithm under general service time where each patient is characterized by a certain probability of no-show. We show that the expected profit is unimodal which provides the necessary stopping rule. Also, we present an analysis for gamma service time.

3 - Modeling Flow for Patients Undergoing Lung Resection at a Tertiary Care Teaching Hospital

Abhik Bhattacharya, Graduate Student, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Ave., ENB 118, Tampa, FL, 33620, United States of America, abhattac@mail.usf.edu, Peter Fabri, Jose Zayas-Castro

This study models the flow of patients undergoing lung resection at a tertiary care teaching hospital. Data from administrative datasets are being used as surrogate markers of flow to model the clinical pathways (during an episode of care) of patients undergoing lung resection procedures. Through simulation, the usual and variant paths will be modeled. The modeling effort should help reduce delays and inefficiencies currently existing in the system.

4 - Integrating a Patient Demand Model into Decision Making Models in Open Access Clinics

Shelly Qu, Assistant Professor, North Carolina A&T State University, ISE Department, NC A&T State Univ., 1601 E. Market Street, Greensboro, NC, 27411, United States of America, xqu@ncat.edu, Jing Shi

Open access scheduling was introduced to improve the accessibility to outpatient clinics and reduce patient no-shows. However, the successful implementation of open access scheduling requires the match of daily healthcare provider capacity and patient demand. Since implementing new scheduling rules affects patient demands for appointments, we propose a patient demand model to capture this effect in this talk. This model can be used to determine optimal parameters in open access scheduling rules.

■ SC35

M - Jackson

Ninth Annual INFORMS Case Competition - Finalists #1 and #2

Sponsor: INFORM-ED
Sponsored Session

Chair: Michael Racer, Associate Professor, The University of Memphis, 334 Fogelman, Memphis, TN, 38152, United States of America, mracer@memphis.edu

1 - Ninth Annual INFORMS Case Competition

Michael Racer, Associate Professor, The University of Memphis, 334 Fogelman, Memphis, TN, 38152, United States of America, mracer@memphis.edu

The four finalists for the 2008 INFORMS Case Competition will deliver final presentations of their material to a panel of judges and the audience. All are welcome to attend and observe their presentations, as well as ask questions of the finalists. The winner of the competition will be selected by the judges at the end of the four presentations. The winner and runners-up will be announced at the annual INFORMed Business Meeting.

■ SC36

M - T. Marshall Ballroom East

O.R. in SpORts

Sponsor: O.R. in SpORts
Sponsored Session

Chair: Lori Houghtalen, Assistant Professor, Babson College, Math & Science Division, 316 Babson Hall, Babson Park, MA, 02457, United States of America, lhoughtalen@babson.edu

1 - There's No Place Like Home

Joel Sokol, Associate Professor, Georgia Tech, Stewart School of ISyE, Georgia Tech, Atlanta, GA, 30332-0205, United States of America, jsokol@isye.gatech.edu, Mark Brown

The successful LRMC method for predicting NCAA basketball tournament outcomes uses a significantly different value for home court advantage than is standard. We investigate the differences, and suggest an explanation for the effectiveness of LRMC's measure.

2 - Offensive Strategy Assessment in Basketball: A Case Study

Gilbert Fellingham, Brigham Young University, Provo, UT, United States of America, gwf@byu.edu, Shane Reese

In an effort to evaluate the effectiveness of a patterned offensive style, the number of times the ball was touched after crossing half court, the number of times the post player touched the ball, and the number of dribbles taken by the player who either took the shot or passed to the player taking the shot were recorded for each offensive possession in every game of a Division I collegiate basketball team's season. A Bayesian hierarchical model was used to estimate expected points.

3 - Incorporating NBA Schedule Imbalances in a Fantasy Basketball Draft

Lori Houghtalen, Assistant Professor, Babson College, Math & Science Division, 316 Babson Hall, Babson Park, MA, 02457, United States of America, lhoughtalen@babson.edu, George Recck

Many NBA fantasy leagues operate on a weekly schedule where rosters are fixed each week. Since fantasy points are accrued according to player performance in real-life play, the success of a fantasy team in a given week is impacted by the number of games played by teams represented on the fantasy roster. We investigate a fantasy drafting approach that incorporates NBA schedule imbalances, and compare the success of this strategy to strategies that do not take scheduling into account.

4 - Are Seeds Reliable Predictors of Outcomes in NCAA Division I (March Madness) Basketball Tournaments

James Cochran, Louisiana Tech University, PO Box 10318, College of Business, Ruston, LA, 71272, United States of America, jcochran@cab.latech.edu

In the annual NCAA Division 1 men's team basketball tournament (March Madness), we expect lower seeded teams to consistently defeat to higher seeded teams. Should this advantage diminish as the tournament progresses and the weaker teams are eliminated? To assess these (and other issues), we model the outcome of tournament games as a function of seed differential, round, bracket, and seed differential*round interaction.

■ SC37

M - T. Marshall Ballroom West

Tutorial: Using Operations Research to Reduce Delays for Health Care

Cluster: Tutorials
Invited Session

Chair: Linda Green, Armand G. Erpf Professor, Columbia Business School, 3022 Broadway, 423 Uris Hall, New York, NY, 10027, United States of America, lvg1@columbia.edu

1 - Using Operations Research to Reduce Delays for Health Care

Linda Green, Armand G. Erpf Professor, Columbia Business School, 3022 Broadway, 423 Uris Hall, New York, NY, 10027, United States of America, lvg1@columbia.edu

The Institute of Medicine identified "timeliness" as 1 of 6 key "aims for improvement" in its most recent report on healthcare quality. Yet patient delays remain prevalent resulting in dissatisfaction, adverse clinical consequences and often, higher costs. This talk will describe several areas in which patients routinely experience significant and potentially dangerous delays and present OR models which have been developed to help reduce these delays, often at little or no cost.

■ SC38

M - Tyler

Pseudo-Boolean Optimization in Memory of Peter L. Hammer

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Endre Boros, Professor, RUTCOR, Rutgers University, 640 Bartholomew Road, Piscataway, NJ, 08854, United States of America, boros@rutcor.rutgers.edu

1 - Set Cover and Pseudo-boolean Optimization

Guoli Ding, Professor, Department of Mathematics, Louisiana State University, Baton Rouge, LA, 70803-4918, United States of America, ding@math.lsu.edu

I will talk about a generalized set-covering problem and its connection with pseudo-Boolean optimization.

2 - On Connections between RLT and Lift-and-project Relaxations for Rank Two or More

Michel Minoux, Professor, University Paris 6, 4 Place Jussieu 75005 Paris, Paris, 75005, France, michel.minoux@lip6.fr, Hacene Ouzia

We show that known simple links between rank-1 Sherali-Adams (RLT) relaxation and rank-1 Lift-and-Project closure do not readily extend to rank 2 or more.To investigate this issue, we introduce a new hierarchy of relaxations, intermediate in strength between the RLT hierarchy and the L&P hierarchy. This new hierarchy is shown to coincide with RLT for MIPs arising from pseudoboolean function minimization. Some preliminary computational results are also reported.

3 - Linear Programming Plus Branch-and-cut for Solving Certain Difficult QUBO Problems

Gabriel Tavares, Dash Optimization, part of Fair Isaac, 560 Sylvan Avenue, Englewood Cliffs, NJ, 07632, United States of America, gabriel.tavares@dashoptimization.com, Endre Boros

A linear optimization framework is proposed to solve the Quadratic Unconstrained Binary Optimization (QUBO) problem. It consists of 2 stages: first it calculates an optimal Basic Feasible Solution (BFS) to the relaxation of the Linearization Model (LM) for QUBO plus some valid cuts; and second it solves LM enhanced with the subset of cuts binding at the BFS. The effectiveness of the approach, implemented using Xpress-Mosel, is shown when solving: minimum 3-partition, MAX-CUT and MAX-SAT.

4 - Applications of Autarkies and Persistencies in Quadratic Unconstrained Binary Optimization

Endre Boros, Professor, RUTCOR, Rutgers University, 640 Bartholomew Road, Piscataway, NJ, 08854, United States of America, boros@rutcor.rutgers.edu, Gabriel Tavares, Ramin Zabih, Ashish Raj

We present some new results on autarkies and persistencies for QUBO problems, and their application in a polynomial tike preprocessing algorithm. We demonstrate that in numerous applications, and in particular in image processing problems, these techniques lead to substantial reduction in problems sizes, and frequently provide a complete optimal solution.

■ SC39

M - Truman

Incentives and Networks

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Ramesh Johari, Stanford University, Terman Engineering Center, Room 319, 380 Panama Mall, Stanford, CA, 94305-4026, United States of America, ramesh.johari@stanford.edu

Co-Chair: Nicolas Stier-Moses, Columbia Business School, Uris 418, New York, NY, 10027, United States of America, ns2224@columbia.edu

1 - Targeted Coupon Distribution Using Social Networks

Srinivas Shakkottai, Assistant Professor, Texas A&M University, Room 332C WERC, Texas A&M University, College Station, TX, 77843-3128, United States of America, sshakkot@tamu.edu, Lei Ying, Ramesh Johari, Sanjay Shakkottai

Traditional targeted marketing either involves self identification of users, or mining social networks. We consider the scenario of a store that distributes discount coupons without such knowledge. Coupons can be transferred between friends. We propose a back pressure algorithm by which user preferences can be identified, and coupons can be transfered in a multihop fashion. We also study incentives for truth telling and compensation of users based on their impact on system performance.

2 - On the Interaction Between Content Distribution and Traffic Engineering

Ramesh Johari, Stanford University, Terman Engineering Center, Room 319, 380 Panama Mall, Stanford, CA, 94305-4026, United States of America, ramesh.johari@stanford.edu, Dominic DiPalantino

In the modern Internet, users are often interested in downloading specific pieces of content, rather than in connecting to a specific host. Since the same content is typically located at multiple places, the end system optimization over available content sources interacts directly with IP address-to-IP address flow optimization by traffic engineers. We present several theoretical results on this interaction.

3 - Two-Stage Myopic Dynamics in Network Formation Games

Esteban D. Arcaute, Stanford University, Stanford University, Mail Code 4042, Stanford, CA, 94305, United States of America, arcaute@stanford.edu, Ramesh Johari, Shie Mannor

We consider two-stage myopic dynamics for network formation games (NFG), where utility to a node is a function of the distance to all other nodes. Since our NFG is a generalization of Myerson's announcement game, we use pairwise Nash stability (PNS) as the solution concept. We prove that, although the price of anarchy of the static game is unbounded, our dynamics converge to PNS networks with constant efficiency ratio. For some utility functions, our dynamics converge to efficient networks.

4 - Non-Cooperative Resource Sharing by Internet Service Providers

Gireesh Shrimali, Assistant Professor, Indian School of Business, Gachibowli, Hyderabad, AP, 500032, India, Gireesh_Shrimali@isb.edu, Sunil Kumar

We study resource sharing by Internet Service Providers (ISPs) in a two ISP model. In absence of customer competition, we show not only that participation in sharing is guaranteed but also that one of the ISPs acts as a resource supplier since it has no incentive to use the other resource. In presence of customer competition, we show that, though participation is not guaranteed, intuitive sufficient conditions for the same may be derived under the special case of quadratic costs.

■ SC40

M - Taylor

Risk-Averse Optimization

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Darinka Dentcheva, Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, darinka.dentcheva@stevens.edu

1 - Cutting Plane Methods for Two Stage Problems with Conditional Risk Mappings

Andrzej Ruszczynski, Professor, Rutgers University, 94 Rockefeller Road, Piscataway, NJ, 08854, United States of America, rusz@business.rutgers.edu, Naomi Miller

We shall discuss two stage stochastic programming problems with risk measures used at both stages. We shall develop and compare cutting plane methods for solving such problems, and we shall illustrate the results on a financial planning problem.

2 - Duality Between Coherent Risk Measures and Stochastic Dominance Constraints in Optimization

Darinka Dentcheva, Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, darinka.dentcheva@stevens.edu, Andrzej Ruszczynski

We consider optimization problems with nonlinear second order stochastic dominance constraints formulated as relations of Lorenz curves. We demonstrate that mean-risk models with law invariant coherent risk measures appear as dual optimization problems to the problems with stochastic dominance constraints.

3 - An Augmented Lagrangian Method for Problems with Probabilistic Constraints

Gabriela Martinez, Student, Stevens Institute of Technology, 1 Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, mgml1979@gmail.com, Darinka Dentcheva

We consider nonlinear stochastic optimization problems with probabilistic constraints. An augmented Lagrangian method for solving a convexification of the problem will be presented. The algorithm yields an optimal solution for problems involving r-concave probability distributions. For arbitrary distributions, the algorithm provides bounds for the optimal value and nearly optimal solutions. The method is compared numerically to two cutting plane methods.

4 - The Multi-Product Risk-Averse Newsvendor with Law Invariant Coherent Measures of Risk

Sungyong Choi, PhD Candidate, Rutgers Business School, 180 University Avenue, #37, Newark, NJ, 07102, United States of America, sungyongchoi@gmail.com, Andrzej Ruszczynski, Yao Zhao

We consider an optimization model for a multi-product newsvendor with law-invariant coherent measures of risk. We first establish a few important properties for the model that characterize the convexity of the problem and the impact of risk aversion. For identical products with independent demands, increased risk aversion leads to decreased orders. For a large but finite number of different products with independent demands, we derive closed form approximations of the optimal order quantities.

■ SC41

M - Taft

Empirical and Experimental Research on Managing Innovation

Cluster: New Product Development
Invited Session

Chair: Kamalini Ramdas, Associate Professor, University of Virginia, 189 FOB, 100 DArden Blvd, Charlottesville, VA, 22902, United States of America, RamdasK@Darden.virginia.edu

1 - Mastering Uncertainty in Telecom New Ventures in Israel
Christoph Loch, Professor of Technology Management, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France, Christoph.LOCH@insead.edu, Svenja Sommer

We describe the approaches used to respond to high uncertainty in a sample of 50 telecom software new venture companies in Israel. We find limitations in how project management in these companies is adapted to the challenges of uncertainty and complexity, and we document the barriers causing these weaknesses.

2 - Idea Generation and the Quality of the Best Idea
Karan Girotra, Professor, INSEAD, Boulevard De Constance, Fontainebleau, 77300, France, karan.girotra@insead.edu, Christian Terwiesch, Karl Ulrich

Creative problem solving often entails generation of multiple solutions to a problem followed by the selection of the top few. We examine the effectiveness of alternate solution generation and selection processes. Existing literature formalizes effectiveness as the average quality of solutions generated; we argue that the quality of the best solutions identified in the process is a more relevant metric. We then re-examine the prescriptions from existing literature using our alternate metric.

3 - The Impact of Component Choice on Outcomes in Total Hip Replacement Surgery
Kamalini Ramdas, Associate Professor, University of Virginia, 189 FOB, 100 DArden Blvd, Charlottesville, VA, 22902, United States of America, RamdasK@Darden.virginia.edu, Steven Stern, Khaled Saleh

Using a multi-year data set from the University of Virginia Hospital, we examine the impact of surgeons' device choices on outcomes in total hip replacement surgery. We examine learning effects related to increased experience with specific surgical components, as well as design effects related to how well the components used are suited to specific cases.

■ SC42

M - McKinley

Advances in Global Optimization

Sponsor: Optimization/ Global Optimization
Sponsored Session

Chair: Nick Sahinidis, John E. Swearingen Professor, Carnegie Mellon University, Department of Chemical Engineering, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, sahinidis@cmu.edu

1 - Adaptive Parameterized Improving Hit-and-run for Global Optimization
Wei Wang, Graduate Student, University of Washington, Industrial Engineering,, Box 352650, Seattle, WA, 98115, United States of America, wangwei@u.washington.edu, Zelda Zabinsky, Archis Ghate

We generalize Improving Hit-and-Run (IHR) by parameterizing its step-size distribution. We adaptively tune the parameter based on the success rate of obtaining improving points. Analytical and numerical results on spherical programs and optimization problems with Lipschitz continuous objective functions are presented to illustrate the relationship between the parametrization and algorithm performance.

2 - Recent Applications of the Multi-start Global Optimization Algorithm MSNLP
Leon Lasdon, University of Texas, Austin, TX, Leon.Lasdon@mccombs.utexas.edu, Zsolt Ugray, John Plummer, Michael Bussieck

The multi-start global optimization algorithm MSNLP starts a local NLP solver from a filtered subset of points generated by a starting point generator or "driver." Recent improvements include dynamic distance and merit filters and stochastic drivers as alternatives to OptQuest. We describe some recent applications of this system to GAMS models of fixed-mix multiperiod investing and to fitting a waterflooding oilfield model to field data.

3 - A Deterministic Lagrangian-based Global Optimization Approach for Large Scale Decomposable Problems
Jeremy Michalek, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Scaife Hall 323, Pittsburgh, PA, 15213, United States of America, jmichalek@cmu.edu, Aida Khajavirad

We propose a deterministic approach for global optimization of large-scale nonconvex problems with decomposable structure using Lagrangian decomposition to generate tight lower bounds in the branch and bound tree. We apply the proposed method to several product line optimization problems. The proposed method shows encouraging efficiency and scalability, enabling solution of large, highly nonconvex problems that cause difficulty for existing solvers.

4 - Provably Near-optimal Solutions for Very Large Single-row Facility Layout Problems
Miguel Anjos, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, manjos@uwaterloo.ca, Ginger Yen

The single-row facility layout problem is concerned with the optimal arrangement of rectangular facilities along a line. Recently, the combination of a semidefinite programming relaxation with cutting planes computed globally optimal layouts for SRFLPs with up to 30 facilities. We propose a new semidefinite programming relaxation with a reduced number of linear constraints, and use it to compute nearly-optimal solutions for instances with up to 100 facilities.

■ SC43

M - Balcony D

Effective Supply Chain Design Under Disruptions

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: John Buzacott, Professor, York University, Schulich School of Business, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada, jbuzacot@schulich.yorku.ca

1 - Supply Chain Network Design from Primary Members' Perspectives under Uncertainty
Jun Zhang, Assistant Professor, North Dakota State University, 1410 14th Avneue N, CIE Building 202E, Fargo, ND, 58105, United States of America, jun.zhang@ndsu.edu

The supply chain network design problem is one of the most comprehensive strategic decision problems that need to be optimized for the long-term efficient operation of whole supply chain. To build a powerful and stable enterprise, the owner should consider supply chain primary members' profits in supply chain network design.This paper introduces a supply chain network model in which the profits of primary members of the supply chain (the owner, first-tier suppliers, and dealers) are considered.

2 - Contract Design for Risk Sharing Partnerships in Manufacturing
John Buzacott, Professor, York University, Schulich School of Business, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada, jbuzacot@schulich.yorku.ca, H Steve Peng

The development of extensive partnerships with suppliers has become a characteristic of manufacturing, particularly in the aircraft and automobile industries. The paper examines how appropriate risk sharing contracts enable the sharing of market risks among the partners. The value of having financial partners as well as manufacturing partners is demonstrated. We also show the benefits of supplier partners supplying competitors, even with positive correlation between competitor demands.

3 - A DEA Framework to Performance Risks: New Concepts and Applications to Supply Chain Management
Chien-Ming Chen, PhD Candidate, Rotterdam School of Management, Erasmus University, PO Box 1738, Burg. Oudlaan 50, Rotterdam, 3000DR, Netherlands, cchen@rsm.nl

Performance variations of chain members have a far-reaching consequence for the entire supply chain. However, performance risks have been a neglected topic in the literature. Existing studies mostly focus on market related risks and the risk of supply disruption. I develop a framework comprising Data Envelopment Analysis (DEA) and simulation techniques to analyze performance variations under two general problem scenarios; I also provide some potential applications of the framework to SCM.

■ SC44

M - Balcony C

Disruptions Modeling

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Thomas G. Schmitt, Foster School of Business, University of Washington Seattle, Seattle, WA, United States of America, glennsch@u.washington.edu

Co-Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Markov Decision Process with Risk

Toshikazu Aiyama, Professor, Tokyo Metropolitan University, 1-1 Minami-Ohsawa, Hachi-Ohji, 192-0397, Japan, tyaiyama@yahoo.com

Consider an optimal policy in expected reward. Supposed a stream of periodic reward is somewhat turbulent following the optimal policy. An alternate policy is not optimal in expected reward sense, but produces lower variance in a stream of periodic reward. We will evaluate the difference in both expected reward, and variance.

2 - Security Risk Management of Confidential Information in Social Networks

Manuel Nunez, Associate Professor, School of Business, University of Connecticut, 2100 Hillside Road Unit 1041, Storrs, CT, 06269, United States of America, mnunez@business.uconn.edu

Information sharing in social networks could lead to security risks when snoopers can gain indirect access to or collude to infer confidential information through the network. Releasing information to a well-connected user could represent a security threat. We study mathematical models relating disclosure risk to social network topology.

3 - A Stochastic Game Model on Overseas Cargo Container Security

Niyazi Bakir, Postdoctoral Researcher, University of Southern California, 3710 McClintock Ave., Room 322, Los Angeles, United States of America, nbakir@usc.edu, Erim Kardes

This study examines the security of incoming overseas cargo at US ports of entry. We propose a stochastic game model that explores risks at various phases of container movement starting from shipment from a warehouse in a foreign country. We model decisions for both the adversary and the defender to understand the equilibrium behavior in the system as well as the cost effectiveness of countermeasures.

■ SC45

M - Balcony B

Cooperation, Competition and Supply Chain Contracts

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Eda Kemahlioglu Ziya, UNC-Chapel Hill, CB # 3490, Chapel Hill, NC, United States of America, Eda_KemahliogluZiya@unc.edu

1 - Role of Quality Investment in Entry Deterrence

Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu, Ozgen Karaer

We study a monopolist's pricing and quality strategies to blockade, deter or accommodate an entrant when entry is in fact avoidable. We also consider the scenario that entry is bound to happen and find the impact of timing and collaboration in the duopoly market. Our model can describe particular platform product markets and hence explain some pricing trends, such as harsh pricing competition, that are observed between the Xbox and Playstation video game consoles.

2 - Competing Manufacturers in a Retail Supply Chain: On Contractual Form and Coordination

Gerard Cachon, The Wharton School, University of Pennsylvania, 3730 Walnut St., JMHH Suite 500, Philadelphia, PA, 19104, United States of America, cachon@wharton.upenn.edu, Gurhan Kok

Retailers commonly sell products from competing manufacturers. How then should firms manage their contract negotiations? The supply chain coordination literature focuses either on a single manufacturer selling to a single retailer or one manufacturer selling to many (possibly competing) retailers. We find that some key conclusions from those market structures do not apply in our setting - manufacturers may prefer wholesale-price contracts over sophisticated coordinating contracts.

3 - Does a Manufacturer Benefit from Selling to a Better-Forecasting Retailer?

Terry Taylor, Associate Professor, U.C. Berkeley, Haas School of Business, Berkeley, CA, 94708, United States of America, taylor@haas.berkeley.edu, Wenqiang Xiao

A manufacturer sells to a retailer with private demand-forecast information. We show that the manufacturer's profit is nonmonotone in the retailer's forecasting accuracy: The manufacturer benefits from selling to a better-forecasting retailer if and only if the retailer is already a good forecaster. If the retailer has poor forecasting capabilities, then the manufacturer is hurt as the retailer's forecasting capability improves.

4 - Partner Selection in Contracting for Capacity under Renegotiation

Eda Kemahlioglu Ziya, UNC-Chapel Hill, CB # 3490, Chapel Hill, NC, United States of America, Eda_KemahliogluZiya@unc.edu

Consider a supply chain with a single supplier of capacity and two buyers. The buyers first negotiate their unit prices with the supplier and place orders. After demand realization they are allowed to trade capacity. The questions we are interested in include: How does capacity trading change the optimal order quantities? Do the players prefer to partner with strong or weak negotiators?

■ SC46

M - Balcony A

Retail Supply Chain Management I

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Narendra Agarwal, Operations & Management Information Systems Santa Clara University, Santa Clara, CA, United States of America, NAgrawal@scu.edu

1 - Do Upstream Stockouts Matter? A Natural Experiment at Fashion Manufacturer Costis Moros

Nicole DeHoratius, Nicole.DeHoratius@ChicagoGSB.edu, Ananth Raman

We observe a natural experiment at fashion manufacturer Costis Moros that entails changing the frequency with which orders are placed from monthly to weekly. This change results in a 30% increase in sales across its retail customers, without controlling for other factors. We explore what operational advantages arose from this change in order frequency and, with the introduction of controls, assess whether this order change alone accounts for the dramatic increase in sales. In so doing, we identify the value of being in-stock among upstream parties and provide evidence contrary to classic multi-echelon inventory models that assume stockout costs are incurred only at the lowest echelon.

2 - Decomposing Retailers' Same Store Sales Growth Rate to Forecast Performance

Saravanan Kesavan,University of North Carolina at Chapel Hill, 27516, United States of America, skesavan@unc.edu, Ananth Raman

Most US public retailers announce their same store sales growth rate. Investors pay close attention to this metric as they believe it is an indicator of future financial performance. In this paper, we argue that it is important to identify the reasons for growth as they have different implications for future performance. Further, we present a new metric that adjusts for the causes of growth and show that it contains information that can be used to predict future financial performance.

3 - The Effect of Labor on Profitability at Retail Stores: The Role of Quality

Zeynep Ton, Harvard Business School, Morgan Hall 425, Boston, MA, 02163, United States of America, zton@hbs.edu

Determining the appropriate amount of labor requires an understanding of marginal costs and benefits of increasing labor.One benefit of increased labor is improved quality.I examine how the amount of labor affects profitability through its impact on conformance and service quality at retail stores.Using data from stores of a large retailer,I find that increasing the amount of labor is associated with an increase in profitability through its impact on conformance quality but not service quality

4 - Assortment Planning in Retail Chains

Narendra Agarwal, Operations & Management Information Systems Santa Clara University, Santa Clara, CA, United States of America, NAgrawal@scu.edu

Many of the recent paper on assortment planning fail to capture an important phenomenon - category effect of key items. We formulate a model to capture category effects of items in addition to substitution, and develop an LP based approximation methodology to solve it. We use a numerical case study to illustrate key insights about assortment planning.

■ SC47

M - Hoover

Emergency Services

Sponsor: Health Applications Section
Sponsored Session

Chair: Shane G. Henderson, Associate Professor, Cornell University, 230 Rhodes Hall, Ithaca, NY, 14853, United States of America, sgh9@cornell.edu

1 - Scheduling Paramedics and Ambulances with a Flexible Hybrid Tabu Search and MIP Resolution Method

Michel Gendreau, Professor, Université de Montréal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michel.gendreau@cirrelt.ca, Patrick Soriano, Julien Crowe

We present a two-phase hybrid approach developed to solve the paramedic personnel scheduling problem in the greater Montréal region. The first phase, which is solved by a tabu search heuristic, deals with the major strategic issues of the problem (paramedics' preferences, ergonomic quality of the schedule, and demand coverage on a coarse time scale). The second phase tackles the more detailed aspects left out initially to improve the first phase schedule and make it implementable using MIP.

2 - Simulation and Optimisation for Ambulance Logistics and Relocation

Lei (Oddo) Zhang, University of Auckland, 70 Symonds Street, Auckland, N, New Zealand, min.oddo@gmail.com, Jeff Meyer

Two decision support products developed by Optima for Public Safety organizations are demonstrated; Siren Predict and Siren Live. Siren Predict is a simulation-based system used for strategic planning and accurately estimating operational performance. Siren Live is an optimization-based system for improving emergency response time by relocating idle vehicles in real-time. We present a new approach for ambulance relocation using Dynamic Programming, and show insights obtained from simple cases.

3 - A Birth Death Model for the Performance of an EMS System with Re-positioning

Ramon Alanis, University of Alberta, School of Business, University of Alberta, Edmonton, AB, T6G2R6, Canada, ramon.alanis@ualberta.ca, Bora Kolfal, Armann Ingolfsson

We present a Markovian Birth and Death model for the behavior of an EMS system, and how it can be used to estimate its expected performance. We demonstrate how it can be used to estimate the effects of changes in repositioning policies, and validate the model with field data.

4 - Ambulance Redeployment Using Approximate Dynamic Programming

Shane G. Henderson, Associate Professor, Cornell University, 230 Rhodes Hall, Ithaca, NY, 14853, United States of America, sgh9@cornell.edu, Mateo Restrepo, Huseyin Topaloglu

Ambulance redeployment is the practice of repositioning idle ambulances in real time to compensate for other ambulances that are busy, in an attempt to improve response times to calls. We use approximate dynamic programming, in conjunction with discrete-event simulation. The key step is to identify a suitable class of basis functions. We sketch the overall methodology, describe the basis functions used, and provide computational results.

■ SC48

M - Coolidge

Entrepreneurship and Decision Making

Sponsor: Technology Management
Sponsored Session

Chair: Moren Levesque, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, levesque@engmail.uwaterloo.ca

1 - Evolution, Games, and Entrepreneurship

Graciela Kuechle, Post-doc research assistant, Witten-Herdecke University, Alfred-Herrhausen-Str. 50, Witten, NR, 58448, Germany, Graciela.Kuechle@uni-wh.de

We obtain conditions under which symmetric and asymmetric evolutionary stable equilibria could be played by a population of agents who engage in entrepreneurship and agents who do not, and explain how equilibrium payoffs to entrepreneurs and non-entrepreneurs could help address the question of whether entrepreneurs differ from other economic agents.

2 - Market Positioning of Technologically Advanced Products

John Angelis, Rochester Institute of Technology, 105 Lomb Memorial Drive, Rochester, NY, United States of America, jangelis@saunders.rit.edu

A first mover sets price and product quality to attract the most profitable market segments. However, such a strategy may not be optimal if a late entrant offers higher quality. We investigate this trade-off in optimal product positioning given typical segment characteristics for a technologically advanced new product.

3 - Market Payoff Estimation for Innovative Projects under Intense Competition

Leonardo P. Santiago, Assistant Professor, Federal University of Minas Gerais, Escola de Engenharia, Av. Antonio Carlos, 6627 - Pampulha, Belo Horizonte, MG, 31270-901, Brazil, lsantiago@ufmg.br, Daniel T. Elòi-Santos

We consider the problem of marketing payoff estimation for innovative projects, taking into account the high competition throughout the innovation life cycle. Motivated by the practical relevance and the gap in the current literature, we developed a game theoretical model for predicting an innovation's potential reward in oligopolistic markets. We analyze the impact of input parameters on the innovation value and discuss the model's practical implementation.

4 - Strategic Interaction between an Established Pioneer and a Startup Follower: Capacity and Entry Time

Moren Levesque, Associate Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, levesque@uwaterloo.ca, Xuan Zhao

This paper considers a situation where a market for a potential new product is emerging, but the market-ready time is unknown. An established pioneer is interested in occupying that market and a startup is also interested in growing and entering that market. We provide analytical results on the market equilibrium. The results provide insights on business strategies in emerging markets to the managers of both established and new firms.

■ SC49

M - Harding

Efficient Simulation and Optimization II

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Chun-Hung Chen, Professor, George Mason University, 4400 University Drive, MS 4A6, SEOR Dept, GMU, Fairfax, VA, 22030, United States of America, cchen9@gmu.edu

Co-Chair: Loo Hay Lee, Associate Professor, National University of Singapore, 10 Kent Ridge Crescent, Singapore, 119260, Singapore, iseleelh@nus.edu.sg

1 - Fully Sequential Procedures with Dormancy for Comparing Constrained Systems

Christopher Healey, Doctoral Student, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, chealey@isye.gatech.edu, Seong-Hee Kim, Sigrun Andradottir

We present procedures for finding the best system satisfying a stochastic constraint. Our approaches improve on other fully-sequential algorithms for solving such constrained comparison problems by halting sampling for systems found to be inferior to other systems until the feasibility of the superior systems is determined. We provide results that show the validity of our procedures and savings over competing approaches.

2 - Applications of Ordinal Optimization: Some Examples

Qing-Shan Jia, Lecturer, Center for Intelligent and Networked Systems, Department of Automation, Tsinghua University, Beijing, 100084, China, jiaqs@tsinghua.edu.cn, Qianchuan Zhao, Yu-Chi Ho

Ordinal optimization is a method developed for the optimization of complex systems via simulation models or other computation-intensive models involving possible stochastic effects and discrete choices. After briefly reviewing this approach, in this talk we present the various successful applications of ordinal optimization in manufacturing systems and decision making, in problems with multiple objective functions and constraints.

3 - Cycle Time Constrained Priority Mix Optimization Based on Decomposition Approximation Model

Shi-Chung Chang, Professor, National Taiwan University, Rm. 245, Department of Electrical Engineering, National Taiwan University, Taipei, 10617, Taiwan - ROC, scchang@cc.ee.ntu.edu.tw, Shin-Shyu Su, Yu-ting Kao, Bo-Jiun Liao

We optimize the priority mix of semiconductor manufacturing under cycle-time target constraints. It is built on top of a novel, hybrid decomposition-approximation-based priority queueing network for quick evaluation of cycle-times under given priority mix, price, and capacity utilizations. Comparisons with simulation models for applications to supply chain management are performed.

4 - A Ranking and Selection Procedure for a Transient Mean Performance Measure

Doug Morrice, Professor, University of Texas at Austin, Red McCombs School of Business, 1 University Station, B6500, Austin, TX, 78712, United States of America, Douglas.Morrice@mccombs.utexas.edu, Mark Brantley, Chun-Hung Chen

We develop a Ranking and Selection procedure for selecting the best configuration based on a transient mean performance measure. The procedure extends the OCBA approach to systems whose means are changing over time. We discuss a few motivating examples for this approach.

5 - Multi-objective Simulation Optimization

Loo Hay Lee, Associate Professor, National University of Singapore, 10 Kent Ridge Crescent, Singapore, 119260, Singapore, iseleelh@nus.edu.sg, Ek Peng Chew, Suyan Teng

In this talk, we will present few new developments of the MOCBA techniques and we will also show the numerical results in comparing theses new developments.

■ SC50

M - Wilson C

Computational Optimization Theory and Software

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Jitamitra Desai, Lehigh University, 200 W Packer Ave, Bethlehem, PA, United States of America, jdesai@lehigh.edu

1 - FilMINT: An Outer-approximation-based Solver for Mixed Integer Nonlinear Programs

Kumar Abhishek, Department of Industrial and Systems Engineering, Lehigh University, Bethlehem, PA, United States of America, kua3@Lehigh.EDU, Sven Leyffer, Jeff Linderoth

We describe a new solver, FilMINT, for MINLPs that implements a linearization-based algorithm in a branch-and-cut framework. The MINTO framework allows us to easily employ cutting planes, primal heuristics, and other well-known MILP enhancements for MINLPs. We offer new suggestions for generating and managing linearizations that are shown to be efficient on a wide range of MINLPs. Comparisons to existing MINLP solvers are presented, that highlight the effectiveness of FilMINT.

2 - Evolutionary Stochastic System Simulation and Optimization

Shengnan Wu, Research Assistant, University of Pittsburgh, 1048 Benedum Hall, Industrial Engineering, Pittsburgh, PA, 15261, United States of America, SHW14@pitt.edu, Ken Sochats, Larry Shuman, Bopaya Bidanda, Oleg Prokopyev, Carey Balaban, Matthew Kelley

To better address the dynamic nature of complex stochastic systems, we develop a procedure to partition the time series and perform simulations in smaller intervals. Based on the simulation framework, a metaheuristic is designed for online optimization that integrates analytical models and offline experimental results, while still accounting for stochastic factors. The methodology is applied to the problem of emergency response logistics.

3 - SCIP - Solving Constraint Integer Programs

Kati Wolter, PhD Candidate, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, wolter@zib.de, Tobias Achterberg, Timo Berthold

The novel paradigm of constraint integer programming integrates constraint programming and mixed integer programming modeling and solving techniques. We introduce the software SCIP which is a solver and framework for constraint integer programming that also features SAT solving techniques. SCIP comes with all of the necessary components to solve mixed integer programs and is currently one of the fastest non-commercial mixed integer programming solvers.

4 - A Mixed Integer Bilevel Programming Solver

Scott DeNegre, Lehigh University, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, sdenegre@Lehigh.EDU, Ted Ralphs

We consider novel solution approaches for mixed integer bilevel programs (MIBLPs). Extensions to polyhedral techniques developed for MIPs are derived and new classes of valid inequalities are introduced, leading to a branch-and-cut algorithm. New branching rules based on the value function of the lower-level problem are discussed. The Mixed Integer Bilevel Solver (MibS), an open-source solver for MIBLP that utilizes CHiPPs, will be described.

■ SC51

M - Wilson B

Empirical Investigations in Electronic Commerce

Sponsor: Information Systems
Sponsored Session

Chair: Subhajyoti Bandyopadhyay, Assistant Professor, University of Florida, 351 Stuzin Hall, PO box 117169, Gainesville, FL, 32611, United States of America, shubho.bandyopadhyay@gmail.com

1 - Location and Time Effects on the Long Tail of Website Requests

Chetan Kumar, Assistant Professor, California State University San Marcos, College of Business Administration, California State University, San Marcos, CA, 92096, United States of America, ckumar@csusm.edu, Yi Sun, John B. Norris

The visitation of users to websites can be captured by a long tail model which demonstrates that there are a few very popular websites and a large number of infrequently requested websites. In this study we investigate this phenomenon by using real world data and show how users' location and time of access affects this long tail model.

2 - Impact of E-procurement on Suppliers: An Empirical Investigation

Chandrasekar Subramaniam, Assistant Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC, 28223, United States of America, csubrama@email.uncc.edu

Even though B2B e-procurement has been adopted by many organizations as buyers, full participation by suppliers is needed if the whole supply chain is to benefit. This paper studies the economic benefits of e-procurement for suppliers using an empirical study and attempts to fill the gap in our understanding of e-procurement impact on supply chains. The paper will propose optimal technology and business policies to help buyers and sellers compete as a supply chain against other supply chains.

3 - Complexity Arbitrage and Offshore Outsourcing of Services Evidence from Field Research

Ravi Aron, Asst. Professor, The Marshall School of Business, Bridge Hall 401-P, 3670 Trousdale Parkway, Santa Monica, CA, 90403, United States of America, arunkund@marshall.usc.edu, Praveen Pathak, Ying Liu

We study the global sourcing of business processes and investigate the factors that contribute to process complexity. We find that process complexity is highly subjective and perceptions of process complexity are driven by factors that have to do with task structure. We investigate the links between process complexity and operational risk based on panel data collected from field research.

■ SC52

M - Wilson A

The Impacts of Environmental Legislation

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Ravi Subramanian, Asst. Professor, College of Management, Georgia Tech, 800 West Peachtree St., Atlanta, GA, 30341, United States of America, ravi.subramanian@mgt.gatech.edu

1 - The WEEE-directive Revised? Alternative Measures for Sustainable Recovery

Rob Zuidwijk, Associate Professor, Rotterdam School of Management - Erasmus University, Burgemeester Oudlaan 50, Rotterdam, NA, 3062PA, Netherlands, RZuidwijk@rsm.nl, Harold Krikke

According to the European directive on Waste Electrical and Electronics Equipment, all member states must have an operational End Of Life recovery system. We present an analytical model to study the impacts of the directive and other policy measures on Pareto optimal recovery strategies in terms of energy production and economic revenues. We apply the model to five product categories and observe that the directive is often ineffective or counterproductive. We explore alternative policy measures.

2 - Misalingned incentives in Take-Back Legislation

Atalay Atasu, Assistant Professor, Georgia Tech., College of Management, Atlanta, GA, 30308, United States of America, atalay.atasu@mgt.gatech.edu, Ravi Subramanian

Product take-back legislation is picking up momentum worldwide. In some cases, manufacturers are responsible for the costs of end-of-life treatment while in other cases consumers are responsible. We aim to address the following questions: How would manufacturers respond to take-back legislation through product design and pricing? How do the alternative take-back formats compare? How does customer valuation of environmental product attributes impact the manufacturer's decisions?

3 - Firm Level Environmental Strategies

Ravi Subramanian, Asst. Professor, College of Management, Georgia Tech, 800 West Peachtree St., Atlanta, GA, 30341, United States of America, ravi.subramanian@mgt.gatech.edu, Cheryl Gaimon, Markus Biehl

We introduce a model to analyze a firm's strategic choice of environmental efforts to control the quantity and toxicity of waste. We consider legislative penalties and subsidies that may vary continuously over time and assess the effects of legislative choice, firm size, and the value of accrued knowledge on the firm's environmental efforts.

4 - Green Renewal: The Role of Technology and Sustainability in Equipment Replacement Decisions

Thomas Sloan, Professor, UMass Lowell, College of Management, One University Avenue, Lowell, MA, 01854, United States of America, Thomas_Sloan@uml.edu

Traditional equipment replacement models assume like-for-like replacement and focus only on cost measures. How can factors related to sustainability be incorporated into replacement decisions? And how do technological advances play a role? An MDP model of a single-machine replacement problem is developed to explore these questions, with particular emphasis on the policy/regulatory aspects of the decision.

■ SC53

M - Nathan Hale- Wardman Tower

Investment and Hedging Strategies

Sponsor: Financial Services
Sponsored Session

Chair: Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu

1 - Dynamic Hedging of Portfolio Credit Derivatives

Yu Hang Kan, Columbia University, 500 West 120th Street, New York, NY, 10027, United States of America, yk2246@columbia.edu, Rama Cont

In this paper, we study hedging of synthetic CDO with the underlying CDS index in various top-down models. Numerical results obtained in models calibrated to iTraxx market data reveal significant differences in the hedge ratios and show, unlike what has been previously suggested in the literature by comparing copula-based models, that hedging strategies are subjected to a substantial amount of model risk.

2 - Electric Power Financial Hedging Strategy

Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu, Chung-Hsiao Wang

Electric power utilities often use financial forward contracts to hedge against risk exposure of their physical power. Because financial forward market is not liquid for non-peak hours, we investigate the strategy of selling additional on-peak forwards to hedge against risk exposure of non-peak power. Optimal amount of on-peak forwards is determined by value at risk (VaR) approach which measures the maximum loss expected within a given time period.

3 - Short Sales and Derivatives in Log-Robust Portfolio Management

Aurelie Thiele, P.C. Rossin Asst Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@lehigh.edu, Ban Kawas

We incorporate short sales and derivatives to our recently developed log-robust optimization model, where the uncertainty is on the continuously compounded rates of return - in line with the traditional Lognormal model - but probability distributions are not known. We develop heuristics and present insights into the structure of the optimal policy as well as numerical results.

■ SC54

M - Congressional - Wardman Tower

Joint Session OS/TM: Learning and Performance

Sponsor: Organization Science, Technology Management
Sponsored Session

Chair: Heather Berry, Wharton School, Management Department. 2000 Steinberg Hall- Dietrich Hall, Philadelphia, PA, berryh@wharton.upenn.edu

1 - Learning and Technology Adoptions

Sebastian Scholz, University of Munich, Amalienstrasse 17, Munich, 80333, Germany, Sebastian.Scholz@lrz.uni-muenchen.de

This paper will be the first that sets up a framework, that examines the optimal mixture of sales and process innovation subsidies, where innovation costs depend on time and production costs on cumulative quantity in the presence of learning. Expertise spills over and an innovation is a substitute for learning. In the optimal control framework, a process innovation or sales subsidy increases the price before the date of innovation and decrease it afterwards; the welfare effect might be negative.

2 - Half-life Theory of Learning Curves for Project Performance Analysis

Adedeji Badiru, Professor and Department Head, Air Force Institute of Technology, AFIT/ENV 2950 Hobson Way, Wright Patterson Air Force Base, Dayton, OH, 45433, United States of America, adedeji.badiru@afit.edu

There is an increasing interest in the behavior of learning curves for performance analysis. In Physics, half-life is used to assess the stability of radioactive substances. This provides an analogy for modeling half-life of learning curves with recognition of diminishing cost with respect to increases in production level. In this paper, we introduce computational equations for half-life analysis of classical and contemporary learning curves with applications to project performance analysis.

3 - Hierarchy, Team Familiarity, and Capability Development: Evidence from Indian Software Services

Brad Staats, Doctoral Candidate, Harvard Business School, Morgan Hall 428B, Boston, MA, 02163, United States of America, bstaats@hbs.edu

I explore how hierarchical team familiarity (managers' experience with engineers) and horizontal team familiarity (engineers experience with one another) influence the development of organizational capabilities. I also consider whether these familiarity measures moderate the relationship between project complexity and performance. Using longitudinal data on software projects (over 1,100 projects & 13,000 individuals), I show that capabilities grow through the strengthening of individual ties.

4 - Learning from Frontline Employees' Safety Concerns

Anita Tucker, Assistant Professor, Harvard Business School, Soldiers Field, Morgan Hall 431, Boston, MA, 02163, United States of America, atucker@hbs.edu, Sara J. Singer, Jennifer E. Hayes

We present results from an intervention to improve safety at 20 hospitals. The intervention consisted of solicitation of safety concerns; resolution; and communication of resolutions. The intervention improved frontline employees' and managers' perceptions of safety. Resolution of higher percentages of concerns was associated with greater improvement.

■ SC55

M - Embassy- Wardman Tower

Joint Session TELCOM/CS: Network Design Issues

Sponsor: Telecommunications, Computing Society
Sponsored Session

Chair: S. Raghavan, University of Maryland, 4345 Van Munching Hall, College Park, MD, 20742, United States of America, raghavan.umd@gmail.com

1 - The Mobile Facility Routing Problem

Russell Halper, AMSC Program, Department of Mathematics, University of Maryland, College Park, MD, United States of America, russ@math.umd.edu, S. Raghavan

In many application domains, a mobile service facility provides service to events while stationary. For example, portable base stations are used in cellular networks to provide coverage in emergency situations and for special events. In this talk, we discuss routing mobile facilities to maximize demand coverage in a continuous time framework. This problem displays some similarities to the Dynamic Facility Location Problem, although we consider a continuous time planning horizon.

2 - Benders Cuts for the Single-source Network Loading Problem

Ivana Ljubic, University of Vienna, Brünnerstr. 72, 1210 Vienna, Austria, Vienna, 1210, Austria, ivana.ljubic@univie.ac.at, Juan Jose Salazar Gonzalez, Peter Putz, Inmaculada Rodriguez Martin

The single source network loading problem asks for installing at most one module type on each edge of an undirected graph G, so that routing demands from the root node to a selected set of customers using installed module capacities is possible. Several ILP formulations are compared, both theoretically and computationally. We show that, by rounding the Benders cuts, we can significantly improve the quality of lower bounds. The Benders cuts are separated within a branch-and-cut framework.

3 - Spanning Trees with Node Degree Dependent Costs and Knapsack Reformulations

Luis Gouveia, University of Lisbon, DEIO-CIO, Campo Grande, Lisbon, Lx, Portugal, legouveia@fc.ul.pt, Pedro Moura

We consider an extension of the degree constrained spanning tree problem where besides the usual edge costs, we also consider node costs which depend of the degree of the nodes. We consider discretized models as well knapsack reformulations in order to linearize the objective function of a standard non linear model. The two approaches will be compared as well as model enhancements.

■ SC56

O - Blue Room

Inland Ports and Container Terminals II

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Michael Dooms, MSc, Senior Researcher, Vrije Universiteit Brussel, Pleinlaan 2Elsene, Brussels, 1050, Belgium, michael.dooms@vub.ac.be

1 - Canal Line Consideration for the Thai Canal

Dr. Satapon Keovimol, Associate Professor, King Mongkut's Institute of Technology, North Bangkok, 101 Satapon Mansion, Raumchid Rd., Dusit, Bangkok, 10300, Thailand, keovimol@hotmail.com

If Thailand builds a Thai Canal, Thailand will become an important centre for international sea transport, it would be considering the best canal line, and the aspects of consideration are 1.Freedom in managing the canal 2.National economy 3.Military Strategic reasons 4.Social & Environmental aspects and 5.Engineering aspects.

2 - Analytical Models for Yard Management in a Distribution Center

Lourdes A. Medina, Graduate Student, Penn State University, O202 Cunningham Hall, Weston Community Center, University Park, PA, 16802, United States of America, lam458@psu.edu, Ufuk Bilsel, Richard A. Wysk, Vittal Prabhu, A. Ravi Ravindran

We propose a combination of optimization and simulation models to improve decision making in yard operations of a distribution center (DC). The optimization model decides truck - dock assignments considering the shipment deadlines, late penalties, loading times etc. Loading times depend on the operations inside the DC modeled by a real time simulation. The models are applied in a large DC in South America and improvements are discussed.

3 - Integrating the Extended Gateway Concept in Long-term Strategic Seaport Planning: A European Case

Michael Dooms, MSc, Senior Researcher, Vrije Universiteit Brussel, Pleinlaan 2Elsene, Brussels, 1050, Belgium, michael.dooms@vub.ac.be, Alain Verbeke

In this paper, we propose an integrative conceptual framework for strategic seaport planning. We analyse port impacts from an extended gateway perspective i.e. integrating a geographical dimension in the framework in order to formally link and consistently align the port's long-term development with the infrastructural development of the wider region and the country as a whole.

■ SC57

O - Blue Room Prefunction

Nicholson Student Paper Prize Competition, I

Cluster: Nicholson Student Paper Prize
Invited Session

Chair: Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu

1 - Option Pricing under a Hyper-Exponential Jump Diffusion Model

Ning Cai, 313 Mudd Building, Department of IEOR, Columbia University, New York, NY 10027, ohcaining@gmail.com

The aim of this paper is to extend the analytical tractability of the Black-Scholes model to alternative models with jumps, no matter whether the jump sizes have exponential-type tails or power-type tails. More precisely, we study a jump difusion model for asset prices whose jump sizes are hyper-exponentially distributed. The hyper-exponential distribution can approximate most heavy-tail distributions as closely as possible, including both power- and exponential-type distributions. We demonstrate the hyper-exponential jump difusion model can lead to analytical solutions for popular path-dependent options such as lookback, barrier and perpetual American options. Numerical examples indicate that the formulae are easy to implement and accurate. These analytical solutions are made possible mainly because we solve several high-order integro-differential equations explicitly related to first passage time problems and optimal stopping problems.

2 - Distributionally Robust Optimization under Moment Uncertainty with Application to Data-Driven Problems

Erick Delage Department of Electrical Engineering, Stanford University, Stanford, California, USA

Stochastic programs can effectively describe the decision-making problem in an uncertain environment. Unfortunately, such programs are often computationally demanding to solve. In addition, their solutions can be misleading when there is ambiguity in the choice of a distribution for the random parameters. In this paper, we propose a model describing ones uncertainty in both the distribution's form (discrete, Gaussian, exponential, etc.) and moments (mean and covariance). We demonstrate that for a wide range of cost functions the associated distributionally robust stochastic program can be solved efficiently. Furthermore, by deriving new confidence regions for the mean and covariance of a random vector, we provide probabilistic arguments for using our model in problems that rely heavily on historical data. This is confirmed in a practical example of portfolio selection, where our framework leads to better performing policies on the "true" distribution underlying the daily return of assets.

3 - Robust Covariance Estimation and Outlier Detection Using Semidefinite Programming

Tri-Dung Nguyen

We study the outlier detection and robust covariance estimation problem. Without outliers, the classical Maximum Likelihood Estimator (MLE) can be used to estimate parameters of known distribution from observation data. With the presence of outliers, the log likelihood function is dominated by outliers such that the MLE estimators are pulled toward outliers. There is an extensive literature in robust statistics. However, the methods proposed suffer either from computational complexity when problem size increases or from giving up desirable properties such as affine equivariance. We take a different approach compared to existing methods where we try to and the optimal probability of occurrence for all the observations such that at the optimal solution, outliers are set with smaller probabilities and can be detected. The optimization problem is designed such that the optimal probability measure is consistent with the probability densities of the observations given the normal behavior of the non-outlier subset. Our robust covariance estimator has the following properties: First, it is affine equivariant. Second, it is computational efficient even for large problem sizes, both in the number of observations as we as the problem dimension. Third, our method is easy to incorporate prior belief into the estimators. We test the accuracy of our method for different contamination models including the most recently proposed ones. We found our method is not only faster than the Fast-MCD method but also slightly more accurate for high dimensional data.

4 - The Profit Curve for Budgeted Learning: Properties and Computation

Brad Null, Stanford University

In the budgeted learning problem we experiment on a set of alternatives (given a fixed experimentation budget) with the goal of picking a single alternative with the largest possible expected payoff. The ratio index, introduced by Goel et al. [5], leads to an index-based constant factor approximation algorithm for this problem. Index-based policies have the advantage that a single number (i.e. the index) can be computed for each alternative irrespective of all other alternatives, and the alternative with the highest index is experimented upon. This value has been highlighted by the famous Gittins index for the discounted multi-armed bandit problem. In this paper, we define the profit curve for budgeted learning, which is critical to calculating the ratio index. In the process, we derive several structural properties for the profit curve with significant consequences. Among these properties, we show that the profit curve is concave and piecewise linear, which, among other things, makes calculation of the ratio index using the profit curve elementary. We also show that the policies which induce the profit curve possess a certain monotonicity property critical to the proof that a greedy algorithm for budgeted learning with respect to the ratio index is a constant factor approximation algorithm. This monotonicity property also leads directly to a proof that the profit curve and the ratio index can be computed in strongly polynomial time. Thus, the greedy algorithm can be executed in strongly polynomial time, as can an index-based approximation algorithm for a discount oblivious version of the multi-armed bandit problem. Further, the techniques we develop may also be useful for deriving strongly polynomial algorithms for other Markov Decision Problems. We conclude with a detailed algorithm for computing the profit curve.

■ SC58

O - Capital

Aircraft Scheduling

Sponsor: Aviation Applications
Sponsored Session

Chair: Jonathan Dumas, GERAD, Ecole Polytechnique de Montreal, 2920, Chemin de la Tour, 4e étage, Montreal, QC, Canada, jonathan.dumas@gerad.ca

1 - Improving the Objective Function of the Fleet Assignment Problem

Jonathan Dumas, GERAD, Ecole Polytechnique de Montreal, 2920, Chemin de la Tour, 4e étage, Montreal, QC, Canada, jonathan.dumas@gerad.ca, François Soumis, Fati Aithnard

The objective function of the standard fleet assignment problem (FAP) is linear in the FAP's binary decision variables. It is hard to make it account correctly for the expected revenue associated with each tentative fleet assignment. We explain how we use a non-linear passenger flow model to iteratively improve the FAP's objective function, and to infuse it with information on network effects, recapture and on the temporal and stochastic nature of the booking process.

2 - On a New Rotation-tour Network Model for Aircraft Maintenance Routing Problem

Zhe Liang, Rutgers, 900 Davidson Rd. Apt 110, Piscataway, NJ, 08854, United States of America, iseliangzhe@hotmail.com, Art Chaovaitwongse, Ellis Johnson, Huei Chuen Huang

In this paper, we present a new compact network representation of rotation tour, which is used in a new formulation for aircraft maintenance routing problem. The quality of the model was assessed on four test instances, and compared with the flight string model. The computational results show that the proposed model provides a very good linear programming relaxation and is able to obtain the optimal solutions to all test instances in very reasonable time.

3 - On the Benefit of Global Tail Assignment Optimization

Thomas Schickinger, Product Manager, Lufthansa Systems, Salzufer 8, Berlin, 10587, Germany, thomas.schickinger@lhsystems.com

In the tail assignment problem the flight schedule is assigned to specific aircraft near the day-of-operations. We present results of a global tail assignment optimizer based on a generic column generation system for crew and aircraft planning, and overview some solution techniques. We report on case studies that investigate the significance of the tail assignment step in an airline's overall planning process and evaluate the room for improvement by integration with maintenance planning.

4 - An Optimization Approach to Airline Integrated Recovery

Jon Petersen, Georgia Tech, 765 Ferst Drive, NW, Atlanta, GA, United States of America, Petersen@gatech.edu, Ellis Johnson, Gustaf Solveling, Yan Shu

In the presence of irregular operations airlines need to restore their schedule, aircraft routings, crew pairings, and passenger itineraries in a timely manner. The current practice of recovery relies on a sequential optimization framework. We present a decomposition scheme that uses flight strings to restore the schedule while assigning individual aircraft, crew, and itineraries in one integrated optimization model. The model yields a passenger-friendly solution with crew considerations.

■ SC59

O - Embassy Room

Intersection of Queueing/Service Systems with Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Baris Ata, Northwestern University, 2001 Sheridan Road, Evanston, IL, United States of America, b-ata@kellogg.northwestern.edu

Co-Chair: Mustafa Akan, Assistant Professor of Operations and Manufacturing Management, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, m-akan@kellogg.northwestern.edu

1 - Pricing with Markups under Horizontal and Vertical Competition

Roger Lederman, Columbia Business School, New York, NY, 10027, United States of America, rdl2102@columbia.edu, Nicolas Stier-Moses, Jose Rafael Correa

We model a market for a single product that may be composed of sub-products that face horizontal and vertical competition. Each firm, offering all or some portion of the product, adopts a price function proportional to its costs by deciding on the size of a markup. Customers then choose a set of providers that offers the lowest total cost. We characterize equilibria of the two-stage game and study the efficiency resulting from the competitive structure of the market.

2 - Is it Worth the Wait? Herding when waiting is expensive.

Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu, Laurens Debo

We study how rational customers choose between two congested service facilities with unknown service value when waiting is expensive. If more customers choose the same service facility because of their private information, longer queues will form at the service facility and therefore a long queue may be an indication of higher quality. On the other hand, a long queue also implies more waiting time to obtain the service. Surprisingly, herding behavior is more pronounced when arrival rate is low.

3 - Inferring Quality from a Queue

Laurens Debo, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, laurdebo@andrew.cmu.edu, Christine Parlour, Uday Rajan

We provide a model in which a queue communicates the quality of a good to consumers. Agents arrive randomly at a market, and observe the queue length and a binary private signal about the good. Service departures from the queue are also random. Agents decide whether to join the queue and obtain the good or to balk. We study the equilibrium arrival rate and system parameters.

4 - Revenue Management by Sequential Screening

Mustafa Akan, Assistant Professor of Operations and Manufacturing Management, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, m-akan@kellogg.northwestern.edu, Baris Ata, James Dana

We consider a dynamic model of revenue management with strategic, i.e. forward looking, consumers who are heterogeneous and learn their valuations sequentially over time. Business travelers learn their true valuations after leisure travelers. A monopolist system manager maximizes profits by sequentially screening consumers. Using a mechanism design approach, we show that the optimal mechanism is a menu of expiring refund contracts and identify when the first-best solution can be achieved.

■ SC60

O - Hampton Room

Panel Discussion: Rails to the Capital Presentations

Sponsor: Railway Applications
Sponsored Session

Moderator: : Steven Harrod, Dr., University of Dayton, Department of MIS, OM, & DS, 300 College Park, Dayton, OH, 45469, United States of America, steven.harrod@udayton.edu

1 - Social Policy and Private Capital in Railway Investment

Panelist: Steven Harrod, Dr., University of Dayton, Department of MIS, OM, & DS, 300 College Park, Dayton, OH, 45469, United States of America, steven.harrod@udayton.edu

The dominant policy of North American railways since 1893 has been private capital funding of railway infrastructure, yet financial support has continued to other transportation modes, particularly roads. This presentation reviews the historic patterns of government transportation funding and the social forces that have shaped current transportation policy.

2 - Norfolk Southern's Infrastructure Investment to Meet Future Growth

Panelist: Wayne Mason, Senior Director, Strategic Planning, Norfolk Southern Corporation, 1200 Peachtree St. NE, Atlanta, Ga, United States of America, Wayne.Mason@nscorp.com

In this presentation, I will talk about Norfolk Southern Capacity/Infrastructure planning process. I will explain what analytical tools we use to determine future needs. Since capitol requirements are very high, Norfolk Southern is actively seeking partnership from the public sector.

3 - Strategies for Public/Private Infrastructure Investment and Management

Panelist: John Gibson, VP Operations Research and Planning, CSX Transportation Inc., 500 Water Street, Jacksonville, FL, United States of America, John_Gibson@csx.com

In order to meet the projected growth in freight and passenger demand over the next 20-30 years, partnerships between freight railroads and public agencies will be very critical. The process used and the role of operations research and train simulation techniques in addressing such issues at CSX will also be described.

4 - Government Objectives in Financing Rail Infrastructure
Panelist: Joyce Rose, Staff Director of the House Subcommittee on Railroads, Pipelines & Hazardous Materials of the Committee on Transportation and Infrastructure, U.S. House of Representatives, 1740 Longworth HOB, Washington, DC, 20515, United States of America, Joyce.rose@mail.house.gov

This presentation will review current initiatives, primarily at the Federal level, to fund and direct railway capital projects.

5 - Easing Rail Owners' Capital Crunch Using Public-Private Partnerships
Neil Pogorelsky, Principal Economist, HDR Decision Economics, 8403 Colesville Road, Suite 910, Silver Spring, MD, 20910, United States of America, neil.pogorelsky@hdrinc.com

For the most part, transportation has always functioned as a public-private partnership (P3), but the terms of the partnership have historically been arbitrary. Recently, however, the public benefits of increasing rail capacity in lieu of truck transport have garnered wide attention. We present a quantitative decision rule to identify feasible P3 investments, and then to rank those investments.

■ SC61

O - Calvert Room

Dynamic Traffic Assignment Models and Algorithms

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu

1 - Online Search Algorithms
David Fajardo, University of Texas at Austin, 1908 San Antonio #312, Austin, TX, 78705, United States of America, davidf@mail.utexas.edu, S. Travis Waller

We develop formulations for several online search algorithms and discuss solution methodologies, both exact and heuristic.

2 - B-Dynamic: An Efficient Path-based Algorithm for Solving Dynamic User Equilibrium
Gitakrishnan Ramadurai, PhD Student, Rensselaer Polytechnic Institute, JEC 4002 Dept of Civil and Environmental, Engineering, Rensselaer Polytechnic Inst, Troy, NY, 12180, United States of America, ramadg@rpi.edu, Satish Ukkusuri

In this paper, we present an efficient algorithm to solve the DUE assignment problem considering simultaneous activity location, time of participation, duration, and route choice decisions. The algorithm obviates path enumeration. The algorithm is an extension of Dial's "Algorithm B", which solves the static UE problem to the dynamic case.

3 - A Robust and Efficient Dynamic Traffic Assignment Solution Procedure for Large-scale Applications
Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Brenda Bustillos, Eric Nava

Most simulation-based dynamic traffic assignment (DTA) models are limited spatially and temporally due to computational resource requirements. The concept of rolling epoch is introduced to perform temporally scalable DTA modeling procedure. Model developments and numerical results are presented and discussed in this talk.

■ SC62

O - Governor's Boardroom

Forecasting Applications

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: John Kros, Assistant Professor, East Carolina University, 3121 Bate, Greenville, NC, 27858, United States of America, krosj@ecu.edu

1 - Forecasting Promotional Sales Using Linear Regression Models
Usha Ramanathan, PhD Candidate, Nottingham University Business School, Jubilee Campus, Wollaton Road, Nottingham, NG81BB, United Kingdom, lixur@nottingham.ac.uk, Bart MacCarthy, Luc Muyldermans

We study CPFR arrangements between a large soft drink manufacturer and major retailers in the UK. The manufacturer's sales are strongly driven by the promotions executed in the retail stores. We develop a conceptual reference demand model, which lists the important factors and events that explain demand. These factors are used in multiple linear regression forecasting models to predict the weekly retailers' sales.

2 - Dynamic Calculation Framework for Real Time Price Guide in Automobile Industry
Ying Wang, Sr. Analyst, Manheim Auction Inc, 6205 Peachtree Dunwoody Road, Atlanta, GA, 30328, United States of America, ying.wang@manheim.com

Manheim is the largest wholesale automobile auction company. Recently we enhanced its daily pricing report, Manheim Market Report by implementing a dynamic sample selection technique. In this framework, historical time periods for different statistical tasks such as outlier exclusion, estimated price and mileage depreciation factor calculation are determined dynamically based on the sample profile of each vehicle model. This technique greatly improved the forecasting accuracy of the product.

3 - Opportunities for Decision Support in the Very Light Jet Market
Dennis Mathaisel, Professor, Babson College, Babson Hall, Babson Park, MA, 02457-0310, United States of America, Mathaisel@Babson.edu, Clare Comm

How do you initiate and sustain service in a very light jet air taxi market? There are four challenges that present opportunities for decision support: marketing the service and changing consumer behavior; forecasting the demand for the service; scheduling the real-time on-demand operation; and optimal aircraft routing.

4 - Evaluation of Hotel Demand Forecasting Techniques
Ahmet Kuyumcu, Prorize, 12138 Madison Dr, Atlanta, GA, United States of America, akuyumcu@prorize.com, Utku Yildirim

Although accurate demand forecasting is one of the most critical component of any revenue management application, it has not received enough attention. This presentation focuses on the commonly used demand forecasting techniques and compares their performances based on real-world hotel booking data.

5 - Managing Trade-In Programs Based on Product Characteristics and Customer Heterogeneity in Business-to-Business Markets
Kate Li, The Pennsylvania State University, Smeal College Business, University Park, PA, 16802, United States of America, jzl120@psu.edu, Susan Xu, Duncan K. H. Fong

The success of trade-in programs depends on accurate prediction of returns. Motivated by a real problem facing a high-tech company, this paper develops a method leveraging product characteristics and customer heterogeneity information to improve forecasting accuracy. Our results emphasize the importance of understanding product portfolios, monitoring customers, and enforcing program policies.

■ SC63

O - Congressional B

Logistics and Distribution

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Kai Furmans, Professor, Dr.-Ing., Institut für Fördertechnik und Logistiksysteme (IFL), Universität Karlsruhe (TH), Karlsruhe, Germany, Kai.Furmans@ifl.uni-karlsruhe.de

1 - Analysis of Factors Affecting Crossdock Operations Using Simulation
Sharon Wong, Graduate Student, The Chinese Univ. of Hong Kong, Department of Syst Engg & Engg Mgmt, The Chinese Univ. of Hong Kong, Shatin, NT, Hong Kong - China, wswong@se.cuhk.edu.hk, C.H. Cheng

In this research, the existing simulation models for crossdocking systems are examined. Modeling assumptions and other salient features are compared and contrasted. Through this taxonomic study, we hope to identify factors that affect the performance of crossdocks. Further, we would like to develop a comprehensive framework for a simulation study.

2 - Robust Optimization of Internal Transports in a Parcel-sorting-center
Brigitte Werners, Professor, Ruhr-University Bochum, Fac of Economics and Management, Bochum, NR, 44780, Germany, or@rub.de

This contribution demonstrates considerable reduction of internal transports in one of the Deutsche Post World Net's main parcel-sorting-centers by the robust solution of a modified three-dimensional linear assignment model. The suggested mathematical model minimizes necessary manual transportation effort by assignment modifications. Additionally, it takes into account specific characteristics and requirements of the parcel-sorting center.

3 - Buffer Configurations for Distribution Centers with Multi-stage Order-processing

Kai Furmans, Professor, Dr.-Ing., Institut für Fördertechnik und Logistiksysteme (IFL), Universität Karlsruhe (TH), Karlsruhe, Germany, Kai.Furmans@ifl.uni-karlsruhe.de, Christian Huber

Larger Warehouses usually organize the processing of customer orders in stages. In each of these stages several orders are processed in parallel in the same or in different areas of the distribution center. In order to prevent blocking between these processes, buffers have to be used between the stages. A discrete time queuing model will be presented that addresses this issue and helps in sizing the buffers in different configurations.

4 - A Review of Integrated Optimization-simulation Approaches to Solve Distribution Problems

Xu Yang, Graduate Research Assistant, University of Louisville, Department of Industrial Engineering, J B Speed School of Engineering, Louisville, KY, 40292, United States of America, x0yang07@gwise.louisville.edu, Gerald W Evans, Sunderesh S Heragu

We review recent work on using integrated approaches of optimization and simulation to solve distribution problem involving truck transportation, and identify important area where further research is needed. Optimization and simulation models are examples of approaches taken by companies as an attempt to improve their operational behavior and remain in the market place. We review and classify over 100 papers in the areas of optimization and/or simulation modeling of distribution problems.

■ SC64

O - Congressional A

Joint Session TSL/AAS: Airport Arrival and Departure Management

Sponsor: Transportation Science & Logistics, Aviation Applications
Sponsored Session

Chair: Robert Hoffman, Principal Analyst, Metron Aviation, Inc., 131 Elden St, Herndon, VA, 20170, United States of America, Hoffman@metronaviation.com

1 - Airport Runway Scheduling under Environmental Constraints

Babak Khorrami, Metron Aviation, Inc., 131 Elden St, Herndon, VA, 20170, United States of America, khorrami@metronaviation.com, Terrance Thompson

Airports are large bottlenecks in the National Airspace System network. Inefficient taxiing process of aircraft on the airport's surface can aggravate traffic delays and also increase the level of pollutants emitted by aircraft engines. An integer program presenting the time-expanded network of the airport surface is introduced with the objective of finding an optimal path for movement of each aircraft on airport surface to reduce emissions and improve traffic delays.

2 - Departure Flow Management Concept and Algorithms Overview

Jason Pepper, Senior Software Engineer, Metron Aviation, Inc., 131 Elden St, Suite 200, Herndon, VA, 20170, United States of America, pepper@metronaviation.com, Ted Carniol

The Departure Flow Management (DFM) system automates the coordination of departures from multiple airports into shared and congested National Airspace System (NAS) resources via improved decision support capabilities and web-based communications. DFM increases situational awareness and moves decision making away from a centralized authority, to parties with more need for control. This presentation will compare current operations to the operations under DFM, and will discuss the DFM algorithms.

3 - Analysis of Gate Hold Delays at the OEP-35 Airports (Summer 2007)

Jianfeng Wang, PhD Student, George Mason University, 4450 Rivanna Ln # 3727, Fairfax, VA, 22030, United States of America, jwang5@gmu.edu, Lance Sherry, John F. Shortle, Juan Wang

One of the congestion points in the air transportation system is the airport terminal gates. During operations with stochastic delays, an outbound flight may not be able to vacate its gate before the inbound flight arrives. This results in gate hold, delays, and/or gate changes. This paper presents a data analysis of gate hold delays at OEP-35 Airports.

4 - Optimal Arrival and Departure Strategies at Congested Airports: Aggregate Flow vs Flight Management

Eugene Gilbo, US DOT/Volpe Center, 55 Broadway, Cambridge, MA, 02142, United States of America, gilbo@volpe.dot.gov, Michael West

Two approaches to optimization of arrival and departure strategies at airports allowing tradeoffs between arrival and departure capacities are discussed. One is based on matching predicted aggregate demand counts and airport capacity while ignoring predicted arrival and departure times for individual flights. Another approach matches the predicted times for individual flights and available slots consistent with airport capacity. Numerical examples illustrate differences in optimal solutions.

■ SC65

O - Council Room

Service Industry I

Contributed Session

Chair: Changrui Ren, IBM China Research Laboratory, Building 19 Zhongguancun Software Park, 8 Dongbeiwang WestRoad, Haidian District, Beijing, 100193, China, rencr@cn.ibm.com

1 - Analysis of Coordinated Systems Based on Operational Policies of Non-profit Organization : Animal Shelters

Naragain Phumchusri, PhD Student, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332-0205, United States of America, naragain@gatech.edu, Julie Swann, Serhan Duran

Today there are two main policies used in animal shelters: In a "Kill" system, animals may be euthanized if a shelter is full. In a "No-Kill" system, a shelter rejects animals when full (diverting to capacity in another shelter if available or leaving to the street otherwise) but does not euthanize them for space. We study queueing systems with no, partial, or full coordination of animals allocation and evaluate their performances, primarily focusing on rejection rates and coordination costs.

2 - Drivers of Evaluation of Conference Communications

Francisco Mas, University Professor, Alicante University, PO Box 99, Alicante, E-03080, Spain, francisco.mas@ua.es, Aurora Calderon, Josefa Parreno, Enar Ruiz

Our paper analyzes the determining factors of conference reviewers' evaluations in terms of the characteristics of the author, the institution and the manuscript. We intend to discover whether the evaluations capture the importance of the contributions, using the ranking of the scientific journal in which the communication is published.

3 - Services Offshoring Maturation Sequencing: A Bayesian Approach

Eugene Hahn, Salisbury University, 1101 Camden Ave., Salisbury, MD, 21801, United States of America, EDHAHN@salisbury.edu, Kraiwinee Bunyaratavej

We examine maturation sequencing in the services offshoring industry to investigate when different categories of offshoring services provision change from being emergent sectors to more mature ones. We employ a database of 1420 offshore services FDI projects and a Bayesian Poisson changepoint model. Results indicate the value-add as well as the information sensitivity of the service category are related to when the service categories progress through the industry life cycle.

4 - iRDM: An Integrated Sub-contractor Management Solution

Changrui Ren, IBM China Research Laboratory, Building 19 Zhongguancun Software Park, 8 Dongbeiwang WestRoad, Haidian District, Beijing, 100193, China, rencr@cn.ibm.com, Qinhua Wang, Jin Dong, Wei Wang, Hongwei Ding, Bing Shao

iRDM (intelligent Resource Deployment Manager) is an integrated solution to support the full lifecycle management of sub-contractors, especially for the assignment and management of high-quality professionals in IT and consulting industry, to ensure hiring right people at the right time for the right project with the right cost. We will introduce this solution and review analytics and optimization capabilities behind iRDM, and share the experience of using this solution at IBM.

■ SC66

O - Cabinet Room

IT Valuation and Portfolio Management

Cluster: Governance of Software Development
Invited Session

Chair: Robert Kauffman, Center for Advancing Business through Information Technology, W. P. Carey School of Business, Arizona State University, Tempe, AZ, 85251, rkauffman@asu.edu

1 - Pricing IT Investment Risks Involving Consumer Adoption Benchmarks

Michel Benaroch, Martin J. Whitman School of Management, Syracuse University, Syracuse, NY, 13210, mbenaroc@syr.edu, Ajit Appari

We develop a linear multifactor model linking IT assets' excess returns to risk factor pricing parameters in an empirical model that leverages arbitrage pricing theory. We discuss required assumptions and a modeling adaptation that uses market data to price idiosyncratic security risk. Our empirical analysis relies on a

competitive benchmark for different online channels, and shows that risk pricing parameters vary by financial services type and firm size, consistent with differences known to hold for the different sectors and size groups.

2 - Fit Between IT Architecture Modularity and IT Governance Design

Amrit Tiwana, College of Business, Iowa State University, Ames, IA, 50011, tiwana@iastate.edu, Benn R. Konsynski

We conceptualize the theoretically-neglected interactions between organizational IT architecture modularity and IT governance design in shaping IT alignment. Building on modular systems theory, we theorize how their mutual alignment helps sustain IT alignment by increasing IT agility. Empirical tests of a firm-level type-II moderated-mediation model using data from 223 organizations support these ideas, contributing insights into how IT architecture modularity complements IT governance choices.

3 - Optimal Timing of an IT Service Contract Benchmark

Ryan Sougstad, Carlson School of Management, University of Minnesota, 319 19th Ave S., Minneapolis, MN, 55455, United States of America, sougs002@umn.edu, Robert Kauffman

IT service contracts often contain provisions to benchmark and control for market and technology risk. We consider pricing benchmarks initiated at the client's behest relative to market prices for the vendor services provided. Benchmarking ensures the provider is operating efficiently. We ask: How should a contract participant time the benchmark? We use a value-at-risk model to optimize benchmark timing involving mark-to-market in IT services contract prices. We also quantify the value of a benchmark provision in a contract under conditions of mark-to-market uncertainty.

■ SC67

O - Forum Room

Uncertainty and Flexibility in Facility Location

Sponsor: Location Analysis
Sponsored Session

Chair: Ho-Yin Mak, University of California, Berkeley, 1117 Etcheverry Hall, University of California, Berkeley, CA, 94720, United States of America, makho@berkeley.edu

1 - Defender/interdictor Location Model for Protecting Critical Infrastructures

Michael Lim, PhD Student, Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL, 60208, United States of America, m-lim2@northwestern.edu, Mark Daskin, Sunil Chopra, Achal Bassamboo

We consider a defender/interdictor location problem for preparing against terrorist attacks. The problem results in a bi-level optimization problem which is very difficult to solve for the large problem instances. We outline a genetic algorithm for solving this problem by capturing the actions of the two opposing parties in two separate populations. Computational results and some other key issues will be addressed.

2 - Reliable Facility Location under the Risk of Disruptions

Tingting Cui, UC Berkeley, 4141 Etcheverry Hall, University of California, Berkeley, CA, 94720, United States of America, tingting@ieor.berkeley.edu

We consider an uncapacitated fixed-charge location problem where the facilities are subject to the risks of disruptions. The failure probability of each facility site is known as a prior and assumed to be independent. Our goal is to choose the number and locations of facilities in order to minimize the expected total fixed location cost, transportation cost and penalty cost.

3 - Continuum Approximation Approach to the Reliable Facility Location Problem

Yanfeng Ouyang, Assistant Professor, University of Illinois at Urbana-Champaign, 1209 Newmark Laboratory, MC 250, Urbana, IL, 61801, United States of America, yfouyang@uiuc.edu, Tingting Cui, Max Shen

We consider the planar version of the uncapacitated fixed-charge location problem under probabilistic service disruptions, where customers are re-assigned if the previously assigned facilities fail. A continuum approximation (CA) approach is proposed to minimize the expected total costs (facility charges, transportation costs, and penalties for not serving customers). Numerical results show that the CA approach solves the problem effectively, and comparisons with discrete models are presented.

4 - Dynamic Sourcing in Supply Chain Design under Supply and Demand Uncertainty

Ho-Yin Mak, University of California, Berkeley, 1117 Etcheverry Hall, University of California, Berkeley, CA, 94720, United States of America, makho@berkeley.edu, Max Shen

The optimal inventory management policies differ under (pure) supply and demand uncertainty. Risk-pooling is favored under uncertain demand and risk-diversification is favored under the risk of disruptions. In this talk we discuss how dynamic sourcing retains partial benefits from both policies. We formulate an integer programming model to study the impacts of this strategy on supply chain design decisions.

5 - The Impact of Cost Uncertainty on the Network Design of Supply Chains

Seokjin Kim, Assistant Professor, Suffolk University, Sawyer Business School, 8 Ashburton Place, Boston, MA, 02108, United States of America, kim@suffolk.edu, Mozart Menezes, Rongbing Huang

A distribution center is to be located on a demand-populated unit line or plane with pre-located suppliers offering uncertain prices following some distributions. The buyer of a product attempts to minimize the sum of the inbound and outbound transportation costs, and the price charged by a chosen supplier. We characterize the optimal location of the distribution center. We also find that the buyer benefits from the price uncertainty, regardless of the location of the distribution center.

■ SC68

O - Senate Room

Technologies and Advanced Methods for Explaining and Predicting Choices and Preferences

Sponsor: Marketing Science
Sponsored Session

Chair: Lynd Bacon, President, Loma Buena Associates, PO Box 620960, Woodside, CA, 94062-0960, United States of America, lbacon@lba.com

1 - Barter Markets for Conjoint Analysis

Eric Bradlow, The K.P. Chao Professor of Marketing, Statistics and Education, The Wharton School, The University of Pennsylvania, 3730 Walnut Street, 761 JMHH, Philadelphia, PA, 19104-6340, United States of America, ebradlow@wharton.upenn.edu, Min Ding, Young-Hoon Park

We propose a new data collection mechanism (barter markets), as an alternative to conjoint analysis, that allows for information diffusion among respondents, as an accelerated method to capture real life learning and measurement of consumer's partworths for product features. An empirical study that compares the barter method and choice-based conjoint demonstrates very superior out-of-sample predictive performance, both immediately (as is commonly done) and on a two-week later validation task, based on data collected from a barter market. We also show evidence that respondents indeed learn from those who are familiar with the product suggesting those cases, and for what people, the barter market is likely to be superior to traditional conjoint measurement methods. However, in the spirit of "no free lunch", as the barter mechanism is "new to the world", we found that subjects did find the task more taxing (in various ways) suggesting a potential tradeoff between consumer resource allocation (at the time of the task) and (managerial) predictive accuracy.

2 - My Mobile Music: An Adaptive Personalization System for Digital Audio Players

Michel Wedel, Pepsico Professor of Consumer Science, Robert H. Smith School of Business, 3303 Van Munching Hall, University of Maryland, College Park, MD, 20742-1815, United States of America, mwedel@umd.edu,Tuck Siong Chung, Roland T. Rust and Michel Wedel

We propose an "Adaptive Personalization System". The proposed system automatically downloads personalized play-lists of MP3 songs into a consumer's mobile digital audio device and requires little proactive user effort. The system works in real-time, and is scalable to the massive data typically encountered in personalization applications. We implemented the Adaptive Personalization System on Palm PDA's and tested its performance.

3 - Cognitive Complexity and Consideration Sets

Olivier Toubia, Columbia Business School, Uris 522, 3022 Broadway, New York, NY, 10027, United States of America, ot2107@columbia.edu, Theodoros Evgeniou, Rene Befurt, Daria Silinskaia, John Hauser

We develop and test methods to identify cognitively-simple decision rules that explain which products consumers select for their consideration sets. Drawing on qualitative research we propose disjunctions-of-conjunctions (DOC) decision rules that generalize well-studied decision models such as disjunctive, conjunctive, lexicographic, and subset conjunctive rules. Drawing on behavioral insights about cognitive complexity, we illustrate how these insights can be implemented to estimate DOC models.

4 - Modeling Competition for Web Viewers Using Clickstream Data

Alan Montgomery, Associate Professor of Marketing, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, alan.montgomery@cmu.edu, Brett Gordon

Web browsers constantly make choices about which web site to view and whether to continue browsing at the current web site or switch to an alternative one. In this research we propose a choice model to predict user browsing behavior which implicitly defines competition. We find that users tend to view related topics together and propose a text mining approach to categorize textual information on a page. We combine this with a time series model to capture user switching behavior across websites.

Sunday, 4:30pm - 6:00pm

■ SD01

M - Marriott Ballroom 3

Joint Session WORMS/To The Memory of Richard Rosenthal: An Interactive Panel/Mentoring Session in Honor of Rick Rosenthal

Sponsor: Women in OR/MS, To The Memory of Richard Rosenthal
Sponsored Session

Chair: Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu

1 - An Interactive Panel/Mentoring Session in Honor of Rick Rosenthal

Moderator: Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu, Panelist: Anne Robinson, Ariela Sofer, Harlan Crowder, Karla Hoffman

In this interactive session we will discuss many issues such as mentoring, work/family/community balance, dual careers, and recruiting and retaining women and underrepresented minorities.

■ SD02

M - Marriott Ballroom 2

Information Systems

Sponsor: Information Systems
Sponsored Session

Chair: Karl Reiner Lang, Professor, Baruch College, CUNY, Zicklin School of Business, 55 Lexington Ave, B11-220, New York, NY, 10010-5585, United States of America, Karl_Lang@baruch.cuny.edu

1 - Social Production of Content in the New Media

Hong Xu, UT Austin, IROM Dept, McCombs School of Business, Austin, TX, 78712, Hong.Xu@phd.mccombs.utexas.edu, Andrew Whinston, Jianqing Chen

An issue with open communities, including online newspapers, blogs, discussion forums, etc, is how to motivate the public to produce desired content? In absent of the hierarchy structure that induces content in traditional media outlets, we propose a moderation mechanism and investigate its impact on new media bias.

2 - Co-production Markets for Digital Culture Goods

Roumen Vragov, Asst. Professor, Baruch College, CUNY, 1 Bernard Baruch Way, New York, NY, United States of America, roumen_vragov@baruch.cuny.edu

Web 2.0 technologies invite new co-production modes in the cultural content industries. Using laboratory experiments we explore three markets: one with post-purchase personalization, one with reuse licenses to other producers, and one with piracy. We show that in the first two markets total surplus is larger than in the case without tradeable transmutation rights, and in the presence of piracy, efficiency gains due to trading of transmutation rights will be diminished or entirely lost.

3 - Social Innovation Models in Digital Entertainment

Reina Yahya Arakji, CUNY - Baruch College, One Bernard Baruch Way, New York, NY, United States of America, Reina_Arakji@baruch.cuny.edu, Karl Reiner Lang

We examine new forms of organization for innovation that are emerging in the digital entertainment space. Taking advantage of Web 2.0 technologies, firms are successfully engaging in outsourcing parts of their digital content design and development to digital consumer networks. Applying economic analysis, we explore the potential risks and benefits to both producers and consumers and propose innovation organization models for the video-game, music and moving image industries.

■ SD03

M - Marriott Ballroom 1

Risk and Decision Analysis Studies at the USC-DHS Center for Risk and Economic Analysis of Terrorist Events (CREATE)

Cluster: Homeland Security
Invited Session

Chair: Henry Willis, Policy Researcher, RAND Corporation, 4570 Fifth Avenue, Pittsburgh, PA, 15217, United States of America, hwillis@rand.org

1 - The Sum of Our Fears and Egocentric Zero-sum Assumptions

Richard John, Associate Professor, University of Southern California, Dept of Psychology mc-1061, CREATE, Los Angeles, CA, 90089-1061, United States of America, richardj@usc.edu, Heather Rosoff

Terrorist strategic decision making for selecting among targets and attack modes depends on terrorist beliefs, objectives, and values. A zero-sum assumption implies that terrorist values are in perfect, direct opposition to our own and demonstrates a flawed egocentric bias. Through use of value focused thinking and decision analytic modeling, we illustrate pitfalls in the zero-sum assumption that may result in an unwarranted emphasis on terrorist scenarios representing our greatest fears.

2 - Models and Algorithms for Stackelberg Games with Incomplete Information

Fernando Ordonez, Associate Professor, University of Southern California, 3715 McClintock Ave, GER 240, Los Angeles, CA, 90089, United States of America, fordon@usc.edu

Stackelberg games, where one player, the leader, selects its action first and the second player decides its optimal strategy knowing the actions of the leader is a natural problem for various security domains. This framework however assumes the leader has an accurate model of the adversary. We present efficient mixed-integer programs and algorithms to solve problems with imperfect information about the adversary, its reward structure, or decision process.

3 - Using Risk Analysis and Constructive Simulation to Evaluate Border Security Technologies

Henry Willis, Policy Researcher, RAND Corporation, 4570 Fifth Avenue, Pittsburgh, PA, 15217, United States of America, hwillis@rand.org, Cameron MacKenzie

Evaluating new technologies for border security is difficult because of the scope and complexity of the task. Using border surveillance as an example, this study presents the results from a probabilistic risk analysis model and constructive simulation of the 28-mile demonstration project conducted as part of SBI Net. The work provides an example of how these methods can be used to help evaluate proposed technologies for border security and develop concepts of operation for their use.

■ SD07

M - Maryland A

Utilizing Secondary Empirical Data in Operations and Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Ken Boyer, Professor, Ohio State University, Fisher College of Business, Management Sciences Department, 2100 Neil Ave, Columbus, OH, 43210, United States of America, boyer_9@fisher.osu.edu

1 - Research on the Effect of Outsourcing and Offshoring on Non-financial Performance Measures

John Gray, Ohio State University, 2100 Neil Avenue, 612 Fisher Hall, Columbus, OH, 43210, United States of America, gray_402@fisher.osu.edu

In this talk, I briefly summarize two on-going research streams which study the relationship between non-financial performance measures and outsourcing/offshoring strategies. In both research streams, secondary data sources were employed to measure the variables of interest. I discuss the benefits and drawbacks of using secondary data, and share some specific lessons learned in the process of performing the studies.

2 - Analyzing Operations Strategies for Effective Supply Chain Design and Management Using Archival Data

Eve Rosenzweig, Emory University, 1300 Clifton Road, Atlanta, GA, United States of America, Eve_Rosenzweig@bus.emory.edu

Drawing upon two research projects that investigate the influence of operations-based choices on capabilities and business performance, I highlight benefits and challenges associated with archival data collection and use. In doing so, I focus on archival data culled from manufacturers, a consulting firm, and online directories.

3 - Examining the Impact of Task Variability on Patient Outcomes

Rachna Shah, Operations and Management Science Department, Carlson School of Management, University of Minnesota, 321 19th Ave S, Minneapolis, MN, 55455, shahx024@umn.edu

We investigate whether variability in the delivery of a professional service is associated with process performance and whether all process variability has equivalent impact on outcomes. Past literature implies that tasks completed within the boundaries of one organization are easier to manage, standardize and improve, whereas tasks which require two organizations to interact are more difficult and complex to manage. Using patient data collected over a two year period, we distinguish the effects of intra-organizational tasks from inter-organization tasks on hospital performance.

4 - Estimating A Composite Measure of Hospital Quality From the Hospital Compare Database

Justin Ren, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, ren@bu.edu, Xin Wang, Erol Pekoz, Mike Shwartz, Joe Restuccia, Alan Cohen

A single composite measure calculated from individual quality indicators is a useful measure of hospital performance and can be justified conceptually even when the indicators are not highly correlated with one another. In this research, we compare two basic approaches for calculating a composite measure: an extension of the most widely-used approach, which weights individual indicators based on the number of people eligible for the indicator, and a Bayesian hierarchical latent variable model.

■ SD08

M - Maryland B

Managing Retail Operations

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Jayashankar Swaminathan, Distinguished Professor, UNC Chapel Hill, 4717 McColl Building, Kenan-Flagler Business School, Chapel Hill, NC, 27599-3490, United States of America, msj@unc.edu

1 - Sales Rebate Policies and Supply Chain Management

Chris Tang, UCLA Anderson School, 110 Westwood Plaza, Los Angeles, CA, United States of America, chris.tang@anderson.ucla.edu

We examine the impact of sales rebate policies on a two-level supply chain.

2 - Managing Conversion Rates for Better Retail Store Performance

Olga Perdikaki, PhD Candidate, The University of North Carolina at Chapel Hill, Kenan-Flagler Business School, CB# 3490, McColl Bldg., Chapel Hill, NC, 27599-3490, United States of America, perdikao@kenan-flagler.unc.edu, Jayashankar Swaminathan, Saravanan Kesavan

In a service oriented retail environment conversion rate defined as sales to traffic ratio is a key performance metric for retailers. In this study we investigate factors that affect conversion rates and its role in driving store profitability.

3 - Modeling the Impact of Competitive Index Sharing in a Grocery Supply Chain

Ananth Iyer, Professor, Purdue University, Rawls Hall, Room 4001, 100 S Grant Street, West Lafayette, IN, 47907, United States of America, aiyer@purdue.edu, Arnd Huchzermeier, Daniela Schmitz-Wiehenbrauk

We model the impact of a manufacturer sharing a retail competition index, based on shipment to retailers, with all retailers in a grocery supply chain. The model suggests conditions under which such information can improve supply chain performance in a Pareto manner. Data from the German grocery industry is used to estimate the impact and suggest managerial insights.

4 - The Effect of Unit Managers on Performance in Chains with Centralized vs. Decentralized Control

Zeynep Ton, Harvard Business School, Morgan Hall 425, Boston, MA, 02163, United States of America, zton@hbs.edu, Dennis Campbel

How much do unit managers affect their units' operational and financial performance? Does the effect on performance differ for organizations with centralized versus decentralized management controls? We explore these questions by examining unit manager movements within two different chain organizations.

■ SD09

M - Maryland C

Quality, Statistics and Reliability in Naval Research Logistics

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Barry L Nelson, Professor, Northwestern University, Department of Industrial Engr. & Mgmt. Sci., 2145 Sheridan Road, Evanston, IL, 60208-3119, United States of America, nelsonb@northwestern.edu

1 - Structured Maintenance Policies on Interior Sample Paths

Lisa Maillart, Assistant Professor, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, United States of America, maillart@pitt.edu, Ludmila Zheltova

We examine the problem of adaptively scheduling perfect observations and preventive replacements for a multi-state, Markovian deterioration system such that total expected discounted cost is minimized. We model this problem as a partially observed Markov decision process and show that the structural properties of the optimal policy hold for certain non-extreme sample paths. Several variations of the basic problem structure are also discussed.

2 - Statistical Analysis of Adaptive Progressively Hybrid Censored Data

H. K. Tony Ng, Assistant Professor, Southern Methodist University, Department of Statistical Science, 3225 Daniel Ave., Dallas, TX, 75275, United States of America, ngh@mail.smu.edu, Ping Shing Chan, Debasis Kundu

We will introduce a mixture of Type-I censoring and Type-II progressively censoring schemes, called adaptive progressively hybrid censoring scheme, which is useful in reliability experiments. This censoring scheme can be viewed as a design in which we are assured of getting a pre-fixed number of observed failure times for efficiency of statistical inference plus the total test time will not be too far away from an ideal time limit. Different methods for statistical inference will be discussed.

3 - Simultaneous Production and Maintenance Scheduling Using In-line Equipment Condition and Yield Information

Thomas Sloan, Professor, UMass Lowell, College of Management, One University Avenue, Lowell, MA, 01854, United States of America, Thomas_Sloan@uml.edu

Equipment condition can have a significant impact on product quality. We present a semi-Markov decision process model of a single-stage production system with multiple products and multiple maintenance actions. The model simultaneously determines maint. and production schedules, accounting for the fact that equipment condition affects the yield of each product differently. Structural results of the optimal policy are explored and numerical examples high-lighting important factors are presented.

■ SD10

M - Room 8206

Electricity Market Prices, Uncertainty and Risk

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Jorge Valenzuela, Associate Professor, Auburn University, 3304 Shelby Center, Auburn, AL, 36849, United States of America, jvalenz@eng.auburn.edu

1 - Effects of Deregulation and Re-regulation on Integrated Resource Planning

Hakan Balci, Dominion Resources, 701 E Cary St. OJRP, 16th Floor, Richmond, VA, 23219, United States of America, hakan.balci@dom.com

Deregulation of the electricity industry was introduced with the expectation of a more reliable power grid with lower electricity prices. However,utilities became more hesitant to invest in baseload units because of the price instability and made investment plans with more peaking units, which makes them more dependent on power purchases. In this study, we discuss the challenges and opportunities during the integrated resource planning considering the effect of the renewable portfolio standards.

2 - Potential Impacts of Plug-in Hybrid Electric Vehicles on Locational Marginal Prices and Emissions

Lizhi Wang, Iowa State University, 3016 Black Engineering, Iowa State University, Ames, IA, 50011, United States of America, lzwang@iastate.edu, Anhua Lin, Yihsu Chen

Temporal and spatial differences of locational marginal prices provide unique opportunity for plug-in hybrid electric vehicle drivers to take advantage of. We study how strategic recharging could impact locational marginal prices and emissions under decentralized and centralized decision making mechanisms.

3 - Price Forecasting for Short-Term Trading

Sevin Sozer, Portfolio Engineer, Southern Company, 600 North 18th Street / GS-8255, PO Box 2641, Birmingham, AL, 35291, United States of America, ssozer@southernco.com, Jeff Baker

We explore short term forecasting the marginal cost of electricity using a weighted Similar Days method based on forward load forecasts and seasonality. We then use this method to benchmark more sophisticated statistical models such as an Autoregressive model with an exogenous variable (ARX) of load.

4 - Modeling Long-term Prices under Uncertainty

Jorge Valenzuela, Associate Professor, Auburn University, 3304 Shelby Center, Auburn, AL, 36849, United States of America, jvalenz@eng.auburn.edu

Knowledge of the statistical distribution of long-term prices is useful in risk assessment and improved decision-making. In this talk, a stochastic model that considers uncertanties of generator availability, demand, and spot price is described. A numerical example is given.

■ SD11

M - Room 8209

Forestry IV: Harvest Systems

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Converting Forest Understory Biomass into a Valuable Renewable Energy Resource

Joseph Roise, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC, United States of America, joe_roise@ncsu.edu, Glen Catts

A large un-measured renewable energy resource exists in the forest. This resource has not been utilized because there is no harvest system available for small diameter woody biomass. Our goal is to create such a machine. We look at a set of models to determine the critical factors that can increase utilization and productivity to a profitable level. Profit changes the problem of "what to do with this stuff" into "how to allocate the resource efficiently".

2 - Solving Really Big LP's for Forestry Strategic Models

Eldon Gunn, Dalhousie University, Department of Industrial Engineering, 5269 Morris St., Halifax, NS, B3J 2X4, Canada, Eldon.Gunn@dal.ca, Wei Yang

Sustainable forest management and supply chain issues mean that location is important in the strategic modelling process. It is both sensible and relatively easy to put location issues into the strategic model but this results in very large linear programming models. We discuss why these models are necessary and how, by modifying Forrest's SPRINT idea for generalised upper bounds, these problems can be solved quickly.

3 - Strategic Forest Management Taking into Account Supply Chain Issues

Mathieu Bouchard, Postdoctoral Fellow, Université Laval, Mechanical Engineering/FORAC, Pavillon Adrien-Pouliot, bureau 3514, Québec, QC, G1K 7P4, Canada, mathieu.bouchard@forac.ulaval.ca, Sophie D'Amours, Alain Martel, Mikael Ronnqvist

We present a modeling approach for strategic forest management that takes into account supply chain economic impacts by considering more spatial and market information. This approach is motivated by recent research showing that there is enough flexibility in sustainable harvests to consider both ecological and economic considerations. We also present a road design algorithm to evaluate transportation costs from regions not yet linked to the road infrastructure. Numerical results are presented.

4 - Optimization Techniques for Forest Transportation Planning under Multiple Goals

Woodam Chung, Department of Forest Management, The University of Montana, 32 Campus Drive, Missoula, MT, 59812, United States of America, woodam.chung@umontana.edu, Pablo Aracena, Marco Contreras

Modern forest transportation planning requires consideration of both environmental impacts and cost efficiency of forest roads. These additional considerations introduce multiple objectives into transportation planning problems, making the problems larger and more complex. This presentation introduces different optimization techniques such as a heuristic network algorithm and Ant Colony optimization that can be used for efficient planning of timber transport routes under multiple goals.

5 - Robust Solutions to a Harvest Scheduling and Machine Assignment Problem

Jorge Vera, Professor, Pontificia Universidad Catolica de Chile, Campus San Joaquìn, Vicuna Mackenna 4860, Santiago, 02142, Chile, jvera@ing.puc.cl, Lui Cheng Lim

Harvest planning is an important issue in forest industry because of cost and yield variability. Robust Optimization can handle uncertain data in problems where no detailed probabilistic information is available. We apply this approach to harvest planning with machine allocation and routing decisions. We show the tradeoff between optimality and robustness and use Monte Carlo simulation to assess the feasibility of solutions and the robustness of the decision model.

■ SD12

M - Room 8212

Recommender Systems and Personalization

Cluster: Data Mining
Invited Session

Chair: Zan Huang, Assistant Professor, Penn State University, 419 Business Building, University Park, PA, 16802, United States of America, zanhuang@psu.edu

1 - Blockbuster Culture's Next Rise or Fall: The Impact of Recommender Systems on Sales Diversity

Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Daniel Fleder

We examine the effect of recommender systems on the diversity of sales. We find that some common recommenders based on collaborative filtering can lead to a net reduction in sales diversity. Further, it is possible for individual-level diversity to increase but aggregate diversity to decrease. We also show how basic design choices affect the outcome.

2 - Improving Collaborating Filtering Using Aggregate Ratings

Akhmed Umyarov, New York University. Stern School of Business., 44 W 4TH ST #8-185, New York, NY, United States of America, akhmed.umyarov@stern.nyu.edu, Alexander Tuzhilin

This talk describes a method of how external aggregate ratings data can be used for improving estimations of individual ratings for a certain class of existing collaborative filtering methods. E.g., can the aggregate movie ratings data from the IMDB database improve estimations of individual Netflix ratings using collaborative filtering? We show both theoretically and empirically that this external aggregate ratings data helps to improve performance of these collaborative filtering methods.

3 - Exploring the Effects of Rating Variability in Recommender Systems

Gediminas Adomavicius, University of Minnesota, 321 19th Avenue South, Minneapolis, MN, 55455, United States of America, gedas@umn.edu, YoungOk Kwon

Many recommender systems provide recommendations based on user-specified ratings, and various techniques have been developed to correctly predict the ratings of unrated items and recommend highly-predicted items for each user. We propose several new approaches to account for rating patterns in recommender systems. In particular, we show how variability of ratings can affect the accuracy and coverage of recommendations, and discuss other possible applications of the proposed approaches.

4 - Partitioning Customers Using Overlapping Segmentation Methods

Rong Zheng, PhD Candidate, NYU Stern School, 44 West 4th, 8-181, New York, 10012, United States of America, rzheng@stern.nyu.edu, Alexander Tuzhilin

We present an optimal customer segmentation problem that splits the customer base into overlapping segments performing prediction tasks and show this problem is NP-hard. We then present several polynomial-time suboptimal segmentation methods that iteratively improve the segmentation with respect to overall performance of the predictive models built on these segments. We show that the best among the proposed overlapping methods outperforms some of the previously studied non-overlapping methods.

■ SD13

M - Room 8216

Data and Text Mining Applications in Finance, CRM and Security

Sponsor: Data Mining
Sponsored Session

Chair: Mary Crissey, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States of America, MaryGrace.Crissey@sas.com

1 - Selecting Process Variables to Classify Production Batches into Two Classes

Michel Anzanello, ISE-Rutgers University, 793 Bevier Road, Piscataway, NJ, 08854, United States of America, michelja@eden.rutgers.edu, Susan Albin, Art Chaovaitwongse

Production data often consists of many, correlated, noisy process variables. Our objective is to select the important variables to classify batches into classes, e.g., premium and regular. Integrating PLS regression and data mining tools, we classify 5 real data sets and find the reduced set of variables yielding accurate classifications.

2 - Leverage Customer Relationship Management for Knowledge Creation in a Supply Chain

Chuni Wu, Assistant Professor, Department of Information Management Hsing-Kuo University of Management, No. 89, Yuying St., Tainan, 70943, Taiwan - ROC, wu.chuni01@msa.hinet.net, Yamei Tian, Shu-Mei Tseng

Customer-oriented approaches and complementary specialist knowledge exchanges are critical success factors in the inter-firm knowledge creation process. This paper aims to leverage customer relationship management (CRM) for knowledge creation in a collaborative supply chain. A case study of two high-tech manufacturers demonstrates how the key factors of CRM affect the knowledge creation process in a supply chain through the SECI modes and ba proposed by Nonaka et al (1998, 2000).

3 - Predictive Analytics Applied to Public Safety and Security

Colleen McCue, Senior Research Associate, Security Analytics, Innovative Analytics & Training, LLC, midlothian, VA, 23113, United States of America, colleen.mccue@innovative-analytics.com

Applied mathematics and critical thinking skills have always been in demand by the public sector. Today with metrics being tracked and monitored - its all the more essential. This talk will cover various consulting engagements where operations research methods have brought new insights and measurable success.

■ SD14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Syncopation Software- The New DPL 7: Portfolio Analysis and More!

Lori Carswell, Syncopation Software, 1623 Main St, Concord, MA, 01742, lcarswell@syncopation.com

Learn about the powerful new features in DPL 7! See how you can glean more insights with the Initial Decision Alternatives Tornado and Option Value Diagram. Save time in the pre-presentation crunch with the new endpoint replay capability. Go beyond project-level analysis by analyzing a portfolio of opportunities.

2 - Innovative Scheduling - Turning Models into Decision Support Systems

Ravindra Ahuja, President, Innovative Scheduling, Inc., GTEC, 2153 SE Hawthorne Road,, Suite, Gainesville, FL, 32611, United States of America, ahuja@ufl.edu

Innovative Scheduling is engaged in building custom decision support systems to solve planning and scheduling problems arising in the field of logistics, distribution, and transportation. In the past few years, we have successfully solved some very difficult optimization problems through cutting-edge network optimization techniques that were considered to be intractable before. In this tutorial, we will give an overview of the decision problems we have solved using decomposition and network-flow based techniques and the methodology we have used. We will also give demonstrations of some of the decision support systems built by us.

■ SD15

M - Room 8219

Service Quality

Sponsor: Service Science
Sponsored Session

Chair: Fugee Tsung, Professor, Hong Kong University of Science and Technology, clear water bay, Kowloon, Hong Kong, HK, China, season@ust.hk

1 - Service Quality Model for IPTV Service: Identification of Key Features and Their Relationship

Kwang-Jae Kim, POSTECH, Nam-Gu Hyoja-Dong, POSTECH, Eng.Bldg. #4-308, Pohang, KB, Korea, Republic of, kjk@postech.ac.kr, Wan-Seon Shin, Sook-Ran Lee, Yong-Kee Jeong, Hyun-Jin Kim, Hyun-Min Lim, Dae-Kee Min, Jin-Sung Yoo

This research develops a service quality model for IPTV(Internet Protocol Television) services. The model consists of three layers of features, namely, QoE, QoS and NP. The key features and their relationships are identified via two-phase quality function deployment. The issues on the improvement of the IPTV service quality are also presented.

2 - Service Six Sigma (Case Studies)

Fugee Tsung, Professor, Hong Kong University of Science and Technology, clear water bay, Kowloon, Hong Kong, HK, China, season@ust.hk

Since 1997, Citibank has begun its Six Sigma initiative for defect reduction and cycle time reduction. After that, AIG, American Express, Bank of America, etc. are all in various stages of Six Sigma deployment. People now realize that Six Sigma is every bit as applicable to service processes as it is to manufacturing. The speaker will give an introduction to Service Six Sigma and demonstrate some real cases from telecommunications, banking, hotel, healthcare, etc.

3 - Developing a Curriculum for Service Systems

Tang Loon Ching, National University of Singapore, 1, Engineering Drive 2, Dept of Ind & Sys Engrg, Singapore, 117576, Singapore, isetlc@nus.edu.sg

There has been a surge in interest in service science, management and engineering in the last two years as a result of active promotion by IBM and its partner universities. It is thus timely for academic institutions to develop program that leverages on the current strength of their academic units and the state of economic development in the country. Here, we present a case in the ISE Department of NUS in which we develop an area of specialization in "service systems" in our MSc program.

4 - Application of Data Mining Methods to Service Process Control and Monitoring

Maggie Ning, ningxh@ust.hk, Fugee Tsung

Service data, like credit card data, has been receiving more research attention in recent years. Treatment of this sort of data needs special skills because it contains a mixed type of variables and is usually high-dimensional. In the presentation, SVM-based approach and density-based method are addressed to perform analysis for service process data.

■ SD16

M - Room 8222

Service Operations Economics

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

Co-Chair: Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu

1 - New Product Shortages: Supply Chain Failures or Smart Marketing Strategies?

Laurens Debo, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, laurdebo@andrew.cmu.edu, Francesca Gino, Peter Boatwright

Shortages of new, innovative products do not only create frustrated buyers, they also generate a lot of free buzz. Manufacturers have been accused in the past of deliberately creating shortages in order to create a buzz and spreading the word better than expensive advertisement campaigns would do. In this talk, we discuss whether these are proper accusations or not.

2 - Strategic Arbitrage and Consumer Behavior

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

For hot-selling products, people may buy them purely with the intention of reselling them at a profit (e.g., over eBay). We develop a model of such strategic behavior and analyze its implications on supply chain performance.

3 - Competition and Contracting in Service Industries

Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu, Ramesh Johari

Two different contractual structures are commonly observed in service industries with congestion: 1) service level guarantees (SLG), where firms are responsible for investing so that the congestion level is equal to the SLG; and 2) best effort service, where firms provide the best possible service, but without guarantees. In this paper we analyze the impact of these contractual agreements on market outcomes in oligopolistic industries, yielding insight into business and policy considerations.

4 - Pricing and Dimensioning Competing Large-scale Service Providers

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Itay Gurvich

We consider a market with several large-scale service-providers that compete on both prices and service-levels. We introduce a framework that combines many-server heavy-traffic analysis with the concept of ϵ-Nash equilibrium to obtain first-order and second-order characterization for the equilibria in this market. The framework allows us to go significantly beyond the tractability boundaries imposed by the regular Nash equilibrium analysis.

■ SD17

M - Room 8226

Advanced Multivariate Statistical Process Monitoring

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Judy Jin, Associate Professor, University of Michigan, Department of Industrial, and Operations Engineering, Ann Arbor, MI, 48109, United States of America, jhjin@umich.edu

Co-Chair: Qingyu Yang, Postdoctoral Research Associate, University of Michigan, Ann Arbor, 1815 IOE Building, 1205 Beal Avenue, Ann Arbor, MI, 48103, United States of America, qiyang@umich.edu

1 - Monitoring of Multistream Functional Data with Enhanced Diagnosability

Qingyu Yang, Postdoctoral Research Associate, University of Michigan, Ann Arbor, 1815 IOE Building, 1205 Beal Avenue, Ann Arbor, MI, 48103, United States of America, qiyang@umich.edu, Judy Jin

In many complex systems, multistream functional data are often obtained through online sensing, which shows the dependency at both the spatial and time domains. This research aims to effectively utilize the independent component analysis method for the functional signal decomposition, which can achieve the enhanced system monitoring and diagnostic capability.

2 - Process Variance Monitoring and Diagnosis through Spatial Pattern Projection

Jian Liu, Assistant Professor, University of Arizona, jliuzz@umich.edu, Judy Jin

Monitoring and diagnosis of process variance based on multivariate quality measurement data is challenging. Existing approaches are mainly applied in univariate processes and provide limited diagnosis capability. This research proposes a method to project multivariate data to a set of pre-estimated spatial patterns that correspond to potential variation sources.

3 - Identifying Outliers in Complex Profile Baseline after Smoothed by Kernel Partial Least Squares

Hang Zhang, Arizona State University, PO Box 875906, Tempe, AZ, 85287, United States of America, hzhang12@asu.edu

We focus on identifying outliers among complex profiles. Profiles are first smoothed by kernel partial least squares (KPLS). KPLS captures nonlinear relationships between explanatory and response variables. Then, we propose two control charts to identify outlying profiles through smoothed profiles or the residuals of KPLS. Simulations show its good performance.

4 - Variability Modeling and Analysis in Wafer Manufacturing Process

Ran Jin, PhD Candidate, School of Industrial and Systems Engineering Georgia Institute of Technology, jinr@gatech.edu, Jianjun Shi, Kaibo Wang

Geometric defect is one of the major quality problems in wafer manufacturing process. The variation and its propagation in wafer manufacturing are modeled and analyzed based on production data. Innovative approaches for process monitoring are studied. Both theoretical investigations and applications will be presented.

■ SD18

M - Room 8228

Quality Management

Contributed Session

Chair: Cynthia Knott Eck, Assistant Professor, Marymount University, 20 West Custis Avenue, Alexandria, VA, 22301, United States of America, cynthia.knott@marymount.edu

1 - The Drivers of Excellence and the Impact of Excellence on Firm Performance

Gunduz Ulusoy, Professor, Sabanci University, Faculty of Engineering, Orhanli, Tuzla, Istanbul, 34956, Turkey, gunduz@sabanciuniv.edu, Gizem Komurcu

A model is designed and tested to determine the drivers of excellence and to measure the impact of excellence on firm performance. A questionnaire is developed and a survey covering 140 firms in 5 different manufacturing sectors is executed. Exploratory and confirmatory factor analysis, are applied together with correlation and regression analysis and structural equation modeling to search for the relationships sought. The positive relationship of excellence to firm performance is established.

2 - A Study on Customer Satisfaction in B2B Context an Investigation from Certification Service Industry

Qin Su, Professor, School of Management, Xi'an Jiaotong University, Xian Ning Road, xi'an, China, qinsu@mail.xjtu.edu.cn, YanWu Cui, JiXiang Dang

This paper put forward a B2B customer satisfaction model to describe customer satisfaction from the transaction and the relationship aspects. Through a questionnaire survey on nearly 800 certification customers, the authors empirically test this model. The results demonstrates that the certification customers' satisfaction level are correlated significantly not only with perceived quality, but also are influenced relationship quality.

3 - Comparative Study on Critical Success Factors of Six Sigma between Korean Service and Manufacturing

Jae-sung Park, Ph.D course, KOREA University, An am Dong, Seoul, Korea, Republic of, jspark@nemopartners.com, Kwangtae Park

Six Sigma is now applied to a variety of industries ranging from manufacturing to service. 200 Experts over Black Belt were interviewed. The paper use Path Analysis Model to compare critical success factors of six sigma between Korean manufacturing and service Sectors. The paper reports that CSF of six sigma is education, leadership, process management, change management in manufacturing sector and infrastructure, process management, market focus in service sector.

4 - Service Quality in Fast-food Industry in Mainland China

Hong Qin, PhD Candidate, Univ. of North Texas, PO Box 305249,ITDS Department, COBA, Univ. of North Texas, Denton, TX, 76203, United States of America, qinh@unt.edu, Victor Prybutok

This study describes the development and comparison of fast food industry models for the U.S. and China. The models include a modified SERVPERF instrument, the role of service quality, food quality, price/value, customer satisfaction, and recoverability as they relate to the customer~{!/~}s behavioral intention. A number of significant findings are reported, and the theoretical and managerial implications are addressed.

5 - The Role of Total Quality Management in Providing Private Legal Services

Cynthia Knott Eck, Assistant Professor, Marymount University, 20 West Custis Avenue, Alexandria, VA, 22301, United States of America, cynthia.knott@marymount.edu, Abigail Isaacs

The purpose of this paper is to investigate the role that Total Quality Management (TQM) might play in improving services in private legal practice in the United States. To achieve this goal theoretical and empirical literature on the subject of TQM will be reviewed. The literature will provide data on the advantages and disadvantages associated with implementing TQM in a legal environment among other things.

■ SD19

M - Lincoln 4

Decisions and Risk Perceptions Involving Ambiguity, Health, Safety, and Savings

Sponsor: Decision Analysis
Sponsored Session

Chair: L. Robin Keller, Professor, Merage School at UC Irvine, UC Irvine, Irvine, CA, 92697-3125, United States of America, lrkeller@uci.edu

1 - Decision under Uncertainty: Explicating the Roles of Perceived Riskiness and Perceived Ambiguity

John Aloysius, Associate Professor, University of Arkansas, Information Systems Department, Fayetteville, AR, jaloysius@walton.uark.edu, Fred Davis, Srinivasan Venkatraman

Riskiness and ambiguity are distinct dimensions of decision making under uncertainty, but their causal interplay as determinants of decision making has not been explicated. Four experiments confirmed our hypothesis that the influence of perceived ambiguity on decision behavior, is partially mediated through perceived riskiness. Studies 1, 2, and 3 manipulated ambiguity, and Study 4 manipulated riskiness to confirm its mediational role via an experimental-causal-chain design.

2 - Life Decisions with Health Outcomes

Jay Simon, Doctoral Candidate, Merage School at UC Irvine, SB 320, Paul Merage School of Business, University of California, Irvine, Irvine, CA, 92697-3125, United States of America, jsimon05@exchange.uci.edu, L. Robin Keller

Decisions with health outcomes involve some interesting theoretical and modeling issues when incorporating multi-attribute utility. These decisions arise frequently in the medical domain, but also in regard to personal lifestyle choices. It is possible to formulate a reasonably straightforward expected utility model, provided that we impose some conditions on the preferences of the decision maker. These conditions help determine the types of contexts for which the model will be valid.

3 - Product Quality Risk Perceptions and Decisions: Pet Food and Lead-painted Toys

L. Robin Keller, Professor, Merage School at UC Irvine, UC Irvine, Irvine, CA, 92697-3125, United States of America, lrkeller@uci.edu, Tianjun Feng, Liangyan Wang, Yitong Wang

We study risk perceptions of consumers when they are faced with product quality crises. Through a survey, we examine the risk perceptions and decisions of consumers regarding the crises of pet food and lead-painted toys in the United States with products from China. Insights are obtained on how to deal with these crises by examining similarities and differences in the responses on other health and safety risks.

4 - A Behavioral Model of Consumption under Anticipated Health and Income Risks

Yitong Wang, UC Irvine, The Paul Merage School of Business, University of California, Irvine, Irvine, CA, 92697, United States of America, ywang07@merage.uci.edu, L. Robin Keller, Tianjun Feng

We study an individual's consumption decisions along an inter-temporal horizon when health, safety and financial risks are involved. Specifically, we propose a behavioral model to analyze individual consumption decisions by linking disparate streams of work on risk perception, time discounting, and consumption vs. savings patterns together. We further conduct a survey on Chinese subjects to test the model and obtain some managerial implications.

■ SD20

M - Lincoln 3

Flexibility and Uncertainty in R&D

Sponsor: Decision Analysis
Sponsored Session

Chair: Yael Grushka-Cockayne, London Business School, Regent's Park, London, United Kingdom, ygrushka.phd2003@london.edu

1 - A Portfolio Model for the Allocation of Resources to Standardization Activities

Juuso Liesiö, Researcher, Helsinki University of Technology, PO Box 1100, Espoo, UM, 02015 HUT, Finland, juuso.liesio@tkk.fi, Ahti Salo

High-tech companies seek to strengthen their competitiveness through standardization activities which contribute to enhanced interoperability and market growth. We present a model developed for a major high-tech company to support allocation of resources to standardization activities. This model captures relationships between market growth and standardization activities, links these activities to strategy and guides the determination of optimal resource levels for the standardization portfolio.

2 - Sequential Innovation under Development Uncertainty: Inventory and New Product Launch Decisions

Ankur Goel, Prof, Case Western Reserve University, ankur.goel2@case.edu, Sreekumar Bhaskaran, Karthik Ramachandran

In this paper, we focus on the Inventory Planning and Introduction timing decisions surrounding product rollovers in sequential innovation when a firm faces uncertainty regarding the outcome of a new product development endeavor. We consider a firm that has to make the inventory decision for an existing product while anticipating the launch of a new product . We characterize the product launch timing decision as the optimal recourse to observed new product quality and current product inventory.

3 - The Value of Flexibility in New Product Development: The Impact of Competition

Janne Kettunen, London Business School, Regents Park, London, NW1 4SA, United Kingdom, jkettunen@london.edu, Yael Grushka-Cockayne, Bert De Reyck, Ahti Salo, Zeger Degraeve

We examine the effect of competition on the value of the flexibilities in new product development accounting for market type and uncertainties in the development process. We develop a multi-stage stochastic optimization model and show that an increase in competition may increase or decrease the value of the flexibilities, delaying product launch is highly valuable in a low competition environment, and flexibilities have greater value in a winner-takes-all market than in a shared market.

4 - Valuing Flexibility in Multi-generation New Product Development

Yael Grushka-Cockayne, London Business School, Regent's Park, London, United Kingdom, ygrushka.phd2003@london.edu, Janne Kettunen, Bert De Reyck, Zeger Degraeve, Ahti Salo

We present a model for valuing a flexible new product development program consisting of multiple product generations, taking into account uncertainty regarding product performance and market requirements, and cannibalization affects across product generations. We derive managerial insights regarding possible decisions the firm can make throughout the program, in the form of possible product line abandonment, development enhancement and flexible launching times of each product generation.

■ SD21

M - Lincoln 2

Queueing Models II

Contributed Session

Chair: Li Xia, Dr., IBM China Research Laboratory, Diamond Building, Zhongguancun SoftPark, Beijing, Be, China, crlxiali@cn.ibm.com

1 - Heavy-traffic Limits for Waiting Times in Many-server Queues with Abandonment

Rishi Talreja, Columbia University, New York, NY, United States of America, rt2146@columbia.edu, Ward Whitt

We prove heavy-traffic limits for waiting times in the M/M/n+M model in the QED and ED regimes. We treat abandonment by studying the limiting behavior of the models with arrivals turned off at a fixed time. Then, the waiting time of a customer is the additional time it takes for the queue to empty. We establish a two-parameter version of Puhalskii's invariance principle for first-passage times to complete the proof.

2 - The Impact of Time-Phased Order Releases on GI/G/1 Queueing Networks

Diederik Claerhout, Jr. Researcher of Operations Management, K.U.Leuven Campus Kortrijk, Etienne Sabbelaan 53, Kortrijk, 8500, Belgium, Diederik.Claerhout@kuleuven-kortrijk.be, Nico Vandaele

One of the key characteristics of MRP systems include the coordination of assembly and purchased component requirements through time-phased order releases. Time-phased release mechanisms are also described in the workload control literature as worthy alternatives to load limited release mechanisms. Based on our exact M/M/1 analysis and simulation results, we present approximations to quantify the impact of time-phased release mechanisms on GI/G/1 queueing networks.

3 - On Fluid and Diffusion Models for Markovian Queueing Systems with Non-differentiable Rate Functions

Young Myoung Ko, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ymko@tamu.edu, Natarajan Gautam

We consider state-dependent queueing systems where fluid and diffusion approximations are frequently used for performance analysis. We find that existing fluid and diffusion models could be extremely inaccurate especially when the rate functions governing system dynamics are non-linear and non-differentiable. The main objective of this research is to suitably fine tune the fluid and diffusion approximations to provide better estimate of performance, as well as validate the adjusted models.

4 - Optimization of Customer-Average Performance in Queueing Systems

Li Xia, Dr., IBM China Research Laboratory, Diamond Building, Zhongguancun SoftPark, Beijing, Be, China, crlxiali@cn.ibm.com, Jin Yan Shao, Wenjun Yin, Jin Dong, Ming Xie

We consider the performance optimization of queueing systems through adjusting state-dependent service rates. The optimization criterion is a customer-average performance, which concerns the average performance on each customer. From the view of Perturbation Analysis, we derive a performance difference equation when the service rates are changed, and then propose a policy iteration algorithm to optimize the service rates. It gives a new direction to optimize the "customer-centric" performance.

■ SD22

M - Lincoln 1

Hybrid Methods

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session

Chair: Willem-Jan van Hoeve, Asst. Professor Operations Research, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, vanhoeve@andrew.cmu.edu

1 - Artificial Intelligence Planning and Operations Research

Menkes Van Den Briel, Arizona State University, 699 South Mill Avenue #553, Tempe, AZ, 85281, United States of America, menkes@asu.edu, Thomas Vossen, John Fowler, Subbarao Kambhampati

Artificial intelligence (AI) planning is concerned with developing automated methods for generating and reasoning about sequences of actions to achieve certain goals. AI planning in its classical form is PSPACE-complete and due to this complexity most of the existing approaches have focused on finding any feasible plan. This presentation is about creating innovative ways for dealing with the inherent computational complexity of AI planning and still being able to produce provably optimal plans.

2 - Constraint Integer Programming: A New Approach to Integrate CP and MIP

Stefan Heinz, ZIB, Division Scientific Computing Department Optimization, heinz@zib.de, Thorsten Koch, Kati Wolter, Timo Berthold, Marc E. Pfetsch, Tobias Achterberg

In this talk we introduce constraint integer programming (CIP), which is a novel way to combine constraint programming (CP) and mixed integer programming (MIP) methodologies. We demonstrate the advantage of CIP on the task to solve chip design verification problems. We present computational results of our solver, which is based on the CIP framework SCIP (http://scip.zib.de).

3 - Propagating Separable Equalities in a MDD Store

John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu, Tarik Hadzic, Peter Tiedemann

We present a propagator that achieves MDD consistency for a separable equality over an MDD (multivalued decision diagram) store in pseudo-polynomial time. We integrate the propagator into a constraint solver based on an MDD store. Our experiments show that the new propagator provides substantial computational advantage over propagation of two inequality constraints, and that the advantage increases when the maximum width of the MDD store increases.

4 - Using Local Search to Speed Up Filtering Algorithms for Some NP-hard Constraints

Gilles Pesant, University of Montreal, CRT, CP 6128, Quebec, Canada, pesant@crt.umontreal.ca, Sandrine Paroz, Philippe Galinier, Alain Hertz

This paper proposes to use local search inside filtering algorithms of combinatorial structures for which achieving a desired level of consistency is too computationally expensive. Local search quickly provides supports for many variable-value pairs, thus reducing the effort required to check and potentially filter the rest of them. The idea is demonstrated on the SomeDifferent constraint, a graph coloring substructure.

■ SD23

M - Lincoln 5

Joint Session AP/ Simulation: Analysis of Simulation

Sponsor: Applied Probability, Simulation
Sponsored Session

Chair: Shane G. Henderson, Associate Professor, Cornell University, 230 Rhodes Hall, Ithaca, NY, 14853, United States of America, sgh9@cornell.edu

1 - Discrete Hit-and-run for Sampling from Arbitrary Subsets of Integer Hyper-rectangles

Archis Ghate, Assistant Professor, University of Washington, Industrial Engineering,, Box 352650, Seattle, WA, 98115, United States of America, archis@u.washington.edu, Stephen Baumert, Yanfang Shen, Seksan Kiatsupaibul, Zelda Zabinsky, Robert Smith

We consider the problem of sampling a point from a distribution p over a subset S of an integer hyper-rectangle, both defined through oracles. We turn to Markov Chain Monte Carlo, where we execute an ergodic Markov chain that converges to p so that the distribution of the point delivered after sufficiently many steps is arbitrarily close to p. Specifically, we propose a discrete variant of hit-and-run, a well-known Euclidean domain Markov chain.

2 - Parameter Choice in Sample-path Algorithms for Root Finding and Optimization

Raghu Pasupathy, Virginia Tech, 250 Durham Hall, Blacksburg, VA, United States of America, pasupath@vt.edu

Retrospective Approximation (RA) is a sample-path technique for solving simulation-optimization and stochastic root-finding problems. RA works by generating and solving a sequence of deterministic problems, using specified sample-size and error-tolerance sequences. In this talk, we provide guidance on choosing these sequences by characterizing a class that is superior to others in a certain precisely defined sense. We provide numerical examples illustrating the key results.

3 - New Monte Carlo Methods for Identifying the Initial Transient

Peter W. Glynn, Stanford University, glynn@stanford.edu

One often wishes to compute the rate of convergence to equilibrium of a Markov process, either because of its modeling implications or its algorithmic implications (e.g. planning a steady-state simulation). In this talk, we introduce some new sampling-based methods for identifying the rate of convergence, and discuss some related convergence results. This work is joint with Jose Blanchet.

4 - Stochastic Root Finding in One Dimension for Increasing Convex Functions

Shane G. Henderson, Associate Professor, Cornell University, 230 Rhodes Hall, Ithaca, NY, 14853, United States of America, sgh9@cornell.edu, Samuel M. T. Ehrlichman

We study this problem first assuming exact function evaluations and second assuming interval estimates. The algorithms studied are gradient-free and do not depend upon any additional smoothness conditions. We provide a performance guarantee in the deterministic case and a probabilistic performance guarantee in the stochastic case.

■ SD24

M - Lincoln 6

Joint Session CS/INFORM-ED: Recommendations of the INFORMS Computing Society Education Committee

Sponsor: Computing Society, INFORM-ED
Sponsored Session

Chair: Jill Hardin, Virginia Commonwealth University, 1001 W. Main St., PO Box 843083, Richmond, VA, 23284-3083, jrhardin@vcu.edu

1 - Recommendations of the INFORMS Computing Society Education Committee

Jill Hardin, Virginia Commonwealth University, 1001 W. Main St., PO Box 843083, Richmond, VA, 23284-3083, jrhardin@vcu.edu, David Rader, Cesar Rego, Chris Beck, Kevin Furman, Arthur Hanna, Allen Holder

At its January 2007 business meeting, the INFORMS Computing Society proposed forming an Education Committee. This committee has been charged with recommending a model undergraduate curriculum which would produce graduates who are well prepared for work at the OR/CS interface. The committee's current findings will be presented, along with recommendations and rationale, followed by a panel discussion with the members of the committee.

■ SD25

M - Lincoln 6A

Computing in Biomedical Applications

Sponsor: Computing Society
Sponsored Session

Chair: Ariela Sofer, Professor and Chair, George Mason University, SEOR MS4A6, Fairfax, VA, 22030, United States of America, asofer@gmu.edu

1 - Parameter Estimation with a Blood Flow, Blood Pressure Model
Scott Pope, Research Assistant, North Carolina State University, 255 Harrelson Hall, Box 8205, Raleigh, NC, 27695, United States of America, srpope@ncsu.edu, C. T. Kelley, Mette Olufsen, Laura Ellwein, Cheryl Zapata

This work aims to use blood flow and pressure data obtained non-invasively to estimate vascular resistances and compliances. The human circulatory system is modeled as a collection of compartments exchanging blood. Each compartment has a compliance parameter and connections between compartments have a resistance parameter. An ODE system dependent upon our parameters is derived. We apply cutting edge optimization techniques to minimize the difference between data and model predicted values.

2 - Optimization-based Predictive Models in Medicine and Biology
Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

We present novel optimization-based classification models that are general purpose and suitable for developing predictive rules for large-scale heterogeneous biological and medical data sets. Application to cardiovascular risk prediction, early cancer diagnosis, mild cognitive impairment, fingerprinting of native and angiogenic microvascular networks for early diagnosis of diabetes, aging, macular degeneracy and tumor metastasis will be discussed.

3 - Design of Network Vaccine Inventory for Epidemic Disease
Yifan Liu, George Mason University, SEOR, MS4A6, Fairfax, VA, 22030, yliu9@gmu.edu

We design the necessary vaccine inventory levels nationalwide, to get prepared for a breakout of an epidemic disease. We produce the relation between the optimal inventory levels and the decisive properties of vaccine production and the infectious disease, including the usual production and shipment rate, and the population dynamics of the infectious disease in the potential regions of vaccine shortage, etc. Both analytical and simulation results are presented.

■ SD26

M - Lincoln 5A

Open Optimization Modeling Systems

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Robert Fourer, Northwestern University, Department of Industrial Engineering and Mgt. Science, Evanston, IL, United States of America, 4er@iems.northwestern.edu

1 - Object-algebraic Modeling Using POAMS: The Platform for Object-algebraic Modeling Systems
Leonardo B. Lopes, Assistant Professor, University of Arizona, Systems & Industrial Eng. Department, 1127 E. North Campus Drive, Tucson, AZ, 85721, United States of America, leo@sie.arizona.edu, William Hart

In this talk we focus on how object-oriented concepts, in particular specialization, in combination with algebraic modeling, aids the development of both optimization models and optimization algorithms. As expected, the object-algebraic approach makes the development of new models easier and less error-prone. In optimization modeling we get an extra benefit: the object-algebraic description of a model often highlights important relationships that lead to decomposition approaches.

2 - Pyomo: Python Optimization Modeling Objects
William Hart, Sandia National Laboratories, PO Box 5800, MS 1318, Albuquerque, NM, 87185, United States of America, wehart@sandia.gov, Leonardo B. Lopes

We describe the Python Optimization Modeling Objects (Pyomo) package. Pyomo is a Python package that provides an optimization modeling capability that is commonly associated with algebraic modeling languages like AMPL and GAMS. Pyomo can be used to define abstract problems, create concrete problem instances, and solve these instances with standard solvers. The Python scripting language provides a clean syntax for defining models while providing the flexibility of a general programming language.

3 - CVXMOD: Convex Optimization in Python
Jacob Mattingley, PhD Candidate, Stanford University, Dept of Electrical Engineering, Stanford, CA, 94305, United States of America, jacobm@stanford.edu, Stephen Boyd

CVXMOD is a Python tool for modeling convex optimization problems. The first development goals were to make a completely free toolchain for convex optimization, to use a modern programming language, and to use a fully object-oriented approach. CVXMOD fulfills these, currently working with CVXOPT's solvers. Later work has included automatic C code generation for convex problems. We will give an overview of the current state of CVXMOD and examples of its use, and discuss future directions.

■ SD27

M - Washington 1A

Queueing Models: Some Asymptotics Insights

Sponsor: Applied Probability
Sponsored Session

Chair: Assaf Zeevi, Professor, Columbia Business School, New York, NY, 10027, United States of America, assaf@gsb.columbia.edu

1 - The M/D/s Queue, the Halfin-Whitt Regime and the Gaussian Random Walk
Johan Leeuwaarden, Technical University of Eindhoven, Netherlands, j.s.h.v.leeuwaarden@TUE.nl

To obtain insight in the quality of heavy-traffic approximations for queues with many servers, we consider the M/D/s queue in steady state as s goes to infinity. In the Halfin-Whitt regime, the queue converges to a Gaussian random walk. We present series expansions that characterize the difference between the queue and this Gaussian limiting process. Joint work with A.J.E.M. Janssen and B. Zwart.

2 - Staffing for Call Centers with General Abandonment Distributions
Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu, Achal Bassamboo

We study the optimal capacity sizing problem for a M/M/N+G system. In a large system setting, we observe that under the optimal operating regime intricately depends on the abandonment distribution. In particular, for many common distributions, the optimal regime has a traffic intensity greater than 1. We propose a fluid based solution and demonstrate its efficacy via simulations.

3 - Optimal Call Center Staffing with Arrival Uncertainty
Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu, Ramandeep Randhawa, Assaf Zeevi

We study the capacity sizing problem in a call center faced with an uncertain arrival rate. In a large system setting, we first characterize the solution to the first order fluid problem. Then, we characterize the second-order refinement to it. We show that the order of this refinement depends on the distribution of the arrival rate. This refinement is typically of a much small order than that proposed by the square root staffing.

■ SD28

M - Washington 1

Dynamic Optimization for Finance Applications

Cluster: Applied Dynamic Optimization
Invited Session

Chair: Ciamac Moallemi, Assistant Professor, Columbia Business School, Uris 416, 3022 Broadway, New York, NY, 10027, United States of America, ciamac@gsb.columbia.edu

1 - The Execution Game
Beomsoo Park, Graduate Student, Stanford University, 161 Packard Building Rm 274, 350 Serra Mall, Stanford, CA, 94305, United States of America, beomsoo@stanford.edu, Ciamac Moallemi, Benjamin Van Roy

We consider a trader who aims to liquidate a large position in the presence of an arbitrageur who is uncertain about the trader's position and learns from observed market activity. This is a dynamic game with asymmetric information. We present an algorithm for computing perfect Bayesian equilibrium behavior and conduct numerical experiments. Our results demonstrate that the trader's strategy differs in important ways from one that would be optimal in the absence of an arbitrageur.

2 - Optimal Partial Liquidation of a Multiple-asset Portfolio with Price Impact

Miguel Lobo, INSEAD, 1 Ayer Rajah Avenue, Singapore, 138676, Singapore, Miguel.LOBO@insead.edu, David Brown

We consider the partial liquidation of a portfolio of assets with temporary and permanent price impact of trading. This involves multiple objectives: the cash from transactions; the valuation of the final portfolio; and the average liquidity of the final portfolio. We obtain a closed-form solution for a basic version of the problem. A dynamic programming formulation accounts for the option value of maintaining a liquid portfolio and for uncertainty about the price impact of trading.

■ SD29

M - Washington 2

Industry Application in Korea

Sponsor: Korea Chapter- INFORMS
Sponsored Session

Chair: Sang Hyung Ahn, Seoul National University, Gwankak 599, Seoul 151-799, Korea, Republic of, shahn@snu.ac.kr

1 - A Framework of Servitization Processes in Manufacturing Companies

Hosun Rhim, Professor, Korea University Business School, Anam-dong Seongbuk-Gu, Seoul, Seoul, S, 136-701, Korea, Republic of, hrhim@korea.ac.kr, Hongil Kim, Kwangtae Park

We present a framework to understand servitization process of manufacturing companies in Korea. Literature on firms, customer relationship, and products is reviewed to develop the framework. Business cases on servitization are introduced and the framework is applied to the cases.

2 - Staff Scheduling at the Mail Center of Korea Post

Jiyoung Choi, ETRI, 138 Gajeongro, Yuseong-gu, Daejeon, Korea, Republic of, cjy@etri.re.kr, Wanseok Kim, Kibaek Lee, Jongheung Park

The purpose of this paper is to present a model of the staff scheduling problem at the Mail Center of Korea Post. The problem is formulated as a pure integer program and solved with Xpress-MP. The model includes both full-time and part-time workers, as well as the constraints about work procedure, limit on the number of staff, etc. The results indicate that the model reflects practical work under same condition and creates cost effective staff schedule under modified condition.

3 - Designing a Supply Chain Coordinating Guaranteed Profit Margins Contract in the Fashion Apparel Industry

Chang Hwan Lee, Professor, Ajou University, San 5, Woncheon-dong, Yeontong-gu, Suwon, 443-749, Korea, Republic of, chlee@ajou.ac.kr, Byong-Duk Rhee

Guaranteed Profit Margin (GPM) is one of the chargebacks that retailers frequently employ in the fashion industry. With this stipulation, the store demands a vendor's guarantee of its target mark-up rate even in a markdown operation. This makes the retailer order too much and later liquidate a greater amount of leftovers. We propose a new GPM scheme for supply chain coordination. Specifically, if the retailer compensates the vendor for the same fraction of the joint costs as the guaranteed mark-up rate, the retailer's quantity decision leads to profit maximization for the entire supply chain. Thus, the supply chain becomes fully coordinated and provides win-win outcomes for both retailer and vendor.

4 - A Single Facility Location Model for Retail Networks under Demand Substitution

Hong Suk Yang, School of Business, Seoul National University, Seoul, 151-742, Korea, Republic of, hongsuk@snu.ac.kr

The conventional location problem with a hierarchy of service facilities tries to obtain the maximum coverage of population or geographical space. In this problem, each demand point is assigned to a certain member of the hierarchy within an appropriate distance. It is often implied that the closer the facilities are to the existing demand points, the better the public welfare (or service) provided. However, the traditional set-covering approach often neglects a fact that companies may strategically locate their new facility closer to competition in order to capture the competitors' market share. Thus, we propose a single facility location model whose goal is to find the optimal size and location of facility, considering both demand cannibalization among the same company's retail outlets and demand substitution among those of competitors. The model is developed using integer programming and tested upon the real data from the two major pizza chains in Korea.

5 - How to Use RFID to Improve 3Vs in Retail Industry in Korea

Youn Sung Kim, School of Business, Inha University, Incheon, 402-751, Korea, Republic of, keziah@inha.ac.kr, Seungwook Park

By leveraging and linking system to automate processes for answering inquires from customers, both reduced the cost of servicing them while increasing their satisfaction and loyalty. More recently, Carrefour, Wal-Mart Stores, and especially Samsung Tesco in Korea have adopted digital-tagging technologies, such as RFID(radio frequency identification), and integrated them with other supply chain systems in order to automate the supply chain and inventory management. So in this research, we study the practice of the leading retailers in Korea as well as the results including 3Vs(velocity, visibility, value).

6 - Performance Management Using Key Performance Indicators (KPI) in Health Service System

Chang Won Lee, Associate Professor, Hanyang University, School of Business, Seoul, 133-791, Korea, Republic of, leecw@hanyang.ac.kr, Seung-Chul Kim

This study presents a performance management model using key performance indicators (KPI) in a health service system in a leading patient-centered hospital in Korea and provides the health decision makers and policy makers with managerial insights for improving operational excellence of a health service system. The case study is invited and analyzed in detail. The results show that the proposed KPI model provides the management with strategic insights.

■ SD30

M - Washington 4

Human Network Analysis: Social Networks in Systems of Systems

Sponsor: Military Applications
Sponsored Session

Chair: Dick Deckro, Professor of Operations Research, Air Force Institute of Technology, AFIT/ENS; Bldg 641, 2950 Hobson Way, Wright-Patterson Air Force Bas, OH, 45433, United States of America, richard.deckro@afit.edu

1 - Social Influence Network Structures: Determination and Detection

James Andrew Leinart, United States Air Force, 1570 Air Force Pentagon, Washington, DC, 20330-1570, United States of America, James.Leinart@pentagon.af.mil, Dick Deckro

A causal analysis approach to determining potential social influence network structures is presented. The method permits not only the identification of relationships between network individuals, but also the possibility of detecting hidden individuals. An illustrative example using Congressional members' voting records is provided.

2 - Detecting Nonrandom Structure in Noisy Networks

Marcus B. Perry, perry.marcus@gmail.com

In this talk, we present a tractable hypothesis testing framework for detecting, characterizing and estimating edge-set structure and strengths between vertices in an undirected network. It is assumed that the edge set is only observable through a noisy adjacency matrix. Application of the proposed method can provide analysts with valuable insight into the true edge structure with a given level of confidence. The proposed method is demonstrated using a real-world terrorist friendship network.

3 - Analysis of Clandestine Networks Using Reliability Properties in Multistate Systems

Edward Pohl, Associate Professor, University of Arkansas, Department of Industrial Engineering, Bell Engineering Center, Fayetteville, AR, 72701, United States of America, epohl@uark.edu, Mauricio Guzman

This study analyzes the reliability level in a clandestine network having a flow of at least d units of influence, from a given source to a target, with looses in some nodes. An algorithm finds the reliability when the nodes are treated as non-identical components using a k-out-of-n:G system structure.

4 - Disrupting Terrorist Networks Using Network Flow Centrality

Susan Martonosi, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, martonosi@hmc.edu

Terrorist networks are vast and complex, and counterterrorism strategies for disrupting these networks depend on their structure and the metric used to measure disruption. We discuss a particular type of disruption to the network that forces communication through a key member to increase, making that member more visible to intelligence officials. Using existing knowledge of the structure of terrorist networks, we explore which strategies yield the greatest disruption.

■ SD31

M - Washington 5

OR, Simulation, and Information Fusion Applied to Cyber Security

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Russell Wooten, Program Manager, Emerging Initiatives, US Department of Homeland Security, 46842 Graham Cove Square, Potomac Falls, VA, 20165-7578, United States of America, russell.wooten@dhs.gov

Co-Chair: Michael Kuhl, Associate Professor, Rochester Institute of Technology, Industrial & Systems Engineering Department, 81 Lomb Memorial Drive, Rochester, NY, 14623, United States of America, mekeie@rit.edu

1 - Tradeoff between Speed and Quality in the Information Fusion Process for Cyber Security

Moises Sudit, State University of New York at Buffalo, 307 Bell Hall (North Campus), Buffalo, NY, 14260, United States of America, sudit@eng.buffalo.edu, Adam Stotz, Rakesh Nagi

One of the hardest problems in Cyber Security is the speed in which sensor information needs to be fused to give decision-making systems or individuals a "real-time" situational awareness of their networks. This creates a clear tradeoff of quality of the status of potential threats and the time in which those situations are calculated. We present issues that arise in the fusion process in the Cyber Domain and a methodology addressing the tradeoff between speed and quality for network security.

2 - Design and Development of a Cyber Attack Simulator

Kevin Costantini, CUBRC, costantini@cubrc.org, Michael Kuhl, Moises Sudit

A simulation modeling approach has been developed to represent computer networks and intrusion detection systems (IDS) to efficiently simulate cyber attack scenarios. This flexible modeling framework is based in Java and enables simulation of various network structures, services, and IDS configurations. The outcome of the simulation model is a set of IDS alerts that can be used to test and evaluate cyber security systems including information fusion methods.

3 - Sensor Management in Cyber Security

Katie McConky, Research Scientist, CUBRC, Inc., 4455 Genesee St, Buffalo, NY, 14043, United States of America, mcconky@cubrc.org, Michael Kuhl, Moises Sudit, Ying Zhang, Rakesh Nagi

Currently, sensor management for cyber network security depends a lot on subjective experience. This may result in inaccurate decisions in many cases. Therefore, our research is dedicated to find a more objective way to conduct effective sensor management. We have develop both an a priori mathematical model to locate sensors based on initial knowledge and assumptions as well as a on-line approach to re-task sensors in the network as new information is obtained.

4 - On the Projection of Cyber Attack Actions and Impact Assessment

Sanchieh Jay Yang, Associate Professor, Rochester Institute of Technology, 83 Lomb Memorial Dr., Rochester, NY, 14623, United States of America, sjyeec@rit.edu, Jared Holsopple

A proactive solution to enhance cyber security is to deduce plausible future attack actions before they happen. Recognizing the diverse and evolving nature of cyber attack, this work develops multiple algorithms requiring minimal a priori information. Specifically, algorithms exploring the attacker's capability, opportunity, and behavior trends will be presented. Promising results suggest the validity and future directions in proactive cyber defense.

■ SD32

M - Washington 6

Challenges and Opportunities in Modeling and Optimization for Healthcare Delivery

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Joseph Jasinski, IBM Research, 19 Skyline Drive, Hawthorne, NY, United States of America, jmjasin@us.ibm.com

1 - Control of Complex Adaptive Healthcare Systems

William Rouse, Professor, Tennenbaum Institute, Georgia Institute of Technology, 760 Spring Street, Atlanta, GA, 30332-0210, United States of America, bill.rouse@ti.gatech.edu

One cannot, using any conventional means, command or force complex adaptive systems to comply with behavioral and performance dictates. The agents in such systems are sufficiently intelligent to game the system, find workarounds, and creatively identify ways to serve their own interests. The key is to devise a portfolio of incentives and inhibitions that cause agents to behave in desirable ways. This paper addresses these issues in the context of healthcare delivery.

2 - Modeling the Healthcare Supply Chain: The Clinical Perspective

Ursula Hubner, Professor, University of Applied Sciences, Caprivistr. 30A, Osnabrück, D-49080, Germany, U.Huebner@fh-osnabrueck.de

This paper aims at presenting a model of supply chain activities in healthcare within the context of eBusiness and its four behavioral components: information distribution and search, transactions, collaboration and decision-making. The supply chain model of eBusiness in healthcare integrates a process, a document, and a functional model that are all geared to the combined view of clinical and economic issues related to the procurement, provision, and use of medical supplies.

3 - Empowering Individuals and Families to Prepare for Public Health Emergencies

Stan Finkelstein, MIT, 1 Amherst Street, E40-251, Cambridge, MA, 02139, United States of America, snf@mit.edu, Richard Larson, Shiva Prakash

Vaccines and medicines may have limited value in flu pandemics. Non-pharmaceutical interventions can reduce the risk of household members becoming sick. Interventions range from hygiene measures to home-based technologies to process indoor air or regulate its temperature and humidity. Published literature suggests these interventions can be effective. Adopting them requires only modest effort and monetary investment and could reduce the pandemic's impact.

4 - An Enterprise Systems Approach to Healthcare

Deborah Nightingale, Professor, MIT, Room 33-312, 77 Massachusetts Ave., Cambridge, MA, 02139, United States of America, dnight@mit.edu, Jorge Oliveira

The global healthcare delivery system is highly fragmented, comprised of multiple stakeholders often with misaligned interests, resulting in high costs and unsatisfactory performance. To truly begin resolving the healthcare system's problems a holistic systems approach is required that addresses the fragmented nature of the healthcare industry. This paper will convey some key insights drawn from applying enterprise architecting frameworks and transformation methodologies to Boston area hospitals.

■ SD33

M - Johnson

Healthcare Flow: Uncertainty In Hospitals

Sponsor: Health Applications Section
Sponsored Session

Chair: Mike Magazine, University of Cincinnati, Department of QAOM, College of Business, Cincinnati, OH, 45221, United States of America, mike.magazine@uc.edu

1 - Estimating Patient Wait Times in a Highly Uncertain Service Environment

Craig Froehle, University of Cincinnati, Department of QAOM, Cincinnati, OH, 45221, United States of America, craig.froehle@uc.edu, Andrew Faehnle

Patients are often subjected to waits of difficult-to-predict durations. Healthcare can entail queue disciplines combining "most in need of service first" with FCFS, and the number of servers (e.g., physicians) available to process patients can change quickly as needs arise. These and other sources of uncertainty make it challenging to predict how long a patient will wait. This research proposes and compares the performance of 3 methods using data from a high-volume pediatric radiology service.

2 - Effective Use of Hospital Stroke Units

Natalia Yankovic, Columbia University, Decision. Risk and Operations, Columbia Business School, Nerw York, NY, 10027, United States of America, ny2106@columbia.edu, Linda Green

We present models for evaluating the impact of alternative bed placement policies for hospital inpatients suffering from ischemic strokes. Specifically, we develop a tandem queuing model to study the impact of the criteria used to admit a patient to a stroke unit as well transfer policies for moving patients from the stroke unit to a neurological unit.

3 - Emergency Disruptions and Patient Overflow: A Simulation Study

Yann Ferrand, University of Cincinnati, Department of QAOM, Cincinnati, OH, 45221, United States of America, ferrany@email.uc.edu, Mike Magazine, Uday Rao

In a hospital that serves elective and emergency patients, we seek to answer whether it is better to deal with emergency overflows by dedicating rooms based on type of patient, or by allowing flexibility through room sharing between all patients. We use discrete event simulation to evaluate the performance of several allocation policies under various input conditions, such as arrival patterns and processing time variance, by measuring patient wait time, doctor utilization and staff overtime.

■ SD34

M - Jefferson

Healthcare Applications for Decision-Makers

Sponsor: Health Applications Section
Sponsored Session

Chair: Stephanie Earnshaw, Global Head, US Health Economics, RTI Health Solutions, 3040 Cornwallis Rd, PO Box 12194, RTP, NC, 27709, United States of America, searnshaw@rti.org

1 - Is Prison-based Substance Abuse Treatment Cost-beneficial?
Katherine Hicks, RTI International, 3040 Cornwallis Rd, RTP, NC, 27709, United States of America, khicks@rti.org, Laura Dunlap, Alexander Cowell, Michael Mills, Vincent Keyes, Steven Belenko, Kimberly Houser, Gary Zarkin

We will present a discrete event model simulating the remaining lifetimes of a cohort of state prison inmates with respect to substance abuse and treatment, criminal activity, healthcare usage and productivity to estimate the lifetime benefits and costs of prison-based treatment and different policy scenarios. We will discuss results and interesting findings, as well as the challenges of developing models for which data is scarce.

2 - Estimating the Insurer's Willingness-to-Pay for Colorectal Cancer Screening Tests
Reza Yaesoubi, PhD Student, North Carolina State University, 421 Daniels Hall, Edward P. Fitts Department of Industrial, Raleigh, NC, 27695, United States of America, ryaesou@ncsu.edu, Stephen Roberts

Among the factors influencing Colorectal Cancer (CRC) screening test utilization, the role of health insurers has gained considerable attention. We propose an analytical model for the market of CRC screening tests which can be used to estimate the insurer's willingness-to-pay to acquire one additional life year by covering the CRC screening tests.

3 - An MDP Model to Compare Decision Maker Perspectives on Optimal Statin Treatment Policies
Jennifer Mason, Edward P. Fitts Department of Industrial & Systems Engineering, North Carolina State University, 111 Lampe Drive, 375 Daniels Hall, Raleigh, NC, 27695-7906, United States of America, jemason2@ncsu.edu, Brian Denton, Nilay Shah, Steven Smith

Patients with Type 2 diabetes are often prescribed statins as part of their treatment to reduce the risk of cardiovascular disease. We propose a Markov decision process model that optimizes the statin treatment decision. We consider three different perspectives: the patient, society, and third-party payer. We present our model formulation, discuss structural properties, and present numerical results comparing the optimal treatment policy for the three different perspectives.

4 - Assessing the Impact of Global Price Interdependencies
Anke Richter, Associate Professor, DRMI Naval Postgraduate School, 699 Dyer Rd., Bldg. 234, Monterey, CA, 93943, United States of America, arichter@nps.edu

Documented launch delays and the ensuing debate over their underlying causes have focused on assessment from the individual country perspective. Seen in a larger game theoretic framework, this may cause problems because while countries see an individual game, the pharmaceutical firm sees a repeated, linked game. A theoretical mixed integer linear model of the firm's launch and pricing decisions is presented along with examples wherein international price dependencies most likely played a role.

■ SD35

M - Jackson

Ninth Annual INFORMS Case Competition - Finalists #3 and #4

Sponsor: INFORM-ED
Sponsored Session

Chair: Michael Racer, Associate Professor, The University of Memphis, 334 Fogelman, Memphis, TN, 38152, United States of America, mracer@memphis.edu

1 - Ninth Annual INFORMS Case Competition
Michael Racer, Associate Professor, The University of Memphis, 334 Fogelman, Memphis, TN, 38152, United States of America, mracer@memphis.edu

The four finalists for the 2008 INFORMS Case Competition will deliver final presentations of their material to a panel of judges and the audience. All are welcome to attend and observe their presentations, as well as ask questions of the finalists. The winner of the competition will be selected by the judges at the end of the four presentations. The winner and runners-up will be announced at the annual INFORMed Business Meeting.

■ SD36

M - T. Marshall Ballroom East

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - SAS Education Division - Turning Data into Information with SAS Enterprise Miner
Susan Walsh, SAS Education Division, Higher Education Consultant, SAS Campus Dr., Cary, NC, 27513, susan.walsh@sas.com

It has been estimated that the amount of data in the world has been doubling every 18 to 24 months. Multi-gigabyte databases are now commonplace. In order to turn this data into information, data mining is used in industry in a number of areas, including but not limited to credit scoring, customer churn, fraud detection and donations analysis. This presentation will introduce SAS Enterprise Miner with an emphasis on its use for predictive modeling.

■ SD37

M - T. Marshall Ballroom West

Tutorial: Total Quality Management to Operational Risk in Manufacturing and Service

Cluster: Tutorials
Invited Session

Chair: Michael Pinedo, mpinedo@stern.ny.edu

1 - Total Quality Management to Operational Risk in Manufacturing and Service
Mike Pinedo, Professor, NYU, Stern School of Business, New York University, NY, NY, 10012, United States of America, mpinedo@stern.nyu.edu, Marcelo Cruz

This tutorial focuses on the relationship between Total Quality Management (TQM) and Operational Risk in the service industries. TQM and Operational Risk have received an enormous amount of attention from academicians as well as from practitioners. However, these topics have been kept somewhat separate in the literature. We consider TQM and Operational Risk in four types of service industries, namely transportation, health care, financial services, and hospitality industries. We compare the types of losses that can be incurred in each type of industry, the measurements of the losses, and the risk mitigation processes and show how TQM should be seen as part of a robust operational risk management process.

■ SD38

M - Tyler

Advances in Discrete Optimization

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Dan Bienstock, Professor, Columbia University, Department of IEOR, 500 West 120th St., New York, NY, 10027, United States of America, dano@columbia.edu

1 - Integer Programming Techniques for the Branchwidth Problem
Illya Hicks, Associate Professor, Rice University, Computational and Applied Mathematics, Houston, United States of America, ivhicks@rice.edu, Cole Smith, Elif Ulusal

Branch decompositions have been used in conjunction with dynamic programming techniques to solve some interesting problems in combinatorial optimization. In contrast, the efficiency of these algorithms is contingent upon the width of the input branch decomposition. Also, finding the branchwidth of a general graph or hypergraph is NP-hard. This talk present integer programming formulations for the branchwidth problem along with some computational results.

2 - FPTAS for Continuous Knapsack with Generalized Upper Bounds
Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu

We consider a very general continuous knapsack problem with generalized upper bounds. An FPTAS is presented based on a very complex and technical dual problem.

3 - A Parallel Macro Partitioning (PMaP) Framework for Large Mixed Integer Programs
Andrew Miller, ajmiller5@wisc.edu, Mahdi Namazifar

We discuss a recently developed parallel framework for solving MIP's. PMaP uses concepts from primal heuristics such as local branching and RINS to create work for many different processors very quickly in such a way that the overlap (if any) is minimal. Computational results indicate that PMaP is competitive with a state-

of-the-art commercial parallel branch-and-bound solver on 32 processors; moreover, unlike commercial codes, it can exploit many times more processors than this.

4 - New Cutting Planes for Cardinality Constrained Optimization

Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu, Ming Zhao

Cardinality constraints are pervasive in applications in fields as diverse as finance, bioinformatics, and data mining. We present a polyhedral study of such problems and new inequalities for use as cutting planes in LP-based branch-and-bound.

■ SD39

M - Truman

The Computation of Equilibria in Markets and Games

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Nikhil Devanur, Toyota Technological Institute, 1427 E 60th St, Chicago, IL, United States of America, nikhil@tti-c.org

1 - The Computation of Approximate Competitive Equilibrium is PPAD-hard

Ye Du, University of Michigan, 2260 Hayward Ave, Ann Arbor, MI, 48109, United States of America, duye@umich.edu, Xiaotie Deng

Arrow and Debreu showed in 1954 that, under mild conditions, a competitive economy always has an equilibrium. In this paper, we show that, given a competitive economy that fully respects all the conditions of Arrow-Debreu's existence theorem, for any positive constant $h>0$, it is PPAD-hard to compute a $\frac{1}{n^{h}}$-approximate competitive equilibrium.

2 - Continuity Properties of Equilibria in Some Fisher and Arrow-Debreu Market Models

Lei Wang, Georgia Tech, 500 Northside Circle, #ii2, Atlanta, GA, 30309, United States of America, wanglei@math.gatech.edu, Vijay Vazirani

Following up on the work of Megiddo and Vazirani \cite{MV.2007}, who determined continuity properties of equilibrium prices and allocations for perhaps the simplest market model, Fisher's linear case, we do the same for: 1. Fisher's model with piecewise-linear, concave utilities 2. Fisher's model with spending constraint utilities 3. Arrow-Debreu's model with linear utilities 4. Arrow-Debreu's model with piecewise-linear, concave utilities.

3 - The Complexity of Nash Equilibria and Other Complementarity Problems

Constantinos Daskalakis, Postdoc, Microsoft Corporation, costis@eecs.berkeley.edu

Nash's proof that every game has a Nash equilibrium relies on Brouwer's fixed point theorem and leaves open the questions: Is there a poly-time algorithm for Nash equilibrium? And is this reliance on Brouwer inherent? We resolve these questions by showing that the Nash equilibrium is a hard computational problem, as hard as any fixed point computation problem, in a precise sense motivated by simplicial algorithms for fixed points. We also present algorithms for approximate equilibria.

4 - Collusive Flow Equilibria are Not Unique

Lisa Fleischer, Dartmouth College, 6211 Sudikoff, Hanover, NH, United States of America, lkf@cs.dartmouth.edu, Umang Bhaskhar, Darrell Hoy, Chien-Chung Huang

We study congestion network games where agents controlling small amounts of flow may form coalitions to improve their average delay. We show that unlike the case without collusion, there may be multiple equilibria. And, we give a complete characterization of network topologies that have a unique equilibria.

■ SD40

M - Taylor

Joint Session Optimization/Stochastic Programming /CS: Algorithms for Stochastic Integer Programming

Sponsor: Optimization/ Stochastic Programming, Computing Society
Sponsored Session

Chair: Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman, OK, 73019, United States of America, yguan@ou.edu

1 - Stochastic Integer Programming Applications in Dynamic Hybrid Systems

Suvrajeet Sen, Professor, The Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, sen.22@osu.edu, Binyuan Chen

Dynamic hybrid systems lead to mixed-integer programming problems, and in cases where the system parameters are uncertain, these systems lead to stochastic mixed integer programs. Such models arise in a variety of applications such as the unit commitment model in power systems. The introduction of renewable energy sources such as wind and solar lead to such models. We will discuss a general SMIP framework for dynamic hybrid systems, and apply it to the above application.

2 - A Branch-and-cut Algorithm for Optimization with First-order Stochastic Dominance Constraints

James Luedtke, IBM Research, jrluedt1@wisc.edu

We present a branch-and-cut algorithm for solving stochastic programs with first-order stochastic dominance (FSD) constraints. The algorithm enforces the non-convex FSD constraint through branching, and hence requires no binary variables. This enables the use of an existing cutting plane method for solving the second-order dominance relaxation to yield bounds. The key challenge we address is how to adapt this relaxation to the constraints imposed by branching.

3 - Designing and Solving Large-Scale Two-Person Zero-Sum Games

Michael Nehme, University of Texas at Austin, 2412 W 12th Street, Austin, TX, 78703, United States of America, mikenehme@yahoo.com

We discuss the so-called ``game design" problems which bridge the gap between Stackelberg and Cournot games. Many of these models can be formulated as mixed-integer programs and are NP-Complete. We have developed novel schemes to tighten the LP relaxation of these MIPs. Some of our developments may be parallelized and may be applied to more general classes of integer programs. Finally, we will motivate these models with an application involving the thwarting of nuclear smugglers.

4 - Strong Formulations for Stochastic Unit Commitment Problems

Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman, OK, 73019, United States of America, yguan@ou.edu

The electricity energy market is transitioned from a Zonal to a Nodal framework in a Deregulated Power Market. There are certain emerging issues due to uncertain demands. In this talk, we focus on studying a fundamental model, named stochastic unit commitment problem, in power portfolio optimization. We developed a strong formulation for the problem and computational experiments show the efficiency of our approach.

■ SD41

M - Taft

Four Perspectives on Innovation Strategy

Cluster: New Product Development
Invited Session

Chair: Raul Chao, University of Virginia - Darden School of Business, 100 Darden Blvd., Charlottesville, VA, United States of America, chaor@darden.virginia.edu

1 - Motivating Innovation

Gustavo Manso, MIT Sloan School of Management
50 Memorial Drive E52-446, Cambridge, MA, manso@mit.edu

The paper shows that incentive schemes that motivate innovation are fundamentally different from standard pay-for-performance incentive schemes. The optimal compensation scheme that motivates innovation exhibits substantial tolerance (or even reward) for early failure and reward for long-term success. Moreover, job security, commitment to a long-term compensation plan and timely feedback on performance are essential ingredients to motivate innovation.

2 - Mechanism Choice and the Sourcing of External Knowledge

Michael Lenox, Professor, Duke University, 1 Towerview Rd., Durham, NC, United States of America, mlenox@duke.edu

Firm innovation strategy has shifted to an emphasis on the sourcing of extramural knowledge that resides outside the firm. Researchers, however, have tended to treat the mechanisms for securing such knowledge in isolation. In this project, we study the tradeoffs between various external knowledge sourcing mechanisms. We highlight the complex portfolio planning problem that firms face as they decide how best to allocate their innovative effort.

3 - Aggregate Diffusion Models Motivated by Agent-based Models

Olivier Toubia, Columbia Business School, Uris 522, 3022 Broadway, New York, NY, 10027, United States of America, ot2107@columbia.edu, Rosanna Garcia, Jacob Goldenberg

We propose a class of aggregate diffusion models resulting from the aggregation of a hazard rate motivated by agent-based models. The proposed class of models provides two major benefits. First, it allows capturing assumptions on the diffusion process that are not traditionally captured by extant models, such as heterogeneity in the number of social ties. Second, the proposed models may be calibrated shortly after launch using a combination of aggregate data and disaggregate data.

4 - On the Effect of Consumer Heterogeneity and Channel Structure in Optimal Product Design

Jeremy Michalek, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Scaife Hall 323, Pittsburgh, PA, 15213, United States of America, jmichalek@cmu.edu, Ching-Shin Shiau

We examine conditions for optimal new product design in an oligopoly under alternative retail channel structures and demand model specifications. We find that homogeneous consumer preferences (logit) cause decoupling of design and market decisions, while heterogeneity (mixed logit) and price-attribute preference interactions lead to interdependencies. We also find that ignoring competitive reactions can lead to severe overestimation of profit and suboptimal decisions.

■ SD42

M - McKinley

Convexification in Global Optimization

Sponsor: Optimization/ Global Optimization
Sponsored Session

Chair: Mohit Tawarmalani, Associate Professor, Purdue University, 100 S. Grant, West Lafayette, IN, 47907, United States of America, mtawarma@mgmt.purdue.edu

1 - Lifting for Conic Mixed-integer Programming

Alper Atamturk, University of California, 4175 Etcheverry Hall MC 1777, Berkeley, CA, United States of America, atamturk@berkeley.edu, Vishnu Narayanan

The lifting procedure has been shown to be very effective in developing strong valid inequalities for linear integer programming and it has been successfully used to solve such problems with branch-and-cut algorithms. Here we generalize the theory of lifting to conic integer programming, i.e., integer programs with conic constraints. We show how to derive conic valid inequalities for a conic integer program from conic inequalities valid for its lower-dimensional restrictions.

2 - Global Optimization of Non Convex Generalized Disjunctive Programs

Juan Ruiz, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, jpruiz@andrew.cmu.edu, Ignacio Grossmann

This work presents a global optimization technique to solve bilinear and concave GDPs based on the disjunctive spatial branch and bound method proposed by Lee & Grossmann. The methodology builds on the work of Sawaya & Grossmann by exploiting the newly discovered hierarchy of relaxations for Linear GDP. A number of basic theoretical properties are established and proved for the proposed method. A set of examples and case studies are presented to illustrate its computational efficiency.

3 - Convexification Methods for Quadratic 0-1 Assignment-type Problems

Monique Guignard-Spielberg, Professor of Operations and Information Management, The Wharton School, Department of OPIM, Philadelphia, PA, 19104, United States of America, guignard@wharton.upenn.edu, Yi-Rong Zhu, Alex Meeraus, Marie-Christine Plateau, Aykut Ahlatcioglu, Mustafa Esen, Artur Pessoa, Peter Hahn

One can convexify nonconvex 0-1 quadratic optimization problems in at least two different ways. RLT linearizations are especially effective for bounding quadratic assignment-type problems. Semi-Definite Programming was proposed recently for convexifying nonconvex quadratic 0-1 problems. We implemented this in GAMS for the Generalized Quadratic Assignment Problem, making it possible to compute continuous and Convex Hull Relaxation bounds exactly.

4 - Strong Inequalities for Orthogonal Disjunctions and Polynomial Covering Sets

Mohit Tawarmalani, Associate Professor of Management, Purdue University, 100 S. Grant Street, West Lafayette, IN, 47907-2076, United States of America, mtawarma@purdue.edu, Jean-Philippe Richard, Kwanghun Chung

We develop strong nonlinear inequalities for polynomial covering sets by convexifying them over the non-negative orthant. In the process, we derive a convex extensions result applicable to large classes of nonlinear knapsacks and a convexification tool for orthogonal disjunctions. Applications to factorable programs are discussed. The results are specialized and refined for bilinear covering sets and preliminary computational results on strength of these relaxations are presented.

■ SD43

M - Balcony D

Information Sharing and Disruptions Management

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Cooperative Competition in Managing Severe Supply Chain Disruptions

H. Charles Ralph, Assistant Professor of Management, Clayton State University, School of Business, 2000 Clayton State Blvd, Morrow, GA, 30260, United States of America, CharlesRalph@mail.clayton.edu

This paper studies the concept of supply chain disruption and a full-sector response to disruption by normally competing supply chains. A simulation model is the basis for analyzing the response to disruptions as risk management through the control of variability in supply and demand. The temporary cooperation of competing chains may lessen the effects of such variability. Properly managed, benefits accrue to competing supply chains, offsetting some costs and transient "windfall profits".

2 - An Emergency Evacuation Model as a Flow Shop Scheduling Problem

Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu, Priyantha Devapriya, Jiangxia Liu

Emergency evacuation planning could be critical in reducing the economic and human losses during catastrophes. We analyze emergency evacuation planning using a rescue vehicle. The objective is to maximize the evacuation effectiveness. Routing and location of vehicles are the decision variables. A meta-heuristic based solutions methodology is developed.

■ SD44

M - Balcony C

Robust Supply Chain Design Under Disruptions

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Kathryn E. Stecke, The University of Texas at Dallas, School of Management, Richardson, TX, United States of America, kstecke@utdallas.edu

1 - Robust Supply Chain Network Design

Vishal Agarwal Lalit, Graduate Student, Purdue University, School of Industrial Engineering, 315 N. Grant Street,, West Lafayette, IN, 47907, United States of America, agarwal8@purdue.edu, Venkat Venkatasubramanian, Aviral Shukla

A scenario planning approach is used to develop a supply chain disruption management model to mitigate disruptions of nodes and edges in a supply chain network. The proposed model is applied on a hypothetical case study. Fixed and operational costs, as well as the expected consequence of disruption under various failure scenarios were considered. The insight gained is used to design a network which would lead to the lowest long term disruption costs.

2 - Remanufacturing in Decentralized Supply Chains with Uncertainty

Huafan Ma, UW-Milwaukee, 1315 N Cass St. APT305, Milwaukee, WI, 53202, United States of America, mahuafan@uwm.edu, Samar Mukhopadhyay

We consider a decentralized supply chain with one OEM and one retailer that trade with either a push or pull contract. The OEM can process both used and new parts for the production of new products while the yield of the used parts is random. The OEM makes procurement and production decisions and the retailer makes ordering decisions based on their own cost/incentive structures. We develop different models to determine their optimal policies.

3 - Flexible Network Design in the Presence of Random Disruption

Michael Lim, PhD Student, Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL, 60208, United States of America, m-lim2@northwestern.edu, Mark Daskin, Achal Bassamboo, Sunil Chopra

We extend the concept of chaining introduced by Jordan and Graves (1995) for designing a robust supply chain network to the case in which the links and nodes are susceptible to disruptions. We introduce the concept of "fragility" to quantify the change in system performance resulting from a disruption and identify network designs which minimize the fragility of a system. Analytical results for single failure cases and numerical results for multiple failure cases will be presented.

4 - Real Time Recovery in Disaster-Disruptions

Amiya Chakravarty, Northeastern University, College of Business Admin, 360 Huntington Ave, Boston, MA, United States of America, akc@neu.edu

The efforts of disaster relief organizations can be counterproductive without some collaboration. While some regions starve, others struggle to manage the excessive and often irrelevant quantities of supplies. We discuss matching supplies with needs, in real time, through coordinated delivery-targets that reflect right incentives.

■ SD45

M - Balcony B

Social Preferences in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu

1 - How to Sell Multiple Units? Competition and Social Preferences

Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu, Richard Engelbrecht-Wiggans, Axel Ockenfels

We consider a setting in which one supplier is selling multiple units to multiple buyers. Our simplified setting can be thought of as the Ultimatum game with one proposer and multiple responder. We extend a model of social preference to multiple responders and find that it implies that rejection rates should go down. We test this prediction in the laboratory and find that our data confirms the theory.

2 - Contracting with a Fair-minded Retailer

Valery Pavlov, PhD Candidate, Pennsylavania State University, 463A Business Building, University Park, PA, 16802, United States of America, vup112@psu.edu, Elena Katok

Extant literature proposes a great variety of contracts that are supposed to coordinate a supplier-retailer channel. However, all contracts tested in a lab so far share one property: they do not work as the theory predicts. Our model incorporates fairness as one of the driving factors treating it as private information. Among other results, we characterize the supplier's optimal profit-maximizing contract. Testing the model in an experiment we find that it works where the standard theory fails.

3 - An Experimental Study on Social Preferences and Group Performance

Yaozhong Wu, Assistant Professor, NUS Business School, National University of Singapore, Singapore, 117592, Singapore, bizwyz@nus.edu.sg, Christoph Loch

Previous research has shown that people have intrinsic desires for reciprocity and status and both preferences systematically affect individual behavior in business interactions. This experimental study investigates both individual effects and the interaction effects of social preferences in a group work context. Our findings provide insights into how to balance social preferences in order to improve group performance.

4 - An Experimental Study of Collaborative Forecasting

Doug Thomas, Smeal College of Business, 463 Business Building, University Park, PA, 16802, United States of America, dthomas@psu.edu, Taylor Randall, Elena Katok

In this study, we examine the extent to which human subjects acting as retailers accurately share demand forecasts with human subjects acting as their suppliers. We investigate how the length of the retailer-supplier partnership, the presence of an auditing mechanism, the inherent value of the forecast information and the presence of a coordinating contract affect the level of collaboration.

■ SD46

M - Balcony A

Retail Supply Chain Management II

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Stephen Smith, Operations & Management Information Systems Santa Clara University, Santa Clara, CA, United States of America, ssmith@scu.edu

1 - The Impact of Special Ordering on Manufacturer-retailer Interactions

Hao-Wei Chen, University of Minnesota, 111 Church Street SE, Minneapolis, MN, 55455, United States of America, hwchen@ie.umn.edu, Haresh Gurnani, Diwakar Gupta

Many retailers offer to special order out-of-stock items at no additional cost to customers. Because special orders reduce stock outs, it is commonly believed that special ordering increases profits. We study the impact of customer participation rates and demand variability on the manufacturer's and the retailer's profits under special ordering.

2 - Empirical Study of Retail Store Execution

Nicole DeHoratius, University of Portland, 15345 SW Lark Lane, Beaverton, OR, 97007, United States of America, dehorati@UP.edu, Serguei Netessine, Marshall Fisher

We describe research with a fast food restaurant chain that uses operating data, customer satisfaction survey results and in stock mystery shopping to identify drivers of sales and satisfaction. Particular attention is paid to the design of the restaurant process. This is part of a larger project with a number of retailers that aims to identify store operating policies that result in outstanding store execution, customer experience and financial performance.

3 - The Role of Component Commonality in Product Assortment Decisions

Lei Xie, Duke University, One Towerview Drive, Durham, NC, United States of America, lx4@duke.edu, Fernando Bernstein, Gurhan Kok

We consider a firm that produces multiple variants of a product. Each product is assembled from a common component and a dedicated component. We characterize the optimal assortment and derive the inventory levels for the common and dedicated components. We investigate the effect of commonality on product variety and compare its benefits under different demand characteristics.

4 - A Mini-max Decision Model for Optimizing Retail Assortments

Stephen Smith, Operations & Management Information Systems Santa Clara University, Santa Clara, CA, United States of America, ssmith@scu.edu

In choosing retail assortments of products with many features such as consumer electronics, offering larger assortments attracts more customers, but gives customers the opportunity to select less profitable products. This paper develops a mini-max decision model for retailers that optimizes the tradeoff between increasing the probability of choosing a particular retailer and maximizing the profit per purchase within the category.

■ SD47

M - Hoover

Quantitative Models for Healthcare Emergency Preparedness

Sponsor: Health Applications Section
Sponsored Session

Chair: John Osborn, Analyst, Mayo Clinic, 200 1st St SW, Centerplace 8, Rochester, MN, 55905, United States of America, Osborn.John@mayo.edu

1 - Heterogeneity in Infectious Diseases: Human Behavior in a Pandemic as a Markov Decision Processes

Karima Nigmatulina, MIT, knigmatu@mit.edu, Richard Larson

High activity and high susceptibility people are drivers of infectious disease such as pandemic flu. A new type of heterogeneity is how individuals alter their behavior in a pandemic scenario. Some will choose to remain at home to decrease their chances of being infected, but others will not or cannot alter their daily routines, implying higher risk of getting sick. We present a Markov Decision Model and show how behavior changes made by individuals can alter the outcome of the pandemic.

2 - Modeling Hospital Surge under the CDC's Cities Readiness Initiative

Nathaniel Hupert, Cornell University, Weill Medical College, 411 E69th Street, New York, NY, 10021, United States of America, nah2005@med.cornell.edu, Wei Xiong

We developed a framework for modeling hospital surge arrivals after a large-scale anthrax exposure to quantify the impact of "best practice" recommendations for community-based mass prophylaxis. Output of this model can shed light on the gap between currently available resources and estimated demand over the course of health sector response to such events.

3 - Evacuating Patients based on Prioritization Modeling

Kevin Taaffe, Assistant Professor, Clemson University, 110 Freeman Hall, Clemson, SC, 29634, United States of America, taaffe@clemson.edu, Ashley Childers

In the event of an emergency evacuation of a healthcare facility, the typical planning assumption is that all patients will be evacuated. With limited resources, there may not be time to transfer all patients. Based on selected objectives, we suggest a decision framework for patient evacuation based on priority modeling.

4 - Simulation Modeling for Mass Vaccination Clinic Design

John Osborn, Analyst, Mayo Clinic, 200 1st St SW, Centerplace 8, Rochester, MN, 55905, United States of America, Osborn.John@mayo.edu, Brian Bailey

In the event of community exposure to an infectious agent, such as during a pandemic or bioterrorist event, rapid prophylaxis of a large population will be essential in effective response. Using simulation models, we evaluated a set of mass vaccination clinic designs to determine optimal staffing and resource allocation to achieve maximal patient throughput. This paper will review pertinent findings, compare model outputs to actual experience, and discuss planning limitations and challenges.

■ SD48

M - Coolidge

Joint Session TMS/OS: KLIC: Influence of Structure (Team, Goals, and Technology) on Learning

Sponsor: Technology Management, Organization Science
Sponsored Session

Chair: Charles Weber, Assistant Professor of Eng. & Tech. Mgmnt., Portland State University, PO Box 751, Portland, OR, 97207, United States of America, webercm@gmail.com

1 - The Effects of Problem Structure and Team Diversity on Brainstorming Effectiveness

Svenja Sommer, Assistant Professor of Management, HEC School of Management, Jouy-en-Josas, France, sommers@hec.fr, Stylianos Kavadias

Since Osborne 1957 brainstorming has acquired a central role during the ideation stage of many product development projects. Yet, experiments reported in the social psychology literature suggest that group brainstorming is an ineffective way to generate ideas. We revisit the two different arguments and develop a formal model of idea generation in product development. We show that the answer is not unidirectional but contingent on the problem structure and team diversity.

2 - Diminishing Returns on Knowledge in Operations Management

Charles Weber, Assistant Professor of Eng. & Tech. Mgmnt., Portland State University, PO Box 751, Portland, OR, 97207, United States of America, webercm@gmail.com, Asser Fayed

An empirically grounded model of the operating curve a high tech manufactuiring facility, which is sufficiently accurate to make capitalization decisions, has been developed. The model is used to simulate the performance of a hypothetical facility that operates under very realistic conditions. Results of the simulation show that the value of additional technological knowledge can be negative. Learning more of a good thing is not always a good idea!

3 - The Hidden Structure of Mental Maps

Charles Weber, Assistant Professor of Eng. & Tech. Mgmnt., Portland State University, PO Box 751, Portland, OR, 97207, United States of America, webercm@gmail.com, Brent Zenobia

Most prior work on mental maps has focused on techniques for their elicitation and representation; what can be gleaned from investigating their structure? This study applies the Motive-Technology-Belief (MTB) framework to analyze structural relationships in mental maps to gain insight into the underlying processes of learning and technology adoption. A previously unsuspected feedback loop operates between bounded rationality and intuition; implications for technology management are discussed.

4 - Brooks' Law Revisited: Improving Software Productivity by Managing Complexity

Michael Lapre, Associate Professor of Management, Vanderbilt University, Owen Graduate School of Management, 401 21st Avenue South, Nashville, TN, 37203, United States of America, Michael.Lapre@owen.vanderbilt.edu, Joe Blackburn, Luk Van Wassenhove

According to Brooks' law for software development projects "adding manpower to a late software project makes it later." Building on Brooks' law, we argue that complexity increases the maximum team size in software development projects and that maximum team size decreases software development productivity. Using a dataset of 117 software development projects conducted in Finland, we find strong support for our hypotheses.

■ SD49

M - Harding

Efficient Simulation and Optimization III

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Chun-Hung Chen, Professor, George Mason University, 4400 University Drive, MS 4A6, SEOR Dept, GMU, Fairfax, VA, 22030, United States of America, cchen9@gmu.edu

Co-Chair: Loo Hay Lee, Associate Professor, National University of Singapore, 10 Kent Ridge Crescent, Singapore, 119260, Singapore, iseleelh@nus.edu.sg

1 - A Particle Filtering Framework for Continuous Optimization: EDAs, CE, MRAS, and More

Enlu Zhou, PhD Student, University of Maryland, College Park, 4305 Rowalt Dr., Apt. 301, College Park, MD, 20740, United States of America, enluzhou@umd.edu, Michael Fu, Steven Marcus

We propose a framework for optimization problems based on particle filtering (also called the Sequential Monte Carlo method). The proposed framework incorporates local/gradient search into the global randomized search. Moreover, this framework provides a unifying view at three randomized methods for optimization: estimation of distribution algorithms (EDAs), the cross-entropy (CE) method, and model reference adaptive search (MRAS). It also sheds light on developing new optimization algorithms.

2 - A General Cross-entropy Approach to Mixed Integer Programing

Yingjie Lan, PhD Candidate, University of Maryland, 7323 Parkwood Ct Apt 204, Falls Church, 22042, United States of America, ylan@rhsmith.umd.edu, Michael Ball, Michael Fu

We introduce a general Cross-Entropy approach to mixed integer programming. Implementation issues will be discussed, computational experiments will be carried out to benchmark the effectiveness of this approach. We believe this work would provide a rich ground for testing Cross-Entropy related techniques, as well as for developing new techniques to improve the current Cross-Entropy heuristics.

3 - Variance Estimators for Simulation Based on Data Re-Use

Dave Goldsman, Professor, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, sman@gatech.edu, Melike Meterelliyoz, Christos Alexopoulos, James Wilson

We perform extensive analytical and empirical evaluations of recently proposed estimators for the variance parameter of a steady-state simulation output process. The estimators are based on functionals of standardized time series and take advantage of data re-use to outperform certain longstanding competitors.

4 - System Improvement Using Random Search in Simulation Studies

Russell Cheng, University of Southampton, School of Mathematics, Southampton, Ha, SO17 1BJ, United Kingdom, R.C.H.Cheng@soton.ac.uk

We consider the use of simulation to optimize system performance under convexity assumptions, but using random search. There are two types of random variation: one occurs because system performance will vary according to the alternatives randomly searched, the other occurs because it will usually not be possible to make simulation runs long enough to determine system performance without noticeable error. We discuss how to model both types of variation and estimate their effect.

5 - Optimal Computing Allocation for Rare-Event Decision Problems

John F. Shortle, George Mason University, 4400 University Dr., MS 4A6, Fairfax, VA, 22030, United States of America, jshortle@gmu.edu, Chun-Hung Chen

Computing time can be a concern when using simulation to estimate rare-event probabilities, since a huge number of simulation replications may be needed. Further, when multiple designs must be compared, then the total number of

samples across all designs can be prohibitively high. We present a new approach to enhance the efficiency of rare-event simulation. Our approach integrates the ideas of level splitting and optimal computing budget allocation to optimize efficiency across multiple designs.

■ SD50

M - Wilson C

New Heuristics in MIP

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: John Chinneck, Professor, Carleton University, Systems and Computer Engineering, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, chinneck@sce.carleton.ca

1 - New MIP Node Selection Heuristics
John Chinneck, Professor, Carleton University, Systems and Computer Engineering, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6, Canada, chinneck@sce.carleton.ca, Daniel Wojtaszek

We present a number of new heuristics for node selection in MIP, including triggering node selection, selecting the next node, and defaulting to a simpler node selection strategy. A large empirical study shows significant improvement over the state of the art.

2 - Primal Heuristics for Mixed Integer Programs
Timo Berthold, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, berthold@zib.de

In modern MIP-solvers like the state-of-the-art branch-cut-and-price-framework SCIP, primal heuristics play a major role in finding and improving feasible solutions at the early steps of the solution process. We give an overview about different categories of heuristics, present a new large-neighborhood-search heuristic and an improved version of the feasibility pump. Finally, we present recent computational results.

3 - Automatic Fine-tuning Xpress-MP to Solve MIP
Gabriel Tavares, Dash Optimization, part of Fair Isaac, 560 Sylvan Avenue, Englewood Cliffs, NJ, 07632, United States of America, gabriel.tavares@dashoptimization.com, Alkis Vazacopoulos, Horia Tipi

Xpress-Tuner is an automated interactive application that finds an algorithmic strategy consisting of control parameters that allows Xpress to solve a MIP (or a family of MIPs) faster than by using default settings (frequently by a factor of 5-10 times). Xpress-Tuner is non expert-friendly, providing at the same time a wealth of information about the various algorithm choices built into Xpress. We present several examples derived from the industry with a focus on how to tune the MIP heuristics.

4 - Information Based Branching Rules in Integer Programming
Fatma Kilinc Karzan, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, fkilinc@gatech.edu, Martin Savelsbergh, George Nemhauser

We address the issue of learning in the context of variable selection for branching in integer programming. We discuss some possibilities for performance improvement through analyzing fathomed nodes in the tree. We show experimental results demonstrating the benefit of deriving information from the fathomed nodes in the tree and different ways to guide the search using this information.

■ SD51

M - Wilson B

Social Network

Sponsor: Information Systems
Sponsored Session

Chair: Ming Fan, Assistant Professor, University of Washington, Foster School of Business, Seattle, WA, 98195, United States of America, mfan@u.washington.edu

1 - An Empirical Analysis On User Decision In Peer-to-Peer Sharing Network
Wenjing Duan, Assistant Professor, The George Washington University, Washington, DC, 20052, United States of America, wduan@gwu.edu, Yun Huang, Andrew Whinston, Mu Xia

Using a large scale peer-to-peer individual music sharing data set, we seek to understand users' keep-sharing behavior as private contribution to a public good. We find that both theories are supported in driving users' decision to keep sharing. More interestingly, in variables that can be compared, our results suggest that the marginal impact of the benefit received by the user dominates that of the benefit the user provides to the network on users' keep-sharing decisions.

2 - Social Networks and Governance of IT Outsourcing Contracts
Anjana Susarla, Assistant Professor, University of Washington, 336 Mackenzie, Box 353200, Seattle, WA, 98195, United States of America, asusarla@u.washington.edu, Kiron Ravindran, Vijay Gurbaxani

Most prior research on Information Technology Outsourcing has characterized the dominant governance modes as either 'Formal' or 'Relational' that rely on stringent assumptions of perfect foresight or about the extent to which one party can punish unilateral deviations by the other. We propose that in addition to dyadic measures of inter-firm reputation, the social network of trading partners enables community enforcement of contracting terms.

3 - Network Formation through Developer Cross-participation in an Open Source Software Community
Nilesh Saraf, Assistant Professor, Simon Fraser University, nsaraf@sfu.ca, Deepa Chandrasekaran, Sivaramakrishna Siddarth

Considering the open source software community as an emergent collaborative network we ask: 1)What drives a developer with prior experience on open source projects to seek out another specific project to participate in? 2) How does the network structure evolve as a result? Analyses of data from the largest open source software portal suggest that a match with past project characteristics largely drive such choices. Surprisingly, preferential attachment theory is only weakly supported.

4 - A Mirror or a Second Life: Friendship and Groups in the Virtual World
Yun Huang, Postdoctoral Fellow, Northwestern University, 2145 Sheridan Rd., TECH C210, Evanston, IL, 60208, United States of America, yun@northwestern.edu, Noshir Contractor

Virtual worlds such as Second Life provide 3D space for individuals to explore new social relations, usually called friendship and groups. However, instead of developing within a virtual world, some virtual relations are just a reflection of friendship and affiliation in the real world. In this research, we estimate different types of virtual relations and test MTML models of co-evolving friendship and group affiliation using 15 million friendships and 4 million group memberships in Second Life.

■ SD52

M - Wilson A

Case Studies in Closed-Loop Supply Chains

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Jacqueline Bloemhof, Dr, Erasmus University Rotterdam, Burgemeester Oudlaan 50, Rotterdam, 3000 DR, Netherlands, JBloemhof@rsm.nl

1 - Logistics Aspects of Collecting and Processing Biomass Rest Flows
Simme Douwe Flapper, Technische Universiteit Eindhoven, Den Dolech 2, Eindhoven, Br, Netherlands, S.D.P.Flapper@tm.tue.nl

After a short introduction into some specific issues related to the logistics of biomass rest flows, two case studies are briefly discussed. Topics for further research are indicated.

2 - Critical Factors Affecting the Sustainability of Electrical Equipment Closed-Loop Supply Chains
Maria Besiou, PhD Candidate, Aristotle University of Thessaloniki, Vithinias 26, Thessaloniki, 54453, Greece, mmpesiou@auth.gr, Patroklos Georgiadis

In this paper we examine the impact of environmental legislation and Design-for-Environment on the behavior of a closed-loop supply chain with recycling activities. We develop a dynamic model using System Dynamics methodology applied to many environmental systems. The developed model is implemented to a real world supply chain of electrical equipment in Greece. Sensitivity analysis reveals statistically significant factors that affect sustainability from an environmental and financial approach.

3 - The Impact of Closed Loop Supply Chains on Cradle to Cradle and Vice Versa.
Jacqueline Bloemhof, Dr, Erasmus University Rotterdam, Burgemeester Oudlaan 50, Rotterdam, 3000 DR, Netherlands, JBloemhof@rsm.nl

The aim of CLSC is to reuse products, components or materials. The gains of CLSC depend on the product design, which has an impact on the recovery. This brings us to Cradle to Cradle (C2C). In the C2C concept, products are designed such that by the end of the lifetime, the "waste" is "food" for another product, without losing any quality. To collect the material for reuse, CLSC processes are needed. In a number of cases we discuss the strengths and opportunities of these two fields.

4 - An Optimization Model to Improve Organizational Sustainability

Fikret K. Turan, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, 15217, United States of America, fkturan@gmail.com, Kim LaScola Needy, Mary E. Besterfield-Sacre

This research presents a stochastic linear programming optimization model that integrates the priorities of stakeholders using stakeholder theory into the process of investment planning and capital budgeting. It enables decision makers to make proactive decisions supporting the strategy of their organization with respect to economic, environmental and social issues (the triple bottom line), and ensure the sustainability of their organization by creating a long-term balanced investment portfolio.

■ SD53

M - Nathan Hale- Wardman Tower

Consumer Lending and Credit Risks

Sponsor: Financial Services
Sponsored Session

Chair: Lyn Thomas, Professor of Management Science, School of Management, University of Southampton, Southampton, United Kingdom, L.Thomas@soton.ac.uk

1 - Improving Credit Risk and Customer-Centric Models Using Genetic Algorithms

Russell Walker, Assistant Director, Kellogg School of Management, Northwestern University, 2001 Sheridan Road, Evanston, IL, 60208, russell-walker@kellogg.northwestern.edu

Financial service firms have invested heavily in analytics for credit risk management and for marketing. Complexity and the scale of candidate variables have also created an opportunity to search for better models and novel variables. This talk will examine how genetic algorithms have been successfully deployed for credit risk modeling and customer behavior modeling. The talk will also highlight the economics of using genetic algorithms to reduce costs and increase time to market of analytics.

2 - Optimal Loss Mitigation of Deliquent Mortgages

Frank Bria, Sr. Vice President, Response Analytics, 7425 E Stetson Dr, Suite 120, Scottsdale, AZ, 85251, United States of America, frank.bria@responseanalytics.com

Given large losses in the US mortgage market, banks and mortgage servicers have been trying to come to terms with how best to stave losses on large numbers of mortgages while at the same time remaining true to the investor covenants they have entered into in order to service those loans. A behavioral model for collections of mortgages is studied. The problem is structured as a MIP and structured to handle the restrictions. This problem is solved for a generic delinquent loan portfolio.

3 - Using Behavioural Scores and Markov Chains to Build Credit Risk Models of Portfolios of Consumer Loans

Lyn Thomas, Professor of Management Science, School of Management, University of Southampton, Southampton, United Kingdom, L.Thomas@soton.ac.uk, Madhur Malik

The problems with sub prime mortgages and the subsequent "credit crunch" have highlighted the need to model the credit risk of portfolios of consumer loans. This paper investigates how one can use behavioural scores as the basis for a dynamic Markov chain model of the credit risk of such portfolios

4 - Rate Sheet Pricing for Consumer Lending

Roger Gung, Sr. Director of Research, Response Analytics, Inc., 7426 E. Stetson Dr., Suite 120, Scottsdale, AZ, 85251, United States of America, roger.gung@responseanalytics.com, Frank Bria, Tao Kang

The nature of today's consumer lending market is prompting the need for more dynamic rate sheet pricing. Profit optimization for such market has been a complex problem as it requires various analytical models to support optimization methodology. In this talk, we present our new solution method to rate sheet pricing in the context of auto lending, including price elasticity modeling, demand forecasting, and profit optimization with business rule constraints.

■ SD54

M - Congressional - Wardman Tower

Evolutionary Computation for Managing Infrastructure Risk

Cluster: Risk Security
Invited Session

Chair: Emily Zechman, Assitant Professor, Texas A&M University, 3136 TAMU, College Station, TX, 77843-3136, United States of America, ezechman@tamu.edu

1 - Using Optimization to Protect Your Water Supply from Attack

Mark Houck, Professor, George Mason University, CEIE Dept, MS 6C1, Fairfax, VA, 22030-4444, United States of America, mhouck@gmu.edu, Zbigniew Skolicki, Tomasz Arciszewski

Municipal water supply systems in the United States are remarkably reliable and resilient in the face of traditional threats but are less secure from the threat of terrorists. Optimization can be used to address this threat, and minimize the effectiveness and risk of this type of attack. A hypothetical but realistic example of optimally protecting a water supply system from attack is used to illustrate the process.

2 - Consequence Minimization Strategy for Water Supply Networks Against Extreme Events

David Jeong, Assistant Professor, Oklahoma State University, Engineering South 207, Stillwater, OK, 74078, United States of America, david.jeong@okstate.edu

This paper presents a mitigation model which can reduce or minimize adverse consequences when a water network suffers from significant water shortage due to the destruction of water networks by malicious attacks or any catastrophic events. A Genetic Algorithm based program linked with a hydraulic solver (EPANET 2.0) is developed to find optimal water supply plans. A case study indicates that the proposed model can successfully generate water supply plans to reduce the consequences

3 - Evolutionary Algorithms in Addressing Contamination Threat Management in Civil Infrastructure

Ranji Ranjithan, North Carolina State University, Raleigh, NC, United States of America, ranji@ncsu.edu

Accurate and timely characterization of contaminant source in water distribution systems is an important problem, with challenges such as resolution of non-uniqueness and adaptive optimization. An ongoing investigation of an evolutionary algorithm (EA)-based simulation-optimization approach coupled with system simulation models is presented. New EA-based search procedures will be described and illustrated for resolving non-uniqueness and adaptive optimization under dynamic data environments.

4 - A Noisy Genetic Algorithm for Emergency Response to Potable Water Contamination Events

Jacob Torres, Graudate Student, Texas A&M University, Zachry Department of Civil Engineering, 3136 TAMU, College Station, TX, 77843-3136, United States of America, jmt9442@neo.tamu.edu, Emily Zechman, Kelly Brumbelow, Seth Guikema

Historical efforts in evolutionary computation have not typically been applied to water distribution system (WDS) threat management. The myriad uncertainties within WDS data such as demands and storage tank levels also yield uncertainties in the performances of management strategies to minimize water contamination threats. This talk will show how a noisy genetic algorithm can build robust threat management strategies for the optimal selection of fire hydrants in flushing detected contaminants.

■ SD55

M - Embassy- Wardman Tower

Joint Session TELCOM/CS: Routing in Telecommunications

Sponsor: Telecommunications, Computing Society
Sponsored Session

Chair: Stefan Voss, Professor, University of Hamburg, IWI - Von-Melle-Park 5, Hamburg, HH, 20146, Germany, stefan.voss@uni-hamburg.de

1 - Network Routing under Active Congestion Control: Theory and Practice

Stanko Dimitrov, University of Michigan - Ann Arbor, 1205 Beal Avenue, Ann Arbor, MI, United States of America, sdimitro@umich.edu, Dushyant Sharma, Marina Epelman

We present formulations of network routing models that incorporate active congestion control and show each is NP-Hard. We next present iterative methods for solving these models and show that the resulting routing policies outperform the current routing policies in the backbone network of the Internet2 community. To conclude we generate a robust routing policy to handle network demand fluctuations.

2 - The Push Tree Problem-accounting for Tradeoffs of Push/Pull Mechanisms in Information Distribution

Stefan Voss, Professor, University of Hamburg, IWI - Von-Melle-Park 5, Hamburg, HH, 20146, Germany, stefan.voss@uni-hamburg.de, Andrea Raiconi, Andreas Fink

The push tree problem is a mixture of building multicast trees with respect to nodes receiving pieces of information while further nodes may obtain information from the closest node within the tree by means of shortest paths. We present some metaheuristics as well as worst case results for simple heuristics.

■ SD56

O - Blue Room

Inland Ports and Container Terminals III

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Soren G. Johansen, University of Aarhus, Ny Munkegade, Bldg. 1530, Aarhus, DK-8000, Denmark, sgj@imf.au.dk

1 - Real-time Yard Crane Control Systems for Seaport Container Transshipment Terminals

Matthew Petering, Assistant Professor, University of Wisconsin - Milwaukee, Industrial and Manuf. Engrg. Department, PO Box 784, Milwaukee, WI, 53201, United States of America, mattpete@uwm.edu, Mark Goh, Robert de Souza, Yong Wu, Wenkai Li

We present several new results on real-time yard crane control at a seaport container terminal. Several control algorithms are evaluated by a fully-dynamic simulation model that considers the detailed movement of every container passing through a terminal over a several week period. The model directly connects the real-time control logic to the long-run average quay crane rate of the facility. We also discuss rule-based versus look-ahead dispatching systems and deadlocking issues.

2 - Container Pickup Sequencing and the Impact on Rehandles at Marine Terminals

Wenjuan Zhao, Graduate Student, Department of Civil & Environmental Engineering, University of Washington, United States of America, wz@u.washington.edu, Anne Goodchild

In a container yard, reducing the number of re-handles reduces cost, handling time, and therefore delay time to the truck waiting for container drop-off or pick-up. This paper explores the relationship between re-handling work for import containers given sequence, and partial sequence information for arriving import trucks. Statistical methods and simulation are employed to estimate efficiency improvements made possible through truck arrival sequence information.

3 - Routing Multiple Automated Stacking Cranes at Container Terminals

Soren G. Johansen, University of Aarhus, Ny Munkegade, Bldg. 1530, Aarhus, DK-8000, Denmark, sgj@imf.au.dk, Hector J. Carlo

The significant growth in volumes of containers being transshipped puts a strain on all logistics processes at container terminals, including the stacking processes. This study is concerned with scheduling storage and retrieval requests for two Automated Stacking Cranes operating in the same block. We show how this problem can be modeled and solved such that the makespan is minimized.

■ SD57

O - Blue Room Prefunction

Nicholson Student Paper Prize Competition, II

Cluster: Nicholson Student Paper Prize
Invited Session

Chair: Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu

1 - Effient Methods for Stochastic Composite Optimization

Guanghui Lan School of Industrial and Systems Engineering Georgia Institute of Technology, Atlanta, GA 30332-0205, glan@isye.gatech.edu

This paper considers an important class of convex programming problems whose objective function is given by the summation of a smooth and non-smooth component. Further, it is assumed that the only information available for the numerical scheme to solve these problems is the subgradients of contaminated by stochastic noise. Our contribution mainly consists of the following aspects. Firstly, with a novel analysis, it is demonstrated that the simple robust mirror-descent stochastic approximation method applied to the a fore mentioned problems exhibits the best known so far rate of convergence guaranteed by a more involved stochastic mirror-prox algorithm. Moreover, by incorporating some ideas of the optimal method for smooth minimization, we propose an accelerated scheme, which can achieve, uniformly in dimension, the theoretically optimal rate of convergence for solving this class of problems. Finally, the significant advantages of the accelerated scheme over the existing algorithms are illustrated in the context of solving a class of stochastic programming problems whose feasible region is a simple compact convex set intersected with an affine manifold.

2 - On Deciding Stability of Multiclass Queueing Networks under Buffer Priority Scheduling Policies

Dmitriy Katz, MIT, Operations Research Center

One of the basic properties of a queueing network is stability. Roughly Speaking it is the property that the total number of jobs in the network remains bounded as a function of time. One of the key questions related to the stability issue is determining the exact conditions under which a given queueing network operating under a given scheduling policy stable. While initially there was a lot of progress in addressing this question, most of the obtained results were partial at best, and the complete characterization of stable queueing networks is lacking. In this paper we resolve this important open problem, albeit in a somewhat unexpected way. We show that characterizing stable queueing networks is an algorithmically undecidable problem for the case of non-preemptive static buffer priority scheduling policies and deterministic interarrival and service times. Thus no constructive characterization of stable queueing networks operating under this class of policies is possible.

3 - Deterministic Pivoting Algorithms for Rank Aggregation and Other Ranking and Clustering Problems

Anke van Zuylen, Cornell University

We consider ranking and clustering problems related to the aggregation of inconsistent information, in particular, rank aggregation, (weighted) feedback arc set in tournaments, consensus and correlation clustering. Ailon, Charikar, and Newman [4] and Ailon [2] proposed randomized constant factor approximation algorithms for these problems, which recursively generate a solution by choosing a random vertex as "pivot" and dividing the remaining vertices into two groups based on the pivot vertex. In this paper, we answer an open question in these works by giving deterministic approximation algorithms for these problems. The analysis of our algorithms is simpler than the analysis of the randomized algorithms in [4] and [2]. We evaluate the randomized algorithm of Ailon et al. [4] against our deterministic algorithm on two real world rank aggregation data sets. Based on the analysis of our deterministic algorithm, we also propose new algorithms that evaluate a small number of randomly chosen pivots and choose the best among these. We compare these algorithms against the CPLEX solver and other heuristics from the literature.

4 - Limited Processor Sharing Systems: Heavy Traffic Analysis and Steady State Approximations

Jiheng Zhang, Georgia Institute of Technology

Motivated by applications in computer and communication systems, we consider a processor sharing queue where the number of jobs being served is limited by K and the excess jobs wait in a buffer. We use random counting measures on the positive axis to model this system. Our first result establishes the heavy traffic limits of the underlying measure-valued processes, which is based on an analysis of the system in both fluid and diffusion scale. We rigorously validate the interchange of steady state and heavy traffic approximations. The limit theorems yield explicit approximations of performance measures, such as queue length, delay probability and response time in steady-state.

■ SD58

O - Capital

Panel Discussion: An Uncertain Future: Where Will Fuel Prices Go and How Can OR Help the Airline Industry Respond?

Sponsor: Aviation Applications
Sponsored Session

Chair: Stefan Karisch, Director, Operations Research and Optimization, Jeppesen, 1800 McGill College Avenue, Suite 1930, Montreal, QC, H3A 3J6, Canada, Stefan.Karisch@jeppesen.com

1 - An Uncertain Future: Where Will Fuel Prices Go and How Can OR Help the Airline Industry Respond?

Moderator: Stefan Karisch, Director, Operations Research and Optimization, Jeppesen, 1800 McGill College Avenue, Suite 1930, Montreal, QC, H3A 3J6, Canada, Stefan.Karisch@jeppesen.com, Panelists: Erik Andersson, John Heimlich, Krishnan Saranathan, John-Paul Clarke

IATA has predicted airline losses of up to $6.1 billion this year at current oil prices. At the 64th Annual General Meeting and World Air Transport Summit in Istanbul, IATA DG and CEO Giovanni Bisignani spoke about an "extraordinary crisis" faced by the world's airlines brought on by soaring fuel prices and slowing traffic growth. Is there anything that operations research can do? This panel of experts will try to answer this and related questions.

■ SD59

O - Embassy Room

Reputation and Recommendation Systems

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Ramesh Johari, Stanford University, Terman Engineering Center, Room 319, 380 Panama Mall, Stanford, CA, 94305-4026, United States of America, ramesh.johari@stanford.edu

Co-Chair: Christina Aperjis, Stanford University, caperjis@stanford.edu

1 - Analyzing Online Reputation Systems: Combining Economics with Textmining

Anindya Ghose, Assistant Professor, NYU Stern School of Business, NY, NY, United States of America, aghose@stern.nyu.edu, Arun Sundararajan, Panos Ipeirotis

We analyze how different dimensions of a seller's reputation affect pricing power in electronic markets. We do so by applying text mining techniques on buyer-generated feedback posted on reputation systems, by scoring these dimensions based sentiment analysis, and using them to estimate econometric models associating reputation with price premiums. This talk will discuss how to integrate econometric, text mining and predictive modeling techniques towards the analysis of user-generated content.

2 - Manipulation Robustness of Collaborative Filtering Systems

Xiang Yan, Stanford University, xyan@stanford.edu, Benjamin Van Roy

Rampant manipulation of collaborative filtering systems is suspected but their effects have received little formal analysis. In this paper, we propose a Bayesian framework to study the relationship between the actions of manipulators with hidden objectives and the resultant decrease in average recommendation quality. Our analysis sheds light on the robustness to gaming that a well-designed collaborative filtering system should exhibit and offers guidance to real system implementation.

3 - Manipulation-Resistant Recommender Systems

Rahul Sami, Assistant Professor, University of Michigan, School of Information, 1075 Beal Avenue, Ann Arbor, MI, 48109, United States of America, rsami@umich.edu, Paul Resnick

An attacker can draw attention to undeserving items by manipulating recommender systems. We present a new algorithm, the Influence Limiter, to make existing recommender systems robust. This algorithm can be viewed as learning a robust reputation from ratings on items. We prove limits on the damage that an attacker with a bounded number of shills can cause, and the information loss incurred. We also present nearly matching lower bounds on information loss in any robust recommender.

4 - Effective Reputation Mechanisms

Christina Aperjis, Stanford University, caperjis@stanford.edu, Ramesh Johari

In online marketplaces potential buyers have to decide whether to buy an item and how much to pay for it without being able to observe it and without knowing whether the seller is trustworthy. Reputation mechanisms promote trust by giving information about past transactions. With the goal of incentivizing sellers to advertise truthfully, we study how the marketplace is affected by (i) the reputation mechanism, and (ii) the way buyers interpret the seller's reputation score.

■ SD60

O - Hampton Room

Rails to the Capital Discussion

Sponsor: Railway Applications
Sponsored Session

Chair: Steven Harrod, Dr., University of Dayton, Department of MIS, OM, & DS, 300 College Park, Dayton, OH, 45469, United States of America, steven.harrod@udayton.edu

1 - Roundtable Discussion: Rails to the Capital

Steven Harrod, Dr., University of Dayton, Department of MIS, OM, & DS, 300 College Park, Dayton, OH, 45469, United States of America, steven.harrod@udayton.edu

A continuation of the prior session, Rails to the Capital, with a moderated town hall discussion format. The speakers from the prior session will remain to answer questions from the audience.

■ SD61

O - Calvert Room

Uncertainty and Traveler Information in Traffic Networks

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Song Gao, Assistant Professor, University of Massachusetts Amherst, 214C Marston Hall, 130 Natural Resources Road, Amherst, MA, 01002, United States of America, songgao@ecs.umass.edu

1 - Reliable Adaptive Departure Time and Route Choices in Stochastic Time-dependent Networks

Xuan Lu, Research Assistant, University of Massachusetts Amherst, xlu@engin.umass.edu, Song Gao

Travelers consider the reliability along with expected travel cost. In this work, travelers are assumed to minimize travel disutility expressed as a linear combination of expected travel time, stay-at-home penalty, early and late schedule delay in a stochastic dynamic network. An exact algorithm is designed to compute an optimal routing policy including adaptive depart time and route choice process. Several approximations are compared with the exact result.

2 - Delivery of Critical Items in a Disaster Relief Operation

Yen-Hung Lin, University at Buffalo (SUNY), Buffalo, NY, 14260, y148@buffalo.edu, Rajan Batta, Peter Rogerson

We introduce the problem of prioritizing the delivery of critical supplies during a disaster relief operation. The first phase applies a genetic algorithm to generate feasible tours. The loading combination on each tour is generated in the second phase. Results are illustrated with the help of several numerical examples.

3 - Strategic Resource Planning for Seismic Retrofit of Transportation Networks

Liang Chang, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, lchang9@uiuc.edu, Yanfeng Ouyang, Fan Peng

Retrofitting seismically-vulnerable transportation infrastructure (e.g., bridges) is essential in mitigating network functional loss and facilitating emergency evacuation. We propose an optimal resource planning model to prioritize seismic retrofit projects in a bridge network. Effective solution algorithms based on Lagrangian relaxation are developed. Numerical results of empirical examples are presented.

■ SD62

O - Governor's Boardroom

Cargo Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Yuri Levin, Queen's School of Business, 143 Union Street, Kingston, ON, K7L 3N6, Canada, YLevin@business.queensu.ca

1 - Shipment Level Overbooking in Air Cargo Revenue Management

Raja Kasilingam, VP - Cargo Solutions, Sabre, 3150 Sabre Drive, Southlake, TX, 76092, United States of America, Raja.Kasilingam@sabre.com

The cargo overbooking models currently in place at many carriers are based on flight level show up rates. The total cargo booked on a flight consists of many shipments with different sizes and different booking and tender patterns. Our purpose is to determine the best overbooking level taking into account the following: innfluence of show-up at departure by bookings on a flight and their characteristics; shipment size (big versus small) and different states of tender (cancelled/no-show, tendered as booked, under-tender, and over-tender) are important; and, the effect of tendered information, i.e. after tendering, a shipment has a constant show-up equal to its tender size. In this presentation we present the shipment level overbooking methodology, preliminary results of the proposed methodology, and the potential benefits from the new methodology.

2 - The State of Research in Air Cargo Capacity Management

Mikhail Nediak, Queen's School of Business, 143 Union St., Kingston, ON, K7L 3N6, Canada, mnediak@business.queensu.ca, Yuri Levin, Tanya Levin, Jeff McGill

We discuss recent developments and current trends in air cargo capacity management research. In particular, we review air cargo industry, compare passenger and cargo capacity management, and formulate main challenges related to cargo. We also discuss our recent work on itinerary flexibility combined with uncertain capacity and network nature of the problem.

3 - Cargo Revenue Management with Allotments

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu, Mikhail Nediak, Yuri Levin

We consider a problem faced by an airline that operates several parallel flights to transport cargo between a particular origin destination pair. The airline can sell its cargo capacity either through allotment contracts or on the spot market. The goal is to simultaneously choose allotment contracts among available bids, assign these contracts to flights, and find a booking control policy for the spot market so as to maximize the total expected profit.

4 - Dynamic Capacity Allocation and Pricing under Competition

Houyuan Jiang, University of Cambridge, Judge Business School, Cambridge, CB2 1AG, United Kingdom, h.jiang@jbs.cam.ac.uk, Mikhail Nediak, Yuri Levin

Firms with fixed capacities compete for customers by repeating the same services. For a monopolist, we prove that a fixed price policy is asymptotically optimal to a dynamic price policy and study monotone properties of prices. We show that the strategy profile based on the fixed price policy in a competitive environment is an epsilon-Nash equilibrium of the dynamic pricing game. We study comparative statics results for both monopolistic and oligopolistic pricing problems.

■ SD63

O - Congressional B

Logistics with Technology or Ergonomics

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Russell Halper, AMSC Program, Department of Mathematics, University of Maryland, College Park, MD, United States of America, russ@math.umd.edu

1 - Lean Manufacturing Implementation of CAT Engine Emissions Program

Izlal Haider, University of Winsor, Windsor, Windsor, ON, Canada, izlalhaider@engineer.com, Leo Oriet, James Nooks, Ahad Ali

This research presents a lean implementation of CAT Engine Emissions Program. This program is one that challenged with complexity and endurance. This program's platform not only incorporated two engine configurations but also impacted over different truck models of the 4000, 7000, 8000 and Bus series product lines.

2 - Modeling Productivity Rates Using a Behavioral Decision Model

José Antonio Larco Martinelli, PhD. Candidate., Erasmus University Rotterdam, 1738, Rotterdam, NL, 3000 DR, Netherlands, jlarco@rsm.nl, Rene de Koster, Jan Dul, Kees Jan Roodbergen

This paper relaxes the common assumption that facility workers work in steady-rate production rates similar to the behavior of machines. The paper analyzes the effect of changing the difficulty of obtaining a production target and the target deadline in production rates and physical exertion. We propose a theoretical model where employees choose their production rate based on a decision making model that contains known systematic biases from the literature.

3 - The Single Mobile Facility Routing Problem

Russell Halper, AMSC Program, Department of Mathematics, University of Maryland, College Park, MD, United States of America, russ@math.umd.edu, S. Raghavan

In many application domains, a mobile service facility provides service to events while stationary. For example, portable base stations are used in cellular networks to provide coverage for emergencies and special events. Also, mobile clinics are used to provide services in developing countries. We discuss routing a single mobile facility to maximize demand coverage over a continuous time planning horizon. We demonstrate how dynamic program can be used to quickly find an optimal schedule.

■ SD64

O - Congressional A

Joint Session TSL/AAS: Integer Programming Models for Novel Airline Scheduling Problems

Sponsor: Transportation Science & Logistics, Aviation Applications
Sponsored Session

Chair: Michael Ball, University of Maryland, Robert H. Smith School of Business, College Park, MD, 20742, United States of America, MBall@rhsmith.umd.edu

1 - Factors Influencing Robustness of Airline Operations

Lavanya Marla, Massachusetts Institute of Technology, 77 Massachusetts Avenue, 1-235, Cambridge, MA, 02139, United States of America, lavanya@mit.edu, Virot Chiraphadhanakul, Cynthia Barnhart

Robust solutions help airlines manage uncertainty and improve operations and costs incurred. We examine the networks and operations of several carriers to identify factors contributing to robustness. In addition, we analyze different approaches to generating robust solutions through experiments, and gain insights into their performance.

2 - A Charter Air Service to Minimize Total Cost of Conference Travel

Anne Goodchild, Assistant Professor, University of Washington, Department of Civil and Environmental Eng., 121E More Hall, Seattle, WA, 98195-2700, United States of America, annegood@u.washington.edu, Gautam Gupta, Mark Hansen

The operations of an air charter service for conference sports are modeled in competition with existing scheduled travel options. The demand subset and the routing and scheduling of aircraft are done in the same framework. Through this modeling we develop an innovative method for formulating and accommodating continuous time windows and competitive market dynamics. We apply the model to a specific sports conference, which provides insight into the market for such a service.

3 - Air Cargo Network Planning – An Integrated Model for a Major Carrier

Stefan Friederichs, University of Cologne, Pohligstr. 1, Cologne, 50969, Germany, stefan.friederichs@uni-koeln.de, Simon Schäfer, Ulrich Derigs

The central issue in the air cargo industry is the generation of optimal flight schedules. We present a novel model and a column-generation based solution procedure developed in course of a feasibility study for a major cargo airline. The model integrates the planning steps flight selection, aircraft rotation and cargo routing by determining the best combination from a list of mandatory and optional flights, assigning the selected flights to aircrafts and identifying optimal cargo flows.

4 - A Strong IP Formulation of the the Ground Delay Problem with Uncertain End Time

Charles Glover, Doctoral Student, University of Maryland, 9307 Spring House Lane, Apartment H, Laurel, MD, 20708, United States of America, cnglover@math.umd.edu, Michael Ball

A ground delay program (GDP) is implemented for the duration of bad weather at an airport. This schedules the arriving flights according to the airport's reduced capacities. The Ration-by-Distance (RBD) algorithm has been proven to minimize the expected delay of a GDP, when the end time is uncertain. Here, we formulate an Integer Program for the GDP with uncertain end time and show that the RBD algorithm provides an optimal solution to the LP Relaxation of this formulation.

■ SD65

O - Council Room

Service Industry II

Contributed Session

Chair: Tim Urban, Collins Professor of Operations Management, The University of Tulsa, 800 South Tucker Drive, Tulsa, OK, 74104, United States of America, urbantl@utulsa.edu

1 - Queueing Models for Appointment-driven Systems

Stefan Creemers, PhD Candidate, K.U.Leuven, Naamsestraat 69, Leuven, NA, 3000, Belgium, stefan.creemers@econ.kuleuven.be, Marc Lambrecht

Many service systems are appointment-driven. In such systems, customers make an appointment and join an external queue. At the appointed date, the customer arrives at the service facility, joins an internal queue and receives service during a service session. Important measures of interest are the size of the waiting list, the waiting time at the service facility and server overtime. These performance measures support strategic decision making. We develop a new model to assess these measures.

2 - Validation of Behavior-based Navigation System for a Restroom Cleaning Robot Using Simulation

Martin Rawski, University of Massachusetts Dartmouth, Weissdornweg 10, Idar-Oberstein, 55743, Germany, rawski@stud.uni-stuttgart.de, Farhad Azadivar

This research presents a theoretical approach of a navigation system for a public restroom cleaning robot for cleaning toilet bowls, sinks and urinals. Using wall following and other behaviors, the navigation system guides the robot to follow the boundaries of a restroom and navigates the robot to sanitary arrangements. RFID-Tags placed within the restroom trigger navigation behaviors and act as landmarks for self-localization. Simulation is used to validate all behaviors and trigger policies.

3 - Shift Scheduling in Call Centers with Multiple Skill Sets and Transportation Costs

F. Sibel Salman, Assistant Professor of Industrial Engineering, Koc University, Rumeli Feneri Yolu 34450 Sariyer, Istanbul, NA, 34450, Turkey, ssalman@ku.edu.tr, Lerzan Ormeci, Emre Emil

Workforce plans in call centers, which usually works with a 24/7 schedule, should satisfy both customer service levels and personnel constraints. In large metropolitans, like Istanbul, call centers also provide the transportation of the staff, so that shuttle costs constitute a major part of the total operational costs. We present a mathematical model to minimize the transportation costs while satisfying the service level and personnel constraints. We test our model with data from call centers.

4 - Winning Streaks and Their Effect on Home/Away Sequencing of Professional Championship Playoff Series

Tim Urban, Collins Professor of Operations Management, The University of Tulsa, 800 South Tucker Drive, Tulsa, OK, 74104, United States of America, urbantl@utulsa.edu

The existence of winning streaks has been debated, whether teams can get on hot streaks beyond random expectations or whether such streaks are simply the result of independent Bernoulli trials. Using 50 years of data from the NBA Finals, the existence of streakiness and the effects of team strength, home-court advantage, previous Finals experience, and the "back-to-the-wall" effect are estimated using logistic regression. Alternative home/away playoff formats are evaluated using these results.

■ SD66

O - Cabinet Room

Teams and Socio-Technical Dynamics

Cluster: Governance of Software Development
Invited Session

Chair: James Herbsleb, Professor, Carnegie Mellon University, 5000 Forbes Avenue, Wean Hall 5321, Pittsburgh, PA, 15213, United States of America, jdh@cs.cmu.edu

1 - Individualized Socio-technical Congruence: Metrics, Exploration, and Impact

Patrick Wagstrom, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, United States of America, pwagstro@andrew.cmu.edu

Research on organizational performance suggests that the closer organizational communication patterns mirror dependencies within the organization, a concept called socio-technical congruence (STC), the higher the performance the team. However, communication is never without cost. Particularly, within radically distributed teams individual cost may outweigh organizational benefits. This work formalizes methods for measuring individualized STC and addresses the implications of the measure.

2 - Identifying and Prioritizing nth-order Organizational Congruence Gaps in Socio Technical Systems

Mary Helander, IBM Research, T.J. Watson Research Center, Yorktown Heights, NY, 10603, United States of America, helandm@us.ibm.com

In this talk, we examine the concept of a "gap" in organizational congruence by extending the concept of a missing coordination link between pairs of individuals. Specially, we define the concept of an nth order gap, that occurs when a direct link does not appear to exist, but where a path of length n+1 indicates possible coordiation through indirect brokership. An approach for identifying and prioritizing nth order gaps is presented.

3 - Chapels in Bazaar? Latent Social Structure in Open Source Projects

Premkumar Devanbu, UC Davis, 1672 Joshua Tree St, Davis, CA, United States of America, devanbu@cs.ucdavis.edu, Chris Bird

Project managers organize teams carefully, mindful of skills, tasks, geography, etc. Such constructed "cathedrals" contrast with the protean, chaotic "bazaar" of open-source. Yet, in the email social networks of the better OSS projects, we find empirically that social "cathedrals" do emerge; we also find that these subgroups manifest strongly in technical discussions, and are significantly connected with collaborative work.

■ SD67

O - Forum Room

Network Location

Sponsor: Location Analysis
Sponsored Session

Chair: Tammy Drezner, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, tdrezner@fullerton.edu

1 - Spatially-Distributed Make-to-Order System with Time-Sensitive Demand

Robert Aboolian, California State University San Marcos, 333 S. Twin oaks Valley Road, San Marcos, CA, 92096, United States of America, raboolia@csusm.edu, Oded Berman, Dmitry Krass

We analyze the problem of optimally locating a set of make-to-order facilities on a network where customer demand is time-sensitive. The objective is to determine the number, locations and capacities of facilities to maximize the overall profit. Customers demand is a decreasing function of the travel distance and the expected waiting time at the facilities.

2 - Robust Coverage Location Problems under Travel Time Uncertainty

Iman Hajizadeh, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, iman@rotman.utoronto.ca, Oded Berman, Dmitry Krass

We study the maximum covering problem on a network with travel time uncertainty. In addition to the standard stochastic and robust formulations, we optimize the average coverage subject to a bound on the worst case coverage. We present greedy and Lagrangian relaxation heuristics and compare their performances with MIP formulation.

3 - The p-median with Construction Costs

Vladimir Marianov, Professor, Pontificia Universidad Catolica de Chile, Department of Electrical Engineering, Vicuña Mackenna 4860, Santiago, Sa, Chile, marianov@ing.puc.cl, Gabriel Gutierrez-Jarpa, Carlos Obreque, Oscar Cornejo

A known number of facilities are located in a rural zone. Minimum cost roads are built, and the total customer-facility travel distance over these roads is minimized. We formulate the problem using a multicommodity flow formulation and propose a Lagrangean-based solution procedure. Computational experience is provided.

4 - Hub Location with Isolated Hubs

James Campbell, Professor, University of Missouri-St. Louis, College of Business Administration, One University Blvd., St. Louis, MO, 63121-4499, United States of America, campbell@umsl.edu

Hub facilities are used in transportation networks to provide a transshipment, sorting and consolidation function. This paper considers multiple allocation hub median and hub arc location problems with connected hubs, that are adjacent to reduced cost hub arcs, and isolated hubs, that are not adjacent to any hub arcs. Service levels are imposed by limiting the maximum travel distance via hubs for each origin-destination pair.

■ SD68

O - Senate Room

Internet Search and Advertising

Sponsor: Marketing Science
Sponsored Session

Chair: P. K. Kannan, Associate Professor of Marketing, Robert H. Smith School of Business, University of Maryland, College Park, MD, 20817, United States of America, pkannan@rhsmith.umd.edu

1 - Resource Packaging in Internet Advertising Auctions

Andrew Whinston, The University of Texas at Austin, CBA 5.202, IROM, Austin, TX, 78712, United States of America, abw@uts.cc.utexas.edu, Jianqing Chen, De Liu

Auctions for keyword advertising resources are a novel form of share auctions in which the highest bidder gets the largest share, the second highest bidder gets the second largest share, and so on. We address the problem of how much resources to set aside for the highest bidder, for the second highest one, etc, and derive implications on how the optimal share structure should change with bidders' demand elasticity, their valuation distribution, total resources, and minimum bids.

2 - Using Online Search Data to Forecast New Product Sales

Gauri Kulkarni, PhD Candidate, University of Maryland, 3330H Van Munching Hall, College Park, MD, United States of America, gkulkarn@rhsmith.umd.edu, Wendy Moe, P. K. Kannan

It is reasonable to assume that people focus their online search engine searches on terms that are of interest to them. As such, data on the search terms used can provide valuable indicators of consumer interest in a new product. This can be particularly valuable to managers in search of tools to gauge potential interest in a new product launch. We use pre-launch search activity as a measure of consumer interest and link search behavior to release-week sales for motion pictures.

3 - Putting the Advertising Back Into Paid Search

Oliver Rutz, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, oliver.rutz@yale.edu, Randolph Bucklin, Michael Trusov

Paid search advertising can be conceptualized as a hybrid between advertising and direct marketing. The purpose of this study is to investigate the nature and extent of the traditional advertising effect of paid search. Based on an advertising framework, the authors test whether paid search affects direct visits to the site. Using data from the automotive industry the authors find that the advertising effect is significant and recovers about 15% of the daily cost of the paid search campaign.

4 - Competitive Strategies in Online Sponsored Search Markets

Siva Viswanathan, University of Maryland College Park, 4313 Van Munching Hall, College Park, MD, 20742, United States of America, sviswana@rhsmith.umd.edu, Animesh Animesh

While it is widely believed that an ad's rank in the sponsored-search listings is the key determinant of its performance, we examine the impact of additional factors - including the seller's positioning strategy, and its ability to differentiate itself from competition - on performance (CTR) of the seller's ad.

Monday, 8:00am - 9:30am

■ MA01

M - Marriott Ballroom 3

INFORMS - Opportunities to Shape the Future (Panel Discussion)

Sponsor: Women in OR/MS
Sponsored Session

Chair: Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu

1 - INFORMS - Opportunities to Shape the Future (Panel Discussion)
Moderator: Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu,
Panelists: Burcu Keskin, Mary Crissey, Ana Muriel, Victoria Chen, Soheila Jorjani

In this panel, past and current female chairs and presidents of fora, societies, regional chapters, and student chapters will talk about their experiences related to being actively involved in INFORMS activities. The goal of this panel is to inform members interested in taking on leadership roles about the different possibilities and to encourage INFORMS members, especially women, to get actively involved.

■ MA02

M - Marriott Ballroom 2

Empirical Research in Information Systems & Economics

Sponsor: Information Systems
Sponsored Session

Chair: Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

1 - "Look at me! Look at me!": The Competitive Dynamic of Wikis and Online Communities
Brian Butler, University of Pittsburgh, 226 Mervis Hall, Pittsburgh, PA, 15260, United States of America, bbutler@katz.pitt.edu

Web 2.0 systems, such as wikis and online communities, are often assumed to be spontaneous, emergent, collaborative structures. Yet, because they are fundamentally dependent on the voluntary action of individuals, they are also subject to a variety of competitive forces. In this presentation we examine the nature of the competitive ecologies in Usenet and Wikipedia and discuss the implications for the design and management of social computing systems.

2 - Fixing SOX IT Control Problems: Relief for Shareholders?
Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

Section 404 of the Sarbanes-Oxley Act (SOX) of 2002 has increased scrutiny of corporate governance practices including those around IT controls. An event study is conducted on a sample of 52 firms with material weaknesses in their internal IT controls. Negative abnormal returns are evident around (0,+1) 2005 10K filings with adverse disclosures. A value reduction occurs when the 2006 10K is filed with remediating and unremediating firms suffering negative abnormal returns.

3 - Profit in the Long Tail
Michael Smith, Associate Professor, Heinz School-CMU, mds@cmu.edu, Erik Brynjolfsson, Mohammad Rahman

One important difference between online and physical markets is the ability of online retailers to stock a virtually unlimited number of products, a phenomenon that has come to be known as "the long tail." Much of the academic literature on the long tail has focused on the role of these niche titles in increasing consumer surplus. In this paper we use a unique dataset provided by a large publisher to analyze the role of long tail titles in enhancing producer surplus.

■ MA03

M - Marriott Ballroom 1

Joint Session Homeland/Humanitarian: Preparedness for Pandemic Influenza

Cluster: Homeland Security, Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Richard Larson, MIT, E40-231, Cambridge, MA, 02139, United States of America, rclarson@MIT.EDU

1 - STEM: The Spatiotemporal Epidemiological Modeler
Daniel Ford, IBM, 86 Indian Hill Road, Mount Kisco, NY, 10549, United States of America, daford@almaden.ibm.com, James Kaufman

The Spatiotemporal Epidemiological Modeler (STEM) is an open source computer software system for defining and visualizing simulations of the spread of infectious disease in space and time. As part of the Eclipse Open Healthcare Framework (OHF), http://www.eclipse.org/ohf, STEM is designed to offer the research community the power and extensibility to develop, validate, and share models on a common collaborative platform.

2 - Modeling as a Means and Barrier to Decision-making
Richard Hatchett, Associate Director for Radiation Countermeasures Research and Emergency Preparedness, NIH/NIAID, 6610 Rockledge Drive, Room 4057, Bethesda, MD, 20892, United States of America, hatchettr@niaid.nih.gov

Policy determinations are seldom if ever driven exclusively by science, much less by the outcomes of modeling exercises. Policy making harmonizes claims and counterclaims, competing interests, political priorities, and science in a delicate balancing act. The author describes how data derived from pandemic mitigation modeling, historical analysis, and studies of influenza epidemiology informed the development of national pandemic preparedness policy.

3 - How to Prepare for Pandemic Flu in a University
Karima Nigmatulina, MIT, knigmatu@MIT.EDU, Richard Larson

With their unique populations and functions, universities will face unusual challenges in the case of pandemic flu. The first question that must be addressed is if and when to send their student body home. This brings up the question of whether this is even possible. Other issues involve supporting the remaining student body on campus, and sustaining the vital functions of the university through this prolonged outage. We present several case studies with a focus on the MIT plan.

■ MA05

M - Virginia B

Methods and Models for Congestion Pricing I

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Siriphong Lawphongpanich, University of Florida, Industrial and Systems Engineering, 303 Weil Hall, Gainesville, FL, 32611, United States of America, lawphong@ise.ufl.edu

1 - Risk-neutral Second Best Toll Pricing
Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu, Michael Ferris

We study second best toll pricing (SBTP) when the user equilibrium (UE) solution is not unique. In this case, we show how the toll designer's risk-taking behaviors can be considered. In particular, if one wants to minimize the expected objective value as UE solution varies, a risk-neutral SBTP can be modeled as a stochastic program. We illustrate such risk-neutral SBTP concept and show how to solve it by the simulation-based optimization technique.

2 - Relating Tolls to the Presence of Loops in Multicommodity Flows
Robert Abrams, Professor, University of Illinois, Information and Decision Sciences, 601 S Morgan, Chicago, IL, 60607-7124, United States of America, rabrams@uic.edu, Jane Hagstrom

Given a desired traffic flow in a network, nonnegative commodity-independent tolls can be added to costs to create a Wardrop equilibrium if and only if the given traffic flow does not contain a multicommodity/single-commodity loop in the sense of Gallager (1977). We relate such loops to the necessity/possibility of commodity-independent, commodity-dependent, or negative tolls using a theorem of the alternative. We show by example that commodity-dependent tolls can reduce total user costs.

3 - Robust Pricing with Boundedly Rational User Equilibrium
Yingyan Lou, yingyan@ufl.edu, Yafeng Yin, Siriphong Lawphongpanich

This paper designs a robust pricing scheme with boudedly rational user equilibrium (BRUE). Users with bounded rationality seek for acceptable paths rather than a necessarily minimum one. BRUE flow distribution is generally non-unique and can be characterized as a non-convex set by relaxing the Wardrop's First Principle. A robust pricing scheme is determined by solving a nonlinear mathematical program with complementarity constraints to minimize the worst-case travel time.

4 - Discrete-time Dynamic User Equilibrium Models
Qipeng Phil Zheng, PhD Student, University of Florida, Department of Industrial and Systems Eng, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611-6595, United States of America, zqp@ufl.edu, Siriphong Lawphongpanich

We present models for determining dynamic user equilibrium flow distributions based on a discrete time horizon. The models consider both route and departure time choices and rely on a time-expanded network. Because time is discretized, it is possible that no flow distribution satisfies the traditional user equilibrium conditions. When this occurs, we assume that users switch to a least-cost route only if doing so reduces their costs by a sufficiently large amount.

■ MA06

M - Virginia C

Auctions Theory - Moving Forward: In Honor of Mike Rothkopf

Cluster: Auctions
Invited Session

Chair: Wedad Elmaghraby, University of Maryland, College Park, MD, Wedad_Elmaghraby@rhsmith.umd.edu

1 - Information Variability Impacts in Auctions
Justin Jia, Smeal College of Business, The Pennsylvania State University, 483A Business Building, The Penn State University, State College, PA, 16802, United States of America, zuj100@psu.edu, Michael Rothkopf, Ronald Harstad

A wide variety of auction models exhibit close relationships between the winner's expected profit and the expected difference between the highest and second-highest order statistics of bidders' information, and between expected revenue and the second-highest order statistic of bidders' expected asset values. We use stochastic orderings to see when greater environmental variability of bidders' information enhances expected profit and expected revenue.

2 - The Bidding Problem in One-shot Combinatorial Auctions: A Look from Decision Analysis
Natalia Santamaria, Smeal College of Business, Penn State, 471B Business Building, Penn State, University Park, PA, 16802, United States of America, nsantam@psu.edu

This presentation explores the problem a bidder faces to determine his bids in an one-shot sealed bid combinatorial auctions of two objects. Bidders in the auction can have superadditive or subadditive preferences for the bundle. The tool we use to model the problem is decision analysis.

3 - Do Auctioneers Pick Optimal Reserve Prices? Theory and Evidence
Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu, Anthony Kwasnica, Andrew Davis

We investigate how auctioneers set reserve prices in second-price auctions. Previous research has proven that the optimal reserve price is independent of the number of buyers. We extend this proof to include certain risk averse preferences and also provide evidence that these results fail to exist through an experimental investigation.

4 - Practical Procurement – Beyond Reverse and Combinatorial Auctions
Olga Raskina, Lead Scientist, Emptoris, 200 Wheeler Road, Burlington, MA, 02476, United States of America, ORaskina@emptoris.com

We consider some of the challenges in implementing multiple item procurement auctions in a business environment. We will discuss our experience with handling more advanced auction requirements we have observed in the field. Many of them go beyond familiar theoretical auction setup, but need to be addressed to align the auction with the actual business needs. Emptoris is a leading provider of enterprise supply management solutions for Global 5000 companies with emphasis in strategic sourcing.

■ MA07

M - Maryland A

Models of Strategic Customers

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Tava Olsen, Washington University in St. Louis, Olin Business School, 1 Brookings Dr., St. Louis, MO, 63141, United States of America, olsen@wustl.edu

Co-Chair: Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

1 - Buy Now and Match Later: The Impact of Posterior Price Matching on Profit with Strategic Consumers
Guoming Lai, Tepper School of Business, Carnegie Mellon University, pittsburgh, pa, 15213, United States of America, laiguoming@gmail.com, Katia Sycara, Laurens Debo

With a posterior price matching policy, a seller guarantees to reimburse the price difference to a consumer who bought the product before the seller marks down. In this talk, we examine the impact of a posterior price matching policy on consumers' purchasing behavior, a seller's pricing and inventory decisions, and their expected payoffs. We find that the price matching policy eliminates strategic consumers' waiting incentive and thus allows the seller to increase the price.

2 - Advance Selling, Strategic Consumers and Competition
Gerard Cachon, The Wharton School, University of Pennsylvania, 3730 Walnut St., JMHH Suite 500, Philadelphia, PA, 19104, United States of America, cachon@wharton.upenn.edu, Pnina Feldman

Advance selling has been shown to be able to provide a firm with higher profits than spot selling. We investigate whether this continues to hold when firms compete in an environment of strategic consumers.

3 - Capacity Management with Strategic Customers
Haiyan Wang, Washington University in St. Louis, Olin Business School, 1 Brookings Dr., St. Louis, MO, 63130, United States of America, hwang27@wustl.edu, Tava Olsen

We consider a service provider managing capacity in the presence of demand surges. Under this strategy, some customers who arrive in the peak demand period are offered a discount if they are willing to be postponed to a non-peak period. However, some non-peak period customers are strategic and may pretend to be a peak period customer in order to obtain a discount. We analyze the effect of the strategic customers' behavior on the service provider's capacity decisions and postponement strategy.

4 - "We Will Be Right with You": Managing Customers with Vague Promises
Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Achal Bassamboo, Itay Gurvich

Delay announcements informing customers about anticipated service delays are prevalent in service-oriented systems. We examine this problem of information communication by considering a model in which both the firm and the customers act strategically: the firm in choosing announcements, and the customers in interpreting the announcements and in making the decision when to join and when to balk. We characterize the equilibrium language that emerges between the service provider and her customers.

■ MA08

M - Maryland B

Finance-Operations Management Interfaces

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Phillip Lederer, Associate Professor, Simon Graduate School of Business Administration, Univesity of Rochester, Rochester, NY, 14627, United States of America, lederer@simon.rochester.edu

1 - Demand-supply Mismatches and Stock Market Reaction: Evidence from Excess Inventory Announcements
Vinod Singhal, Professor, College of Business, Georgia Institute of Technology, Atlanta, GA, 30332, vinod.singhal@mgt.gatech.edu, Kevin Hendrick

This paper documents that excess inventory announcements, an indication of demand-supply mismatch, are associated with an economically and statistically significant negative stock market reaction. The results are based on a sample of 276 excess inventory announcements made during 1990-2002. Over the day of the announcement and the day before the announcement the mean the stock market reaction ranges from -6.79% to -6.93% depending on the benchmark used to estimate the market reaction.

2 - Capital Structure, Inventory Management, and Coordination

Matthew Sobel, Professor, Weatherhead School, Department of Operations Management, Case Western Reserve, Cleveland, OH, 44106-7235, United States of America, Matthew.Sobel@Case.edu, Qaiohai (Joice) Hu

We optimize the expected present value of dividends in a dynamic model of a firm with long-term debt and stochastic product market demand. The results depend on whether short-run operating and financial decisions are coordinated or decentralized. Coordinated decisions yield higher expected dividends net of capital subscriptions with smaller inventories, retained earnings, and default risk. A firm that coordinates short-term decisions needs less long-term debt than if it decentralizes them.

3 - Capital Justification and Project Risk

Phillip Lederer, Associate Professor, Simon Graduate School of Business Administration, Univesity of Rochester, Rochester, NY, 14627, United States of America, lederer@simon.rochester.edu, Michael Raith

This paper studies the agency problem when project proposers have more information about project risk than the capital allocator, and the proposer can hide his actions. We study this problem in two situations where risk matters: limited liability and risk aversion of proposers, and seek optimal contracts. We show that agency costs can be very large, and lower project value significantly.

4 - Earning Management and Operations Response

Song (Alex) Yang, PhD Student, The University of Chicago Graduate School of Business, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States of America, syang1@chicagogsb.edu, John Birge

In accounting literature, there is substantial evidence that managers manage earnings by manipulating real operations activities. While it is questionable if it is the "right" thing to do, it unveils some manager's incentive under the current market equilibrium. In this talk, we will investigate how optimal operational decisions should be made under those incentives.

■ MA09

M - Maryland C

Joint Session QSR/CS: Statistical Monitoring for Healthcare Quality

Sponsor: Quality, Statistics and Reliability, Computing Society Sponsored Session

Chair: Harriet Nembhard, Associate Professor, Penn State University, Department of Industrial Engineering, 310 Leonhard Building, University Park,, PA, 16802, United States of America, hbn2@psu.edu

1 - Recent Research in Disease and Public Health Surveillance

Kwok-Leung Tsui, Professor, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, ktsui@isye.gatech.edu, David Goldsman

Due to various outbreaks of influenza, research on disease and public health surveillance has become very important. In this talk we will present overview and review of general issues involved in healthcare, public health, and syndromic surveillance. We review the latest research in disease transmission models, surveillance systems, monitoring methods, and performance measures. We also discuss the research challenges and illustrate them with various problems and examples.

2 - Economic Design for Individual Measurements, Motivated by Models of Flu Activity

Justin Chimka, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, jchimka@uark.edu, Jia Zhou

Consider situations in which the sample used for process monitoring consists of an individual unit. Our motivation comes from gamma regression model-based control charts for flu activity, where individual units are absolute values of residuals. We have developed probability statements for computing true errors associated with individuals control charts of continuously distributed measurements. Assuming simple cost functions, we have searched for and discovered economic designs.

3 - Using the Repeated Two-sample Rank (RTR) Procedure for Detecting Anomalies in Space and Time

Ronald Fricker, Associate Professor, Naval Postgraduate School, Operations Reaserch Dept, 1411 Cunningham Road, Monterey, CA, 93943, United States of America, rdfricke@nps.edu

The RTR procedure is a nonparametric statistical process control methodology. The method transforms a sample of data into univariate statistics; changes in the distribution of the data are then detected using nonparametric rank tests. In this discussion we explore its use as a spatio-temporal event detection and monitoring methodology. Upon a signal of a possible distributional change, the methodology suggests a way to graphically indicate the likely location of the distributional change.

4 - On Quality and Reliability of Electronic Prescribing in Primary Care: A Case Study

Yi-Chin Lin, PhD Student, Carnegie Mellon University, 515 S Aiken Ave Apt 503, Pittsburgh, PA, 15232, United States of America, yichinl@andrew.cmu.edu, Keith Kanel, Toni Fera, Rema Padman

We examine the adverse impact of an IT failure on the quality and reliability of the prescribing process as a critical barrier to adoption of electronic prescribing in primary care. We apply a statistical change-point detection algorithm to identify the tipping point in actual usage and control charts to monitor trends in usage behavior that will allow for early detection of system failures and rapid process improvement.

5 - An Analogues-changepoint Methodology for Influenza-like-illness and Drug Sales Surveillance

Harriet Nembhard, Associate Professor, Penn State University, Department of Industrial Engineering, 310 Leonhard Building, University Park,, PA, 16802, United States of America, hbn2@psu.edu, Elisabeta Vergu, Bruno Lambert, Clément Turbelin, Wenny Chandra, Antoine Flahault

We design an SPC analogues-changepoint methodology to monitor French Influenza-Like-Illness (ILI) weekly incidence (clinical data) and support it with multivariate monitoring of weekly pharmaceutical sales (non-clinical data) of 14 preselected medications in ILI context. Our results show that drug sales data provide indirect but earlier indicator of influenza outbreak which could serve as early warning for public health officials.

■ MA10

M - Room 8206

Managing Risk in Competitive Electricity Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Shmuel Oren, Professor, UC Berkeley, IEOR Department, Rm. 4119 Etcheverry Hall, Berkeley, CA, 94720, United States of America, oren@ieor.berkeley.edu

1 - A Multi-period Equilibrium Pricing Model for Weather Derivatives

Yongheon Lee, yhlee@ieor.berkeley.edu, Shmuel Oren

Weather derivatives are gaining popularity as financial instruments for hedging price or volumetric risk, however pricing such instruments is challenging due to the lack of a valued underlying. We introduce a multi-period equilibrium pricing model based on supply and demand for weather derivatives that are determined dynamically from utility indifference pricing and portfolio optimization. A numerical example illustrates the equilibrium pricing methodology and hedging results.

2 - Evaluating the Impact of Real-time Demand Response on the Integration Cost of Wind

Ramteen Sioshansi, Assistant Professor, The Ohio State University, ISE Department, Baker Systems Building, Columbus, OH, 43210, United States of America, ramteen@ieor.berkeley.edu

Wind generation presents unique operational planning challenges due to its highly variable and uncertain availability that can result in suboptimal and costly unit commitments and dispatches. Demand response can help to reduce these costs by allowing loads to react to real-time resource availability. We analyze a model of the Texas electric power system to show the cost of wind forecasting errors and demonstrate the potential for real-time demand response to reduce these costs.

3 - Systematic Optimistic Bias in Market Equilibria: Application to the Northwest European Power Market

Ming-Che Hu, Johns Hopkins University, Department Geography & Environ. Engineering, Baltimore, MD, 21218, United States of America, mhu4@jhu.edu, Benjamin F. Hobbs

Under uncertain costs and demand, outcomes of market models suffer from optimistic biases, where the projected performance of markets is better, on average, than what is actually realized. Net benefit estimates for new technologies are also optimistically biased under certain assumptions. Biases are quantified for a parameterized power market model.

4 - A Stochastic Power Market Equilibrium with Risk-averse Investors

Lin Fan, lfan@jhu.edu, Catherine S. Norman, Benjamin F. Hobbs

A simulation considers producers in a competitive market. Investment decisions are a two-stage equilibrium problem. Initially, investment is made under regulatory uncertainty; then the regulatory state is revealed and producer's returns realized. Under carbon emission regulation risk, risk-averse producers prefer less carbon-intensive investment. We then discuss implications for electricity modeling.

■ MA11

M - Room 8209

Forestry V: Wildfire and Pest Management

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Combating the "Broken Windows" of Arson

Douglas Thomas, Building and Fire Research Laboratory, National Institute of Standards and Tech, 100 Bureau Drive, Mailstop 8603, Gaithersburg, MD, 20899, United States of America, douglas.thomas@nist.gov, Jeffrey Prestemon, David Butry

From criminology, we know that indicators of urban decay provide would-be criminals with signals identifying neighborhoods with lower crime detection and apprehension rates. We model the incidence of arson as a function of "broken window" indices and identify several factors that affect future incidents. Changes in these indices, through neighborhood watches, police patrolling, or community beautification, can combat other, less controllable, but predictable factors, such as weather.

2 - Scheduling Fuels Removal Projects Across a Forest

Richard Church, Department of Geography, University of California, Santa Barbara, CA, 93106, United States of America, church@geog.ucsb.edu

To reduce the chance of large devastating fires and protect habitat, The US Forest Service has been been under a court order to develop plans for SPLATs (strategically placed areas for treatment). In order to maximize the "Finney" effect, such treatements should be clustered whenever possible. We describe a scheduling model to spatially cluster fuels removal projects to the greatest extent possible. Applications will also be discussed along with the implementation of the model in Arc/GIS.

3 - Integrated Forest Fire Detection and Initial Attack Planning

David Martell, Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, M5S 3B3, United States of America, martell@smokey.forestry.utoronto.ca

Forest fire detection system managers attempt to find and report fires at small sizes on the assumption that initial attack system performance declines as detection size increases. Detection system management is complicated by the "unorganized" public detection system which detects and reports many fires at little or no cost. We describe the development of an integrated detection-initial attack model and how we used it to develop detection system performance measures for the province of Ontario.

4 - Cost-effective Detection and Eradication of Forest Pest Colonies

Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

Establishment and growth of invasive species are ongoing processes, and managers need cost-effective strategies to detect and eradicate colonies over time. We address this problem with an age-class model of colony establishment and growth and determine cost-minimizing search strategies where eradication cost depends on colony size at time of detection. Results are presented for gypsy moth control in the western United States.

■ MA12

M - Room 8212

Predictive Modeling for Business Intelligence

Cluster: Data Mining
Invited Session

Chair: Maytal Saar-Tsechansky, Assistant Professor, University of Texas at Austin, Austin, TX, 78712, United States of America, Maytal.Saar-Tsechansky@mccombs.utexas.edu

1 - Multi-component Rating and Collaborative Filtering for Recommender Systems

Nachiketa Sahoo, The Heinz School of Public Policy and Management Carnegie Mellon University, nsahoo@gmail.com

Collaborative filtering algorithms have been traditionally designed to work with user ratings with only one component. However, recently there has been growing interest in using ratings on multiple aspects of items. In this work we present a mixture model based collaborative filtering algorithm for multi-component rating data. In developing this approach we draw from psychometric literature pertaining to the halo effect in multi-component rating. We evaluate the algorithm using data collected from Yahoo Movies. We found that the use of multiple components leads to improvement in recommendations over using only one component when very little training data is available. However, it is observed that when a lot of training data is available we do not gain much from using additional components of the ratings. Beyond generating recommendation, we also show that we can use the proposed model to fill-in missing rating components.

2 - Opinion Aggregation in Social Information Systems

Srujana Merugu, Yahoo! Research, United States of America, srujana@yahoo-inc.com

Recent advances in Web 2.0 applications and tools that facilitate generation and publication of content have resulted in huge social information systems, e.g., product review/rating systems (Epinions, Youtube, Yelp), community forums (Y! Answers), social encyclopedias (Wikipedia). The availability of community generated opinions can be of tremendous value as it can enable individual users to leverage the "wisdom of crowds". However, aggregating opinions involving heterogeneous topics and sources (i.e., users/automated information extraction agents) is highly challenging due to a variety of reasons: (1) sources tend to have varying bias and expertise w.r.t. different topics and can often be anonymous, unreliable and even malicious, (2) the observed opinions are often sparse and cannot be assumed to be missing at random, (3) the notion of "objective truth" is often not meaningful, and is known only for an extremely limited number of cases even when applicable making it difficult to calibrate the system. In this talk, we describe a principled statistical opinion aggregation methodology (for the special case where there exists an "objective truth") that relies on modeling the opinion generation process as a stochastic transformation of the "truth".

3 - BANTER: Anything Interesting Going On Out There in the Blogosphere?

Claudia Perlich, T.J. Watson IBM Research, 1101 Kitchawan Rd, RTE 134, Yorktown Heights, United States of America, perlich@us.ibm.com

Social media marketing is of extreme relevance in today's dynamic market environment. The youngest and by traditional means least understood is the Web 2.0 media. Marketing groups are very curious to learn what people in general and their customers in particular are saying in their blogs, how the expressed opinions could impact business, and how to extract business insight and value from these blogs. The BANTER (Blog Analysis of Network Topology and Evolving) system integrates a number of different analytical and machine learning techniques including active and transfer learning to provide an effective tool to support marketing with insights from the Blogosphere. We will address the 4 main components: 1) The identification of a RELEVANT subset of the 77M size blog universe, 2) the identification of authorities in this sub-universe, 3) the analysis of the relevance and sentiment of the expressed opinions and 4) the detection of emerging hot topics and themes.

4 - Ordering Links on a Web Page when Learning User Profiles

Pelin Atahan, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75080, United States of America, pxa041000@utdallas.edu, Sumit Sarkar

Websites can learn user profiles quickly by carefully determining the links to make available to a user. The set of links that is more informative in terms of learning the profile can be made available to a user at each page. This research examines how the order of links in the offer set should be determined in order to learn profiles quickly.

■ MA13

M - Room 8216

Joint Session DM/CS: Data Mining Methods and Applications

Sponsor: Data Mining, Computing Society
Sponsored Session

Chair: Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu

1 - Variable Selection in High-dimensional Ordinal Class Prediction Problems with Genomics Applications

Kellie Archer, Assistant Professor, Virginia Commonwealth University, 730 East Broad Street, PO Box 980032, Richmond, VA, 23298-0032, United States of America, kjarcher@vcu.edu

Although classification accuracy is often a goal in predictive modeling, often when conducting high-throughput genomic experiments, it is of interest to identify the genes most predictive of the observed class. Herein, measures of variable importance from bootstrapped classification trees using our proposed ordinal impurity function will be compared to variables identified from L1-penalized GLMs predicting the ordinal response. Results will be presented for both simulated and genomic datasets.

2 - A Frequentist Assessment of Bayesian Inclusion Probabilities for Quantiative Trait Loci

Edward Boone, Assitant Professor of Statistics, Department of Statistical Sciences and Operations Research, Virginia Commonwealth University, 1001 W. Main St, Richmond, VA, 23284, United States of America, elboone@vcu.edu, Albert Lee

Bayesian inclusion probabilities have become a popular tool for variable assessment. This presentation shows how a frequentist may evaluate Bayesian inclusion probabilities. This evaluation looks at both restricted and unrestricted model spaces and develops a framework that can be utilized for inclusion probabilities that preserve Type I error rates. This framework is applied to an analysis of the Arabidopsis thaliana with respect to determining QTL associated with cotelydon opening angle.

3 - Mining Oriented Frontier Outliers

Jose Dula, Associate Professor, Virginia Commonwealth University, School of Business, Richmond, VA, United States of America, jdula@vcu.edu

Frontier outliers attain upper or lower limits of the magnitudes not just in one dimension but also when these are combined. They are naturally interesting since they may expose risk, profit, fraud, or security. Their identification is a challenge especially when no weights are designated for combining the attributes and when the data set is massive. We present a framework for defining and processing frontier outliers in general magnitude data sets.

4 - Robust L1 Principal Component Analysis

Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu, Edward Boone

Principal component analysis (PCA) can be viewed as an optimization problem on a given training data set. The objective is to find a linear subspace such that the sum of orthogonal distances of observations to the linear subspace is minimized. In the interest of increasing robustness to outlier observations, we introduce a method for PCA where the L1 distance of points to the hyperplane is minimized, rather than the sum of squared Euclidean distances.

■ MA14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Responsive Learning Technologies, Inc.- Online Games to Teach Operations and Supply Chain Management

Sam Wood, President, Responsive Learning Technologies, Inc., 10181 Partlett Pl., Cupertino, CA, 95014, wood@responsive.net

Participate in a demonstration of online games that are used in operations management courses and supply chain management courses in more than 100 undergraduate and MBA-level programs to teach topics like capacity management, lead time management, inventory control, and supply chain design and logistics.

2 - Fair Isaac - Building Optimization Applications in Xpress-MP

Gabriel Tavares, Fair Isaac, gabrieltavares@fairisaac.com

This tutorial will focus on developing and deploying complete optimization applications using Fair Isaac's array of mathematical modeling and optimization tools. These tools can be used for modeling, solving, analyzing and visualizing optimization problems, and integrating them seamlessly in business applications. We will explain how Xpress-Mosel, Xpress-IVE and Xpress-Application Developer can decrease development time for new optimization applications and enable you and your customers to make smarter decisions. The proven technologies offered by Fair Isaac can be used in a range of applications such as supply chain management, transportation, finance, energy, manufacturing, retail, insurance, manufacturing industries, to name a few.

■ MA15

M - Room 8219

Panel Discussion: Service Science Curriculum Development Responding to Educational Goals and Field Demands

Sponsor: Service Science
Sponsored Session

Chair: Namkyu Park, Associate Professor, Ohio University, Industrial & Systems Engineering, Stocker Hall 277, Athens, OH, 43016, United States of America, parkn@ohio.edu

1 - Panel Discussion: Service Science Curriculum Development Responding to Educational Goals and Field Demands

Moderator: Namkyu Park, Associate Professor, Ohio University, Industrial & Systems Engineering, Stocker Hall 277, Athens, OH, 43016, United States of America, parkn@ohio.edu,
Panelists: Kwang-Jae Kim, John Surtherland

This session will embrace several viewpoints coming out of a range of academic foci as well as industry demands in the context of service sciences curriculum development. Activities in other countries are going to be introduced as well. Academic endeavors and experiences on the NSF-supported service science curriculum development will be shared in this session.

■ MA16

M - Room 8222

Information Asymmetry and Customer Behavior

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu

1 - Seat Value in Stadiums and Theaters: An Empirical Investigation

Ramnath Vaidyanathan, PhD Student, The Wharton School, 500 Jon M Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, ramnathv@wharton.upenn.edu, Senthil Veeraraghavan

We study how seat value perceived by patrons attending an event in a theater/stadium, depends on the location of their seat relative to the stage/field. Using a proprietary dataset collected by a professional baseball franchise, we quantify the influence of seat location and consumer characteristics on customers' ex-post valuations. We find that frequent customers experience lower variance in their valuations, and customers in symmetric seat locations might perceive very different values.

2 - Consumer Returns Policies and Supply Chain Contracts

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

Many stores offer consumer returns policies. Although such policies stimulate demand, firms may be left with excess inventory as a result of product returns. We discuss the implications of consumer returns policies on supply chain coordination.

3 - Quality and Information Asymmetry in Service Outsourcing

Justin Ren, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, ren@bu.edu, Fuqiang Zhang

This paper studies how to design service outsourcing contracts with quality consideration and the presence of asymmetric information. An outsourcer procures a service from a service provider whose cost structure is private information. Our results suggest that outsourcing companies can use relatively simple and yet robust contracts to assure a high level of capacity and quality service even when they do not have perfect information of the service provider.

4 - Speculative Behavior in a Queue

Andres Catalan-Cardenas, The Wharton School, University of Pennsylvania, Philadelphia, PA, andresc@wharton.upenn.edu, Senthil Veeraraghavan, Gerard Cachon

Not all the customers waiting for a service actually want the service: sometimes people queue solely to make a proﬁt from customers. We analyze the behavior of a speculator in a single queue that sells his position to the arriving customers. We find the price he will request and derive different thresholds in terms of queue length, system utilization and the speculator's waiting costs that lead him to behave speculatively (i.e. to hold his position and wait) to maximize his profit.

■ MA17

M - Room 8226

Joint Session QSR/DM: Statistical Data Mining Techniques for Process Monitoring

Sponsor: Quality, Statistics and Reliability, Data Mining
Sponsored Session

Chair: Myong K. (MK) Jeong, Rutgers, The State University of New Jersey, RUTCOR, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, mjeong@utk.edu

1 - Spatial Correlogram-based Dynamic Time Warping for Detection of Defect Patterns in Wafer Maps

Youngseon Jeong, PhD Student, Rutgers, The State University of New Jersey, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, yjeong@utk.edu, Seong-Jun Kim, Myong K. (MK) Jeong

This paper proposes a new methodology which combines spatial correlogram with dynamic time warping (DTW) for the automatic detection of defect patterns in semiconductor wafer maps. Spatial correlogram is used for the detection of the presence of spatial autocorrelations while DTW distance is adopted for the automatic classification of defect patterns. The experimental results show that our method is robust to random noise, defect location and size.

2 - A Framework for a Self Healing Assembly System

Jaime Camelio, Assistant Professor, Michigan Technological University, Department of Mechanical Engineering, 815 R.L. Smith ME-EM Building, Houghton, MI, 49931, United States of America, jcamelio@mtu.edu

Advances in statistical process monitoring and control have focused primarily on more efficient ways to diagnosis faults, reducing variation, developing robust design techniques, and increasing sensor capabilities. System level advances are largely dependent on the introduction of new techniques in the listed areas. A unique system level manufacturing process is introduced in this paper as a means to integrate rapidly advancing computing technology and analysis methods.

3 - A Simple Bayesian Regression Diagnostic to Account for Bias

Theodore Allen, Associate Professor, Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, allen.515@osu.edu, Ravishankar Rajagopa

To provide diagnostic information about the bias and other summative information, we propose a model diagnostic that can be used like adjusted R2 but which explicitly accounts for bias errors. Unlike the Cp statistic, our proposed diagnostic can be estimated even if the bias sources are inestimable using ordinary least squares. The proposed diagnostic has the simple interpretation of being the expected plus or minus prediction errors in the units of the response.

4 - In-situ Monitoring of Etching Processes of the Oxide Film Using Optical Emission Spectral Signals

Myong K. (MK) Jeong, Rutgers, The State University of New Jersey, RUTCOR, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, mjeong@utk.edu, Young-Don Ko, Byungwhan Kim, Youngseon Jeong

In situ optical emission spectroscopy (OES) signals are used to monitor the etching processes. This paper proposes kernel based process modeling such as kernel partial least square regression for the etch rate and uniformity in plasma process. Based on the experimental results, we can conclude that in-situ OES data can be used to predict the performance of plasma etching process as well as detect fault patterns of the process via the kernel based modeling.

■ MA18

M - Room 8228

Joint Session QSR/CS: Decision Theoretic Approaches for Quality and Reliability Assessment

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Martin Wortman, Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77843-3131, wortman@tamu.edu

Co-Chair: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu

1 - Reliability, Risk, and High-stakes Wagering

Martin Wortman, Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77843-3131, wortman@tamu.edu

The analytical relationship between reliability, risk, and high-stakes wagering will be examined within the context of technology assessment. Particular emphasis will be given to predictive modeling and subsequent computational methods for identifying, from among competing alternatives, that alternative having the most favorable risk.

2 - The Mathematics of Decision Making

George Hazelrigg, NSF, ghazelri@nsf.gov

Decision making has 3 components, determination of alternatives from which a decision maker may choose,prediction of outcomes for each alternative,and expression of preferences against which the most preferred alternative may be determined. To get the mathematics of decision making correct,we must apply decision theory only to decisions, formulate predictions that are consistent with our beliefs and data,accept that predictive models cannot be validated,and construct a valid preference function.

3 - Monitoring CMP Process by Particle Filtering through Parameter Estimation and Prediction

Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu, Satish Bukkapatnam, Ranga Komanduri

Chemical Mechanical Planarization (CMP) has been widely used in semiconductor manufacturing industry to polish surface of wafers with more planarity. This paper proposes a method of online dynamic modeling to estimate and predict process state parameters, and further predict MRR. The fundamental challenge of this task is the non-linear nature of the CMP processes. This challenge is tackled by applying particle filtering method, to capture the non-linear dynamic of the CMP process.

4 - The Utility of Reliability and Survival

Nozer Singpurwalla, Distinguished Research Professor, George Washington University, Department of Statistics, 2140 Penn. Av., Washington, DC, 20052, United States of America, nozer@gwu.edu

It is by now a well appreciated fact that the purpose of reliability and life testing is to make coherent decisions. Utility is a key element of decision making. In this talk I propose a model for eliciting a decision maker's utility for reliability. The model is motivated by the Rasch Model of item response theory. I describe how the model can be invoked in practice and propose a statistical approach for estimating the model parameters. I conclude by presenting a real life case study.

■ MA19

M - Lincoln 4

Building Decision Analysis Approaches at FDA

Sponsor: Decision Analysis
Sponsored Session

Chair: Kara Morgan, Senior Advisor for Risk Analysis, US FDA/ORA, 5600 Fishers Lane, HFC-1 14C-20, Rockville, MD, 20857, United States of America, kara.morgan@fda.hhs.gov

1 - Using Decision Analysis to Regulate Medical Devices

Telba Irony, telba.irony@fda.hhs.gov, David Chan, Larry Kessler

The Center for Devices and Radiological Health at the FDA is investigating the use of quantitative decision analysis in regulating medical devices across the total product life cycle. The idea is to analyze certain situations and determine how much evidence is needed in each case in order to make a decision about a certain medical device product. In this talk we will describe the ideas being explored and request feedback from the audience on how to streamline our efforts.

2 - Applying More Formalized Approaches to Drug Risk-benefit Assessments

Theresa Mullin, Theresa.Mullin@fda.hhs.gov

FDA risk-benefit assessment includes safety and effectiveness data for a specified drug, findings for other drugs for the same indication, and other factors, using quantitative analysis as well as subjective weighing of evidence. Some have recommended FDA adopt formalized multi-attribute approaches; FDA is interested in exploring the potential applicability and limitations. This talk will describe candidate case studies where more formalized methods might be helpful and criteria for evaluation.

3 - Risk-based Approaches for Directing Field Activities

Kara Morgan, Senior Advisor for Risk Analysis, US FDA/ORA, 5600 Fishers Lane, HFC-1 14C-20, Rockville, MD, 20857, United States of America, kara.morgan@fda.hhs.gov

Risk-based models are in full bloom at FDA, particularly to inform decisions to direct field activities for inspections and imports. Now that the models are developed, an evaluation strategy will be developed to ensure the models are on a continuous improvement path. This talk will describe research being conducted into linking public health outcomes to FDA activities as a means for validating and improving these risk based models.

4 - Comments on Building Decision Analysis Approaches at FDA
Jeffrey Stonebraker, Assistant Professor, University of Denver, Daniels College of Business, 2101 S. University Blvd, Denver, CO, 80208, United States of America, Jeffrey.Stonebraker@du.edu

The discussant will provide comments and questions for the FDA speakers, and facilitate a discussion about the methods and approaches that have been described in their talks.

■ MA20

M - Lincoln 3

Joint Session DA/ENRE: Green Decision Analysis

Sponsor: Decision Analysis, Energy, Natural Res & the Environment
Sponsored Session

Chair: Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com

1 - Adaptive Capacity Planning for Data Centers
Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com, Surya Swamy

The rapid growth in energy use by data centers puts them on track to exceed the carbon emissions of worldwide air travel by 2012. There are many promising methods to improve efficiency of data centers. ADCAPT is a decision tool to assist data center managers create adaptive capacity plans that dramatically reduce costs and energy use, while meeting IT demand in the face of large uncertainties about demand growth, Moore's law, and the energy efficiency of new IT, cooling and power technologies.

2 - Applying Expert Elicitations to Inform Climate Policy: Carbon Capture and Storage
Erin Baker, University of Massachusetts, Amherst, 220 ELab, Amherst, MA, United States of America, edbaker@ecs.umass.edu, Jeffrey Keisler

We combine economics and decision analysis to incorporate the uncertainty of technical change into climate change policy analysis. We present the results of an expert elicitation on the prospects for technical change in carbon capture and storage. We conclude that we need to gather more information about the technical and societal potential for Carbon Capture.

3 - Risk Analysis of DOE Energy R&D Programs
Sam Baldwin, Chief Technology Officer, Department of Energy/EERE, 1000 Independence Ave., SW, Washington, DC, 20585, United States of America, Sam.Baldwin@ee.doe.gov

A methodology has been developed for quantitatively evaluating the technical risks of energy technology system R&D and the associated economic and environmental benefits. Key issues include: the probability assessment process; expert recruitment; energy technology system modeling; evaluation of alternative technology pathways; benefits analysis; decision analysis; and lessons learned.

4 - Stochastic Modeling to Support Energy R&D Decisions
Walter Short, Principal Researcher, National Renewable Energy Laboratory, 1617 Cole Blvd, Golden, CO, 80401, United States of America, Walter_Short@nrel.gov, James Milford

This presentation will describe the Stochastic Energy Deployment System model under development by seven national laboratories for the Department of Energy. This model simulates the U.S. energy system over the next 50 years with explicit consideration of the uncertainties inherent in technology development, fuel prices, market factors, and policy. We will describe its development and immediate use for the evaluation of different technology portfolios of federal energy R&D efforts.

■ MA21

M - Lincoln 2

Joint Session Computational Biology/CS: Optimization Problems in Complex Biological Systems

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Teresa Przytycka, Principal Investigator, NIH | NLM | NCBI, przytyck@ncbi.nlm.nih.gov

1 - Optimization of the Genetic Code and Gene Sequences for Translational Robustness
Eugene Koonin, NCBI, NIH, koonin@ncbi.nlm.nih.gov

The universal, standard genetic code table has a distinctly non-random structure, with similar amino acids often encoded by codons series that differ by a single amino acid substitution, typically, in the third or the first position of the codon. It has been repeatedly argued that this structure of the code results from selective optimization for translational robustness such that translational misreading has the minimal adverse effect. Indeed, it has been shown in several studies that the standard code is more robust than a substantial majority of random codes. However, it remains unclear how much evolution the standard code underwent, what is the level of optimization, and what is the likely starting point. I describe a simulation analysis of evolution of the genetic code that leads to the conclusions that the universal code is a result of partial optimization of a random code for translational robustness.

2 - Systems Biology of Infectious Disease
Jason Papin, University of Virginia, papin@virginia.edu

Infectious disease is a tremendous global health problem. Systems biology promises to integrate high-throughput data in a mathematical context to make the connection between genotype and phenotype, and thus may facilitate the rapid identification of drug targets for emerging pathogens. Two topics will be discussed: (1) the development of novel computational approaches for interrogating properties of mathematical representations of biochemical networks; and (2) the discovery of fundamental biology with systems-level models of human pathogens.

3 - New Methods for Identification of Transcription Factor Binding Sites
John Spouge, NCBI,NIH, spouge@ncbi.nlm.nih.gov

Many computational methods for identifying regulatory elements use a likelihood ratio between motif and background models. Often, the methods use a background model of independent bases. At least two different Markov background models have been proposed with the aim of increasing the accuracy of predicting regulatory elements. Both Markov background models suffer theoretical drawbacks. I discuss a new a ontext dependent Markov background model from fundamental statistical principles.

4 - Using Combinatorial Optimization to Predict Domain-domain Interactions
Teresa Przytycka, Principal Investigator, NIH | NLM | NCBI, przytyck@ncbi.nlm.nih.gov

Comprehending the cell functionality requires knowledge about the functionality of individual proteins as well as the interactions among them. Proteins typically contain two or more domains, and a protein interaction usually involves binding between specific pairs of domains. Identifying such interacting domain pairs is an important step towards determining the protein-protein interaction network. We demonstrate that evolutionary parsimony principle combined with combinatorial optimization techniques leads to an approach to detecting domain-domain interactions that outperforms other methods to attack the problems.

■ MA22

M - Lincoln 1

CP/OR interface II

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session

Chair: John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu

1 - Strong Inequalities for Disjunctive Sets Via Lifting
Mohit Tawarmalani, Associate Professor of Management, Purdue University, 100 S. Grant Street, West Lafayette, IN, 47907-2076, United States of America, mtawarma@purdue.edu, Jean-Philippe Richard

The lifting theory is used to generate convex hulls and strong cuts for disjunctive sets. Illustrative examples involving small-dimensional sets are presented. A generalization of perspective cuts is derived by lifting the Fenchel-Young inequalities. The theory is applied to bilinear knapsack sets, where the lifting function is found to be supermodular. This property is then used to develop valid inequalities for bilinear knapsacks and covering sets.

2 - A Unifying Framework for Domain Reduction
Nick Sahinidis, John E. Swearingen Professor, Carnegie Mellon University, Department of Chemical Engineering, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, sahinidis@cmu.edu, Mohit Tawarmalani

Based on Lagrangian outer-approximation, we present a unified treatment of existing and several new domain reduction techniques for integer programming, global optimization, and constraint programming.

3 - Advancing AND/OR Search for Optimization
Rina Dechter, Professor, UC Irvine, Irvine, California, Irvine, CA, United States of America, dechter@ics.uci.edu, Radu Marinescu

Recently, Branch-and-Bound search algorithms were developed, exploring the AND/OR search graph for solving constraint optimization problems, demonstrating tremendous gain using problem decomposition (using AND

nodes), equivalence (by caching) and irrelevance (via the mini-bucket heuristics). We show here additional improvements gained by exploiting constraint propagation, using initial upper bounds generated via stochastic local search and improving the quality of the guiding pseudo tree.

4 - Efficient Context-Free Grammar Constraints

Meinolf Sellmann, Brown University, PO Box 1910, Providence, RI, United States of America, sello@cs.brown.edu, Serdar Kadioglu

Recently, constraints based on grammars higher up in the Chomsky hierarchy were introduced. We devise a time- and space-efficient incremental arc-consistency algorithm for context-free grammars. Particularly, we show how to filter a sequence of monotonically tightening problems in cubic time and quadratic space. Experiments on a scheduling problem show orders of magnitude improvements in time and space consumption.

■ MA23

M - Lincoln 5

The Applied Probability Society Markov Lecture

Sponsor: Applied Probability
Sponsored Session

Chair: Steven E. Shreve, Orion Hoch Professor of Mathematics, arnegie Mellon University, shreve@steve.math.cmu.edu

1 - Mixing Models to Capture Stock Price Volatility

Steven E. Shreve, Orion Hoch Professor of Mathematics, Carnegie Mellon University, shreve@steve.math.cmu.edu

The celebrated Black-Scholes formula for the price of a European call assumes that the underlying stock price is a geometric Brownian motion with constant volatility, which implies that the distribution of the stock price at each .xed time is log-normal. If this were actually the case, then the same value for the volatility parameter in the Black-Scholes formula could be used to price all options on a particular stock. Market data shows signi.cant departures from this idealized situation, and for exotic options (i.e., those with path-dependent payo.s), these departures can create serious errors in prices and hedges. To address this short-coming of the Black-Scholes model, a variety of models have been implemented in which the volatility is itself a stochastic process. One of these is the local volatility model of B. Dupire in which the volatility at each time is a function of the time and the stock price at that time. This function is chosen so that the prices produced by the model match a variety of market prices of calls and puts with various expiration dates and strike prices. In addition, some ad hoc .xes have been implemented. One of these ad hoc .xes is to assume that the distribution of the stock price at each time is a mixture of log-normal distributions. This mixture of distributions can produce realistic prices for a variety of European calls and puts with the same expiration date, and thus has practical appeal. However, it is not really a model because it speci.es the distribution of the stock price at one or several times but does not specify how the stock price evolves over time. In other words, it does not specify the distribution of the paths of the stock price. In this talk, we describe how to build a model for the evolution of the stock price so that at each particular time, the distribution of the stock price is a mixture of the distributions produced by two di.erent models. This model is in the spirit of a local volatility model, although the volatility may now depend on more than the current time and the current stock price. The model extends a result by Gy®ongy on the construction of a di.usion process that has desired one-dimensional distributions. This is joint work with former PhD Student Gerard Brunick, Department of Mathematics, University of Texas at Austin. The discussants for this presentation are Paul Glasserman, Graduate School of Business, Columbia University and Ronnie Sircar, Department of Operations Research and Financial Engineering, Princeton University.

■ MA24

M - Lincoln 6

Joint Session CS/ Optimization/Discrete Optimization: Cutting Planes

Sponsor: Computing Society, Optimization
Sponsored Session

Chair: Robin Lougee-Heimer, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, robinlh@us.ibm.com

1 - A Decomposition Algorithm for Solving a Large-scale MILP Model for Petroleum Supply Operations

Roger Rocha, PETROBRAS, Av. Horàcio de Macedo 950, Rio de Janeiro, Brazil, rrocha@andrew.cmu.edu, Ignacio Grossmann, Marcus V. S. Poggi de Aragão

We consider a problem faced by PETROBRAS. This problem is to determine a minimum cost offloading scheduling of platforms to supply refineries. In this work we propose a decomposition algorithm that resembles the Benders decomposition algorithm but we present a new way of generating cuts based on disjunctive program.

2 - Cutting Planes in SCIP

Kati Wolter, PhD Candidate, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, wolter@zib.de

SCIP is a solver for constraint integer programming, which integrates constraint programming and mixed integer programming modeling and solving techniques. We introduce one component of the solver, namely the generation of cutting planes. The solver includes efficient separation algorithms for general cutting planes as well as for problem specific cutting planes.

3 - Cardinality Cuts: Optimization and Aggregation

Osman Oguz, Associate Professor, Bilkent University, Department of Industrial Engineering, Ankara, 06800, Turkey, ooguz@bilkent.edu.tr

We use cardinality cuts as a means of cutting away the explored regions of the underlying polyhedron associated with a 0-1 integer programming problem. Exploration is done by solving smaller size restricted subproblems by customary branch-and-cut. Our computational experiments show that significant savings (up to more than ten times) in computing time and memory space are possible for large problems using this method.

4 - Simultaneous Lifting in Knapsack Polytopes

Todd Easton, Associate Professor, Kansas State University, 2021 Durland Hall, Manhattan, KS, 66506, United States of America, teaston@ksu.edu, Kamana Sharma, Jessica Heier

The binary knapsack has been one of the most widely studied polytopes. This talk describes a new technique to generate numerous exact simultaneously lifted cover inequalities in quadratic time. Conditions when these inequalities are facet-defining are also presented along with some computational results.

■ MA25

M - Lincoln 6A

Computational Intelligence in Financial and Prediction Markets

Sponsor: Computing Society
Sponsored Session

Chair: Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu

1 - Quantifying Market Liquidity from Order Flow

Adlar Kim, Postdoctoral Associate, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, jwkim@csail.mit.edu

In the first part of this talk, I demonstrate statistical modeling techniques to model order flow generation of financial markets. A simulation of the model successfully replicates various statistical properties of price returns. In the second half, I argue that change in market liquidity explains how my order flow model satisfies the weak form of Efficient Market Hypothesis. A method of quantifying market liquidity from order flow data is introduced to explain this.

2 - How do Prediction Markets Predict?

Abraham Othman, Carnegie Mellon University, 5560 Bartlett Street, Pittsburgh, PA, 15217, United States of America, aothman@cs.cmu.edu

Prediction markets are remarkable aggregators of information. But are they more accurate than, say, a subsidized average estimate from a handful of their most prescient contributors? In this talk, I discuss the evidence for and against the so-called "Marginal Trader Hypothesis", which attributes virtually all of a market's success to a small group of savvy participants. I discuss the implication of this hypothesis in the design of future markets, and computation's vital role in that future.

3 - Blind Portfolio Auctions

Michael Padilla, Stanford University, Packard, Stanford, CA, 94305, United States of America, mtp@stanford.edu, Benjamin Van Roy

Institutional investors sell a large volume of assets to brokers using blind portfolio auctions, typically first-price auctions where the investor engages a few potential buyers and provides limited information about the portfolio contents. Such trades can be inefficient for several reasons. We propose a mechanism that addresses these concerns via careful information management. This mechanism can be implemented through either a trusted mediator or an equivalent cryptographic protocol.

4 - Adapting to a Shock: Optimal Sequential Market-making

Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu, Malik Magdon-Ismail

We present a dynamic-programming approach to optimal sequential price-setting in a stylized model of dealer markets. Our algorithm reveals a surprising insight: an optimal monopolist can provide more liquidity to the market in periods of high uncertainty, because she is willing to absorb initial losses to learn valuations more quickly.

■ MA26

M - Lincoln 5A

Open Source Trends

Sponsor: Computing Society: Open Source Software
(Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Joao Goncalves, IBM Research, T. J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, jpgoncal@us.ibm.com

1 - Performance of Huge Scale Collaborative Network

Yuji Fujita, research expert, NiCT, 2-2-2 Hikaridai, Seika-cho, Kyoto, Japan, fyuji@nict.go.jp, Yutaka Hamaoka

Groups of huge scale has been formed on the Internet of their own accord to develop various open-source software or provide support for their software products. This kind of people's network has some notable points that its membership is changeable or has multiple roles that supporting users and creating software. About 2 thousands of open-source projects are examined in this study concerning about progress of development, communications and other aspects and their correlations.

2 - The Effect of Evolving Software Complexity on Open Source Co-developer Participation

Rajiv Jayant, PhD Candidate, School of Management, University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75080, United States of America, rajiv@utdallas.edu

In this study, we examine the effect of software complexity on co-developer activity as OSS projects evolve over time. Co-developers act as maintainers by fixing bugs and creating new features. However, with OSS being a voluntary activity, it is hard to know apriori if the software will be maintained once adopted. To this end, we develop a model for the pattern of co-developer participation over time. The results of testing this model on real world OSS projects are presented and discussed.

3 - A Parallel Open Software and Hardware Reference Platform for the Operations Research Community

Timothy Middelkoop, University of Florida, PO Box 116595, Gainesville, FL, 32611, United States of America, t.middelkoop@ufl.edu

In this work we propose that the natural extension of an open source optimization framework is a standards based open software and hardware reference system. We first outline the need for such a platform and its requirement to be parallel followed by an overview of a concept system based on the PS3. We then show that it can be used both to promote the open exchange of ideas and as an educational platform with a low barrier to entry. We conclude with forward looking ideas and a demonstration.

4 - A Comparison of Open Source Versus Commercial Operations Research Software

Haluk Akin, Research Assistant, University of Central Florida, 4000 Central Florida Blvd., PO Box 162993, Orlando, FL, 32816, United States of America, halukakin@gmail.com, José Sepulveda

Open source software is emerging as an important part of Today's software world. Availability of free software creates equal access opportunity independent of available funds in many academic fields. In this paper we will compare performances of three optimization software, COIN-OR (open source), LPSOLVE (open source) and CPLEX (commercial). We will use five highly cited multi-dimensional knapsack problem sets as test beds. We will compare the solution times and the best solutions found.

■ MA27

M - Washington 1A

Applied Probability and Optimization in Wireless Sensor Networks

Sponsor: Applied Probability
Sponsored Session

Chair: Yannis Paschalidis, Associate Professor, Boston University, Center for Information & Systems Eng., 15 Saint Mary's St., Brookline, MA, 02446, United States of America, yannisp@bu.edu

1 - Dynamic Sleep Time Control in Wireless Sensor Networks Using Traffic Statistics

Christos Cassandras, Professor, Boston University, Department of Manuf. Engineering, 15 St. Mary's St., Brookline, MA, 02446, United States of America, cgc@bu.edu, Xu Ning

We present a dynamic optimization approach to save energy in wireless sensor networks at the link level. Using known traffic statistics, we optimally control the sleep interval between consecutive wake-ups of the receiver. We derive necessary conditions for optimality and propose an explicit solution algorithm. When statistics are unknown, we use an iterative scheme to estimate them and provide a second algorithm. Simulation shows the optimal policy dominating the best fixed sleep time control.

2 - Expected Delay Analysis for Constrained Queuing Systems

Ness Shroff, Ohio Eminent Scholar in Networking and Communications, and Professor of ECE and CSE, The Ohio State University, Department of ECE, Columbus, OH, 43210, United States of America, shroff@ece.osu.edu, Gagan Gupta

We analyze the expected delay for a general class of shared resource systems, which impose arbitrary constraints on the set of users that can be served simultaneously at any given time. This model has been used to describe input-queued switches and wireless networks. We provide lower and upper bounds for scheduling policies in this system. These bounds lead us to the development of an accurate estimate of the expected delay for the well-known Maximum Weighted Matching (MWM) scheduling policy.

3 - Arbitrary Throughput and Complexity Tradeoffs in Presence of Delay Guarantees in Wireless Networks

Saswati Sarkar, Associate Professor, University of Pennsylvania, 200 S. 33rd St., Philadelphia, PA, 19104, United States of America, swati@seas.upenn.edu, Saikat Ray

We develop a class of parameterized policies that given any positive constant a that is between 0 and 1, approximates the maximum throughput region in a large class of wireless networks within a factor of a, using a computation time that depends only on the maximum node degree and a. These policies also attain asymptotically optimal delays in these networks.

4 - Localization in Sensor Nets: Adventures in Decision Theory and Facility Location

Yannis Paschalidis, Associate Professor, Boston University, Center for Information & Systems Eng., 15 Saint Mary's St., Brookline, MA, 02446, United States of America, yannisp@bu.edu, Dong Guo

I will present an approach for a localization system allowing Wireless Sensor Networks to determine the physical location of their nodes. Such a service has many applications including asset and personnel tracking. Information theoretic tools help us characterize performance and we address the problem of optimal deployment. We show that localization decisions can be distributed. The approach is validated in a testbed yielding promising results.

■ MA28

M - Washington 1

Dynamic Oligopoly Models

Cluster: Applied Dynamic Optimization
Invited Session

Chair: Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu

1 - Nash-Cournot Equilibrium Problems under Uncertainty: Solution Properties and Scalable Algorithms

Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Peter W. Glynn, Gerd Infanger

We consider a class of stochastic Nash-Cournot equilibrium problems arising from settings where agents are competing in a two-period setting. The resulting dynamic game is often referred to as an S-adapted open-loop equilibrium problem. We provide existence and uniqueness results for such games, as well as their generalizations. A scalable Newton-splitting method is suggested for solving such a class of problems.

2 - Extensions to Oblivious Equilibrium

Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu, C. Lanier Benkard, Benjamin Van Roy

Oblivious equilibrium (OE) is a new solution concept for approximating Markov perfect equilibrium in dynamic oligopoly models. In this talk we extend our base model, OE, and our algorithms to incorporate aggregate random shocks common to all firms. This extension is important when analyzing the dynamic effects of industry-wide business cycles and it further expands the set of dynamic industry models that can be analyzed computationally.

3 - Structural Estimation of Dynamic Demand Models

Che-Lin Su, Assistant Professor of Operations Management, Graduate School of Business, University of Chicago, 807 South Woodlawn Avenue, Chicago, IL, 60637, United States of America, che-lin.su@chicagogsb.edu

We consider the dynamic analog of the discrete choice demand system with forward-looking consumers. We look at the cases, such as in durable goods markets, where consumers are strategic about when they purchase. We propose a constrained optimization formulation that minimizes the GMM objective function subject to the constraints that Bellman's equation is satisfied at all consumer states and that the market share equations hold. We discuss numerical results from Monte Carlo experiments.

4 - The Flat Rental Puzzle

John Rust, Professor of Economics, University of Maryland, 4115 E Tydings Hall, College Park, MD, 20742, United States of America, jrust@gemini.econ.umd.edu

Why don't rental car companies rent older cars at a discount versus renting only relatively new cars at full price? We present a detailed analysis of a large rental car company that gave us unprecedented access to its operations. We show that it can significantly increase profits by keeping its cars twice as long as it currently does and discounting the prices of older cars to induce its customers to rent them. These predictions were confirmed in a field experiment run by the company.

■ MA29

M - Washington 2

NSF Grants - The Inside Scoop

Cluster: INFORMS Outreach

Invited Session

Chair: Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

1 - Funding Opportunites at NSF and Proposal Writing Tips

Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

Service, manufacturing and operations research are key areas essential to the continued growth of our economy. This presentation will discuss the efforts and funding opportunities at the National Science Foundation in these areas, give hints on proposal writing and allow for an open discussion related to the future of these areas.

■ MA30

M - Washington 4

Defense Supply Chain Analysis I

Sponsor: Military Applications

Sponsored Session

Chair: Alan Johnson, Associate Professor, Air Force Institute of Tech, Wright-Patterson AFB, Dayton, OH, United States of America, alan.johnson@afit.edu

1 - Inland Troop Resupply Without a Road or Runway: Airdrop Solutions Including High-altitude Precision

Derek Williamson, AF Insitute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, derek.williamson@wpafb.af.mil, Shane Hall, Brad Anderson

Given the variety of airdrop options available, it may be difficult to determine the least cost mix of paradrop and aircraft types to employ in a strategic military setting and how the chosen types affect delivery weight capacity while meeting specified sustainment goals subject to drop zone weight, altitude, offset, and accuracy requirements. We present a methodology to analyze these decisions. Several different scenarios are considered and practical insights are discussed.

2 - Optimizing a Worldwide Maintenance and Logistics Support Network

Dr Doug Popken, Systems View, 2127 Mountain Maple Ave, Highlands Ranch, CO, United States of America, dpopken@systemsview.com, Kevin Roderick

This presentation describes a decision support system that will model the performance of certain fielded military IT systems. The model will allow managers to assess alternative support scenarios with respect to a set of "performance-based logistics" criteria. The problem is difficult, requiring simultaneous optimization of maintenance labor and inventory levels. Problem complexity led us to an approach based on simulation-optimization.

3 - Translating Chem-bio Effects on Airports into Theater-level Impacts

Phil Collins, Senior Scientist, BBN Technologies, 1337 Park Plaze, Suite 3, O'Fallon, IL, United States of America, pcollins@bbn.com, Jeff Tustin, Dan Hazen

A Chem-Bio attack on a theater aerial port of debarkation (APOD) has far-reaching impacts on theater operations, including capability loss from contamination, anti-access and higher reliance on transload operations, which hurt the warfight. Previous attempts to model these impacts were confined to reducing the Maximum-on-Ground or degrading the APOD throughput. We show a capability to accurately model port-level throughput degrades and higher order effects on the theater.

4 - Integrated Distribution Planning and Forecasting for Medical Logistics

Scott Mason, Associate Professor, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, 72701, United States of America, mason@uark.edu, Heather Nachtmann, Edward Pohl

Demand at military medical facilities must be managed in the face of unexpected events (natural disasters, humanitarian efforts, and military conflicts). In today's constantly changing world, there exists a need for effective forecasting capabilities to plan for future events while simultaneously being able to plan and coordinate transportation activities and movement of medical supplies for current military operations. We present mathematical models for distributing military medical supplies.

■ MA31

M - Washington 5

Activity Detection for Counter Insurgency / Counter Terrorism

Sponsor: The Practice Section of INFORMS

Sponsored Session

Chair: Tom Mifflin, Directon of East Coast Operations, Metron, Inc., 11911 Freedom Dr., Suite 800, Reston, Va, 20190, United States of America, mifflin@metsci.com

1 - Track Analysis and Anomaly Detection - Maritime (TAANDEM) for Maritime Domain Awareness (MDA)

Bob Zarnich, Senior Manager, Metron, Inc, 11911 Freedom Dr, Reston, VA, 20190, United States of America, zarnich@metsci.com

A Maritime Domain Awareness (MDA) capability is sought by the Department of Homeland Security and the U.S. Navy. A key component is automated alerts of tracks inconsistent with "Normal" behavior of commercial traffic. This presentation will provide an overview of the methods developed to address this capability. Of critical concern is defining normal behavior and choosing statistics oriented towards intuitive justification via graphical display while controlling the alert rate of the system.

2 - A Supervised Learning Approach to Detect Threatening Cargo

Chris Boner, Senior Manager, Metron, Inc., 11911 Freedom Dr, Suite 800, Reston, VA, 20190, boner@metsci.com

This paper describes a supervised learning technique to (a) learn joint cargo feature values that are good discriminators between threat and non-threat cargo, and (b) to estimate a threat probability for each new cargo shipment based on its strongest threat indicator. This approach is implemented in Metron, Inc.'s Shipping Cargo Anomaly Detection and Classification (ScanDeck) technology and has demonstrated impressive detection performance during evaluations at Customs and Border Protection.

3 - A Bayesian, Nonlinear Particle Filtering Approach for Tracking the State of Terrorist Operations

Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com, Tuan Tran

We describe a novel approach to track the progress of suspected terrorist operations and to optimize courses of action to delay or disrupt these operations. The approach uses Monte Carlo sampling and Bayesian, nonlinear particle filtering to estimate the state (schedule) of a terrorist operation, specified as a project management model with uncertain task durations. We perform a set of experiments that evaluate the effectiveness of the estimation given observables of variable quality.

■ MA32

M - Washington 6

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Modeling and Optimizing the Public Health Infrastructure for Emergency Response

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Chien-Hung Chen, Hannah Smalley

Planning for a catastrophe involving a disease outbreak or mass casualties is an ongoing challenge for first responders and emergency managers. They must make critical decisions on treatment distribution points, staffing levels, impacted populations and potential impact in a compressed window of time when seconds could mean life or death. In this talk, we present the design and implementation of a software enterprese system that provides an adaptive planning and assessment tool for large-scale emergencies. The program can assist in the design and of an all-encompassing, flexible and dynamic public health emergency response capability that requires strategic and operational systems planning.

■ MA33

M - Johnson

Capacity Planning and Scheduling in Health Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Nilay Argon, Assistant Professor, University of North Carolina, Department of Statistics and Operations Res., Smith Building CB#3260, Chapel Hill, NC, 27599, United States of America, nilay@unc.edu

1 - Long Term Capacity Planning for a Residential Care Facility

Martin Puterman, Professor, Sauder School of Business UBC, 2053 Main Mall #470, Vancouver, BC, V6T 1Z2, Canada, Martin.Puterman@sauder.ubc.ca, Marc Levine

As board members of a residential care facility in Vancouver, we faced the challenge of planning capacity expansion to meet the needs of constituents through 2021. To this end, we developed forecasting and queuing models to investigate the sensitivity of capacity to model inputs. Finding that capacity projections were most sensitive to length of stay (LOS), we used censored data methods to forecast LOS. Results were presented to the board and implementation planning has begun.

2 - Clinical Scheduling of Patients with Heterogeneous No-show Probabilities

Mark Lawley, Purdue University, 206 S. Martin Jischke Drive, West Lafayette, IN, 47907, United States of America, malawley@purdue.edu, Ayten Turkcan, Bo Zeng, Ji Lin

We consider clinical scheduling problem with overbooking for heterogeneous patients with different no-show probabilities. Our objective is to maximize the expected profit, which includes revenue, patient waiting time and physician overtime costs. We derive the properties of an optimal schedule. We propose a local search algorithm and two sequential scheduling algorithms. We show the significance of considering heterogeneous patients instead of homogeneous patients.

3 - Dynamic Scheduling of Outpatient Appointments under Patient No-shows and Cancellations

Nan Liu, University of North Carolina, 210 Smith Building, CB #3260, Chapel Hill, NC, 27599, United States of America, nliu@email.unc.edu, Serhan Ziya, Vidyadhar Kulkarni

We build an MDP model for the outpatient appointment scheduling problem under patient no-shows and cancellations, and propose heuristic methods based on the idea of applying one step of the policy-improvement algorithm on a state-independent policy. The heuristic assigns an appointment date to each request, depending on the appointment schedule. Our simulation study shows that our methods outperform some of the policies that are used in practice, particularly when the clinic capacity is small.

4 - Stochastic Sequential Scheduling without Fixed Appointment Slot for Outpatient Clinics

Santanu Chakraborty, Purdue University, 203 Martin Jischke Drive, Mann Hall, Suite 225, West Lafayette, IN, 47907, United States of America, santanu@purdue.edu, Mark Lawley, Kumar Muthuraman

In this paper we develop a sequential scheduling algorithm for the case where the service period is not divided into slots. We assume that the service time distribution is exponential and each patient is characterized by a certain no-show probability.

■ MA34

M - Jefferson

OR, Infectious Diseases, and Public Policy

Sponsor: Health Applications Section
Sponsored Session

Chair: Ruben Proano, Assistant Professor, Rochester Institute of Technology, 81 Lomb Memorial Drive, KGCOE, Rochester, NY, 14823, United States of America, rapeie@rit.edu

1 - A Game Theoretical Approach for Hospital Stockpiling in Preparation for Pandemics

Po-Ching DeLaurentis, PhD Candidate, Purdue University, 203 Martin Jischke Drive, Mann Hall Suite 225, West Lafayette, IN, 47907, United States of America, chenp@purdue.edu, Elodie Adida, Mark Lawley

Our problem addresses the issue of hospital stockpiling in preparing for a flu pandemic. Taking into account the uncertain demand that may occur under various possible pandemic scenarios, we consider the problem of determining the stockpile quantity of one critical medical item. A game theoretical framework is used to capture any mutual aid agreement that a group of hospitals may have. A discussion on the implications of the game results will be presented.

2 - Healthcare Associated Infections: An Agent-based Simulation of the Dynamics of Pathogen Flows

Reidar Hagtvedt, Assistant Professor, University of Alberta School of Business, 3-23 Business Building, Edmonton, AB, T6G 2R6, Canada, hagtvedt@yahoo.com, Gregory Todd Jones, Paul Griffin, Pinar Keskinocak

Healthcare associated infections (HAIs) are an increasing concern the world over, especially as resistant pathogens multiply. The economics of regulation of HAIs and the dynamics of pathogen flows may be analyzed in a system of interdependent agents, e.g. as a collective goods problem. We generalize previous studies on pathogen flows in individual units to an agent-based simulation on a social network, and in particular, consider emergent properties and policy.

3 - An SI Model with Behavioral Feedback and Trajectories That Reach a DNSS Point in Positive Time

Irmgard Zeiler, Post-doctoral fellow, Department of Mathematical Methods in Economics, Vienna University of Technology, Argentinierstrasse 8/105-4, Vienna, A-1040, Austria, irmgard.zeiler@gmx.net, Jonathan P. Caulkins, Dieter Grass, Gernot Tragler

We apply optimal dynamic control to a standard epidemiological SI-model augmented to include behavioral change in the incidence rate and parameterized for HIV. The solution is substantively provocative and manifests an interesting new type of threshold behavior not previously reported in the optimal control literature.

4 - Bridging Theory and Applied: Operational Science in Health Care

Moderator: John Fontanesi, Director, Center for Management Science in Health, University of California, San Diego, 9500 Gilman Drive, #0821, La Jolla, Ca, 92093, United States of America, jfontanesi@ucsd.edu, Panelists: David Goldsman, Debra Bowers, Kwok-Leung Tsui

Health systems are struggling in a world of increasing complexity and limited resources. With few exceptions, Operational Science has not been well used, largely because of misunderstandings between health and O/R professionals about eaxh others core concepts. This panel presentation will review specific examples of how O/R improved public health nursing, emergency department-to-Hospital throughput and patient compliance and provided challenges to O/R.

■ MA35

M - Jackson

Panel Discussion: Teaching Modern Project Management - Tactical Issues

Sponsor: INFORM-ED
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Teaching Modern Project Management- Tactical Issues
Moderator: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Panelists: G. Anand Anandalingam, Edward Anderson, Ted Klastorin, George Vairaktarakis

This panel discussion considers several tactical issues related to the teaching of project management. These include: syllabus design, advance information for students, workload and work variety, level of technical detail, software support, PMI certification content and relevance, finding good case materials, in class presentations of case analysis, in class discussion issues, games and other simulation exercises, finding good guest speakers, final exam design.

■ MA37

M - T. Marshall Ballroom West

Tutorial: Optimal Learning

Cluster: Tutorials
Invited Session

Chair: Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

1 - Optimal Learning
Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu, Peter Frazier

Optimal learning addresses the challenge of efficiently collecting information to improve our knowledge of the parameters of an optimization problem. Applications include finding the best choice from a list, allocating resources and finding the best path through an uncertain network. We describe on-line and off-line applications, and review a variety of practical techniques, including the knowledge gradient algorithm which we illustrate for a general class of learning problems.

■ MA38

M - Tyler

Methods in Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Jean-Philippe Richard, Assistant Professor, Purdue University, School of Industrial Engineering, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907-2023, United States of America, jprichar@ecn.purdue.edu

1 - Parallel Approximation and Integer Programming Reformulation
Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu, Mustafa Tural

We prove that in a low density knapsack problem branching on a vector which is "near parallel" to the constraint vector gives a short proof of infeasibility for almost all right hand sides. As a corollary we prove that in a reformulation using basis reduction, branching on the last variable achieves the same result.

2 - The Mixing-MIR Set with Two Nondivisible Capacities
Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu, Ming Zhao

The capacitated mixing-MIR set, CMMIR, is a generalization of Nemhauser and Wolse's mixed-integer rounding (MIR) set and of Gunluk and Pochet's mixing-MIR set. Recently, it has been shown that linear optimization over CMMIR can be performed in polynomial time when the capacities are divisible. Here we show that when there are two different nondivisible capacities, linear optimization over CMMIR can be performed in polynomial time.

3 - A Heuristic Approach for Solving Large 0-1 Integer Programs
Ahmet Keha, Assistant Professor, Arizona State University, PO Box 875906, Tempe, AZ, 85287, United States of America, Ahmet.Keha@asu.edu, Gerardo Trevino

In this talk we introduce an approach that can be used for finding near optimal solutions to large scale 0-1 integer programs. The approach solves the problem over a reduced feasible region that hopefully contains the optimal solution. We compare several ways to generate the reduced feasible region and give an approach to improve the reduced feasible region. We also give extensive computational results that show that our heuristic gives solutions that are very close to the optimal ones.

■ MA39

M - Truman

Algorithmic and Economic Aspects of Social Networks

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Mohammad Mahdian, Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, mahdian@alum.mit.edu

1 - Optimal Marketing over Social Networks
Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu, Jason Hartline, Mukund Sundararajan

We discuss the use of social networks in viral marketing. While influence maximization has been studied in this context, we study revenue maximization. In our model, a buyer's decision to buy an item is influenced by the price of the item and the set of buyers that own the item. To solve this problem, we identify influence-and-exploit strategies. We first argue why such strategies are reasonable and then show how to use submdoualr maximization to implement these strategies.

2 - Treasure Hunt: Social Learning in Real-World Social Networks
Markus Mobius, Associate Professor of Economics, Harvard University, Cambridge, MA, 02138, United States of America, mobius@fas.harvard.edu, Tuan Phan, Maya Eden

We design a simple experiment to measure the spread of information in a real-world social network. We carefully document subjects' evolving beliefs and whom they talk to. We analyze the resulting data using a simple model which allows us to estimate (1) how far information travels, and (2) how subjects weigh information from different regions of the social network.

3 - The Role of Compatibility in the Diffusion of Technologies in Social Networks
Nicole Immorlica, Northwestern University, Evanston, IL, Evanston, IL, United States of America, nickle@eecs.northwestern.edu, Mohammad Mahdian, Jon Kleinberg, Tom Wexler

Competing technologies often adopt a limited amount of compatibility with one another. We show that, in a simple model of diffusion in social networks in which users choose between two technologies of varying qualities, or both at an additional compatibility cost, limited compatability may arise from purely strategic considerations: in some cases, for one technology to survive the introduction of another, the compatibility cost must be balanced within a narrow, intermediate range.

4 - Effects of Community Structure on Respondent-Driven Sampling
Sharad Goel, Yahoo! Research, 111 W. 40th Street, 17th Floor, New York, NY, 10018, United States of America, goel@yahoo-inc.com, Matthew Salganik

Respondent-driven sampling (RDS) is a widely used technique for estimating disease prevalence in hidden populations. The sample is collected through a form of snowball sampling where current sample members recruit future sample members. We present RDS as Markov chain Monte Carlo importance sampling, and examine the effects of community structure and recruitment methodology on the estimates. Our results are based on data collected as part of the National Longitudinal Study of Adolescent Health.

■ MA40

M - Taylor

Stochastic Optimization of Inventory Management, Revenue Management and Healthcare Management

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Retsef Levi, Professor, Sloan School, MIT, 50 Memorial Drive, Building E53-389, Cambridge, MA, 02142, United States of America, retsef@mit.edu

1 - Average Cost Inventory Models: An Analysis Using a Vanishing Discount Approach

Mahesh Nagarajan, Assistant Professor, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mahesh.nagarajan@sauder.ubc.ca, Woonghee Tim Huh, Ganesh Janakiraman

We characterize, for single stage stochastic inventory models that can be modeled as Markov decision processes with non-compact action spaces and weakly continuous transition probabilities, a set of sufficient conditions under which the optimal policies under the infinite horizon discounted cost criterion converge to the optimal policy under the average cost criterion as the discount factor approaches one. These conditions are relatively easy to verify.

2 - Stochastic Depletion Problems: On the Greedy Policy for a Class Of Dynamic Optimization Problems

Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu, Carri Chan

We consider 'Stochastic Depletion Problems'. These problems are difficult both from a pragmatic computational perspective as also from a theoretical perspective. We isolate two simple properties that, if satisfied by a problem within this class, guarantee that a myopic policy is a 2-approximation. We demonstrate applications of the result to problems ranging from stochastic broadcast scheduling to delay sensitive control of a discrete time `call-center' model.

3 - A Sampling-based Approach to Appointment Scheduling

Mehmet Begen, PhD Candidate, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Retsef Levi, Maurice Queyranne

We consider the appointment scheduling problem with discrete random durations, studied by Begen and Queyranne, but without assuming the knowledge of the job duration distributions. Instead, information on the duration distributions may be obtained by random sampling. We show that the objective function is convex under a simple condition and characterize its subdifferential, and determine the number of independent samples required to obtain a provably near-optimal solution with high probability.

■ MA41

M - Taft

Innovation Networks

Cluster: New Product Development
Invited Session

Chair: Olav Sorenson, Rotman School, University of Toronto, 50 Prince Arthur Ave, Toronto, ON, M5S3E6, Canada, olav.sorenson@rotman.utoronto.ca

1 - Noncompetes and the Value of Social Capital

Lee Fleming, Harvard Business School, Morgan 485, Boston, MA, 02163, United States of America, lfleming@hbs.edu

Though sociologists have long argued for the importance of social capital, they have had less success in demonstrating and measuring its value. How legal regimes and laws influence the value of social capital has also remained underexplored. By exploiting an inadvertent change in noncompete laws by the State of Michigan, we demonstrate how the law changed the value of an inventor's social networks for future mobility.

2 - Networks in Nanotechnology

Stine Grodal, Assistant Professor, Boston University, 595 Commonwealth Ave., School of Management, Boston, MA, 02215, United States of America, grodal@bu.edu

A central issue during the emergence of an organizational field is the creation of symbols that enables distinct communities to collaborate across institutional barriers. The creation of a field is thus impacted by communities' shared linguistic practice. I use network analysis to examine the linguistic development of five communities in the nanotechnology field. The results show that over time the nanotechnology label became increasingly central to the communities' linguistic practices.

3 - Heterogeneity, Network Position and Performance

Jeongsik Lee, Assistant Professor, Georgia Institute of Technology, 800 W Peachtree St NW, Atlanta, GA, 30308-1149, United States of America, Jeongsik.Lee@mgt.gatech.edu

I examine how past performance influences actor positions and how accounting for endogeneity alters position-performance association. On the collaboration network of U.S. biotech inventors, I find that inventors with superior track records are more apt to occupy brokering positions. Controlling for past performance weakens the relationship between brokering position and patent performance. When inventor-level heterogeneity is accounted for, the position-performance correlation almost disappears.

4 - Private and Public Networks: What You Know Versus What You Show

David Waguespack, University of Maryland, 4511 Beechwood, College Park, MD, 20740, United States of America, dwaguesp@rhsmith.umd.edu, Tim Simcoe, Lee Fleming

Research about superior network positions frequently suffers from the fact that intrinsic and extrinsic explanations are simultaneously loaded on a single observable. A good network position simultaneously deliver better resources and information to the focal actor, making the actor more attractive, but also sends signals to third parties. In this paper we exploit a natural experiment to compare how private network positions and revealed (public) network positions influence future tie formation.

■ MA42

M - McKinley

Global Optimization Problems Arising in Networks and Graphs

Sponsor: Optimization/ Global Optimization
Sponsored Session

Chair: Jitamitra Desai, Lehigh University, 200 W Packer Ave, Bethlehem, PA, United States of America, jdesai@lehigh.edu

1 - Network Simplex-like Algorithms for Stochastic Appointment Scheduling

Robert Storer, Professor, Lehigh University, 200 West Packer Av, Bethlehem, PA, 18015, United States of America, rhs2@lehigh.edu, Camilo Mancilla

Scheduling appointment times when appointment durations are random is a common problem. Given the sequence of appointments, and scenarios generated from duration distributions, optimizing appointment starting times is an LP. We develop a "network simplex-like" algorithm to solve it, and contrast with previous algorithms based on the L-shaped method.

2 - Fractional Multiple-ratio Combinatorial Optimization on Graphs

Oleksii Ursulenko, Industrial and Systems Engineering, Texas A&M University, College Station, TX, United States of America, ursul@tamu.edu, Sergiy Butenko, Oleg Prokopyev

We consider fractional programming problems such as Minimum Multiple-Ratio Spanning Tree, Minimum Multiple-Ratio Shortest Path and Minimum Multiple-Ratio Shortest Cycle, which extend classical combinatorial optimization problems to the case of a sum-of-ratios objective function. Complexity results, a global optimization framework for this type of problems, and computational results are presented.

3 - Positioning Mobile Agents to Decontaminate a Graph

John Penuel, University of Florida, 303 Weil Hall PO Box 116595, Gainesville, FL, 32611-6595, United States of America, jpenuel@ufl.edu, J. Cole Smith

We consider the problem of using mobile agents to decontaminate a graph. We model the problem as a two-stage MIP. In the first stage, we position agents. In the second stage, we determine the fastest cleaning strategy (we show this is NP-hard). Previous literature focuses on the minimum number of agents required to clean the graph. We focus on how quickly the graph can be cleaned. We give formulations and propose a method to optimally position agents so to minimize average cleaning time.

4 - A Fractional Programming Approach to Determine the Independence Number of a Graph

Jitamitra Desai, Lehigh University, 200 W Packer Ave, Bethlehem, PA, United States of America, jdesai@lehigh.edu, Baski Balasundaram, Ruken Duzgun

In this paper we present a continuous optimization approach to determine the independence number of a graph via a fractional programming formulation. Previously known properties are utilized in developing two new global optimization algorithms to determine the independence number of a graph. Computational results that show the efficacy of these approaches and comparisons to other bounds on the independence number are also provided.

■ MA43

M - Balcony D

Mitigating the Risk of Outsourcing

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: A. Ravi Ravindran, Professor, Penn State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, aravi@psu.edu

1 - Disruption Risk Modeling and Mitigation in Outsourcing
Ufuk Bilsel, PhD Student, Penn State University, 215 W. Fairmount Ave #514, State College, PA, 16801, United States of America, rub150@psu.edu, A. Ravi Ravindran

This research presents a risk quantification framework based on extreme value distributions. Risks are divided into several components which are first independently quantified and then aggregated. We use this framework to quantify disruption risks and include the risk value as an objective to minimize in a multicriteria mathematical model. The model determines primary suppliers and order allocations as well as backup suppliers in a multiple product - multiple supplier supply chain.

2 - Mechanisms for Mitigating Quality Risk with Outsourced Manufacturing
Sean Handley, The Ohio State University, 600 Fisher Hall, 2100 Neil Ave, Columbus, OH, United States of America, handley.20@osu.edu, John Gray

Increasingly, companies in the food, drug and medical device industries are outsourcing manufacturing. Previous research has shown that there is an increased quality risk with outsourced production relative to internal production. We empirically evaluate the conditions under which various quality risk mitigation approaches are most effective.

3 - Procurement Contracts for Supply Chains Considering Decision Makers' Risk Attitudes
Seong Hyun Nam, Associate Professor, University of North Dakota, Management Department, Grand Forks, ND, 58202, United States of America, seong_nam@und.edu

Most research on supply chain contracts assumes that decision-makers are risk-neutral. In practice, they are usually risk averse. The level of risk aversion plays an important role in the buyer's strategy and it influences procurement decisions. The focus of this paper is on contracts design for supply chain considering of a buyer and its suppliers,compare the contracts under different risk constraints,and derive the best overall contract for the buyer and suppliers.

■ MA44

M - Balcony C

Risk Management in Supply Chain

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Tieming Liu, Assistant Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74074, United States of America, tieming.liu@okstate.edu

1 - Dual Sourcing and Supplier Improvement under Supply Risk
Yimin Wang, Assistant Professor, Arizona State University, W.P. Carey School of Business, Department of Supply Chain Management, Tempe, AZ, 85287, United States of America, Yimin_Wang@asu.edu, Wendell Gilland, Brian Tomlin

The existing literature treats supplier uncertainty as exogenous. Yet, industry evidence suggests that many firms can influence supplier uncertainty through supplier improvement efforts. In this research we relax the exogenous assumption in supply uncertainty and connect the diversification strategy with the process improvement strategy. We characterize the firm's optimal strategy and obtain a number of important managerial insights.

2 - Inventory Systems with Stochastic Demand and Supply: Properties and Approximations
Amanda Schmitt, Postdoctoral Associate, MIT Center for Transportation & Logistics, 77 Massachusetts Ave., E40-266, Cambridge, MA, 02139, United States of America, aschmitt@mit.edu, Lawrence V. Snyder, Max Shen

We develop tools for analysis for a retailer subject to supply disruptions. We combine discrete-event uncertainty (disruptions) and continuous sources of uncertainty (stochastic demand or supply yield), which have differing impacts on optimal inventory settings and make closed-form optimal solutions unachievable. We develop a closed-form approximate solution by focusing on a single stochastic period of demand or yield and demonstrate that it performs very well compared to the optimal solution.

3 - Supply Disruptions in a One-warehouse Multiple-retailer System
Zumbul Bulut, zub205@lehigh.edu, Lawrence V. Snyder

In this study, we examine the impact of supply disruptions on the OWMR systems. We analyze a locally controlled OWMR system with identical retailers each having deterministic demand. Assuming that supply disruptions happen only in the supply system of warehouse or retailers, we derive the expressions for the optimal base-stock levels. We propose a heuristic for approximating the base-stock levels when the disruptions happen in the supply systems of all locations.

4 - Manufacturing Disruption Management with Cross Pricing and Cross Production
Tieming Liu, Assistant Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74074, United States of America, tieming.liu@okstate.edu, Ho-Yin Mak, Max Shen

We study the optimal capacity investment portfolio of a firm by considering responsive pricing and partial manufacturing flexibility. The firm produces two substitutable products and invest in resources that can be used for both products but with different efficiencies. We characterize the structure of the optimal pricing and allocation policies and derive managerial insights on the benefits of production and pricing flexibilities.

■ MA45

M - Balcony B

Topics on Sales Channel and Supplier Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Ozalp Ozer, Stanford University, Stanford, CA, United States of America, oozer@stanford.edu

1 - Supplier Selection in Health Care
Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu, Jin Kyung Kwak

Although there has been extensive research on supplier selection, health care industry has rarely been the focus, despite its importance. In this study, we conducted an extensive empirical analysis of how decision-makers in hospitals make supplier-selection decision when purchasing expensive medical equipments.

2 - Behavioral Experiments in Dual Sales Channel Management
Murat Kaya, Sabanci University, Tuzla, Istanbul, TR, Turkey, mkaya@sabanciuniv.edu, Kay-Yut Chen, Ozalp Ozer

We develop a model to determine effective dual (online and retail) sales channel strategies. We also conducted behavioral experiments with human subjects and study whether the model's predictions are consistent with human behavior. We determine risk aversion as an important behavioral factor. We also determine optimal pricing strategies that take into consideration behavioral issues. To do so, we extend the model to account for risk aversion with mean-variance trade-off.

3 - Supply Chain Dynamics and Contracting in the Presence of Gray Market
Mehmet Sekip Altug, PhD Candidate, Columbia University, maltug10@gsb.columbia.edu, Garrett van Ryzin

We consider a supply chain with one manufacturer and several authorized retailers that face uncertain demand and a potential gray market. While the gray market can be seen as an opportunity to sell any excess inventory, it also is a threat for authorized retailer's demand. We characterize the equilibrium market-clearing gray market price and analyze how gray market changes the supply chain dynamics including certain contracts that are provided by the manufacturer to its authorized retailers.

4 - Sales Competition and the Value of Capacity
Navid Sabbaghi, MIT, 77 Massachusetts Ave. #32-D712, Cambridge, MA, 02139, United States of America, sabbaghi@mit.edu, Yossi Sheffi, John Tsitsiklis

We consider a supply chain model with supplier competition. Using the model, we motivate and define the value of capacity, show existence and uniqueness, and characterize that value. Finally, we show how the value of capacity can be calculated for a related model.

■ MA46

M - Balcony A

Supply Chain Execution by integrated Optimization-Negotiation Approaches

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Hans-Juergen Sebastian, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, Sebastian@or.rwth-aachen.de

1 - Improving Supply Chain Execution by an Integrated Optimization- Negotiation Approach

Hans-Juergen Sebastian, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, Sebastian@or.rwth-aachen.de, Christoph Hempsch, Tung Bui

We consider the execution phase of SCM. A supply chain agent analyses the current state of the SC and uses a structured set of optimization models to compute decision alternatives in order to find out how to fulfill customer orders. This alternatives are the basis of negotiation processes between the SC-agent and customer agents. We will explain the advantages of the integrated optimization-negotiation approach.

2 - Implementation of Optimization and Negotiation Support for the Capable-to-promise Function

Christoph Hempsch, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, hempsch@or.rwth-aachen.de, Hans-Juergen Sebastian, Tung Bui

In a production environment that is driven by customer orders a company needs to decide which orders to fulfill and what lead times to promise to the customers. The combination of optimization techniques and negotiation processes allows the company to make this decision more effectively and to operate the supply chain at higher efficiency. The paper puts focus on the integrated implementation of the two aspects to support this capable-to-promise function within a supply chain.

3 - Promising Delivery Dates by Multi-objective Optimization under Stochastic Uncertainty

Tobias Winkelkotte, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, winkelkotte@or.rwth-aachen.de

Promising delivery dates requires considering many conflicting aspects. On the one side customers expect an early delivery. On the other side the delivery time should not be too short to avoid backlogs and to reduce stocks. Since lead times are stochastic, the factors are measured by metrics depending on a service level that describes the probability of in-time-delivery. We search for a service level that optimizes all aspects by multi-criteria optimization to promise a reliable delivery date.

■ MA47

M - Hoover

Cost-Effectiveness of Healthcare Interventions

Sponsor: Health Applications Section
Sponsored Session

Chair: Stephanie Earnshaw, Global Head, US Health Economics, RTI Health Solutions, 3040 Cornwallis Rd, PO Box 12194, RTP, NC, 27709, United States of America, searnshaw@rti.org

1 - Cost-effectiveness of Darunavir for Treatment-experienced Adults with HIV Infection in the US

Anita Brogan, Senior Director, Health Economics, RTI Health Solutions, 3040 Cornwallis Rd, RTP, NC, 27709, United States of America, abrogan@rti.org, Erik Smets, Silas Martin, Josephine Mauskopf

Darunavir is a novel protease inhibitor used with other antiretroviral medications for the treatment of HIV infection. We developed a Markov model to estimate the cost-effectiveness of darunavir versus other protease inhibitors in treatment-experienced adults. The model tracks the remaining lifetime of a treatment-experienced cohort by virologic and immunologic response to treatment. We discuss this model with an emphasis on the application of modeling techniques to HIV.

2 - Cost-effectiveness of Fluticasone Propionate/Salmeterol (250/50mcg) Compared to Salmeterol (50mcg)

Christopher Blanchette, Director, CPOR, Lovelace Respiratory Research Institute, PO Box 760, Davidson, NC, 28036, United States of America, cblanchette@lrri.org, Harris Silver, Hans Petersen, Meaghan St. Charles

Bootstrapping methods were assessed to provide population-based parameter estimates for a cost-effectiveness analysis of Fluticasone Propionate/Salmeterol 250/50mcg (FSC) compared to Salmeterol 50mcg (SAL) from a trial based economic analysis using incremental cost-effectiveness ratios (ICER).

3 - Modeling HIV Testing Options in the Emergency Department Setting

Teresa Kauf, Associate Professor, University of Florida, PO Box 100496, Gainesville, FL, 32610-0496, United States of America, kauf@cop.ufl.edu

The Centers for Disease Control and Prevention recommends routine HIV testing in all health care settings. Yet, existing cost-effectiveness analyses have not considered the perspective of specific providers, such as emergency departments (EDs), when evaluating the cost-effectiveness of testing. This paper uses decision analysis to compare the cost-effectiveness of HIV testing from the perspective of an ED and the overall health care system. Barriers to efficient testing are discussed.

4 - Optimization of Prostate Cancer Screening Decisions

Jingyu Zhang, North Carolina State University, Graduate Program in Operations Research, Campus Box 7913, Raleigh, NC, 27695-7913, United States of America, jzhang2@ncsu.edu, Hari Balasubramanian, Nilay Shah, Brant Inman, Brian Denton

Prostate Specific Antigen (PSA) testing is widely used in screening for prostate cancer, although the cost and quality of life benefit remains uncertain. In our talk, we propose a Markov Decision Process model to determine the optimal PSA threshold at which to refer a patient for biopsy. We describe structural properties of the problem and present numerical results based on real data from a large longitudinal data set.

■ MA48

M - Coolidge

KLIC: Origin, Diffusion and Management of Knowledge for Competitive Advantage

Sponsor: Technology Management
Sponsored Session

Chair: David Moore, KLICNET.ORG, 3788 Davidson Place, Boulder, CO, United States of America, dmoore@klicnet.org

1 - Offshoring and the Geography of Innovation

Francisco Veloso, Associate Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131D, Pittsburgh, PA, 15213, United States of America, fveloso@cmu.edu, Brian Fifarek

This paper investigates the long term impact of the globalization of knowledge and value chain offshoring on the spatial distribution of innovation activities. It examines the spatial pattern of innovation in rare earth applications from 1976 to 2002. It finds that rare earth catalyst innovation activities expand globally, while rare earth magnet innovation activities become more clustered and that these responses are conditioned by the role of geographic within value chain knowledge.

2 - The Evolution of Technological Paths and Market Value

Kun Liu, Assistant Professor, Washington State University, Pullman, WA, United States of America, k_liu@wsu.edu

We investigate how the evolution of technological path affects the firm's market value. We suggest that innovations of the same technological paths are genealogically related, which allows the firm to better protect and appropriate value from its intellectual property rights. Our results show that such superior position of appropriating value from intellectual property rights increases the firm's market value.

3 - Institutional Convergence and the Diffusion of University- Versus Firm-origin Technologies

Andrew Nelson, Asst Professor of Strategy, University of Oregon, Lundquist College of Business, Eugene, OR, 97403, United States of America, andrew.nelson@stanford.edu

While knowledge flows are a major theme in the strategy literature, our understanding of the processes by which knowledge moves between different organizations remains thin. By mixing longitudinal network analyses with rich archival data for specific inventions, I outline various channels through which knowledge spreads over time, the reliance of these channels on personal networks, and the role of personal connections in shaping the struggle between community and competitive orientations.

4 - Not Invented Here: Managing Corporate Innovation in a New Era

Vareska van de Vrande, Assistant Professor, Rotterdam School of Management, Erasmus University, Burgemeester Oudlaan 50, Room T7-33, Rotterdam, 3062 PA, Netherlands, vvrande@rsm.nl

Nowadays, the behavior of innovating firms has changed considerably. Instead of performing all their R&D activities in-house, companies are now increasingly looking for new ideas outside the boundaries of their own organization. As a result, the portfolio of external sourcing modes firms engage in has expanded.

This thesis focuses on the use of different modes for external technology sourcing, including strategic alliances, corporate venture capital investments, and mergers and acquisitions.

■ MA49

M - Harding

Using Simulation for Solving Difficult Problems

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Bahar Biller, Assistant Professor, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, billerb@andrew.cmu.edu

1 - A Monte Carlo Study of Uncertainty in Random Forest Scores

Thomas Willemain, Professor, Rensselaer Polytechnic Institute, Troy, NY, 12180, United States of America, willet@rpi.edu, Randall Dahlberg

We present a Monte Carlo study of the factors governing uncertainty in scores generated by random forest classifiers. Included is an assessment of bootstrap estimates of the standard errors of scores produced by random forests built on transactional databases. Implication for practice relate to determining sample sizes required for accurate estimates of scores and accounting for score uncertainty when developing lists of putative members of the interesting class.

2 - Skart: A Skewness- and Autoregression-adjusted Batch-means Procedure for Simulation Analysis

James Wilson, Professor, North Carolina State University, 111 Lampe Drive, Campus Box 7906, Raleigh, NC, 27695, United States of America, jwilson@ncsu.edu, Ali Tafzzoli, Emily Lada, Natalie Steiger

We discuss Skart, an automated sequential batch-means procedure for constructing a skewness- and autoregression-adjusted confidence interval for the steady-state mean of a simulation output process that satisfies user-specified requirements on (absolute or relative) precision and coverage probability. In an extensive performance evaluation, Skart compared favorably with ASAP3, WASSP, SBatch, ABATCH, LBATCH, and the Heidelberger-Welch and Law-Carson procedures.

3 - Setting Inventory Targets in a Multi-Product, Joint Service-Level Model with Correlated Demands

Bahar Biller, Assistant Professor, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, billerb@andrew.cmu.edu, Sridhar Tayur

We introduce a simulation-based framework that develops mixed integer linear programs for multi-product settings in which joint service-level criteria naturally arise and solves them for inventory-target estimators using a simulation-optimization technique. A computational study illustrates the importance of using this framework for managing multi-product inventory subject to joint service-level criteria under multivariate time-series demand uncertainty.

■ MA50

M - Wilson C

Computational Integer Programming I

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Ricardo Fukasawa, Postdoctoral Fellow, IBM Research, 1101 Kitchawan Road / Rte 134, Yorktown Heights, NY, 10598, United States of America, rfukasaw@us.ibm.com

1 - Constraint Orbital Branching

Jeff Linderoth, University of Wisconsin Madison, 1513 University Avenue, Madison, WI, United States of America, linderoth@wisc.edu, Stefano Smriglio, James Ostrowski, Fabrizio Rossi

Orbital branching is a method for branching on variables in integer programming that reduces the likelihood of evaluating redundant, isomorphic nodes in the branch-and-bound procedure. In this work, the orbital branching methodology is extended so that the branching disjunction can be based on an arbitrary constraint. Computations computing the optimal incidence width of Steiner Triple Systems and minimum cardinality covering designs are discussed.

2 - Mixed Integer Programming Models for Non-separable Piecewise Linear Cost Functions

Juan Pablo Vielma, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, gtg531t@mail.gatech.edu, George Nemhauser, Shabbir Ahmed

We review several Mixed Integer Programming formulations for separable continuous piecewise linear cost functions and their extensions to the non-separable and/or discontinuous cases. We compare both existing and new formulations by their theoretical properties and by their performance in computational experiments. We present results for different classes of transportation problems with separable/non-separable, continuous/lower-semicontinuous non-convex piecewise linear cost functions.

3 - Performance Variability in Mixed Integer Programming

Emilie Danna, Ilog Inc., 1195 W Fremont Ave, Sunnyvale, CA, 94087, United States of America, edanna@ilog.com

The solving time for a given MIP model sometimes varies dramatically if the branch-and-cut algorithm used to solve it is modified slightly, even if the algorithmic change is theoretically neutral with respect to performance. We will present evidence of this performance variability, examine its causes, describe its consequences, propose a few ideas to address it, and raise several related questions.

4 - Experiments with Extended Capacity Cuts

Ricardo Fukasawa, Postdoctoral Fellow, IBM Research, 1101 Kitchawan Road / Rte 134, Yorktown Heights, NY, 10598, United States of America, rfukasaw@us.ibm.com, Artur Pessoa, Eduardo Uchoa

Extended Capacity Cuts (ECC) are derived from an extended reformulation of the fixed-charge network flow problem. Simple ECCs have been used successfully to significantly reduce the duality gap of combinatorial optimization problems like the Capacitated MST, but can be applied to other important problems like vehicle routing and machine scheduling. We perform exact separation of ECCs and a variation called path-ECCs based on a result by Dash et al.. Computational results are presented.

■ MA51

M - Wilson B

Diffusion in Social Networks

Sponsor: Information Systems
Sponsored Session

Chair: Monica Johar, Assistant Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Friday 352-C, Charlotte, NC, 28223, United States of America, msjohar@uncc.edu

1 - Location, Location and Location: An Analysis of Profitability and Position in Online Advertising

Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Michael Smith, Ashish Agarwal

Advertisers engage in intense competition in online ad auctions in order to secure top positions in the list of sponsored results. We evaluate the impact of ad placement on revenues and profits generated from sponsored search using data from for several hundred keywords from the ad campaign of an online retailer. Using a hierarchical Bayesian model, we find that the topmost position is not necessarily the revenue-maximizing or profit-maximizing position.

2 - Combinatorial Search in Social Networks

Vijay Mookerjee, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, United States of America, vijaym@utdallas.edu, Milind Dawande, Yunxia Zhu, Chelliah Sriskandarajah

We study three important problems of search in social networks: elite group, portal, and influence group. These problems and preliminary solution methods are discussed.

3 - Network Effects: The Influence of Quality and Diversity of Ties on Value of Software Innovation

Ram Gopal, University of Connecticut, University of Connecticut, School of Business, 2100 Hillside Road, Storrs, CT, 06269, United States of America, Ram.Gopal@business.uconn.edu, Xinxin Li, Harpreet Singh

Software innovations are heterogeneous in value with majority of them worth little. In this study, we investigate the impact of network social capital on value of software innovation. Based on empirical analysis on software patents data, we find that the count of quality weighted external direct contacts of a team and regional diversity of contacts significantly influence the value of innovation while the count of quality weighted external indirect contacts of a team has no significant impact.

4 - Using Knowledge Sharing in Organizational Social Networks to Improve Service Delivery

Su Dong, Student, University of North Carolina at Charlotte, 9201 University City Blvd, Friday, Charlotte, NC, 28223, United States of America, sdong1@uncc.edu, Monica Johar, Ram Kumar

This paper illustrates how knowledge sharing in organizational social networks can be used to enhance service delivery. We present an integer-programming model in which employees can use their social networks to acquire knowledge required to complete service-related tasks. A simulation-based heuristic is used to solve this problem. Our model can be used to study the impact of different network structures and task assignment strategies on organizational performance, and knowledge diffusion.

■ MA52

M - Wilson A

Remanufacturing Operations

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Meltem Denizel, Professor, Sabanci University, Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, denizel@sabanciuniv.edu

1 - Production Planning and Common Part Strategy in Closed-loop-supply Chains

Jenny Steinborn, TU Braunschweig, Institut for Production and Logistics Management, Katharinenstrasse 3, Braunschweig, 38106, Germany, j.steinborn@tu-bs.de, Grit Walther, Thomas S. Spengler

For OEMs with many product variants, a combination of product and component recycling strategies hold economic potentials. But strategies have to be implemented into forward production planning regarding rivalry for returned products and uncertainties. A model is developed for integrated production and recycling planning on tactical level. Returned products are allocated to recycling strategies allowing assessment of feasibility of recycling strategies and impact on demand for new components.

2 - Network Configuration and Capacity Planning in Hybrid Manufacturing/Remanufacturing Systems

David Francas, University of Mannheim, Schloss, S233, Mannheim, 68131, Germany, francas@bwl.uni-mannheim.de, Stefan Minner

We study hybrid manufacturing/remanufacturing systems with uncertain demand and return where manufacturing and remanufacturing processes are conducted in the same facility or each process is dedicated to separate facilities. With respect to different priorizations of the two processes, we analyze the optimal capacity decisions for both network configurations. Our analysis further demonstrates that shared facilities may be preferred due to the benefits of pooling demand and return risks.

3 - Harvesting and Refurbishing Decisions of a Remanufacturer

Oznur Ozdemir, Sabanci University, Sabanci University Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, oznurozdemir@su.sabanciuniv.edu, Mark Ferguson, Meltem Denizel

We consider the disposition decisions of a remanufacturer. There are three options: a core can be refurbished, harvested for spare parts or salvaged at a certain value. The demand for the refurbished products and the spare parts are uncertain over time. The core availability is limited to meet all demand. We address the problem in a revenue management framework to maximize the firm's revenue over a T period horizon.

4 - Solution Approaches for a Capacitated Multi-Product Lot-Sizing Problem with Remanufacturing

Ibrahim Karakayali, Graduate Research Assistant, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, ibrahimk@ufl.edu, Sila Cetinkaya, Halit Uster, Elif Akcali

We consider a capacitated multi-product lot-sizing problem for a hybrid manufacturing and remanufacturing system. We focus on a setting where manufactured and remanufactured items are perfectly substitutable; manufacturing, remanufacturing, and disposal activities are capacitated; and manufacturing capacity is shared among multiple product types. We develop decomposition-based solution approaches, and present computational results illustrating the efficiency of the proposed solution approaches.

■ MA53

M - Nathan Hale- Wardman Tower

Advances in Finance Engineering

Sponsor: Financial Services
Sponsored Session

Chair: James Primbs, Stanford University, japrimbs@stanford.edu

1 - Efficient Pricing of Discretely Monitored Barrier Options in a Lévy Model

Gudbjort Gylfadottir, University of Florida, Industrial and Systems Engineering, Gainesville, FL, United States of America, gudbjort@ufl.edu, Farid AitSahlia

We present a recursive method to price barrier options of European exercise style and where the underlying is assumed to follow an exponential Lévy process. The option is monitored at a specific set of discrete dates. Our method relies also on an efficient combination of quadrature approximations with the Lévy-Khintchine representation.

2 - Pricing Double-barrier Options under a Hyper-exponential Jump Diffusion Model via Laplace Transform

Xiangwei Wan, The Chinese University of Hong Kong, RM B104, PGH5, of Hong Kong, Shatin, N. T., Hong Kong, China, xwwan@se.cuhk.edu.hk, Ning Cai, Nan Chen

This paper studies the double-barrier options pricing under a jump diffusion model whose jump sizes are hyper-exponential distribution. By double-Laplace transform, analytical solution is given. And the option price is given by Laplace inversion algorithm. We prove the non-singular property of the matrix which guarantees the existence and uniqueness of the solution. Extensional barrier options are also formulated. Numerical examples are given at the end of the paper.

3 - American Option Pricing with Stochastic Volatility

Kumar Muthuraman, University of Texas at Austin, McCombs School of Business, Austin, TX, United States of America, kumar.muthuraman@mccombs.utexas.edu, Arun Chockalingam

We present a method to compute the optimal exercise policy and the price of an American options when the underlying asset price has stochastic volatility and a jump component. The method we present is essentially a transformation that transforms the arising free boundary partial integro differential equations into a sequence of fixed boundary problems.

4 - Fast Receding Horizon Methods for Hedging High Dimensional Options

James Primbs, Stanford University, japrimbs@stanford.edu

We present receding horizon dynamic hedging methods designed for high dimensional option hedging. Receding horizon methods repeatedly solve optimization problems in order to construct a hedging policy. In this talk, we provide and compare formulations designed to efficiently handle very high dimensional options.

5 - Optimal Hedging of Prediction Errors Using Prediction Errors

Yuji Yamada, Associate Professor, University of Tsukuba, 3-29-1 Otsuka, Bunkyo-ku, Tokyo, 112-0012, Japan, yuji@gssm.otsuka.tsukuba.ac.jp

Predicting the future weather conditions is considered important in real businesses for many industries including electricity producers and suppliers, because their profit or loss is largely affected by the weather conditions. Under these circumstances, we may have a new risk when the prediction error exists. In this work, we will propose a new type of weather derivative to effectively hedge the loss caused by prediction errors.

■ MA54

M - Congressional - Wardman Tower

Models for Managing Cybersecurity Risk

Cluster: Risk Security
Invited Session

Chair: Lawrence Bodin, Professor Emeritus, University of Maryland, R. H. Smith School of Business, College Park, MD, 20742, United States of America, LBodin@rhsmith.umd.edu

1 - Identity Theft and Enterprise Data Leakage

Eric Johnson, Professor, Dartmouth College, Center for Digital Strategies, Tuck School of Business, Hanover, NH, 03755, United States of America, M.Eric.Johnson@tuck.dartmouth.edu

Identity theft impacts millions of consumers each year. We model the link between enterprise data leakage and the incidence of identity theft. Using data sets from US consumer complaints and file leakage from the top US banks, we find a statistical link between leak propensity and reported identity thefts.

2 - Impacts of Optimal Investment Models on Cybersecurity Risk Management

Kanta Matsuura, Professor, University of Tokyo, Tokyo, Japan, kanta@iis.u-tokyo.ac.jp

In cybersecurity risk management, it is difficult to find a straightforward way to use optimal investment models in practice. However, existing models have made impacts on the research community through their implications. For the purpose of exploring more applications, this talk discusses some of the realized and potentially expected impacts including new cyber-insurance issues in a recent model.

3 - Effectiveness of Software Assurance Programs: Evidence from Common Criteria

Rahul Telang, Associate Professor, Carnegie Mellon University, 4800 Forbes Avenue, HBH 2107D, Pittsburgh, PA, 15213, United States of America, rtelang@andrew.cmu.edu, Yubao Yang

To overcome the information asymmetry problem, one potential reason for poor security, governments have proposed certification programs like common criteria. Numerous countries have adopted common criteria and government agencies do not purchase a software unless it is certified. We collected data over many different product markets on vulnerabilities in a software product to test whether the certification programs lead to fewer vulnerabilities. Results are presented in this talk.

4 - Multiple Criteria Risk Measures for Cybersecurity

Lawrence Bodin, Professor Emeritus, University of Maryland, R. H. Smith School of Business, College Park, MD, 20742, United States of America, LBodin@rhsmith.umd.edu, Martin Loeb, Lawrence Gordon

Most procedures that have been developed for assessing risk for Cybersecurity base the analysis on a single criterion. However, assessing risk for Cybersecurity is best viewed in terms of multiple criteria. In this paper, we describe a process for carrying out this multi-criteria analysis and illustrate this process with several examples.

■ MA55

M - Embassy- Wardman Tower

Joint Session TELCOM/CS: Telecommunications Network Design

Sponsor: Telecommunications, Computing Society
Sponsored Session

Chair: Youngwook Kim, Korea University / Division of Information Management Engineering, Sung-buk ku Anam dong 5-1,Seoul, S.Korea, Seoul, St, Korea, Republic of, actsmile@korea.ac.kr

1 - Clustering Telecommunications Nodes: Objectives and Challenges

John Klincewicz, Principal Member of Technical Staff, AT&T Labs, 200 South Laurel Avenue, Room D5-3C06, Middletown, NJ, 07748, United States of America, klincewicz@att.com

Planners often partition large networks into clusters that represent communities of interest. Clusters should have high volumes of intra-cluster traffic, be well-connected by network links and be compact in a geographic sense. In this talk, we discuss the shortcomings of applying traditional clustering algorithms to this problem and suggest possible approaches.

2 - Equitable Bandwidth Allocation in Content Distribution Networks

Hanan Luss, Senior Scientist, Telcordia Technologies, One Telcordia Drive, RRC-1D254, Piscataway, NJ, 08854, United States of America, hluss@telcordia.com

We present a bandwidth allocation model for a network that consists of multiple trees, where the root of each tree has a server that broadcasts multiple programs. The model is formulated as an equitable resource allocation problem with a lexicographic maximin objective function. The constraints include link capacity constraints and tree-like ordering constraints. We present an algorithm that provides an equitable solution in polynomial time for certain performance functions.

3 - A Branch-and-cut Procedure for Solving a Large-scale Next Generation Access Network Design Problem

Youngwook Kim, Korea University / Division of Information Management Engineering, Sung-buk ku Anam dong 5-1,Seoul, S.Korea, Seoul, St, Korea, Republic of, actsmile@korea.ac.kr, Kyunam Jang, Youngho Lee, Gigyoung Park

We present a branch-and-cut procedure for finding the optimal solution of large-scale broadband convergence access network. We formulate the problem as a three-level capacitated facility location-allocation model that minimizes the total cost, while satisfying nonlinear QoS constraints. The proposed branch and cut procedure implements a class of disjunctive cuts.

■ MA56

O - Blue Room

Maritime Transportation & Routing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Kevin Furman, ExxonMobil, 1545 Route 22 East, Annandale, NJ, 08801, United States of America, kevin.c.furman@exxonmobil.com

1 - Procuring Transportation for US Food Aid

Ozlem Ergun, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, United States of America, oergun@isye.gatech.edu, Owen Carroll, Justin Stowe, Steven Butt, Emily Sarver, Jan Zhang

The US sends food aid through the Food for Peace program. Each month, an invitation to bid is published to acquire and transport food commodities. After the government receives all bids from commodity suppliers and ocean carriers, it awards contracts so that the total cost is minimized. We discuss an analytical tool that uses forecasting techniques, an optimization model to simulate the contract awarding process, and analysis tools to aid the ocean carriers in selecting the best bid price.

2 - Routing and Scheduling of Bulk Shipments: An Australian Perspective

Heng-Soon Gan, Department of Mathematics and Statistics, The University of Melbourne, Parkville, VIC, 3010, Australia, hsg@unimelb.edu.au, Olivia Smith, Natashia Boland

We present a multi-product ship scheduling problem encountered by a major Australian importer of bulk materials.We consider ships with different hold sizes (fixed bulkheads). Demands must be met by incoming shipments, existing inventory or trucks from nearby facilities. The problem is to determine a minimal cost shipping (and trucking) schedule such that demands, draft constraints, contractual obligations and practical limits are met. We solve this problem as a multi-stage mixed integer program.

3 - A Novel Heuristic to Solve Tanker Routing and Scheduling Problems

Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg, Hong Choon Oh

Tanker routing and scheduling problems have attracted extensive interest from researchers for more than half a century. To date, none of these researchers manage to offer efficient solution methodologies that meet the practical needs of industry practitioners. This paper aims to bridge the application gap by introducing a novel solution methodology that can efficiently solve tanker routing and scheduling problem with account of all key operating constraints.

4 - A Maritime Split Pickup and Split Delivery Problem with Multiple Commodities and Non-paired requests

Frank Hennig, PhD Candidate, Norwegian University of Science and Technology, Alfred Getz veg 3, Trondheim, 7491, Norway, frank.hennig@iot.ntnu.no, Bjorn Nygreen

We discuss alternative formulations of the multi commodity split pickup and split delivery problem without predefined pairings of pickups and deliveries. The solution defines which pickups serve which deliveries. All pickups/deliveries can be split between an arbitrary number of ships. We assume that we have available a heterogeneous fleet of ships. Each ship can carry several commodities simultaneously. We wish to report computational results for small test cases solved by different approaches.

■ MA57

O - Blue Room Prefunction

Green Supply Chain Management

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Lawrence V. Snyder, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, lvs2@lehigh.edu

1 - Design and Operation of Closed-loop Supply Chains: Practical Aspects and Analytical Models

Elif Akcali, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, akcali@ise.ufl.edu, Halit Uster, Sila Cetinkaya

The increased popularity of remanufacturing requires firms to design and operate efficient closed-loop supply chain (CLSC) systems. In this talk, we will provide a critique of the existing literature on network design and inventory and production planning for CLSC systems. We examine the degree to which the existing quantitative models address the practical challenges encountered in industry. We also discuss new research avenues that will aid in the practical implementation of remanufacturing.

2 - Replacement Strategies for Potentially Hazardous Substances

Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu, Tim Kraft, Robert Carlson, Dariush Rafinejad

In 2007 the EU established strict chemical regulations to better protect human health and the environment. The US does not have such laws in place; hence there is often a gap between discovery of potentially hazardous substances and regulation. As a result, firm's replacement decisions are made without clear insight into risks and future regulations. We model a replacement decision, including public relations and competition risk. We then derive insights into how this reshapes a firm's strategy.

3 - LCA Methods for Estimating Supply-chain Contaminant Emissions for Construction Projects

Seth Guikema, Assistant Professor, Johns Hopkins University, Department of Geography and, Environmental Engineering, Baltimore, MD, 21218, United States of America, sguikema@jhu.edu, Neethi Rajagopalan

Supply chains have been shown to account for a significant portion of total contaminant emissions from construction projects, and environmental assessments that ignore supply chain effects miss this portion of the environmental impact of these projects. However, life-cycle assessment for construction projects is challenging. This talk provides an overview and comparison of the two basic methods for incorporating supply chain effects into a life-cycle assessment for construction projects.

■ MA58

O - Capital

Topics in Aviation OR

Sponsor: Aviation Applications
Sponsored Session

Chair: Stefan Karisch, Director, Operations Research and Optimization, Jeppesen, 1800 McGill College Avenue, Suite 1930, Montreal, QC, H3A 3J6, Canada, Stefan.Karisch@jeppesen.com

1 - Aircraft Operations for Minimum Environmental Impact

Stephen Altus, Jeppesen, 225 West Santa Clara Street, Suite 1600, San Jose, CA, 95113, United States of America, steve.altus@jeppesen.com, Geoffrey Bower

There is a direct relationship between aircraft operating costs, fuel, and emissions, but just how close are their optimal solutions? We review current optimization methods, including the impact of rising fuel prices in the solution, and compare different merit functions. How close are the results, and what is the sensitivity to changes in specific costs? Ongoing research to optimize operations for cost and environment, including fleet and schedule implications, is described.

2 - Extending the Basic Airline Crew Pairing Problem

Johan Ivarsson, Jeppesen, Odingsgatan 9, Gothenburg, 411 03, Sweden, johan.ivarsson@jeppesen.com, Lennart Bengtsson, Curt Hjorring, Fredrik Altenstedt, Henrik Delin

We will look at two extensions to the crew pairing problem, which at first sight might not appear related but may be addressed with the same technique, namely retiming and fly below rank. Retiming is about changing the actual flight schedule in order to obtain a better solution, whereas fly below rank is about letting a crew change to a more junior role temporarily. The variable crewing extension will also be discussed briefly, which addresses how to team crew together efficiently.

3 - Large Scale Crew Rostering- A Combined Local Search and Column Generation Approach

Tomas Gustafsson, Head of Optimization, Jeppesen, Jeppesen Systems AB | PO Box 192, Goteborg, 411 03, Sweden, tomas.gustafsson@jeppesen.com, Hamid Kharraziha

Large scale weighted fair share crew rostering problems are in them selves very challenging to solve. If you add the requirement that the approach should work for more or less any airline without significant changes, the challenge increase dramatically. We will describe the current Jeppesen approach in production with many major airlines and discuss further ideas to increase performance.

4 - Airline Operations Control Modeling

Goran Stojkovic, Jeppesen, 1800 McGill College Avenue, Suite 1930, Montreal, QC, H3A 3J6, Canada, goran.stojkovic@jeppesen.com

Most airlines are organized in functional silos. The resulting fragmented processes prove suboptimal and can be costly, slow and inconsistent in operations. To provide an efficient holistic solution, we created the airline business process model that maps functional areas and processes. The developed model helps to measure efficiency, detect bottlenecks, create what-if scenarios and build robust, integrated mathematical models. Examples that highlight the value of our approach will be provided.

■ MA59

O - Embassy Room

Pricing and Learning in Competitive Networks

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Nicolas Stier-Moses, Columbia Business School, Uris 418, New York, NY, 10027, United States of America, ns2224@columbia.edu

Co-Chair: Asu Ozdaglar, MIT, 77 Massachusetts Avenue , 32-D630, Cambridge, MA, 02139, United States of America, asuman@mit.edu

1 - The Anarchy of Price Competition

Amr Farahat, Cornell University, 370 Sage Hall, Ithaca, NY, 14853, United States of America, farahat@cornell.edu, Georgia Perakis

We investigate the effects of price competition, compared to centralized pricing, on industry profits and total surplus in differentiated oligopolies. The products are gross substitutes, the number of firms is arbitrary, and the demand model is a nonnegative extension of the affine function. We provide sharp bounds on the ratio of decentralized to centralized profits that are independent of marginal costs and we prove that the loss of efficiency due to competition is no more than 25%.

2 - Markups in Network Pricing

Nicolas Stier-Moses, Columbia Business School, Uris 418, New York, NY, 10027, United States of America, ns2224@columbia.edu, Jose Rafael Correa

We study a game in which producers adopt price functions proportional to their production costs by deciding which markups to charge. In a second phase, consumers learn the producers' price functions, which leads to an allocation of consumers to producers. We look at characteristics of the resulting equilibrium and show that its social cost is close to that of the optimal allocation. In particular, we study the worst-case inefficiency as a function of the competitiveness of the marketplace.

3 - Rule-of-Thumb Learning in Social Networks

Angelia Nedich, UIUC, angelia@uiuc.edu, Asu Ozdaglar, Daron Acemoglu

We study the problem of dynamic learning by a social network of connected agents. Each agent receives a signal about an underlying time-varying state and communicates with a subset of agents (his neighbors). We consider the rule of thumb learning rules whereby each agent constructs his posterior as a weighted average of his prior, his signal and the information he receives from neighbors. Our main results characterize the convergence behavior of beliefs.

4 - Decision-making in Social Networks

Ilan Lobel, 77 Massachusetts avenue, Cambridge, MA, 02139, United States of America, lobel@mit.edu, Daron Acemoglu, Munther Dahleh, Asu Ozdaglar

We study the equilibrium of a model of learning and decision-making over a social network. Each individual receives some signal about an underlying state, observes the actions of a neighborhood of individuals, and chooses an action. We characterize conditions that allow efficient aggregation of information. We show that information with unbounded likelihood almost always propagates efficiently, while bounded likelihood demands specific network topologies for information aggregation.

■ MA60

O - Hampton Room

Student Rail Research Paper Contest

Sponsor: Railway Applications
Sponsored Session

Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Student Rail Research Paper Finalists

Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

This presentation, and two others in this session, will showcase finalists in the Rail Applications Section's student paper contest.

2 - First Prize: A Decision Support Framework for Rolling Stock Rescheduling

Lars Nielsen, PhD Student, Erasmus University Rotterdam, Rotterdam School of Management, PO Box 1738, Rotterdam ZH 3000DR, Netherlands, lnielsen@rsm.nl

We present a generic framework for modeling disruptions in railway rolling stock schedules. A disruption is modeled as an online rolling stock rescheduling problem where information on resource availability becomes available as the situation evolves. We propose a rolling horizon approach to decompose the problem and

extend an existing model for generic rolling stock scheduling to the real time case. We perform computational tests on instances constructed from real life cases and discuss their implications.

3 - Second Prize: An Algorithm for Railway Crew Rescheduling

Daniel Potthoff, PhD Student, Erasmus University Rotterdam, Econometric Institute, PO Box 1738, Rotterdam ZH 3000DR, Netherlands, potthoff@few.eur.nl, Guy Desaulniers, Dennis Huisman

On the Dutch railway network, there are daily about 20 disruptions. In this paper, we present an algorithm to reschedule the crew when such a disruption occurs. The algorithm is based on column generation techniques combined with Lagrangian heuristics. Since the number of duties is in practical instances very large, we first define a core problem of tractable size which has a high chance to deliver a good rescheduling solution. Then the algorithm performs a limited number of large neighborhood search steps to improve the solution.

■ MA61

O - Calvert Room

Transportation Network Vulnerability and Performance Assessment

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, nagurney@gbfin.umass.edu

1 - Assessing Transportation Network Vulnerability Considering Driver Re-routing

Pam Murray-Tuite, Assistant Professor, Virginia Tech, 7054 Haycock Road, Falls Church, VA, 22043, United States of America, murraytu@vt.edu

Transportation network vulnerability assessments must consider more than the network topology. The drivers are independent entities who exert independent control over their decisions to travel if at all and the route, which may change once begun. A mathematical program is presented to identify links to which the network is most vulnerable considering driver decisions.

2 - The Impacts of Area-covering Disruptions in Road Networks

Erik Jenelius, Royal Institute of Technology (KTH), Teknikringen 78B, Stockholm, SE-100 44, Sweden, jenelius@infra.kth.se, Lars-Göran Mattsson

Events such as snow storms and earthquakes can affect extended areas of the transport system. We present a systematic methodology for analyzing the consequences of such events. The studied road network is covered with grids of varying sizes and positions, where each square represents a disrupting event. The consequences, in terms of travel time increases, of each disruption are then calculated for different regions. The methodology is applied to the Swedish road network.

3 - Optimizing Network Infrastructure Service Recovery

Alan Murray, Professor, Arizona State University, School of Geographical Sciences, Tempe, AZ, 85287, United States of America, atmurray@asu.edu, Timothy Matisziw

Reestablishing functionality to network infrastructure following a damaging event is an essential component of any disaster recovery plan. However, necessary repairs can be costly and time consuming, and recovery efforts need to be prioritized to ensure repairs take place as efficiently as possible. This paper details a multi-objective spatial optimization approach for prioritizing recovery efforts with respect to budgetary and scheduling constraints.

4 - A Relative Total Cost Index for the Evaluation of Transportation Network Robustness

Qiang Qiang, Doctoral Student, University of Massachusetts Amherst, Isenberg School of Management, Amherst, 01003, United States of America, qqiang@som.umass.edu, Anna Nagurney

We show how to capture the robustness of a transportation network in the case of degradable links. With the use of BPR user link travel cost functions, we propose two relative total cost indices to assess transportation network robustness in the case of U-O or S-O travel behavior. We derive certain upper bounds and illustrate the indices on several transportation networks.

■ MA62

O - Governor's Boardroom

Pricing for Goods and Services

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg

1 - Numerical Analysis of Optimal Product-line Design

Chi-Guhn Lee, Associate Professor, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, cglee@mie.utoronto.ca, Kevin Ferreira

In this research we have developed an optimization framework to find a product-line, a collection of products with varying specifications and prices, which maximizes the expected total. We have performed optimization in various market situations to shed light on how optimal product-line reacts to changing market conditions. We also carried out the analysis on a large scale consumer survey.

2 - Inventory Models with Fully Backlogged Orders and Alternative Delivery Lead Time

Haifeng Wang, Chinese University of Hong Kong, Hong Kong, China, hfwang@se.cuhk.edu.hk, Houmin Yan

A supplier has a periodical review inventory system that provides multiple lead-time options to customers. The supplier serves a higher and lower priority class with a short and a flexible lead-time requirement, respectively. Unsatisfied customer orders are fully backlogged. With the backlogged the orders, one has to consider the priority to clear backlogs. We consider FCFS and SCFS rules. We characterize optimal inventory-commitment and inventory-replenishment policies.

3 - Channel Management in the Sale of After-Sales Services

Ming Hu, Assistant Professor, Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, ming.hu@rotman.utoronto.ca, Shailendra Jain, Jose Luis Beltran, Julie Ward, Guillermo Gallego

The work extends research in the field of after-sales service management by examining competition in selling extended warranties and service contracts between a supplier and a retailer. Since the supplier depends on the retailer for product sales and competes with her for services, it is challenging to manage these relationships. A product-service bundling schedule with wholesale price discount is proposed to coordinate the decentralized supply chain.

4 - Dynamic Pricing for Hotels Considering Multiple-Day Stays

Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg, Qing Ding, Kum-Khiong Yang

We study the pricing policy that maximizes the expected revenue for hotels with stochastic and nonstationary arrivals of requests for a single room type. We consider the capacity requirement of multiple-day stays if customers make such reservations. We formulate this problem as a stochastic dynamic program. Our results suggest that we should substantially raise the rental rates for high-demand days and simultaneously lower the rental rates for their neighboring, low-demand days.

■ MA63

O - Congressional B

Material Handling in Wafer Fabrication

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Dima Nazzal, Assistant Professor, the Department of Industrial Engineering and Management Systems, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL 32816, United States of America, dnazzal@mail.ucf.edu

1 - A Queuing Model of a Conveyor-based AMHS to Support Configuration Design of Semiconductor Wafer Fabs

Dima Nazzal, Assistant Professor, the Department of Industrial Engineering and Management Systems, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL 32816, United States of America, dnazzal@mail.ucf.edu, Hector J. Carlo, Jesus Jimenez, Andy Johnson

This study proposes an analytical queuing model of a conveyor-based Automated Material Handling System (AMHS) to enable rapid capacity and configuration design of semiconductor wafer fabs. The goal of the study is to accurately estimate the work-in-process (WIP) on the AMHS and assess the system stability. Numerical examples demonstrate and validate the queuing model over a wide range of operating configurations. Results show that this model estimates expected WIP with reasonable accuracy.

2 - Efficient Modeling Abstractions for Simulating the Wafer Fab and the AMHS

Jesus Jimenez, Assistant Professor, Texas State University-San Marcos, Ingram School of Engineering, 601 University Drive, San Marcos, TX, 78666-4616, United States of America, jesus.jimenez@txstate.edu

Simulation models representing the wafer processing steps and the automated material handling systems (AMHS) are used for wafer fab design. However, it takes too much time to build and analyze such models. This research presents several abstraction methods for simulating the fab at lower levels of detail, seeking to accurately and efficiently appraise the fab capacity and the AMHS. Our results show that some abstractions generate good performance estimates while reducing computational time.

3 - A Metamodel Approach to Simulate Material Handling in Wafer Fabs

Yan Wang, Assistant Professor, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, 32816, United States of America, wangyan@mail.ucf.edu, Ola Batarseh, Dima Nazzal

Simulation is used to model automated material handling systems (AMHS) in wafer fabs. The models produce accurate assessments of performance but are time-consuming to construct and execute. We present a metamodel that provides fast and reasonably accurate estimates of the AMHS response time to move requests. The metamodel is based on a new reliable simulation mechanism that takes essential simulation parameters as intervals to incorporate uncertainties associated with dependency relationships.

■ MA64

O - Congressional A

Joint Session TSL/AAS: Optimization Models for Enroute Air Traffic

Sponsor: Transportation Science & Logistics, Aviation Applications
Sponsored Session

Chair: David Lovell, Associate Professor, University of Maryland, 1173 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, lovell@umd.edu

1 - Weather Integrated Airspace Capacity Modeling and Optimization

Tim Myers, Senior Analyst, Metron Aviation, 431 W Princess Anne Road, Norfolk, VA, 23517, United States of America, myers@metronaviation.com

Achieving the FAA Flight Plan goals of increased capacity and reduced congestion will require an evolving understanding of existing airspace capacity and congestion issues. Research was conducted using recently-enhanced weather forecasting products to derive improved airspace capacity forecasts which were applied in a network flow model representation of the National Airspace System to optimize the routing and scheduling of aircraft under dynamic capacity and demand constraints.

2 - A Comparison of Resource Allocation Algorithms for Traffic Flow Management with Rerouting

Nathaniel Gaertner, Analyst, Metron Aviation, 131 Elden St. Ste 200, Herndon, VA, 20170, United States of America, gaertner@metronaviation.com, Robert Hoffman

The need to address the problem of resource allocation in traffic flow management while incorporating rerouting as well as delay has spawned a variety of algorithms and models, ranging in approach from classic optimization to heuristics. Though efficiency in terms of total cost is a primary driver, consideration should also be given to other performance metrics such as equity, predictability, flexibility, and runtime. We evaluate and compare alternative algorithms for solving this problem.

3 - Prediction of Weather Related Center Delays

Deepak Kulkarni, NASA, MS 169-2, Moffett Field, CA, 94035, United States of America, deepak.kulkarni@nasa.gov, Dr. Banavar Sridhar

In this study, the methodology used for estimating the delay at the national level was extended to estimate delays caused by a center and delays experienced by a center. It was found that delays caused by a center can be predicted using that center's WITI whereas delays experienced by a center are best predicted using WITI of that center and that of a few prominent centers. Futhermore, there is differential impact of weather of different centers on center delays.

■ MA65

O - Council Room

Strategic Planning

Contributed Session

Chair: Arief Suharko, PT Bakrie & Brothers Tbk, Jl. HR Rasuna Said, Jakarta Selatan, Indonesia, suharko@indosat.net.id

1 - Multistage Stochastic Program for Planning of Offshore Oilfield Infrastructure under Uncertainty

Bora Tarhan, Graduate Student, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, btarhan@andrew.cmu.edu, Ignacio Grossmann

We consider design and planning of an oilfield infrastructure over a planning horizon. Main uncertainties considered are initial maximum oil flowrate, size and water breakthrough time of reservoir, which are gradually revealed as a function of design and operation decisions. We propose a multistage stochastic programming model that optimizes investment and operation decisions. Solution method relies on duality based branch and bound method involving nonconvex mixed-integer nonlinear subproblems.

2 - New Product Introduction Timing and Capacity Allocation: A Dynamic Programming Approach

Banu Gemici-Ozkan, PhD Candidate, Lehigh University, 200 West Packer Ave, Bethlehem, PA, 18015, United States of America, bag4@lehigh.edu, S. David Wu, Chung-Yee Lee

Contract Manufacturer (CM) often faces the strategic options of devoting its capacity entirely to a brand-carrying customer (BC), or leveraging its capabilities to develop its own market presence. We propose a dynamic programming approach to analyze market entry timing and capacity allocation decisions for varying diffusion models.

3 - Measuring Customer Satisfaction in Multi Service Companies

Baris Carikci, TUSSIDE, Gebze / Kocaeli, Istanbul, Turkey, bcarikci@yahoo.com

The reorganization of a multiservice company makes trouble, when the services are interrelated and provided in different locations. To measure customer satisfaction of each service of a multiservice company by using only survey seems to be a solution to find a customer oriented structure. In this practice, the survey process and its effect on reorganization will be discussed.

4 - A Simulation Model for Steel Project Development Optimization

Arief Suharko, PT Bakrie & Brothers Tbk, Jl. HR Rasuna Said, Jakarta Selatan, Indonesia, suharko@indosat.net.id

A simulation model is developed to assist the decision making process in determining the path to be chosen in developing a steel mill complex. The objectives of the exercise are to find the maximum economic value for the parent company while concurrently maximizing the fair risk and returns for the related subsidiary companies such as in the area of the property and general infrastructure.

■ MA66

O - Cabinet Room

Architecture and Governance

Cluster: Governance of Software Development
Invited Session

Chair: Tim Klinger, IBM Thomas J. Watson Research Center, 19 Skyline Drive, Hawthorne, NY, 10532, United States of America, tklinger@us.ibm.com

1 - Adaptive Architectures and Governance

Peri Tarr, IBM Thomas J. Watson Research Center, 19 Skyline Drive, Hawthorne, NY, 10510, United States of America, tarr@us.ibm.com

Architectures represent the mapping of a problem domain into a software solution. As such, they are early indicators of degree of alignment between a business need and a proposed solution. Although every system has an identifiable architecture, substantial portions of architectures arise via emergence and adaptation over time. We present adaptive architectures, focusing on architectures from agile and open source projects and what they teach us about developing business-aligned architectures.

2 - The Value of Software Architecture

Clay Williams, Manager, Governance Science Research, IBM, IBM Research, Hawthorne, NY, 10532, United States of America, clayw@us.ibm.com

Software architecture has moved beyond addressing purely computational concerns, as academics in both computer science and business have explored how architectures can create value for a firm. In this talk, I will review some of

the fundamental work exploring the economics of software architecture. I will then present a framework where architecture is central to the questions of value and governance in software development. I conclude by discussing some open research questions.

■ MA67

O - Forum Room

Location Models

Sponsor: Location Analysis
Sponsored Session

Chair: Zvi Drezner, Professor, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, zdrezner@Fullerton.edu

1 - Max Dispersion Territory Design Problems

Stefan Nickel, Professor, Saarland University and Fraunhofer ITWM, Campus A 5 3, Saarbrücken, Germany, s.nickel@orl.uni-saarland.de, Jörg Kalcsics, Elena Fernandez, Roger Rios

The problem we discus is motivated by the new recycling directive WEEE of the EC. The core of this law is that each company which sells electronic products has the obligation to recollect and recycle an amount which is proportional to the market share of the company. To avoid a monopoly in some region, all basic areas which are allocated to the same corporation should be geographically as dispersed as possible. We present a mathematical model, properties and computational results.

2 - Strategic Redeployment of Emergency Helicopters based on Weather and Visibility

Rajan Batta, Professor, Department of Industrial & Systems Engineering, University at Buffalo (SUNY), 420 Bell Hall, Buffalo, NY, 14260, United States of America, batta@eng.buffalo.edu, Elif Tokar-Erdermir

Emergency helicopters may not be dispatched under bad weather/visibility conditions, and night dispatch requires larger helipads. We study the problem of locating ambulances and emergency helicopters under changing weather/visibility conditions, and whether to redeploy the helicopters at different states of the system. We consider three coverage types: only ground, only air, and joint ground-air. Objective is to maximize accident coverage at each state without exceeding relocation cost limit.

3 - Bi-objective Coverage Models for EMS Facility Location

P. M. Dearing, Clemson University, PO Box 340975, Clemson, SC, 296340975, United States of America, pmdrn@clemson.edu, Matthew Saltzman, Jennifer Van Dyken

Location problems may involve trade offs between conflicting objectives. We present algorithms for generating all nondominated outcomes for locating a fixed number of EMS facilities while maximizing coverage of demand points within two different response times and for minimizing the number of facilities while maximizing coverage within a given time.

4 - A Cover-based Competitive Location Model

Tammy Drezner, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, tdrezner@fullerton.edu, Pawel Kalczynski, Zvi Drezner

We propose a new approach to estimating market share captured by competing facilities. Each competing facility has a 'sphere of influence' determined by its attractiveness level. More attractive facilities have a larger radius of the sphere of influence. The buying power of a customer in the sphere of influence of several facilities is equally divided among the competing facilities. The buying power of a customer in the sphere of influence of no facility is lost.

■ MA68

O - Senate Room

Issues in Customer Relationship Management

Sponsor: Marketing Science
Sponsored Session

Chair: B.P.S. Murthi, Associate Professor, The University of Texas at Dallas, SM 32 School of Management, 800 West Campbell Road, Richardson, TX, 75080, United States of America, murthi@utdallas.edu

1 - Returns to Consumer Search and its Determinants

Shweta Singh, Assistant Professor, Texas Woman's University, 304 Administration Drive, PO Box 425589, Denton, TX, 76204, United States of America, Shweta_utd@hotmail.com, B.P.S. Murthi, Brian Ratchford

We provide a comprehensive approach to measuring returns to consumer search. We base our conceptual framework of returns to search on the household production model and define returns to search as the efficiency with which consumers are able to make optimal choices. We employ Data Envelopment Analysis (DEA) to create a measure of returns to search. Our findings indicate that Internet users and more experienced and informed consumers tend to make more efficient choices.

2 - Uniform Pricing for Digital Goods: Effects on Competition

Dinah Vernik, PhD Candidate, Fuqua School of Business, Duke University, Durham, NC, 27708, United States of America, dav2@duke.edu, Preyas Desai, Debu Purohit

The digitization of goods such as music and movies has led to the emergence of a new class of retailers that specialize in digital downloads. The resulting competition has led to interesting pricing policies. Online retailers tend to prefer uniform pricing where all "products" carry a single price, while traditional retailers differentiate prices. In our paper we show how the asymmetric equilibrium we observe in the market can change with the nature of competition between the retailers.

3 - Optimal Referral Bonuses with Asymmetric Information: Firm-Offered and Interpersonal Incentives

Laura Kornish, Assistant Professor, Leeds School of Business, University of Colorado, UCB 419, Boulder, CO, 80305, United States of America, kornish@colorado.edu, Qiuping Li

Referral bonuses are currently a popular way to stimulate word-of-mouth in some categories. We analyze optimal bonuses and pricing, when people's reasons for making product recommendations include placing value on a friend having a positive experience with a product they recommend. We find that in many cases, the more that people care about the outcomes of their recommendations, the higher the referral bonus should be. However, if people care enough about others, the firm should not use bonuses.

4 - The Effect of Modes of Acquisition and Retention Strategies on Customer Profitability

Erin Steffes, Assistant Professor, Towson University, 8000 York Road, Towson, MD, 21252, United States of America, esteffes@towson.edu, B.P.S. Murthi, Ram Rao, Andrei Strijnev

We investigate how acquisition and retention strategies differ in their ability to attract and keep profitable customers in the credit card industry. Among the acquisition modes, Internet and direct mail generate more profitable customers than telemarketing and direct selling. We find that customers with loyalty cards and/or affinity cards are less profitable. Our work adds to the CRM literature and our results have managerial implications for marketing resource allocation.

5 - Risk Adjusted Lifetime Value: An Application to Credit Card Market

B.P.S. Murthi, Associate Professor, The University of Texas at Dallas, SM 32 School of Management, 800 West Campbell Road, Richardson, TX, 75080, United States of America, murthi@utdallas.edu, Shweta Singh, Erin Steffes

Current customer lifetime value models are not suitable for application in financial services industry as they only consider the discounted profits generated by a customer but do not control for the associated risk factors. We use Stochastic Frontier Analysis(SFA) techniques to develop a Risk-adjusted lifetime value model (RALTV). We apply it to credit card market and show that it performs better than current lifetime value models in identifying profitable but less risky customers.

Monday, 11:00am - 12:30pm

■ MB01

M - Marriott Ballroom 3

Equilibria in eBusiness

Sponsor: eBusiness
Sponsored Session

Chair: Bob Day, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, bob.day@business.uconn.edu

1 - Expectation-based Versus Potential-aware Automated Abstraction in Imperfect Information Games

Andrew Gilpin, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, gilpin@cs.cmu.edu, Tuomas Sandholm

Automated abstraction algorithms for sequential imperfect information games are a key component in developing competitive game theory-based agents. Previously, agents whose construction has used automated abstraction have only been compared under confounding effects. We conduct systematic experiments on Rhode Island Hold'em poker, comparing abstraction algorithms against each other, against optimal play, and against each agent's nemesis.

2 - Supply Chain Progress Monitoring Based on Individualized Trace Data

Jun Shu, Assistant Professor, Penn State, Department of Supply Chain and Informati, 462 Business Building, University Park, PA, 16802, United States of America, junshu@psu.edu, Dr. Russell Barton

Although quality control is widely used in manufacturing, its use in supply chains is practiced ad hoc, rather than rigorously defined using statistical characterizations. We develop a mathematical framework to represent and manipulate individualized trace data at multiple levels of aggregation. Using this framework, we propose several generic quality measures for the progress of entities through a supply chain and describe methods to monitor these measures.

3 - Online Bidding Agents and Walrasian Equilibrium Prices

Bob Day, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, bob.day@business.uconn.edu, Rohit Aggarwal

Minimal Walrasian equilibrium prices can be used to provide a benchmark for the study of markets consisting of online auctions for identical or nearly identical items. The derivation of these equilibrium prices suggests bidding strategies that can be implemented by automated agents, and we show conditions under which the use of these bidding agents forms a Nash equilibrium.

4 - RFID Adoption through Supply Chain Collaboration and Standardization

Jun Shu, Assistant Professor, Penn State, Department of Supply Chain and Informati, 462 Business Building, University Park, PA, 16802, United States of America, junshu@psu.edu, Terry Harrison

We present a theory that predicts and guides the adoption and standardization of RFID technology in early stage. We show that without a strong presence of network effects for \emph{all} firms involved—-a fact in RFID adoption currently—-a universal standard will not form; however, with the sharing of individual firms' network benefits from technology, we can increase the sizes and reduce the number of isolated standard coalitions, and help the technology's overall adoption.

■ MB02

M - Marriott Ballroom 2

Joint Session IS/CS:Digital Goods and Markets: Emerging Models and New Frontiers II

Sponsor: Information Systems, Computing Society
Sponsored Session

Chair: Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu

1 - Diffusion of User-Generated Digital Content in a Social Network Structure

Anjana Susarla, Assistant Professor, University of Washington, 336 Mackenzie, Box 353200, Seattle, WA, 98195, United States of America, asusarla@u.washington.edu, Yong Tan, Jeongha Oh

The growth of social computing models in a variety of online markets has increased access to information and greatly expanded the available set of choices to consumers. We gather data from YouTube to understand the role of social influence on the diffusion of digital content. Econometrically, the contribution of this paper is to identify social influence in digital markets. Another contribution is to distinguish between social contagion and user heterogeneity in the diffusion process

2 - Influential Research in Information Systems: A Social Network Analysis of Research in Digital Goods

Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu, Harpreet Singh, James R. Marsden

We identify over 130 research papers in two digital goods domains - software and music - published in peer-reviewed journals. We then create a social network based on a paper's listed references within the set of chosen papers. We identify influential papers in each domain, and provide a structured identification and classification of key papers and contributors. We also contrast network linkage density between the domains, and draw conclusions and suggestions for future research.

3 - Music for a Song: An Empirical Look at Uniform Song Pricing and its Alternatives

Joel Waldfogel, Professor, Wharton, 1405 ShDh, The Wharton School, Philadelphia, PA, 19104, United States of America, waldfogj@wharton.upenn.edu, Ben Shiller

We explore various song pricing schemes, including song-specific pricing, bundling, and third-degree price discrimination, using survey-based data. We find that revenue could be increased by a tenth while maintaining consumer surplus at the high level accompanying current $0.99 uniform song pricing. Even with sophisticated pricing, however, much of the area under the demand curve for this product cannot be appropriated as revenue.

4 - The Impact of Music Blogging on Consumption

Jui Ramaprasad, University of California, Irvine, Paul Merage School of Business, Irvine, CA, United States of America, jramapra@uci.edu, Sanjeev Dewan

We examine an integrated framework of music blogging, sampling and sales. We first study the impact of blog and music characteristics on sampling; then we examine the relationship between sampling/blog buzz and album sales. We gain insights on the role of blog influence and popularity on sampling in the body and tail of the sales distribution. Ongoing work uses Granger causality analysis to study the relationship between blog buzz and album sales for 'independent' vs. 'mainstream' music.

■ MB03

M - Marriott Ballroom 1

Current Research in Homeland Security and Counterterrorism: Reports from the Daniel Rose Technion-Yale Initiative and the NPS-JIEDDO Program

Cluster: To The Memory of Richard Rosenthal
Invited Session

Chair: Ed Kaplan, Yale University, School of Management, edward.kaplan@yale.edu

1 - Dynamic Coordination between Two Asymmetric Agents Moving Along a Route

Boaz Golany, Technion - Israel Institute of Technology, golany@ie.technion.ac.il, Konstantin Kogan, Uriel G. Rothblum

We consider a two-agent dynamic location problem with asymmetric settings. The model can be implemented in various environments: sales, inventory control, homeland security and more. Since each agent has its individual objective function and these functions are interdependent, decisions made by one agent may affect the performance of the other agent and thus affect the overall performance of the system. We show that under a broad range of system's parameters, centralized (system-wide optimal) and non- cooperative (Nash) behavior of the agents are characterized by a similar structure. Specifically, the faster agent captures first a greater territory at its maximum speed, but then slowly retreats to some optimal location to possibly rest before getting back to the starting point in a similar way. The timing of these trajectories and the intermediate speeds are however different. Moreover, non- cooperative agents travel more and may never rest and thus the system performance deteriorates under decentralized decision- making. We show that a general (static) linear reward approach developed in Golany and Rothblum (2006) can be extended to provide coordination of the moving agents and suggest its dynamic modification.

2 - Why it is Hard to Defeat Insurgencies: The Effect of Intelligence in Counterinsurgency Operations - A Best Case Scenario

Roberto Szechtman, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93940, United States of America, rszechtm@nps.edu, Moshe Kress

In insurgency situations, the government organized force is confronted by a small guerrilla group that is dispersed in the general population with no or very small signature. Effective counterinsurgency operations require good intelligence. Absent intelligence, not only the insurgents may get away unharmed and continue their violent actions, but collateral damage caused to the general population from poor targeting may generate adverse response against the government and create popular support for the insurgents, which may result in higher recruitment to the insurgency. We model the dynamic relations among intelligence, collateral casualties in the population, attrition, recruitment to the insurgency, and reinforcement to the government force. Even under best case assumptions we show that the government cannot totally eradicate the insurgency by force. The best it can do is contain it at a certain fixed level.

3 - Confronting Elusive Insurgents

Ed Kaplan, Yale University, School of Management, edward.kaplan@yale.edu, Roberto Szechtman, Moshe Kress

Under what conditions should government forces attack insurgent strongholds? How should the government allocate its force across different strongholds when the insurgents' threat to the population must be taken into account? How should the government respond to "smart insurgents" who anticipate government's optimal plan of attack and prepare accordingly? Using Lanchester models modified to account for imperfect intelligence, we approximate optimal force allocations for the government, and model the resulting sequential force allocation game between the insurgents and the government where the (zero sum) payoffs are determined by government battle and homefront casualties.

■ MB05

M - Virginia B

Methods and Models for Congestion Pricing II

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Yafeng Yin, University of Florida, Civil and Coastal Engineering, 365 Weil Hall, Box 116580, Gainesville, FL, 32611, United States of America, yafeng@ce.ufl.edu

1 - Network Topology and the Global Effectiveness of Decentralized Road Pricing Strategies

Lei Zhang, Assistant Professor, Oregon State University, School of Civil & Construction Engineering, 220 Owen Hall, Corvallis, OR, 97331, United States of America, imleich@yahoo.com

This paper considers a particular scenario of road pricing where a number of decentralized agents set toll rates according to independent non-cooperating objectives. Pricing games between multiple private roads or between local jurisdictions are real-world examples of this decentralized network pricing scenario. The global effectiveness of decentralized decisions, defined at the system level, is examined for networks with various topologies (e.g. grid, hub-spoke, ring, scale-free, and hybrid).

2 - Solving the Pareto-improving Toll Problem

Siriphong Lawphongpanich, University of Florida, Industrial and Systems Engineering, 303 Weil Hall, Gainesville, FL, 32611, United States of America, lawphong@ise.ufl.edu, Yafeng Yin

Congestion tolls are said to be Pareto-improving if they lead to an improvement in travel delay or social benefit and ensure that no user is worse off when compared to the situation without any tolling. The problem of finding Pareto-improving tolls can be formulated as a mathematical program with complementarity constraints. Using concepts from manifold suboptimization, we propose a new algorithm that converges to a strongly stationary solution in a finite number of iterations.

3 - Self-sufficient and Pareto-improving Toll with Continuously Distributed Travel Times

Marco Nie, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, y-nie@northwestern.edu

This paper considers a static congestion pricing model in which users select a mode from either, passenger car or transit service, to minimize their own travel cost. The cumulative distribution of users' value of time (VOT) is assumed to be a continuous function. A general condition is established to ensure the existence of a self-sufficient and pareto-improving toll scheme. We prove that a self-sufficient and Pareto-improving toll always exists if the VOT distribution function is concave.

4 - Pareto-improving Congestion Pricing on Multimodal Transportation Networks

Di Wu, University of Florida, Department of Civil & Coastal Engineering, Gainesville, FL, 32611, United States of America, thu.woody@gmail.com, Yafeng Yin, Siriphong Lawphongpanich

This paper determines a pricing scheme to maximize the social benefit without increasing any individual user's travel cost or transportation authority's expense on a multimodal transportation network with transit services, high-occupancy/toll and regular lanes. The Pareto improvement is achieved by designing transit fares and highway link tolls to optimally distribute travel demand among the available modes. A multimodal Pareto-improving toll model is presented with numerical examples.

■ MB06

M - Virginia C

Mike Rothkopf's Influence on Research in Auctions and Beyond

Cluster: Auctions
Invited Session

Chair: Jonathan Eckstein, Professor, Rutgers University, 640 Bartholomew Road, RUTCOR Room 155, Piscataway, NJ, 08854, United States of America, jeckstei@rci.rutgers.edu

1 - Dedicated to Mike Rothkopf: Monitoring an Information Source under a Politeness Constraint

Jonathan Eckstein, Professor, Rutgers University, 640 Bartholomew Road, RUTCOR Room 155, Piscataway, NJ, 08854, United States of America, jeckstei@rci.rutgers.edu, Avigdor Gal

Imagine scheduling a limited number of polls to an information source whose contents are continuously modified by a nonhomogeneous Poisson process. We develop an optimal polling schedule model that is ill-suited to either standard nonlinear or integer programming methods, but - following a suggestion of Mike Rothkopf's - can be solved to near optimality by a combination of dynamic programming and local search, with provable quality guarantees.

2 - Mike Rothkopf's Contribution to the Analysis of Bidding in Sequential Auctions

Shmuel Oren, Professor, UC Berkeley, IEOR Department, Rm. 4119 Etcheverry Hall, Berkeley, CA, 94720, United States of America, oren@ieor.berkeley.edu

This paper will detail an early contribution by Mike Rothkopf and myself to the analysis of multiplicative bidding strategies in sequential auctions. The work examines the affect of competitive interaction where bidders who interact repeatedly in sequential auctions adjust they strategies in response to prior bidding behavior of their rivals.

3 - Optimization and Dynamical Systems Algorithms for Finding Equilibria of Stochastic Games

Arun Sen, Senior Consultant, NERA Economic Consulting, 1166 Ave. of the Americas, 28th floor, New York, NY, 10036, United States of America, sen@post.harvard.edu, Dave Shanno

We present two new algorithms for computing Nash equilibria of stochastic games. One is a global random start algorithm based on nonlinear programming, while the other combines a dynamical system with nonlinear programming to find stable equilibria. Promising numerical results are presented.

■ MB07

M - Maryland A

MSOM Fellows Presentation

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Martin Lariviere, Kellogg School of Management, Evanston, IL, United States of America, m-lariviere@northwestern.edu

1 - Stochastic Processing Networks

J. Michael Harrison, Graduate School of Business, Stanford University, Stanford, CA, 94305, United States of America, harrison_michael@gsb.stanford.edu

About 50 years ago, a general linear model of an operating enterprise was developed by mathematicians and economists working in the area that T. C. Koopmans called "activity analysis." Stochastic processing networks are a class of system models which extend that powerful conceptual framework in a natural way, adding stochastic variability and feedback control. This model class has a potentially important role to play in a unified theory of operations management.

2 - Assesing Risk to Hospitals in Response to a Pandemic Influenza

John Muckstadt, Acheson-Laibe Professor, Cornell University, 286 Rhodes Hall, Cornell UNiversity, Ithaca, NY, 14853, United States of America, jack@orie.cornell.edu, Peter Jackson

We describe a decision support environment that provides decision makers in hospitals with a dynamic analysis of how a varying set of human and material resources, and a set of policies governing their deployment, will perform under the time-dependent demands resulting from a pandemic infuenza.

3 - Multi-echelon Inventory Models – An Overview

Sven Axsäter, Lund University, PO Box 118, Lund, 22100, Sweden, sven.axsater@iml.lth.se

We give an overview of stochastic multi-echelon inventory models starting with the early contributions by Clark and Scarf, and Sherbrooke. The main focus is on serial and distribution inventory systems. Different control policies and other assumptions are discussed. We describe the problems that we face when going from single-echelon to multi-echelon models. Advantages and difficulties with different approaches are analyzed. Finally, we discuss practical implications of the research results.

■ MB08

M - Maryland B

Game Theory Applications to the Interface between Finance, Operations, and Risk Management

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Volodymyr Babich, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48109, United States of America, babich@umich.edu

1 - Optimal Market-making with Risk Aversion

David Simchi-Levi, Professor, MIT, 77 Massachusetts Ave. Rm. 1-171, Cambridge, MA, United States of America, dslevi@MIT.EDU, Miao Song, Kan Huang

Market-makers have the obligation to trade securities at quoted bid or ask prices, and their inventories are exposed to the potential loss when the market price moves in an undesirable direction. One approach to reduce this risk is to adjust the inventory at the price of losing potential spread gain. We show that a threshold inventory control policy is optimal with respect to an exponential utility criterion, and more general results are obtained for mean-variance analysis.

2 - Capacity Investment by Competitive Start-ups

Robert Swinney, Graduate School of Business, Stanford University, 518 Memorial Way, Stanford, CA, 94305-5015, United States of America, swinney@stanford.edu, Gerard Cachon, Serguei Netessine

We analyze duopolistic capacity investment games in which firms may be either start-ups (subject to bankruptcy risk) or established firms (with no chance of bankruptcy). Firms build capacity in advance for a market facing a stochastic multiplicative demand shock. We consider how the presence of one or more start-ups affects total equilibrium capacity investment and price. We also endogenize the order of commitment to enter the market and address how start-ups affect market entry.

3 - On Supply Risk and Asymmetric Information

Zhibin Yang, University of Michigan, Ann Arbor, MI, zhibiny@umich.edu, Goker Aydin, Volodymyr Babich, Damian Beil

We study a manufacturer using dual-sourcing and backup-production (manufacturer's or supplier's) options to manage supply risk under asymmetric information about supplier reliability. These options may be more or less valuable for the manufacturer under asymmetric information. Asymmetric information discourages the manufacturer from using dual-sourcing and supplier backup production options with the less reliable supplier type. Higher reliability may not be a substitute for information.

4 - Financing in Supply Chain Management

Song (Alex) Yang, PhD Student, The University of Chicago Graduate School of Business, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States of America, syang1@chicagogsb.edu, John Birge

In supply chains, it is common for one party, who normally has easier access to financial market, to finance the other party in various ways (trade credit, loans, etc.). In this talk, we discussed the advantages and limitations of supply chain financing, as well as associated problems, including incentives and credit risks, based on a model where firms make operational and financing decisions jointly.

■ MB09

M - Maryland C

Bayesian Reliability Modeling and Uncertainty Analysis

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu

1 - Bayesian Models for Executives' Environmental Uncertainty After 9/11

Ehsan Soofi, Professor, University of Wisconsin-Milwaukee, PO Box 742, Milwaukee, WI, United States of America, esoofi@uwm.edu, Paul Nystrom, Masoud Yasai-Ardekani

Shortly after 9/11, we solicited probabilities from 93 executives to study their uncertainties about the state of future economy, its effects on the organizations, and organizational ability to respond. The data provide two bivariate marginal distributions. The trivariate distributions of state-effect-response are imputed by maximum entropy. Uncertainty about probabilities is modeled using a Dirichlet model and by a Bayesian hierarchical model. A set of uncertainty tableaux present the results.

2 - A New Bayesian Approach to Analyzing the Marshall-Olkin Model

Thomas Mazzuchi, EMSE, George Washington university, Washington, DC, 20052, United States of America, mazzu@gwu.edu

A new approximation to the Multivariate Marshall-Olkin Model for common cause failure is presented. The model aggregates component failures due to outside shocks into ordered modes, where each mode is composed of all possible failure combinations of a given number of components. The model is analyzed in a Bayesian framework and results of the new model are produced for a three component system using simulated data.

3 - Bayesian Mortgage Default Models and Reliability Analysis

Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu, Feng Xu

The Bayesian point of view is rather new in the mortgage default literature. In this talk we present some recent Bayesian mortgage models for analysis of aggregate and individual loan level data. In so doing, we also discuss how these models can be used for loan maintenance using a decision theoretic approach.

4 - A Markov Modulated Poisson Model for Software Reliability

Joshua Landon, Institute for Integrating Statistics in Decision Sciences, The George Washington University, Washington, DC, 20052, jlandon@gwu.edu, Suleyman Ozekici, Refik Soyer

In this paper we consider a latent Markov process governing the intensity rate of software failures. The latent process represents the behavior of the debugging operations over time and enables us to deal with imperfect debugging scenario. We develop the Bayesian inference for the model and introduce a method to infer the unknown dimension of the Markov process.

■ MB10

M - Room 8206

Energy Security and Risk Management

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Frederic Murphy, Professor, Temple University, Fox School of Business, Philadelphia, PA, 19122, United States of America, fmurphy@temple.edu

Co-Chair: Fernando Oliveira, Assistant Professor, ESSEC Business School, Avenue Bernard Hirsch - BP 50105, 95021 - Cergy-Pontoise, France, oliveira@essec.fr

1 - Designing and Valuation of Financial Options on the Strategic Petroleum Reserve

Fernando Oliveira, Assistant Professor, Warwick Business School, Gibbet Hill Road, Coventry, 1, CV4 7AL, United Kingdom, Fernando.Oliveira@wbs.ac.uk, Frederic Murphy

We design and evaluate financial options for market-based management of the U.S. government's Strategic Petroleum Reserve (SPR). We use a coupled Markovian Decision Process to model a game in which a public maximizes social welfare and a private player is a speculator. We compute the optimal number of options required by the optimal policy. Finally, we analyze the conditions under which the value of such options can be computed and we solve instances of the model using Monte-Carlo simulation.

2 - The Energy Independence and Security Act (EISA) 2007 and Future Refining Needs

Peter Whitman, Policy Analyst, Department of Energy, 1000 Independence Ave SW, Washington, DC, 20585, United States of America, Peter.Whitman@hq.doe.gov

The Energy Independence and Security Act of 2007, with its renewable fuel and vehicle efficiency mandates, will have a significant impact on the petroleum product mix in the U.S over the next 15 years. In particular, it is expected that the additional renewable fuels will impact the gasoline pool much more than diesel. We use an LP based refinery model to examine the ability of the domestic refining industry to respond to these changes.

3 - Energy Only, Capacity Market and Security of Supply: A Stochastic Equilibrium Analysis

Yves Smeers, Professor, Universite Catholique de Louvain, 34 Voie du Roman Pays, Louvain la Neuve, 1348, Belgium, yves.smeers@uclouvain.be, Andreas Ehrenmann

We formulate an equilibrium model of the electricity sector with both investments and operations. Electricity prices are set at the fuel cost of the last operating unit when there is no curtailment, and at some regulated price cap when there is curtailment. The equilibrium model is stochastic We model risk aversion of the agents through a CVaR of the net margin of the industry. The CVaR induces a risk neutral probability according to which investors value their plants.

4 - A Risky Two Stage Nash Game for Modeling Investment

Danny Ralph, University of Cambridge, Judge Business School, Cambridge, United Kingdom, d.ralph@jbs.cam.ac.uk, Yves Smeers

We present a Nash game where the 1st stage involves investment in both electricity generation capacity and financial instruments (hedges), with production to occur in an uncertain 2nd stage environment. Electricity generators are risk averse, and seek to minimise their cost (or maximise profit) across both stages. The cost of future production is assessed via risk measures instead of expectations. This is a new game in which (risk neutral) probabilities are endogenous - found at equilibrium.

■ MB11

M - Room 8209

Applications of Operations Research in the Mining Industry

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States of America, anewman@mines.edu

1 - Scheduling the Excavation of an Open Pit Mine: An Integer Programming Approach

Marcos Goycoolea, Assistant Professor, Universidad Adolfo Ibanez, Diagonal Las Torres 2640, Oficina 534 C., Santiago, Chile, marcos.goycoolea@uai.cl, Daniel Espinoza, Eduardo Moreno, Enrique Rubio

We consider a classic integer programming formulation for the open-pit-mine scheduling problem. Using standard optimization software results in prohibitively long computation times. By introducing rounding heuristics (based on topological sortings), clever branching rules, and pre-processing into the branch-and-bound process we significantly improve computational performance. Computational results from three medium-sized mines are presented.

2 - Cluster Analysis Based Aggregation in Mine Planning Models

Andres Weintraub, Professor, University of Chile, 701 Republica, Santiago, Chile, aweintra@dii.uchile.cl, Ricardo Vega, Marianela Pereira, Ximena Schultz, Andreas Bley

CODELCO, the largest mining firm in Chile, has developed large scale models to support detailed planning of mine extraction. For purposes of corporate planning or when incorporating uncertainty, aggregate planning is adequate. We use cluster analysis and both a priori (on raw data) and a posteriori (on the detailed LP formulation) aggregation. Computational results show significant reductions in problem size and CPU run time, while guaranteeing a moderate bound on the error due to aggregation.

3 - Open Pit Mine Production Scheduling

Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States of America, anewman@mines.edu

We present a model for open pit mine production scheduling in which we maximize net present value of the extracted blocks subject to production and processing constraints. We show how we are able to use variable elimination, cuts, and Lagrangian Relaxation to solve problem instances containing about 20,000 blocks and 6-10 time periods in minutes, whereas it is not possible for commercial software to obtain even a feasible solution for the monolith in days.

4 - Local Search for the Open-pit-mine Scheduling Problem

Thomas Prevost, Universite Catholique de Louvain, Louvain, Belgium, prevost.thomas@gmail.com, Marcos Goycoolea, Eduardo Moreno, Jorge Amaya

Directly solving real-sized open-pit-mine scheduling problems with an integer programming solver is not possible due the huge number of variables. We present a local search algorithm, which, starting from simple heuristic solutions, computes better ones by optimizing over randomly selected small sections of the mine. This method is not limited by mine size, and adapts well to parallel architectures. Computational results are presented.

■ MB12

M - Room 8212

Novel Methodologies for Capturing and Using Data to Model and Measure Behavior

Cluster: Data Mining
Invited Session

Chair: Theodoros Evgeniou, INSEAD, Boulevard de Constance, Fontainebleau, Fr, France, theodoros.evgeniou@insead.edu

1 - Why Wikipedia Works: Modeling the Stability of Collective Information Update Processes

Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu, Malik Magdon-Ismail

How do Wikipedia pages become stable and trusted information sources? We analyze highly edited Wikipedia pages and show that they almost inevitably converge to a stable state instead of continuing to accrue edits (the expected behavior under traditional growth models). We present a stochastic model of information growth for Wikipedia pages and show that this model provides an excellent fit to the actual accumulation of edits on highly-edited Wikipedia pages.

2 - Effective Re-Identification in Dynamic Networks

Shawndra Hill, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, shawndra@wharton.upenn.edu

Re-identification in the context of dynamic networks is a matching problem that involves comparing the behavior of networked entities. A similarity score can be assigned to pairs observed over two different time periods. The score can be used as an attribute to classify the pair of entities as a match or a non-match. This work presents the impact of network structure and choices one can make when representing entities on dynamic networks on re-identification.

3 - A Unified Framework for Active Classifier Learning

Maytal Saar-Tsechansky, Assistant Professor, University of Texas at Austin, Austin, TX, 78712, United States of America, Maytal.Saar-Tsechansky@mccombs.utexas.edu

Empirical active learning approaches for classification often offer intuition to explain how the policies identify informative examples for learning. However, the intuitions are sometimes inconsistent and do not help explain some empirical results. I will present a unified theoretical framework that can be used to explain the benefits of popular active learning policies. The framework also lays foundations for the development of new active learning policies.

4 - Models of Behavior and Models for Market Data Analysis

Theodoros Evgeniou, INSEAD, Boulevard de Constance, Fontainebleau, Fr, France, theodoros.evgeniou@insead.edu

Marketing has been a key application area of data mining and machine learning. Meanwhile, researchers in consumer behavior and psychology have been developing theories of how people "actually" make decisions. However, there has been little interaction between these two fields. In this talk we discuss novel methods for analyzing consumer data that are based on principles from these two seemingly unrelated fields.

■ MB13

M - Room 8216

Bayesian Approaches in Data Mining

Sponsor: Data Mining
Sponsored Session

Chair: Ilona Murynets, PhD Student, Stevens Institute of Technology, Hoboken, NJ, United States of America, imurynet@stevens.edu

1 - Accounting for Multivariate Parameter Uncertainty in Large-scale Simulations

Canan Gunes, PhD Student, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, canalp.canan@gmail.com, Bahar Biller

We consider a large-scale stochastic simulation with correlated inputs and develop a Bayesian framework that provides point estimates and confidence intervals for performance measures by accounting for stochastic and multivariate input uncertainties. We demonstrate the importance of the joint representation of stochastic and multivariate input uncertainties for multi-product inventory simulations.

2 - Monitoring Data Quality in Distributed Data Warehouses with Delays

Ilona Murynets, PhD Student, Stevens Institute of Technology, Hoboken, NJ, United States of America, imurynet@stevens.edu, Wei Jiang, Rong Duan, S. Tom Au

Poor data quality and the lack of integration in data warehouse (DWH) make it difficult for business users to obtain a consistent view of business processes. To monitor operational data feeding systems, this paper proposes a statistical model for data feeding systems from heterogeneous databases to a central DWH. An online statistical process control (SPC) procedure is developed to identify inconsistencies in the feeding data.

3 - Asymptotic Theory of Sequential Change Detection and Identification

Kazutoshi Yamazaki, Graduate Student, Princeton University, ORFE Department, Princeton University, Princeton, NJ, 08540, United States of America, kyamazak@gmail.com, Warren Powell, Savas Dayanik

Suppose the distribution of a sequence of i.i.d. random variables changes suddenly at some unobservable time to one of finitely many distinct alternatives, then one needs to detect and identify the change at the earliest. We propose a sequential decision strategy that triggers an alarm when the posterior probability of a certain type of change exceeds some threshold, and show its asymptotic optimality under the Bayesian and the fixed-error formulations.

4 - Adaptive SMOTE for Imbalanced Learning

Yafeng Yin, Stevens Institute of Technology, ECE Department, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, startor.2006@gmail.com, Hong Man, Haibo He, Jing Wang

This paper presents a novel approach for adaptively generating synthetic minority classes based on SMOTE. The main idea is to assign different weighted distribution for each minority class during the up-sampling process. Therefore, this approach can reduce the bias of the data set as well as forcing the learning algorithms to focus more on the minority classes that are relatively more difficult to learn. Simulation results shows improvement in the prediction accuracy and F-values.

■ MB14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Imagine That, Inc. - ExtendSim-Power Tools for Simulation
Dave Krahl, Imagine That, Inc., 6830 Via Del Oro, Ste. 230, San Jose, CA, 95119, davek@extendsim.com

See how quickly you can build robust, intuitive models with the power tool for simulation - ExtendSim. Revolutionary new simulation technology and 3D animation in ExtendSim is paired with core ExtendSim features such as hierarchical model building, user interface creation, and interactive modeling to make it the tool to watch in the simulation industry. Don't miss this demo!

2 - XJ Technologies –AnyLogic - Professional Tool for Multi-Method Simulation Modeling
Andrei Borshchev, CEO and Managing Director, XJ Technologies, Office 410, 49 Nepokorennykh pr., St., Petersburg, 195220, Russia, andrei@xjtek.com

AnyLogic is the first and only simulation tool that supports system dynamics, process-centric (discrete event) and agent-based methods within one modeling language and one model development environment. We will demo several AnyLogic models and show how the user can benefit from using different modeling methods, and from agent-based modeling in particular.

■ MB15

M - Room 8219

Measurement and Metrics in Service Science

Sponsor: Service Science
Sponsored Session

Chair: Michael Goul, Professor, Arizona State University, PO Box 874606, W.P. Carey School of Business, Tempe, AZ, 85287-4606, United States of America, Michael.Goul@asu.edu

Co-Chair: Haluk Demirkan, Assistant Professor, W. P. Carey School of Business, Arizona State University, PO Box 874606, Tempe, AZ, 85287-4606, United States of America, Haluk.Demirkan@asu.edu

1 - Call Center Workforce Optimization Through Simulation Incorporating Retrial Calls
Hideki Yamanaka, Fujitsu Laboratories Ltd., 4-1-1 Kamiodanaka, Nakahara-ku, Kawasaki, 211-8588, Japan, hyamanaka@jp.fujitsu.com

A call center model with retrial calls was validated by analyzing the CTI log with notified customer telephone numbers in real call centers, with the result that hourly average retrial call ratios and retrial intervals for abandoned calls vary considerably with human behavior, giving us another room for workforce optimization.

2 - Selecting Sourcing Partners for a Make-to-order Supply Chain
Yu Xia, Assistant Professor, Middle Tennessee State University, Department of MGT&MKT, Murfreesboro, TN, 37132, United States of America, axia@mtsu.edu, Thuhang Tran, Bintong Chen, Jinfeng Yue

Our research provides a decision supporting system to facilitate the sourcing process for these manufacturers using information about their sourcing partners' cost and processing time. For a desired service level, a range of sourcing alternatives instead of a single optimal sourcing solution is presented. The portfolio allows the manufacturer to make trade-offs between cost and probability to finish the job on time.

■ MB16

M - Room 8222

Manufacturing

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Justin Ren, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, ren@bu.edu

1 - An Econometric Analysis of Patient Flows in the Cardiac ICU
Diwas Kc, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104, United States of America, diwas@wharton.upenn.edu, Christian Terwiesch

This paper explores the rationing of bed capacity in a cardiac intensive care unit (ICU). We find that a patient is likely to be discharged early when the occupancy in the ICU is high. This in turn leads to an increased likelihood of the patient having to be readmitted to the ICU at a later time. We analyze the capacity implications of revisits, shedding light on the question if an ICU should apply an aggressive discharge strategy.

2 - Does Performance-Based Contracting Improve Product Reliability? An Empirical Study
Jose Guajardo, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, josegu@wharton.upenn.edu, Morris Cohen, Serguei Netessine, Sang-Hyun Kim

In this paper we analyze the impact of a performance based contract to provide after sales maintenance and repair services. Based on a primary data sample from a major Aerospace and Defense manufacturer, we analyze the impact of such a contract on long term product reliability. Our econometric model incorporates the endogeneity of contract selection into the estimation process.

3 - Outsourcing a Two-tier Service Process
Hsiao-Hui Lee, PhD Student, Simon School, 711 University Park, Rochester, NY, 14620, United States of America, hsiao-hui.lee@simon.rochester.edu, Edieal Pinker, Robert Shumsky

Many service processes are constructed as a two-level system where the first level serves as a gatekeeper for the second level. Service firms who outsource these processes must decide which part to outsource (first level, second level, or both). We examine this outsourcing decision as well as the contract design problem, given the decision to outsource particular levels.

4 - An Empirical Study of the Relations between Hospital Volume, Teaching Status and Service Quality
Carol Theokary, Doctoral Student, Boston University School of Management, 595 Commonwealth Avenue, Room 664, Boston, MA, 02215, United States of America, carolth@bu.edu, Justin Ren

This paper contributes to research on quality drivers in healthcare settings. We propose that the impact of a hospital teaching status on its service quality can vary across hospitals of different sizes. We use a new large dataset that measures objective operations quality on the treatment for three conditions in all major US hospitals. Our results suggest that the impact of teaching intensity on quality is dependent upon the specifics of each condition and might vary with hospital size.

■ MB17

M - Room 8226

Novel Quality Control Strategies to Improve Process Efficiency

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Seoung Bum Kim, Assistant Professor, University of Texas at Arlington, 500 W. First Street, Arlington, TX, 76019, United States of America, sbkim@uta.edu

1 - Continuously Monitoring a Fraction in Service Processes and Achieving the Nominal False Alarm Rate
Rodrigo Duran, Teaching Assistant, Department of Industrial and Systems Engineering, Rutgers University, 173 Clinton St., South Bound Brook, NJ, 08880, United States of America, rodduran@eden.rutgers.edu, Susan Albin

In service processes where we continuously monitor fractions, traditional p-charts may not be useful. The fraction may be anywhere between 0 and 1 and rules of thumb such as Np>5 may not be helpful. We propose a Cusum chart where the nominal false alarm rate is achieved, and the parameters are calculated easily (without tables, simulation, or Markov Chain analysis). The new method also has a superior sensitivity compared with other easily designed existing methods.

2 - A Discretization Method for Approximating ARL with the Markov Chain Method

Chang-Ho Chin, Assistant Professor, Kyung Hee University, 1 Seocheon-dong, Giheung-gu, Yongin-si, Korea, Republic of, chin@khu.ac.kr

The integral equation method and the Markov chain method are generally used to approximate the ARL of control charts. The former is more accurate than the latter. However, the integral equation method cannot be used with certain kinds of control charting problems. Although the Markov chain method is more versatile, it has an important limitation in implementation − a memory space problem due to the large state space. A discretization method to alleviate the difficulty is discussed.

3 - Multistage-PRIM for Optimization of Multistage Manufacturing Processes with Insufficient Data

Doh-Soon Kwak, Division of Mechanical and Industrial Engineering, Pohang University of Science and Technology, Republic of Korea, dskwak@postech.ac.kr, Kwang-Jae Kim

We propose a new method to optimize a multistage manufacturing process. The proposed method is based on a data mining technique, called Patient Rule Induction Method (PRIM). The issues associated with insufficiency of the observational data, which is often encountered in electronics industry, are also discussed. The performance of the proposed method is demonstrated using a case from a semiconductor manufacturing process.

■ MB18

M - Room 8228

QSR Best Student Paper Award Session

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

1 - QSR Best Student Paper Award

Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

This session includes presentations from four finalists for the QSR best student paper award. The four finalists are selected after reviewing all of the submitted papers for this competition. The results will be announced at the QSR business meeting.

■ MB19

M - Lincoln 4

Panel Discussion: Portfolio Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Moderator: Jeffrey Keisler, Assoc. Professor, Univ. of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA, 02125, United States of America, Jeff.Keisler@umb.edu

Co-Chair: Alec Morton, London School of Economics, A.Morton@lse.ac.uk

1 - Portfolio Decision Analysis and Organizational Planning- Who Are We and What can We Offer?

Panelists: Alec Morton, London School of Economics, A.Morton@lse.ac.uk, Martin Schilling, Ahti Salo, James Felli

Decision Analysts are not the only analytic professionals who want and have a role in organizational resource planning. Finance professionals often drive capital budgeting. Information systems provide much of the data decisions require. Cheap computation and user-friendly software make math programming approaches ever more practical. As a group with a distinct identity, how do we position ourselves in this crowded marketplace? How do/should we relate to other providers of modeling and advice?

■ MB20

M - Lincoln 3

Environmental Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Richard Anderson, Assistant Professor, Duke University, Box 90328 - Nicholas Sch of the Environ, LSRC A321, Durham, NC, 27708, United States of America, richard.anderson@duke.edu

1 - Evaluating Alternatives for Wetland and Barrier Island Building in the Mississippi River Delta

Melissa A. Kenney, Postdoctoral Fellow, Environmental Decision Analysis, Johns Hopkins University, 3400 N Charles St, 313 Ames Hall, Baltimore, MD, 21218, United States of America, m.kenney@jhu.edu, Benjamin F. Hobbs, Robert R. Twilley

Since the 1930s, the Mississippi River Delta has lost ~1.2 million acres of land. Agencies are making important restoration decisions regarding the locations and methods of sediment and freshwater delivery. We re-evaluate which of the proposed 27 projects are in the non-dominated set and discuss their tradeoffs, providing guidance for which projects give the "biggest bang for your buck."

2 - Using Decision Analysis to Guide Oyster Restoration in North Carolina, USA

Richard Anderson, Assistant Professor, Duke University, Box 90328 - Nicholas Sch of the Environ, LSRC A321, Durham, NC, 27708, United States of America, richard.anderson@duke.edu

Restoration of North Carolina oysters and the reefs they create involves tradeoffs between ecosystem services and fishery revenue hitherto unquantified for North Carolina. Quantifications of flows of services derived from oyster reef ecosystems depend on hypotheses about how they depend upon ecological functions. We develop a decision analytic framework to explore the implications of these considerations for management of North Carolina native oyster populations.

3 - Using Multiobjective Analysis for Multi-dam Removal Decisions in the Lake Erie Basin

Pearl Q. Zheng, PhD Candidate, 313 Ames Hall, Department Geography & Environmental Engineering, Johns Hopkins University, 3400 N Charles St, Baltimore, MD, 21218, pzheng1@jhu.edu, Benjamin F. Hobbs, Joseph F. Koonce

Removal of deteriorating dams on tributaries to Lake Erie involves tradeoffs between ecological benefits and costs. We develop a mixed integer linear program to select a portfolio of potential dam removals that could achieve the best possible value of a weighted sum of objective(s), while still satisfying the constraints.

■ MB21

M - Lincoln 2

Joint Session Computational Biology/CS: Population Genetics

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Tanya Berger-Wolf, University of Illinois at Chicago, Department of Computer Science, 851 S. Morgan St, Chicago, IL, 60607, United States of America, tanyabw@uic.edu

1 - Theoretical and Experimental Results for Haplotyping Problems with Recombination

Daniel Brown, Associate Professor, University of Waterloo, 200 University Ave W, Waterloo, ON, N2L 3G1, Canada, browndg@uwaterloo.ca

Haplotype inference problems entered the computer science literature relatively recently. As mathematical problems, they show a surprising connection to random graphs, to mathematical programming, and to linear algebra. As computer science problems, they are an example of a problem area that is theoretically hard, but almost always easy in practice. We show a few recent results from this domain, paricularly oriented toward practical examples that incorporate recombination.

2 - Reliable Genotype Tagging

Alex Zelikovsky, Georgia State University, Department of Computer Science, Atlanta, GA, 30303, United States of America, alexz@cs.gsu.edu, Irina Astrovskaya

It is widely accepted that variation of a single nucleotide polymorphism (SNP) is covered by another SNP if their correlation is greater than 0.8. Tagging saves budget by genotyping less SNPs and haplotype computation by reducing the size of the SNP data. We propose a new 2LR-tagging method that finds less SNPs than widely accepted Tagger and avoids of overfitting of tagging based on multiple linear regression.

3 - Hidden Markov Models of Haplotype Diversity and Applications in Genetic Epidemiology

Ion Mandoiu, University of Connecticut, Computer Science & Engineering Departmen, 371 Fairfield Way, Unit 2155, Storrs, CT, 06269-2155, United States of America, ion@engr.uconn.edu, Justin Kennedy, Bogdan Pasaniuc

Currently there is much interest in mapping genes involved in complex human diseases using whole-genome association studies. Harnessing the full power of these studies requires addressing several challenging computational problems including genotype phasing, genotype error detection, and missing data imputation. This talk will review inapproximability results and efficient heuristics for finding maximum-likelihood solutions to these problems based on Hidden Markov Models of haplotype diversity.

4 - Reconstructing Sibling Relationships from Microsatellite Data

Tanya Berger-Wolf, University of Illinois at Chicago, Department of Computer Science, 851 S. Morgan St, Chicago, IL, 60607, United States of America, tanyabw@uic.edu, Bhaskar DasGupta, Saad Sheikh, Art Chaovaitwongse, Mary Ashley

Reconstruction of sibling relationships from genetic data is an important part of many biological applications. Most reconstruction methods use statistical and heuristic techniques that rely on a priori knowledge about various parameter distributions. We present a deterministic algorithm that parsimoniously reconstructs sibling groups. We use Mendelian laws of inheritance to generate feasible sibling groups and optimally select a minimum set of groups necessary to explain the data.

■ MB22

M - Lincoln 1

Constraints and Search

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session

Chair: Meinolf Sellmann, Brown University, PO Box 1910, Providence, RI, United States of America, sello@cs.brown.edu

1 - Hidden Structure in Constraint Reasoning Problems

Bistra Dilkina, Cornell University, Department of Computer Sciences, 4148 Upson Hall, Ithaca, NY, 14853, United States of America, bistra.cs.cornell.edu, Ashish Sabharwal, Carla P. Gomes, Bart Selman

Modern constraint solvers can handle problems with up to a million variables and several million constraints. A recent explanation for the good scaling properties of state-of-the-art constraint solvers is that in many real-world combinatorial problems the true combinatorics is captured by a relatively small set of critical variables, called backdoor variables. We will discuss a series of new insights into backdoor variables sets.

2 - Postoptimality Analysis for Integer Programming Using Binary Decision Diagrams

John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu, Tarik Hadzic

We show how binary decision diagrams (BDDs) can be used to solve and obtain postoptimality analysis for linear and nonlinear integer programming problems. The constraint set corresponds to a unique reduced BDD that represents all feasible or near-optimal solutions, and in which optimal solutions correspond to certain shortest paths. The BDD can be queried in real time for in-depth postoptimality reasoning. We illustrate the analysis on capital budgeting and network reliability problems.

3 - Elimination Algorithm for Integer Binary Inequalities

Chendong Li, Texas Tech University, Compter Science Department, 8th & Boston, Lubbock, TX, 79409, United States of America, chendong.li@ttu.edu, Yuanlin Zhang

The problem of solving inequalities involving two variables has been studied in both the Constraint Programming and the Mathematical Programming community. In this paper, we present a new simple algorithm on solving those inequalities with integer variables. The algorithm is based on the idea of Motzkin Elimination on real variables and a new representation of an inequality.

4 - Detailed Scheduling in ILOG CP Optimizer

Paul Shaw, Constraint Programming R&D, ILOG, 9 rue de Verdun, Gentilly, France, pshaw@ilog.fr, Philippe Laborie, Jerome Rogerie, Petr Vilim

This talk describes the detailed scheduling support in ILOG CP Optimizer. The modeling framework uses interval variables, precedence constraints, sequences and functions to model a wide variety of problems. Automatic search uses various techniques including: the computation of partial order schedules, linear temporal relaxation to guide re-optimization, and machine learning to speed up convergence. The robustness of the approach is illustrated on a large panel of scheduling problems.

■ MB23

M - Lincoln 5

Asymptotic Analysis of Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu

1 - Stability Analysis of Queueing Systems Using Augmented Fluid Models

Tolga Tezcan, Assistant Professor, University of Illinois at Urbana-Champaign, 117 Transportation Bldg., 104 S. Mathews Ave, Urbana, IL, 61801, United States of America, ttezcan@uiuc.edu

In this talk we introduce the concept of augmented fluid models (AFM). AFM's are related but more powerful than traditional fluid models because they can be used to establish the stability of policies that cannot be analyzed using traditional fluid models. We illustrate how AFM's can be used by solving some open problems from the literature. In particular, we focus on N-model systems with multiple servers under static-priority policies and threshold-type policies.

2 - On the Optimality of Chaining for Flexible Retail and Service Systems

Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu, Achal Bassamboo, Jan Van Mieghem

It is known that chained configurations yield good performance. In this talk, we demonstrate that they are in fact optimal in retail and service systems. We provide explicit prescriptions for the optimal configuration of flexibility in inventory systems (newsvendor models). Further, we show that when faced with arrival rate uncertainty and impatient customers, queueing systems reduce to newsvendor models, and thus our results apply to these settings as well.

3 - Global Dual Sourcing: Tailored Base & Surge Allocation to Mexico and China

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Jan Van Mieghem

When designing a global dual sourcing strategy, a firm must determine the average order rates placed to each source since it affects supplier management and cost. We consider a firm that has access to a responsive but expensive source (Mexico) and a cheap but remote source (China). The firm determines an inventory sourcing policy to satisfy random demand. We analyze a base-surge policy, which is simple, used in practice, and captures the classic tradeoff between cost versus responsiveness.

■ MB24

M - Lincoln 6

Recent Advances in Integer Programming

Sponsor: Computing Society
Sponsored Session

Chair: Hans Mitttelmann, Professor, Arizona State University, Box 871804, Tempe, AZ, 85287, United States of America, MITTELMANN@asu.edu

1 - Benchmark Updates in Integer and Nonlinear Programming

Hans Mitttelmann, Professor, Arizona State University, Box 871804, Tempe, AZ, 85287, United States of America, MITTELMANN@asu.edu

Areas in numerical optimization that have seen recent progress include sparse optimization, derivative-free optimization, and mixed integer programming. Software in the latter area has reached the most mature state and it is also needed in a wide variety of applications. The talk will give an overview of the state-of-the-art in mixed integer linear and nonlinear programming covering free and some commercial software. Progress in a few other areas such as SDP/SOCP may also be documented.

2 - Detecting Orbitopal Symmetries

Timo Berthold, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, berthold@zib.de, Marc E. Pfetsch

Symmetries are present in many IP models, but they are usually not desirable, since they derogate the performance of IP-solvers. Symmetries for which blocks of variables encode an assignment structure can be effectively handled with so-called orbitopes. We present an algorithm that detects orbitopal symmetries. It bases on the analysis of the IP's constraint graph. Furthermore, we show that the detection of orbitopal symmetries is as hard as the graph isomorphism problem for bipartite graphs.

3 - Solving Nonconvex MINLPs with LaGO- Current and Future Developments

Stefan Vigerske, Humboldt University Berlin, Department of Mathematics, Unter den Linden 6, Berlin, 10099, Germany, stefan@math.hu-berlin.de

COIN-OR/LaGO implements an extended Branch and Cut algorithm for the solution of block-separable nonconvex mixed-integer nonlinear programs (MINLPs). First, nonconvex terms are underestimated by quadratic terms using a powerful heuristic. Subsequently, nonconvex quadratic terms are convexified. Further, a simple constraint propagation method is applied to reduce variable bounds. Finally, we discuss future developments on integrating LaGOs techniques in the constraint programming framework SCIP.

■ MB25

M - Lincoln 6A

AI and Computing in Counterterrorism

Sponsor: Computing Society
Sponsored Session

Chair: Amy Ding, University of Illinois, IL, United States of America, wxding@uic.edu

1 - Modeling and Simulation Methodology: The Challenge of Complex Endeavors

Bernard Zeigler, Professor, Arizona Center for Integrative Modeling and Simulation, Arizona, Tucson, AZ, 85715, United States of America, zeigler@ece.arizona.edu

Complex Endeavors have been defined as arising when a large group of disparate entities join together to achieve a common goal. Such endeavors pose extreme challenges to current modeling and simulation methodology. In this talk, we review the issues that have been raised and discuss cutting edge approaches and technologies that can help address these challenges.

2 - Representing Social-science Knowledge of Terrorism and Counterterrorism with Qualitative Models

Paul Davis, Principal Researcher, RAND, 1776 Main St., Santa Monica, CA, 90407-2138, United States of America, pdavis@rand.org

Social science has much to say about terrorism, but the form of that knowledge is often not suitable for analysis intended to inform strategy, policy, and operations. This paper describes an approach of qualitative causal modeling that draws heavily upon existing social science, but expresses it in a theoretical framework intended to fill that gap. The methods employed include qualitative modeling, multiresolution modeling, and exploratory analysis.

3 - Identifying Significant Facilitators of Social-network Evolution

Siddharth Kaza, Assistant Professor, Towson University, 8000 York Rd., Room 467, Towson, MD, 21252, United States of America, skaza@towson.edu, Hsinchun Chen, Daning Hu

Social networks evolve over time with the addition and removal of nodes and links to survive and thrive in their environments. In a research partnership with law enforcement agencies, we used dynamic social network analysis methods to examine several plausible link formation facilitators in a large-scale narcotics network consisting of individuals and vehicles.

4 - Modeling the Psychosocial Effects of Terror Threats and its Social Dynamics

Amy Ding, University of Illinois, IL, United States of America, wxding@uic.edu

In the area of information war, information can be used to produce various psychosocial impacts on the society. In this talk, we analyze the working procedure of brain components that are in charge of human memory and decision making. We then use differential dynamics to model how individual generates a response decision when facing a threat and project population-level possible psychosocial consequences.

■ MB26

M - Lincoln 5A

Research Projects That Use Open Source Software

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

1 - DICE: Software for Collaborative Engineering

Suvrajeet Sen, Professor, The Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, sen.22@osu.edu, Shugang Kang, Yunwei Qi

DICE is a collaborative environment which allows a engineers to gain insights into a system by interacting with a data using natural language queries. The software provides a retrospective understanding of the system through its database, and a predictive outlook of the system using modeling and simulation.

2 - Random Number Generators and Open Source

Jiheng Zhang, Georgia Institute of Technology, 765 ferst dr, Atlanta, GA, 30332, United States of America, jrz@gatech.edu

Numerical experiments on stochastic systems normally involves random number generators. The quality of random numbers generated is very important in obtaining accurate insight from numerical results. We discuss some existing random number generators, and present a user friendly and open source package written by the the speaker.

3 - Development of a Supply Chain Design Optimization Tool Using Xpress-Mosel and GLPK

Ricki Ingalls, Associate Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74078, United States of America, ricki.ingalls@okstate.edu, Chinnatat Methapatara, Peerapol Sittivijan, Mario Cornejo

This paper addresses an on-going effort of developing a supply chain modeling tool that combines optimization and simulation. Two different versions of the optimization module are developed, one using Xpress-Mosel and the other one using the open source software GLPK (GNU Linear Programming Kit). This paper discusses the advantages and disadvantages of using a commercial solver such as Xpress-Mosel and an open source solver such as GLPK. It also discusses modeling and execution issues.

4 - Solving the Large Scale Stochastic Programming with Sampling, Decomposition

Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

We will talk about my experience when conducting numerical experiments on solving the large scale stochastic programming with sampling, decomposition, and Monte-carlo simulations. I found the COIN-OR project is quite powerful to handle some operations, such as matrix operations, which are typically completed by commercial packages. We also present a random number generator for selected distributions.

■ MB27

M - Washington 1A

Algorithmic Large Deviations and Sharp Approximations

Sponsor: Applied Probability
Sponsored Session

Chair: Jose Blanchet, Columbia University, ‏500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, jose.blanchet@columbia.edu

1 - Importance Sampling for a Tandem Queue with Server Slowdown

Kevin Leder, Postdoctoral Fellow, Columbia University, 500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, kevinleder@gmail.com, Paul Dupuis, Hui Wang

We consider the problem of estimating buffer overflow probabilities of a queuing system with two queues in tandem where the service rate of the first server slows down when the buffer size of the downstream queue reaches a given threshold. We propose an importance sampling algorithm for estimating these probabilities and show that this algorithm is asymptotically efficient. The construction of our change of measure is based on a PDE approach to importance sampling that is broadly applicable.

2 - Beyond Edgeworth Expansions for Regularly Varying Random Walks

Henry Lam, PhD Student, Harvard University, 1 Oxford St. 7th Floor, Cambridge, MA, 02138, United States of America, khlam@fas.harvard.edu, Jose Blanchet, Martin Bazant, Damian Burch

Edgeworth expansions provide additional correction terms to the Central Limit Theorem up to the highest moment. We provide subsequent correction terms beyond these expansions for regularly varying random walks. Our extra terms can be expressed in terms of the Dawson integral and behave qualitatively different depending on whether the highest moment is odd, even or non-integer. Surprisingly, these terms can blend smoothly with large deviations or not depending on the qualitative behaviors.

3 - Importance Sampling Methodology for Multidimensional Heavy-tailed Random Walks

Jose Blanchet, Columbia University, ‏500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, jose.blanchet@columbia.edu

Estimating small first-passage time probabilities for multidimensional heavy-tailed random walks involves an interesting interplay among the drift, the dependence of the coordinates and the position of a target set. We construct an importance sampling estimator with uniformly bounded coefficient of variation. The construction of our estimator hinges on a Lyapunov inequality that bounds its second moment. Moreover, it involves interesting connections between linear algebra and regular variation.

■ MB28

M - Washington 1

Approximate Dynamic Programming Applications

Cluster: Applied Dynamic Optimization

Invited Session

Chair: Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

1 - Capacity-dependent Bid-prices for Network Revenue Management

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

We develop a method to approximately solve the dynamic programming formulation of the network revenue management problem. Our approach is based on relaxing the constraints that link the decisions for different flight legs. The resulting policy can be interpreted as a capacity-dependent bid-price policy.

2 - A Duality Based Relaxation and Decomposition Approach for Inventory Distribution Systems

Sumit Kunnumkal, Assistant Professor, Indian School of Business, AC 4, Level 1, 4116, Indian School of Business, Hyderabad, AP, 500032, India, sumit_kunnumkal@isb.edu, Huseyin Topaloglu

We present a new method to make the inventory replenishment decisions in a distribution system consisting of multiple retailers and a single warehouse. Our method is based on relaxing the constraints that ensure the nonnegativity of the shipments to the retailers by associating Lagrange multipliers with them. Numerical studies show that our method can provide significant improvements over traditional methods when the balance assumption of Clark and Scarf (1960) is not satisfactory.

3 - Approximate LP for Network Control: Column Generation and Upper Bounds

Michael Veatch, Gordon College, 255 Grapevine Rd, Wenham, MA, 01984, United States of America, mike.veatch@gordon.edu

Approximate linear programming (ALP) bounds average cost for queueing network control problems. Column generation more efficiently solves the dual LP. For certain quadratic approximation architectures, the algorithm is very efficient; examples with 40 queues are approximated. Upper bound methods based on expected Bellman error are discussed.

■ MB29

M - Washington 2

Communicating Your Research to the News Media

Cluster: INFORMS Outreach

Invited Session

Chair: Barry List, Director of Communications, INFORMS, 7240 Parkway Dr., Hanover, MD, 21076, United States of America, barry.list@informs.org

1 - Communicating Your Research to the News Media

Barry List, Director of Communications, INFORMS, 7240 Parkway Dr., Hanover, MD, 21076, United States of America, barry.list@informs.org, Denise Graveline

As an O.R professional, you need to communicate your research with those outside our field; reporters, interviewers, clients, even friends and family. Join media trainer Denise Graveline, who conducts workshops for AAAS, as she discusses why the news media matter in public outreach; the reporter's job; your job as an interviewee; everyday tips for working with reporters; and how to work with your communications office. This program is sponsored by the INFORMS Public Information Committee.

■ MB30

M - Washington 4

Defense Supply Chain Analysis II

Sponsor: Military Applications

Sponsored Session

Chair: Alan Johnson, Associate Professor, Air Force Institute of Tech, Wright-Patterson AFB, Dayton, OH, United States of America, alan.johnson@afit.edu

1 - Return on Investment of Extended Warranties for Material Handling and Construction Equipment

Dan Widdis, Principal Operations Research Analyst, Concurrent Technologies Corporation, 5897 Castleberry Peak Ave, Las Vegas, NV, 89131-2043, United States of America, widdisd@ctc.com, John Dulin

Since 1998, the US Marine Corps Program Manager, Engineering Systems has procured warranties for Material Handling and Construction Equipment. Standard warranties provide direct savings in spares and labor costs, while extended warranties also save transportation costs. In addition, contractor logistics support has demonstrated significant reductions in Repair Cycle Time. Analysis techniques for determining the return on investment of the cost of the extended warranties will be presented.

2 - Aggregating Aircraft Mission Capable Rates to Determine Total Airlift Availability

Bill Cunningham, Professor of Logistics Management, AF Insitute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, william.cunningham@afit.edu, John Johnson, Alan Johnson

We examine the Logistics Balanced Scorecard metrics for aircraft Mission Capable (MC) rates and recommend a MC rate aggregation method for families of aircraft and a method for defining the mission areas of Red, Yellow, and Green stop light standards used by the Air Force. We used an Analytic Hierarchy process to classify aircraft in terms of speed, range, and payload. Capability-weighting factors were developed to enable standardization to a C-17 equivalent.

3 - Future Combat System (FCS) Deployability Analysis

Kaye McKinzie, Principal Analyst, TRADOC Analysis Center, 255 Sedgwick Ave, Fort Leavenworth, KS, United States of America, Kaye.McKinzie@us.army.mil

This analytical work updates previous deployment work with current FCS BCT (FBCT) structure. This analysis compared two Corps one with Future Combat Systems (FCS) Brigade Combat Teams (FBCT) compared to one with heavy BCTs (HBCT) conducting strategic deployment (SD); and operational maneuver from strategic distances (sea) (OMSD) and operational maneuver (air and sea) (OM) of an FBCT compared to an HBCT; and impacts of using transportation assets in 2015 to those that would be available in 2024.

4 - Modeling the C-5 Isochronal Inspection Process

Martha Cooper, Professor of Logistics Management, AF Institute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, Martha.cooper@afit.edu, Ted Heiman, Alan Johnson

Isochronal (ISO) inspections are a periodic examination of military aircraft health. The Air Force plans to streamline ISO flow and reduce the number of C-5 ISO inspection sites from five to three, to reduce cost and promote inspection scheduling predictability. We use an Arena-based simulation and DOE to estimate the expected impacts to cost and fleet mission capability.

■ MB31

M - Washington 5

Joint Session Practice/MAS: Force Management/Personnel Readiness

Sponsor: The Practice Section of INFORMS, Military Applications

Sponsored Session

Chair: Joseph Albert, Computer Laboratory Director/Instructor, MPRI/ Army Force Management School, 5500 21st Street, Bldg 247, Suite 1400, Fort Belvoir, VA, 22060, United States of America, joseph.albert@us.army.mil

1 - Measuring the Impact of Force Generation Policies on Force Size

Steven Stoddard, Operations Research Analyst, Office of the Secretary of Defense, Program Analysis and Evaluation, Land Forces Division, Washington, DC, 20301-1800, United States of America, Steven.Stoddard@osd.mil

To analyze force size and rotation/readiness policies, we employ a method that shows contingency and enduring operations along with a service's force generation policies. We use a graphical frontier to show feasible combinations of events under various force generation policies. Each frontier is a graph of supply

capacity that is constant for any force size and force generation policy. This allows assessment of force size, force generation process, and the range of potential demand scenarios.

2 - Consequence Management (CM) Response Study

Lisa Seymour, Homeland Defense Analyst, OSD, PA&E, SAC, 1225 S Clark Street, Arlington, VA, 22202, United States of America, Lisa.Seymour.Ctr@osd.mil, Thom Ford, Dan Lotz

The DoD is in the process of configuring and sourcing CM response forces. The objective of our study will be to determine the demand (based on effects of the National Planning Scenarios (NPS)) and the supply (capabilities) of the CM response units from DoD and other early responders. Our analysis will evaluate capability gaps or overmatch, where current and projected capabilities fail to meet or exceed projected NPS demands.

3 - A Proposed Multi-agent Framework for Future Global Force Management (GFM)

Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com, Charles H. Shaw, III

Future operations by the US Military Services will require greater collaboration within the government and with the private sector. Commercial enterprises that normally compete with one another will have to cooperate to satisfy the goals of our National Security and Military Strategies in support of the Global War on Terrorism (GWOT) and other operations. Of particular interest is the management of human capital/ personnel which is the focus of a new Global Force Management System (GFMS) and emerging policies, standards, and methods vice existing Military Service and Government Agency centric Personnel Management Systems. This presentation will provide insights into and lessons learned from other "Global" efforts to optimize constrained resources under stochastic conditions with often significant uncertainty across organizations, time and space. A market-based approach currently implemented for constrained supplies and services called the Virtual Personnel Command (VPC) will also be presented using autonomous Software Agents (SWA) to represent the interests of each Service and Agency collaboratively.

4 - Negotiation Mechanisms for Coordinated Unmanned Aerial Vehicle Surveillance

Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com

As the size of unmanned aerial vehicle (UAV) fleets increases in the future, so will the need to coordinate these fleets effectively. In this paper, we define several negotiation mechanisms for autonomous, distributed coordination of surveillance tasks. These mechanisms are based on dynamic target swapping between UAVs, where the criterion for swapping can be greedy or cooperative and where the amount of information shared by UAVs can be relatively high or low. The results show that high-quality system solutions can be obtained through local optimization by individual UAVs. In addition, we show how the rate of convergence to good system solutions can improve given cooperative UAV behavior (adherence to system goals rather than strictly local goals) and greater information sharing.

■ MB32

M - Washington 6

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Managing Inventory in Supply Chains with Non-Stationary Demand

John J. Neale, Boston University School of Management, jneale@bu.edu, Sean P. Willems

Many companies experience nonstationary demand due to product lifecycle effects, seasonality, customer buying patterns, or other factors. We present a practical model for managing inventory in a supply chain facing stochastic, nonstationary demand. Our model is based on the guaranteed service modeling framework. We first describe how inventory levels should adapt to changes in demand at a single stage. We then show how nonstationary demand propagates in a supply chain, allowing us to link stages and apply a multiechelon optimization algorithm originally designed for stationary demand. We describe two successful applications of this model. The first is a strategic project to evaluate the benefits of an inventory pool at Case New Holland (CNH). The second is a tactical implementation to support monthly safety stock planning at Microsoft.

2 - Correcting Heterogeneous & Biased Forecast Error at Intel for Supply Chain Optimization

Matthew P. Manary, Intel Corporation, matthew.manary@intel.com, Alison F. Shihata, Sean P. Willems

Inventory optimization techniques generally require demand characterization be well behaved in error structure. However, imperfections such as bias, heterogeneity, and non-parametric residuals are common in practice. Add in system and organizational complexities that make traditional corrective procedures infeasible and modeling efforts quickly become sub-optimal. This presentation covers techniques and algorithms Intel has developed over several years to counter these common hurdles while working within the reality of corporate dynamics.

■ MB33

M - Johnson

Optimization in Healthcare and Medicine

Sponsor: Health Applications Section
Sponsored Session

Chair: Hari Balasubramanian, Mayo Clinic, Rochester, 200 First St. SW, Rochester, MN, United States of America, Balasubramanian.Hari@mayo.edu

1 - An Applied Example of Operations Research Simulation Modeling Within an Outpatient Procedure Center

Todd Huschka, Health Systems Analyst, Mayo Clinic, 901 1st St. SW, Rochester, MN, 55905, United States of America, huschka.todd@mayo.edu, Bradly Narr, Adam Thompson, Brian Denton

Surgery accounts for a large portion of a hospital's total expenses and revenues. Therefore efficient use of operating rooms and other surgical resources is of great importance. We describe a discrete event simulation model to evaluate a number of scenarios involving the movement and expansion of an outpatient procedure center while attempting to answer some important questions regarding the new environment and how it may impact the operations of this area.

2 - A Capacity Planning Model for Internal Access Within a Large Integrated Academic Practice

Brian Bailey, Operations Research Analyst, Mayo Clinic, 200 1st St. SW, Rochester, MN, 55905, United States of America, bailey.brian@mayo.edu, Hari Balasubramanian

Within an integrated medical practice, appointment capacity is allocated between varying sources of demand. New medical encounters are often booked weeks in advance, whereas internal downstream referrals are requested within a few days. Using actual appointment and resource data from Mayo Clinic of Rochester, we introduce a multi-period planning model to forecast internal demand. The model is being evaluated as a short-range planning tool to assign capacity and minimize schedule changes.

3 - Flexible Shift Scheduling of Medical Residents

Jens Brunner, Technische Universität München, Arcisstrasse 21, München, D-80333, Germany, jens.brunner@wi.tum.de, Jonathan Bard, Rainer Kolisch

This research addresses a shift scheduling problem in which medical residents are assigned to demand periods. We propose a new modeling approach that requires shifts to be generated implicitly. The objective is to minimize the paid out overtime hours under the restrictions given by the labor agreement. Our problem is formulated as a mixed-integer program and solved with CPLEX. Computational results indicate that high quality schedules can be obtained.

4 - Reducing Ward Congestion at Vancouver Island Health Authority Through Improved Surgical Scheduling

Vincent Chow, Operations Research Analyst, British Columbia Cancer Agency, 600 West 10th Avenue, Vancouver, BC, V5Z 4E6, Canada, vchow@bccancer.bc.ca, Neda Salehirad, Derek Atkins, Wenhai Huang, Martin Puterman

This talk describes a significant study carried out at Royal Jubilee Hospital in Victoria BC, Canada involving surgical scheduling and its impact on downstream ward utilization. We developed a portable MS EXCEL based simulation model (BUS) which we combined with an integer program to help surgical planners reduce ward congestion. Results from the project are currently being used within the health authority.

■ MB34

M - Jefferson

Applications in Disease Management

Sponsor: Health Applications Section
Sponsored Session

Chair: Jose Zayas-Castro, Professor & Chair, IMSE, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, Fl, 33620, United States of America, josezaya@eng.usf.edu

1 - Optimizing Screening Strategies for Chronic Diseases from a Dynamic Angle

Marion Rauner, Associate Professor, University of Vienna, Bruennerstr. 72, Vienna, A-1230, Austria, marion.rauner@univie.ac.at, Walter Gutjahr, Joachim Wagner, Joseph Pasia, Kurt Heidenberger

We present a dynamic risk-group oriented chronic disease model embedded within a Pareto Ant Colony Optimization of the policy variables. Policy-makers are provided with Pareto-optimal breast cancer screening schedules for risk groups by considering cost and effectiveness outcomes as well as budget constraints. We then discuss policy implications of 16 mammography screening scenarios varying the screening schedule and the rate of women tested.

2 - Optimal Control of Dosage Decisions in Controlled Ovarian Hyperstimulation

Miao He, Graduate Student, Tsinghua University, Beijing, 100084, China, hem03@mails.tsinghua.edu.cn, Lei Zhao, Warren Powell

We formulate an MDP model for the controlled ovarian hyperstimulation (COH) cycle in the IVF-ET therapy. We then study the impact of misclassification of patients' responsiveness to gonadotropin dosages on their treatment cycle outcomes.

3 - Risk Identification, Assessment, and Monitoring in the Delivery of Health-care Services.

Laila Cure, Graduate Student, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, Fl, 33620, United States of America, lncure@mail.usf.edu, Jose Zayas-Castro, Peter Fabri

Patient safety research evidence the existence of risk beyond patient disease or chronic condition. This risk is intrinsic to the health-care delivery system and it is generally attributed to human error. We believe most incidents stem from substandard interactions of system components. We propose a methodology to combine expertise and near-miss reports to assess and monitor risk in health-care service delivery.

■ MB35

M - Jackson

Panel Discussion: Teaching Modern Project Management - Strategic Issues

Sponsor: INFORM-ED
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Teaching Modern Project Management- Strategic Issues

Moderator: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Panelists: G. Anand Anandalingam, Edward Anderson, Ted Klastorin, George Vairaktarakis

This panel discussion considers several strategic issues related to the teaching of project management, especially for new instructors. These include: whether to teach this course, generating student interest, overview of course design, learning objectives, prerequisite courses, managing students' expectations, students' varied experience levels, and opportunities for synergistic course development (e.g., how a well-designed PM course is related to most other courses in an MBA curriculum).

■ MB37

M - T. Marshall Ballroom West

Tutorial: Is It Really Safe to Fly?

Cluster: Tutorials
Invited Session

Chair: Arnie Barnett, Sloan School of Management, E53-379 MIT, Cambridge, MA, 02139, United States of America, abarnett@mit.edu

1 - Is It Really Safe to Fly?

Arnie Barnett, Sloan School of Management, E53-379 MIT, Cambridge, MA, 02139, United States of America, abarnett@mit.edu

This tutorial investigates how the mortality risk of passenger air travel has evolved over the last half-century. Much of the news is good: fatal air accidents in the First World are on the verge of extinction. But a near-extinct species can stage a major comeback, and I discuss future risks related to airport and midair collisions. I also discuss the menace of aviation terrorism, which might pose considerably greater risk to future air travelers than all other hazards combined.

■ MB38

M - Tyler

Mixed-integer Programming: Strong Formulations and Cuts

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu

1 - Modeling Disjunctive Constraints with a Logarithmic Number of Binary Variables and Constraints

Juan Pablo Vielma, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, gtg531t@mail.gatech.edu, George Nemhauser

For specially structured disjunctive constraints we give sufficient conditions for constructing mixed integer programming (MIP) formulations with a number of binary variables and extra constraints that is logarithmic in the number of terms of the disjunction. Using these conditions we introduce formulations with these characteristics for SOS1, SOS2 constraints and piecewise linear functions. We present computational results showing that they can significantly outperform other MIP formulations.

2 - Generalized MIR Cuts

Jean-Philippe Richard, Assistant Professor, Purdue University, School of Industrial Engineering, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907-2023, United States of America, jprichar@ecn.purdue.edu, Santanu Dey

In this talk, we present a generalization of the MIR procedure so as to generate cutting planes using multiple rows of a simplex tableau. To this end, we study an extension of the simple MIR set with three unstructured constraints that contains two integer and one continuous variable. Using the facet-defining inequalities of this constraints set, a technique is presented to generate valid cutting planes that consider three rows of a simplex tableau simultaneously.

3 - Optimization with Cardinality Constraints: Computational Experience and 0-norm Learning

Silvia Canale, Department of Computer and Systems Sciences, University of Rome "Sapienza", via Ariosto 25, Rome, 00185, Italy, canale@dis.uniroma1.it, Ismael de Farias, Ming Zhao

We present computational experience with branch-and-cut and Lagrangian relaxation to solve large-scale optimization problems with cardinality constraints. In particular, we apply the algorithm to the problem of maximizing sparsity of large-margin classifiers in supervised machine learning.

■ MB39

M - Truman

Message-passing Algorithms and Network Optimizaiton

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Mohsen Bayati, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, bayati@stanfordalumni.org

1 - Message-passing Algorithms for Bounded Depth Steiner Trees

Riccardo Zecchina, Professor, Politecnico di Torino, Corso Duca degli Abruzzi 24, Turin, 10129, Italy, riccardo.zecchina@polito.it, Mohsen Bayati, Christian Borgs, Alfredo Braunstein, Jennifer Chayes, Abolfazl Ramezanpour

The Minimum Weight Steiner Tree (MST) is a basic optimization problem over networks. Here we discuss a general technique to translate the imposed global connectivity constrain into many local ones that can be analyzed with Belief Propagation techniques. This approach leads to a new message-passing algorithm for MST with bounded depth and for its generalizations. We discuss the statistical properties of optimal MSTs on random graphs of various types together with some benchmark examples.

2 - Message Passing Algorithms for Stochastic Loss Networks

Kyomin Jung, MIT, 77 Massachusetts Ave, Cambridge, MA, 02139, United States of America, kmjung@mit.edu, Mayank Sharma, Mark Squillante, Yingdong Lu, Devavrat Shah

We proposes a novel message passing algorithm for estimating the stationary loss probabilities in stochastic loss networks based on structural properties of the exact stationary distribution. We show it converges to asymptotically exact results. Using a variational characterization of the stationary distribution, an alternative proof is provided for an important result due to Kelly. We determine structural properties of the inverse Erlang function characterizing the region of capacities.

3 - Random Matchings in Forests with Given Marginals

Arash Asadpour, Stanford University, Terman Engineering Building, Room 395, Stanford, CA, 94305, United States of America, asadpour@stanford.edu, Amin Saberi

In this work, we propose a message passing algorithm to sample matchings in a forest when the marginal probability of every edge is given. We study the properties of final probability distribution made by this method and show that it in fact is a distribution which maximizes the entropy. We show how this method can be used as a crucial part in designing an approximation algorithm for a seemingly irrelevant resource allocation problem.

4 - Belief Propagation and Linear Programming

Mohsen Bayati, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, bayati@stanfordalumni.org, Christian Borgs, Jennifer Chayes, Riccardo Zecchina

Belief propagation (BP) is an iterative, message-passing algorithm for making inference in graphical models. We study the relationship between the convergence and correcness of the BP and integrality of linear programming (LP) in the context of combinatorial optimizaiton problems. We show some theoretical results which shed more light on this often noted but poorly understood connection.

■ MB40

M - Taylor

Stochastic Programming Models in Operations Management

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Kai Huang, Assistant Professor in Supply Chain Management, Binghamton University, State University of New York, School of Management, Binghamton University, Binghamton, NY, 13902, United States of America, K.Huang@tue.nl

1 - Dominance Constrained Stochastic Programs for Energy System Operation

Ruediger Schultz, Professor, Duisburg-Essen University, Forsthausweg 2, 47057 Duisburg, Duisburg, Germany, schultz@math.uni-duisburg.de

We consider random optimization problems in energy systems operation for which the framework of two-stage stochastic programming is one possible modeling alternative. Rather than optimizing expectations or mean-risk expressions of recourse functionals, we set up models where the recourse functionals occur within stochastic dominance constraints. We analyze these models, propose decomposition algorithms for their numerical treatment, and conclude with computational results.

2 - Oil Supply to Nepal- Steady State Inventory

Stein W. Wallace, Professor, Molde University College, PO Box 2110, Molde, 6402, Norway, Stein.W.Wallace@himolde.no, Biju Kumar Thapalia

We present a two-stage stochastic programming model for analyzing the steady state of inventory control in oil supply to Nepal. The focus will be on how we formulate this infinite horizon problem as a two-stage program.

3 - Cost Minimization of Assemble-to-order Systems via Stochastic Programming

Kai Huang, Assistant Professor in Supply Chain Management, Binghamton University, State University of New York, School of Management, Binghamton University, Binghamton, NY, 13902, United States of America, K.Huang@tue.nl, Ton de Kok

We develop a two-stage stochastic integer programming model for joint optimization of base stock levels and component allocation in Assemble-To-Order systems. This model is based on the concept of "matching" between supply and assembly of components, and counts the inventory holding cost and order backlogging cost accurately. The algorithm design is discussed.

■ MB41

M - Taft

Collaboration Challenges in NPD

Cluster: New Product Development
Invited Session

Chair: Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu

1 - Hogging the Credit and Assigning Blame: The Role of Outcomes & Nature of Group Task

Sanjiv Erat, University of California at San Diego, serat@ucsd.edu

The old adage that "success has many fathers while failure is an orphan" is one proposition that not many managers would disagree with. Still, the empirical studies that have tested this proposition, have found evidence for it mixed. In this paper, I shall analytically develop and empirically test a set of propositions that link the nature of the group task and the task outcome to the degree to which each group member claims credit for success (or assigns blame for failure).

2 - Being Different or Being Better? Vertical Individualism Facilitates Creative Idea Generation

Jack Goncalo, Cornell University, Ithaca, NY, United States of America, jag97@cornell.edu

Recent research suggests that individualism facilitates creativity in groups. However, there are two types of individualism (1) vertical which promotes competition and (2) horizontal which promotes equality and no research to investigate whether one form of individualism stimulates greater creativity than the other. The results of an experiment show that VI facilitates the expression of creative ideas and that group creativity requires not just independence but also competition.

3 - Coordination and Performance of Engineers in New Product Innovation

Bilal Gokpinar, Assistant Professor, University College London, Management Science and Innovation, London, WC1E 6BT, United Kingdom, bilal@northwestern.edu, Seyed Iravani, Wallace Hopp

In this empirical study, we investigate the role of organizational networks in new product innovation. Our results suggest that design engineers who have more coordination links to their peers perform better, but that it takes longer for them to resolve design issues. We discuss how this insight may help managers improve the design process along both the speed and quality dimensions.

■ MB42

M - McKinley

Joint Session OPTIM/HAS: Medical Decision Making

Sponsor: Optimization/ Medicine and Healthcare, Health Applications Section
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - MINLP Model for Scheduling the Adjuvant Endocrine Therapy for Early Stage Breast Cancer

Sergiy Butenko, Assistant Professor, Texas A&M University, Department of Industrial and Systems Eng, College Station, TX, 77843-3131, United States of America, butenko@tamu.edu, Sera Kahruman, Elif Ulusal, Illya Hicks, Kathleen Diehl

Based on the data available through published trial results, we propose a mixed integer nonlinear programming (MINLP) model in order to find an optimal treatment plan for a given Hr+ early stage breast cancer patient who is postmenopausal. The results of numerical experiments suggest the effectiveness of some of the schedules currently used in practice, as well as indicate some effective alternative treatment plans.

2 - Pattern-based Techniques in Integrative Cancer Genomics

Gabriela Alexe, Research Scientist, The Broad Institute of MIT and Harvard, 7 Cambridge Center, Cambridge, MA, 02142, United States of America, galexe@broad.mit.edu

Integrative cancer genomics is aimed to integrate multiple forms of molecular information for understanding the mechanisms of cancer. This novel type of coordinated research raises strategic challenges in the identification of relevant genomic cancer signatures. We review a framework for integrative cancer genomics which addresses some of these challenges. The proposed approach is rooted in the Logical Analysis of Data methodology initiated by Peter L. Hammer.

3 - Interactive Multiobjective Optimization in Radiotherapy

Kaisa Miettinen, Professor, University of Jyvaskyla, Department of Math Inf Tech, PO Box 35 (Agora), University of Jyvaskyla, FI-40014, Finland, kaisa.miettinen@jyu.fi, Henri Ruotsalainen

In radiotherapy, conflicting goals, i.e. treating a tumor with radiation without irradiating healthy tissue, cannot be satisfied simultaneously. We employ interactive multiobjective optimization to avoid specifying more or less artificial weights or penalties and trial-and-error planning. In our approach, a treatment planner can utilize one's expertise and direct the solution process interactively to find the best treatment plan. We report encouraging results in both IMRT and brachytherapy.

■ MB43

M - Balcony D

Information Sharing for Managing Disruptions

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Mitigate Supply Interruption Risk by Sharing Information and Using Coordinating Contract

Zhaolin Li, Assistant Professor, City University of Hong Kong, P7620, 83 Tat Chee Avenue, Hong Kong, Hong Kong - China, zherli@cityu.edu.hk

We consider a one-supplier-one-retailer inventory system with random supply interruption, fixed upstream setup cost, lost sales, and stochastic demand. We show that the optimal policy for the retailer is a (s,S) policy. We propose a coordinating contract that coordinates the system (the retailer's optimal (s,S) policy is the same as the system optimum). We then perform a sensitivity analysis on contract parameters to see how various cost parameters may affect the channel performance.

2 - A General Framework for Cooperation under Uncertainty

Ulas Ozen, Researcher, Bell Labs Ireland, Alcatel-Lucent, Alcatel-Lucent, Blanchardstown Industrial Park, Dublin, 15, Ireland, uozen@alcatel-lucent.com, Henk Norde, Marco Slikker

In this paper, we introduce a general framework for situations with decision making under uncertainty and cooperation possibilities. This framework is based upon a two stage stochastic programming approach. We show that under relatively mild assumptions the cooperative games associated with these situations are totally balanced and, hence, have non-empty cores. Finally, we consider several example situations, which can be studied using this general framework.

3 - Revenue Sharing Contract in Supply Chain under Asymmetry Information and Disruptions

Pin Zhuang, Nanjing University of Aeronautics and Astronautics, 29 Yudao Street, Nanjing, 210016, China, zhuang-pin@163.com

Revenue sharing contracts for a two-level supply chain model under asymmetric information and disruptions are investigated. With non-linear demand and the retailer's cost asymmetric information, a revenue sharing contract is proposed in a regular scenario. After retailer's cost is disrupted, we obtain the optimal emergency strategies of supply chain by considering deviation cost. We illustrate the results by numerical examples.

4 - Supply Chain Efficiency with Downside Risk-averse Agents

Sudarsan Rangan, The University of Alabama, ISM Department Box 870226, Tuscaloosa, AL, 35487, United States of America, srangan@cba.ua.edu, Charles Sox

We consider supply chains with one or more downside risk-averse agents. The downside risk-averse supplier is the Stackelberg leader in the decentralized chain and designs the "optimal" contract parameters. We compare the performance of this decentralized contract with channel performance under two centralized coordinating contracts: coordinating contracts with and without consideration of agent risk perspectives.

■ MB44

M - Balcony C

Risk-Informed Pricing and Sourcing

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Metin Cakanyildirim, University of Texas at Dallas, School of Management SM 30, Richardson, TX, United States of America, metin@utdallas.edu

1 - Sourcing and Pricing Strategies under Capacity Uncertainties

Qi Feng, Assistant Professor, The University of Texas at Austin, 1 University Station, B6500, Austin, TX, 78712, United States of America, Annabelle.Feng@mccombs.utexas.edu

We examine simultaneous ordering and pricing decisions in a periodic review inventory system with random supply capacities. We show that there is a reorder point for each of the suppliers. The reorder points are in the increasing order of the procurement costs, indicating that cost consideration dominates the risk consideration in the sourcing decision. Additional insights of the problem are also obtained by discussing several special applications of the problem.

2 - A Two-period Newsvendor Problem with Production Cost Learning

He Xiuli, Visiting Assistant Professor, School of Management, University of Texas at Dallas, Richardson, 75083, United States of America, xiulihe@utdallas.edu, Suresh Sethi

We consider a supply chain with a manufacturer and a retailer who faces demand uncertainty. We adopt a price-dependent newsvendor model which takes the multiplicative form. We assume that the manufacturer can reduce the per unit product cost in the second period as a result of accumulated production experience in economy of scale. The retailer decides a retail price and an order quantity prior to facing random demand in each period. We consider two cases: a myopic and a far-sighted retailer.

3 - Pricing Services with Strategic Customers

Pengfei Guo, Hong Kong Polytechnic University, Kowloon, Hong Kong - China, lgtpguo@polyu.edu.hk, Yulan Wang

The paper studies a two-period pricing game in a single-server service system. We assume two types of servers: one is to maximize its revenue and the other is to maximize the social welfare. Then we consider both myopic and strategic customers and derive the subgame perfect Nash equilibrium (SPNE) prices. We evaluate the impact on the system's performance measures of misunderstanding strategic customers to be myopic and myopic customers to be strategic by decision makers.

4 - Optimal Transshipments and Orders: A Tale of Two Retailers in Competition

Metin Cakanyildirim, University of Texas at Dallas, School of Management SM 30, Richardson, TX, United States of America, metin@utdallas.edu, Nagihan Comez, Kathryn E. Stecke

Consider a decentralized system of retailers that order/sell the same product. When a customer demand occurs at a stocked-out retailer, that retailer can request a unit to be transshipped from the other retailer. If this request is rejected, the unsatisfied customer can go to the other retailer with a demand overflow probability. Each retailer maximizing own profit makes two types of decisions: initially the order quantity from a manufacturer and afterwards transshipment decisions.

■ MB45

M - Balcony B

Biopharmaceutical Supply Chain Optimization

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Max Shen, Professor, UC Berkeley, IEOR, Berkeley, CA, 94720, United States of America, shen@ieor.berkeley.edu

1 - An Automated Planning Engine for Biopharmaceutical Production

Rob Leachman, Professor, University of Calif. at Berkeley, 4127 Etcheverry Hall, Berkeley, CA, 94720-1777, United States of America, leachman@ieor.berkeley.edu

This optimization-based production planning system generates capacity-feasible batch processing schedules for the facilities in a biomanufacturing supply chain and an availability schedule for finished product against given demands. It precisely reflects constraints imposed by regulatory approvals, outcomes of quality testing and processing options. Problems with 30,000 binary variables, 150,000 linear variables and 90,000 constraints are automatically formulated and solved within several hours.

2 - Clinical Trial Supply Chains for Biotech Pharmaceuticals

Micah Siegel, Planner, Global Biologics Supply Chain, 133 Airdale Road, Bryn Mawr, PA, 19010, United States of America, MSiegel1@CNTUS.JNJ.COM

Learn about the steps required to provide experimental drug to a patient participating in an investigative study. Discuss risks to supply and demand and ways to mitigate those risks. Discuss OR tactics, software, and innovative supply strategies for improving efficiency and lead times in clinical supply chains.

3 - Planning for Demand Failure: A Dynamic Lot Size Model for Clinical Trial Supply Chains

Adam Fleischhacker, Rutgers University, 180 University Ave #35, Newark, NJ, 07102, United States of America, adam_fleischhacker@yahoo.com, Yao Zhao

How much of a product do you manufacture if demand for that product may disappear? To answer this question, we generalize the Wagner-Whitin (W-W) model to incorporate the risk of disappearing demand. We highlight this model's applicability and relevance to the clinical trial drug supply chain. In addition, we show how to transform this stochastic model into the deterministic W-W model and thus, one can directly apply decades of W-W model results in cases where demand may suddenly cease.

4 - New Drug Development in the Pharmaceutical Industry-A Teaching Game

Shan Li, PhD Candidate, UC Berkeley, IEOR, Berkeley, CA, 94720, United States of America, lisapine@berkeley.edu, Max Shen, Yao Ma

We developed a game to help students understand the complexity involved in selecting which new drugs to develop and how to schedule the production of these drugs. The problem is further complicated with the presence of capacity constraints and the dependencies between drug candidates. The game is also capable of evaluating the performance of several practical decision rules.

■ MB46

M - Balcony A

Product Variety Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Aydin Alptekinoglu, SMU Cox School of Business, Dallas, TX, United States of America, aalp@ufl.edu

1 - Assortment Selection and Pricing for Configurable Products

Betzabe Rodriguez, PhD Student, University of Michigan - Ann Arbor, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, betzabe@umich.edu, Goker Aydin

Consider a retailer selling a configurable product, whose price depends on what option the customer chooses for each feature. We analyze the retailer's option assortment and pricing problem. We utilize a two-stage consumer choice model: The customer first decides whether or not to visit the retailer, followed by the actual purchase decision. We show that options with higher demand uncertainty will be dropped from the assortment and tighter service level goals result in narrower assortments.

2 - An Algorithm and Demand Estimation Procedure for Retail Assortment Optimization

Ramnath Vaidyanathan, PhD Student, The Wharton School, 500 Jon M Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, ramnathv@wharton.upenn.edu, Marshall Fisher

We consider the problem of choosing a subset of SKUs in a category, to be carried by a retailer, to maximize sales or a defined profit function. Assortments can vary by store, subject to a maximum number of different assortments. We describe an approach to estimate demand and substitution parameters from sales history, and propose heuristics to select the optimal assortment. We apply this approach to optimize assortments for two categories, tires and snacks, producing sales lifts of 41% and 36%.

3 - When to Carry Eccentric Products? Optimal Assortment under Product Returns

Alex Grasas, University of Florida, Department of Industrial & Systems, Engineering, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, agrasas@ufl.edu, Elif Akcali, Aydin Alptekinoglu

Motivated with the question of whether retailers should consider product returns when merchandising (as they compose their product lines), we explore the interactions between product assortment and return policy decisions of a firm under both make-to-order (MTO) and make-to-stock (MTS) environments. We show that the structure of the optimal assortment critically depends on the refund fraction and whether the products are supplied on an MTO or MTS basis.

■ MB47

M - Hoover

OR Models for Disease Management

Sponsor: Health Applications Section
Sponsored Session

Chair: Vedat Verter, Associate Professor, McGill University, 1001 Sherbrooke Street W., Montreal, QC, H3A 1G5, Canada, vedat.verter@mcgill.ca

1 - Emergency Room Service Facility Location and Capacity Planning Problem

Elif Akcali, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, akcali@ise.ufl.edu, Chin-I Lin

A hospital may declare divert status, when its emergency room (ER) is full or all intensive care beds are occupied. To a critical patient, this can be the difference between life and death. We present a model that simultaneously determines the number of ER service facilities to be opened as well as their respective locations and capacity levels where the probability that an ER facility declares divert status does not exceed a pre-determined level.

2 - A Partially Observable Model for the Liver Transplant Waiting List

Burhaneddin Sandikci, Assistant Professor, University of Chicago, Graduate School of Business, Chicago, IL, 60637, United States of America, burhaneddin.sandikci@chicagogsb.edu, Mark Roberts, Lisa Maillart, Andrew Schaefer

The liver transplantation system in the United States publishes incomplete information about the composition of the liver transplant waiting list. We model and analyze the accept/reject decision of a liver patient under this incomplete information system as a partially observed Markov decision process (POMDP). We compare the POMDP model to a previous MDP model to obtain more precise estimates of the patient's price of privacy. We present the results of clinically driven numerical experiments.

3 - Radiation Therapy Treatment Decision Making for Prostate Cancer Patients Based on PSA Dynamics

Mariel Lavieri, University of British Columbia, 2053 Main Mall, Vancouver, BC, Canada, Mariel.Lavieri@sauder.ubc.ca, Steven Shechter, Scott Tyldesley, Martin Puterman

In this talk we model the decision of when to start radiation therapy (RT) in prostate cancer patients who are undergoing neoadjuvant hormone therapy. We develop and validate a dynamic Kalman filter model for within patient serial PSA values. Our decision making model trades off the risk of beginning RT too soon so that hormone therapy has not achieved its maximum effect vs. waiting too long to start therapy so that there is an increased risk of tumor cells becoming resistant to the treatment.

4 - Planning for HIV Screening and Treatment at the VA

Sarang Deo, Northwestern University, s-deo@kellogg.northwestern.edu, Kumar Rajaram, Uday Karmarkar

Routine HIV screening has been shown to be cost-effective in a variety of settings and is now recommended by the CDC. However, these studies typically ignore resource constraints at an organizational level that can impede implementation. We formulate a dynamic optimization model combining a disease progression model with a patient flow model under constrained resources. We apply this model to a VA facility and demonstrate the impact of resource constraints on the optimal screening policy.

5 - Designing Antithrombotic Therapy for Stroke Prevention in Atrial Fibrillation

Beste Kucukyazici, McGill University, 1001 Sherbrooke West, Montreal, QC, Canada, beste.kucukyazici@mail.mcgill.ca, Vedat Verter

Randomized trials show that antithrombotic therapy with warfarin reduces the risk of stroke, however it also increases risk of major bleeding. Given the benefits and risks of therapy, decisions are two-fold: initialization of the therapy, and the intensity of warfarin use. Hence, we aim to develop an analytical framework for designing optimal therapy with a patient-centered approach by incorporating complex probabilistic data and permitting explicit quantitative comparison of benefits and risks.

■ MB48

M - Coolidge

Service Innovation

Sponsor: Technology Management
Sponsored Session

Chair: Pedro Oliveira, Assistant Professor, Catholic University of Portugal Palma de Cima, 1649-023 Lisboa, Lisbon, Portugal, poliveira@fcee.ucp.pt

1 - Service Innovation in Manufacturing

John E. Ettlie, Professor, E. Phillip Saunders College of Business, Rochester Institute of Technology, 107 Lomb Memorial Drive,, Rochester, NY, 14623-5608, jettlie@saunders.rit.edu, Stephen Rosenthal

In spite of the dominance of the service sector in developed countries there is little applied research on service innovation. In this longitudinal study of nine significant service innovations in seven manufacturing firms, persistence of the new service concept served as the dependent variable. The new service offering survived for all nine cases, although in two cases the innovation was spun-off as a separate business. Emergent concepts attendant to successful service innovation were organizational philosophy,championship, and multifunctional strategy-making.

2 - Intangible Factors of Service Delivery Readiness

Jillian Davis, PhD Student, Clemson University, Department of Management, 101 Sirrine Hall, Clemson, SC, 29634, United States of America, jilliad@CLEMSON.EDU, Aleda Roth, Janis Miller

We empirically investigate the intangible factors of a new "service delivery readiness," construct, which we define as the capability to perform service delivery requirements across a range of conditions and environments. We model service delivery readiness as a second-order latent construct comprised of three interrelated intangible competencies: employee development, organizational support and customer development. Operational measures of these competencies are presented.

3 - Retail Information Processing and Store Design Strategy: Testing a Model of Alignment

Jeff Shockley, PhD Student, Clemson University, 101 Sirrine Hall, Department of Management, Clemson, SC, 29634, United States of America, tshockl@clemson.edu, Lawrence Fredendall, Aleda Roth

This study examines the operational alignment of delivery system design strategies with the information requirements of retail service encounters. Using survey data from 175 stores in the Southeastern US, we develop and test a model of design strategy coalignment. We find that higher overall employee and customer satisfaction is strongly associated with the retailer's ability to align job and structural design strategies with the information requirements of store service encounters.

4 - The Mediating Role of the Usability Requirements on Electronic Retail Satisfaction

Diogo Gonçalves, Research Assistant, FCEE - Catòlica, Catholic University of Portugal, School of Economics and Management, Lisboa, 1649-023, Portugal, diogo.goncalves@yahoo.com, Pedro Oliveira, Marlene Amorim

We empirically explore the following research questions: what are the main typologies of electronic retail customers according to their psychographic and demographic characteristics? How do these characteristics influence their usability requirements? How do the usability requirements and B2C capabilities influence electronic retail satisfaction and loyalty? We show how the different customer segment's expectations towards the provider's portal vary across their usability requirements.

5 - New Service Development through Lead-Users: An Empirical Investigation

Rosa Eterno, Research Assistant, Catholic University of Portugal, School of Economics and Management, Lisbon, PT, Portugal, rpe@fcee.ucp.pt, Pedro Oliveira, Ana Pòvoa

There is increasing evidence that most new products are developed by users, who then to give ideas to manufacturers. Despite the importance of services, scarce attention has been paid to the study of service innovation through lead-users. This research attempts to fill that gap. We empirically investigate (using data from a large Portuguese service company) the extent to which users can be sources of ideas for new services, the antecedents that influence innovation and the implications of such practices for the company.

■ MB49

M - Harding

Tutorial on Agent-based Modeling and Simulation

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Charles Macal, Senior Systems Engineer, Argonne National Laboratory, 9700 S. Cass Ave., Decision & Information Sciences Division, Argonne, IL, 60439, United States of America, macal@anl.gov

1 - Tutorial on Agent-based Modeling and Simulation

Charles Macal, Senior Systems Engineer, Argonne National Laboratory, 9700 S. Cass Ave., Decision & Information Sciences Division, Argonne, IL, 60439, United States of America, macal@anl.gov, Michael North

Agent-based modeling and simulation (ABMS) is a new approach to modeling systems comprised of autonomous, interacting agents. Complex adaptive systems, emergent behavior, and self-organization are a few of the notions from ABMS. Applications are growing rapidly in fields ranging from modeling the stock market to predicting the spread of epidemics. This tutorial covers the foundations of ABMS, development toolkits and methods, practical aspects, and the relationship of ABMS to conventional OR.

■ MB50

M - Wilson C

Computational Integer Programming II

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Yan Xu, SAS Institute Inc., SAS Campus Drive, Cary, NC, 27519, United States of America, Yan.Xu@sas.com

1 - Implementation and Evaluation of Separation Algorithms Based on Mixed Integer Rows

Philipp Christophel, DS&OR Lab, University of Paderborn, Warburgerstr. 100, Paderborn, 33098, Germany, christophel@dsor.de, Uwe Suhl, Leena Suhl

Cutting plane separation algorithms are an important part of modern mixed integer programming (MIP) solvers. For generating cutting planes from the rows of the constraint matrix three separation algorithms are usually implemented: aggregated c-MIR cuts, flow cover cuts and flow path cuts. In this talk we give some details about the implementation of these algorithms, show alternatives and extensions to them and evaluate their importance for solving MIP problems.

2 - A New Rule to Branch in the Branch and Bound Algorithm Based on Flatness Information

Ivan Derpich, Doctor, University of Santiago of Chile, Av Ecuador 3769 Estacion Central, Santiago, Chile, iderpich@usach.cl

The rule proposed is related to measures of the integer with, as provided by so called "Flatness theorem". Our selection rule uses that knowledge to define branching priorities on the variables. Computational results with simulated integer problems are presented, as well with multi-knapsack problems. These show savings of about 40% in CPU time, as well in nodes generated in the search tree, and compare favorable with reports to the others standard branching rules.

3 - On Branching on General Hyperplanes for Mixed Integer Programming

Ashutosh Mahajan, Lehigh University, 200 W Packer Ave, Bethelehem, PA, 18015, United States of America, asm4@Lehigh.edu, Ted Ralphs

Most implementations of branch-and-bound method for solving Mixed Integer Programs (MIPs) consider branching on variable-disjunctions only. We consider the problem of selecting more general disjunctions for branching. We study two criteria for selecting best such disjunctions: integer width and maximizing lower bound. We formulate this problem as a MIP and solve it using a standard solver. We report the effects of using these hyperplanes on the size of the tree for some instances.

4 - Lifted Inequalities for 0-1 Mixed Integer Programs: A Computational Study

Amar Narisetty, Purdue University, School of Industrial Engineering,, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907-2023, United States of America, anariset@purdue.edu, George Nemhauser, Jean-Philippe Richard

In this paper we describe five families of strong inequalities for 0-1 MIP problems. We first show how these inequalities can be applied to the simplex tableaux of the LP relaxations of 0-1 MIPs. We then show how these inequalities can be applied to the formulation of 0-1 MIPs and propose different separation algorithms. Finally we present the results of a computational study comparing the performance of these cuts on a family of randomly generated problems.

■ MB51

M - Wilson B

Online Trust and Electronic Commerce

Sponsor: Information Systems
Sponsored Session

Chair: Han Zhang, Associate Professor, Georgia Institute of Technology, 800 West Peachtree Street, NW, Atlanta, GA, 30308, United States of America, Han.Zhang@mgt.gatech.edu

1 - Understanding the Impact of Brand Equity in Electronic Markets: An Empirical Investigation

Wenjing Duan, Assistant Professor, The George Washington University, Washington, DC, 20052, United States of America, wduan@gwu.edu, Mark Parry, Qing Cao

This study examines the impact of brand equity in electronic markets. On the one hand, it helps establish brand name more quickly, therefore making the impact of brand equity stronger. On the other hand, it provides more information about unknown (niche) products, thus helping the sales of more unpopular brands. Using a panel data from CNET.com, we document the extent to which brand equity influence consumers product choices on the Internet.

2 - Don't Ask My Personal Information Too Much: Consumer's Personal Information Disclosure Behavior on the Web

Dan Kim, Associate Professor, University of Houston - Clear Lake, 2700 Bay Area Blvd, Houston, TX, 77058, United States of America, KimDan@UHCL.edu

The present study proposes a research framework including factors which affect an Internet consumer's personal information disclosure decision. Drawing upon previous literature, we adopt three factors (i.e., Consumer Trust, Perceived Value, and Perceived Risk) affecting the decision. Along with these three factors, we propose another cost factor (i.e., Perceived Irksomeness) which is accompanied by the labor of filling in or typing in personal information.

3 - Trust-Or-Not: Exploring the Dark Side of Trust in Electronic Commerce

Dezhi Yin, Doctoral Student, Georgia Institute of Technology, 800 West Peachtree Street, NW, Atlanta, GA, 30308, United States of America, Dezhi.Yin@mgt.gatech.edu, Han Zhang, Samuel Bond

Building trust has become one of the most vital issues in e-commerce. Unfortunately, most prior papers focus on the trust-enhancing mechanisms, overlooking the trust-destroying ones. Based on prior literature, we define the distrust concept, argue for its separable role from trust, and build a framework to reveal their distinct fundamental structures. We point out the potential problems of conceptualizing/measuring trust previously, and provide a new exciting perspective for future research.

■ MB52

M - Wilson A

Pricing and Contracting in Closed-Loop Supply Chains

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Jonathan Linton, Power Corporation Professor, Universit of Ottawa, 55 Laurier Street, Ottawa, ON, Canada, linton@telfer.uottawa.ca

1 - Impact of Refill Shops on Cartridge Business

Deniz Ozdemir, Professor, Universidad Autonoma de Nuevo Leon, Graduate Program in Systems Engineering, San Nicolas de los Garza, 66420, Mexico, deniz@yalma.fime.uanl.mx, Xachitl Aquiahuatl

The operational impact of refill shops on the original printer cartridge manufacturer is studied. We consider consumer concerns as depreciated satisfaction for the products of recovery shop. A mathematical model is developed to analyze the impact of price and collection effort of the original manufacturer on collection and recovery activities of independent agents. We showed that consumer preferences and pricing policy of both parties affect their profits nonlinearly.

2 - Consumers' Willingness to Pay for Recycled Versus New/Conventional

Jonathan Linton, Power Corporation Professor, University of Ottawa, 55 Laurier Street, Ottawa, ON, Canada, linton@telfer.uottawa.ca, Leila Hamzaoui

An empirical study of the willingness to pay for product that contains recycled or reused product is conducted to obtain a better understanding of the factors that positively and negatively influence consumers willingness to purchase recycled/refurbished/remanufactured product instead of new product.

■ MB53

M - Nathan Hale- Wardman Tower

Banking Operations

Sponsor: Financial Services
Sponsored Session

Chair: Mei Xue, Boston College, 350 Fulton Hall, 140 Commonwealth Ave., Chestnut Hill, MA, United States of America, xueme@bc.edu

1 - Why Are the Banks Still Opening Branches? The Impact of On-line Channel on Off-line Channel Capacity

Mei Xue, Boston College, 350 Fulton Hall, 140 Commonwealth Ave., Chestnut Hill, MA, United States of America, xueme@bc.edu, Lorin Hitt, Jun Zhang

In this paper we study the impact of the on-line channel (e.g. Internet banking) on the capacity expansion of a firm's existing off-line channel (e.g. bank branches) with both analytical modeling and empirical study. We first present a dual-channel spatial model and then we test a series of hypotheses regarding service capacity expansion based on the model and related literature. The empirical study finds strong support for the proposed model and mixed results of the alternative explanations.

2 - Staffing Home Equity Lending Operations During a Financial Crisis

Jim Bander, Assistant Vice President, Wells Fargo, 11601 N Black Canyon Hwy, Phoenix, AZ, 85029, United States of America, Jim.Bander@wellsfargo.com

We present a model for simultaneously determining optimal staffing levels and schedules in the face of uncertain sales forecasts, dynamic credit policies, and challenging service level agreements and deadlines. Methodological issues include the integration of forecasting with simulation and optimization. Data management issues include change management and the exchange of information between management, technical staff, and subject matter experts.

3 - Outsourcing Arrangements in Financial Services Operations under Stochastic Staffing Demand

Preetam Basu, University of Connecticut, OPIM Department, 2100 Hillside Road, Storrs, CT, 06269, United States of America, Preetam.Basu@business.uconn.edu

Complementing in-house staffing with outsourcing is an effective strategy in meeting the highly volatile and stochastic demand requirements of financial services operations. Economic implications of the contractual arrangement, in-house employee scheduling constraints and the volatility of demand determine the capacity that is maintained in-house and the proportion of work that is outsourced.

■ MB54

M - Congressional - Wardman Tower

Modeling of Interdependent Power and Networking Infrastructure Systems

Cluster: Risk Security
Invited Session

Chair: Alex Sprintson, Assistant Professor, Texas A&M University, TAMU 3128, College Station, TX, 77843, United States of America, spalex@tamu.edu

1 - Establishing the Link Between Climate Change and the Frequency of Hurricane Landfalls

Roshanak Nateghi, Miss, JHU, 511 Ames, 3400 N Charles, Baltimore, MD, 21218, United States of America, roshanak.nateghi@googlemail.com, Steven Quiring, Seth Guikema

Hurricanes pose significant risk to power systems. Therefore it is of crucial importance to be able to predict their frequency and intensity. The collected data consists of counts of the hurricane landfalls in the Atlantic Coast and Gulf Region of the U.S. One particular challenging aspect of the data is the excess number of zero counts. We develop statistical models for estimating the impact of Climate Change on the frequency and intensity of hurricanes landfalls.

2 - Probabilistic Modeling and Performance Prediction of Power and Water Systems Using Synthetic Cities

Arijit Bagchi, Graduate Student, Texas A&M University, 320 B, Weisenbaker Engg Research Center, Texas A&M University, College Station, TX, 77843, United States of America, abagchi82@neo.tamu.edu, Jacob Torres, Kelly Brumbelow, Seth Guikema, Chanan Singh

Modeling and predicting the performance of interdependent infrastructure systems in order to prepare for and recover from catastrophic events is important for emergency management and resource allocation. This work will show how a synthetic, yet realistically developed city can be used for modeling and evaluating the performance of power and water systems during fire spread events.

3 - Genetic Algorithms for Network Availability Evaluation

Graham Booker, Texas A&M University, MS 3128, College Station, TX, 77843, United States of America, gbooker@tamu.edu, Emily Zechman, Alex Sprintson

In this talk we analyze the availability of backbone communication networks in the presence of multiple links failures. Due to built-in redundancy and protection mechanisms such networks are highly reliable. This makes them difficult to evaluate through traditional means since their failures are comprised of numerous rare events. In this talk we will present efficient availability evaluation methods based on genetic algorithms and show their advantage over traditional Monte-Carlo based methods.

4 - Modeling Impact of Natural Disasters on Power System Reliability Using Markov Cut-Set Approach

Yong Liu, PhD Student, Texas A&M University, Lincoln Ave 313, Apt 134, College Station, TX, 77840, United States of America, liuy0004@neo.tamu.edu, Chanan Singh

In the environment of catastrophic events, such as hurricanes, modeling and evaluation of power system reliability, considering the interdependence with other infrastructure systems, is a challenging task. We are investigating OPF-based Markov Cut Set method to achieve this goal. The proposed approach has been implemented in modified IEEE Reliability Test System. The application cases demonstrate that the proposed method is effective and efficient.

■ MB55

M - Embassy- Wardman Tower

Wireless Networking

Sponsor: Telecommunications
Sponsored Session

Chair: Timothy Matis, Texas Tech University, Department of Industrial Engineering, Lubbock, Tx, United States of America, timothy.matis@ttu.edu

1 - Parallel Optimization Algorithms for the Lifetime Prolonging Design of Wireless Sensor Networks

Hui Lin, Texas A&M University, Industrial and System Engineering, College Station, TX, 77843-3131, United States of America, linhui@tamu.edu, Halit Uster

We present an integrated analytical modeling framework for wireless sensor networks design incorporating topology control and routing decisions. The model attempts to promote energy efficiency with the purpose of prolonging network lifetime.We develop efficient parallel heuristics reinforced with exact methods and cut generations. Computational evidence suggests that such framework and algorithm can provide very good solutions with significantly improved solution times compared to exact methods.

2 - Wireless Ad-hoc Biological Habitat Sensor Networks with Semantic Data Processing

Ivan Guardiola, Assistant Professor, Department of Engineering Management and Systems Engineering University of Missouri S & T, 223 Engineering Management 1870 Miner Ci, Rolla, MO, 65409-0370, United States of America, ivan.guardiola@ttu.edu

In wireless ad-hoc networks often wireless radio transmissions are the most energy costly operation. Hence, in an effort to reduce the overall number of transmissions within such networks a semantic data processing technique is presented. In particular, this research focuses in the identification of animals through Hidden Markov Models in an effort to eliminate useless information and distribute the data processing necessary for identification amongst the sensors node participants.

3 - A MAC-layer Modification to Increase Ad-hoc Network Performance

Aaron Phillips, Texas Tech University, Box 43061, Lubbock, Tx, United States of America, aaron.phillips@ttu.edu

This is a proposed scheme to dynamically modify the Request To Send/Clear To Send mechanism of the MAC-Layer. In this scheme, the retry limit settings are first evaluated for significance, then, through designed experimentation, they are chosen according to their performance at different mobile states. These levels are then combined to create a dynamic mechanism that allows transmitting nodes to adjust their settings based on their own specific mobile states.

4 - On the Development of Dynamic Ad-hoc Protocols

Timothy Matis, Texas Tech University, Department of Industrial Engineering, Lubbock, Tx, United States of America, timothy.matis@ttu.edu

There have been many recent statistical studies examining the influence of environmental factors on the performance of established link and MAC layer protocols. We illustrate many of these and propose new directions towards the development of dynamics adjustments to optimize end-to-end performance measures.

■ MB56

O - Blue Room

Decision Making in Freight Transportation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Richard Chen, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, United States of America, richchen@umich.edu

1 - Scheduling Truckload Shipments with Customer Flexibility

Jonathan Turner, IEMS at Northwestern University, 2145 Sheridan Rd, Evanston, IL, 60201, United States of America, jonathan@northwestern.edu, Soonhui Lee, Karen Smilowitz, Mark Daskin, Tito Homem-de-Mello

A small trucking firm wishes to maintain its delivery rate while reducing its fleet size. While existing scheduling techniques can achieve some of the desired results, we demonstrate that shifting delivery times can achieve even more. To receive a load at an hour different than initially requested customers will require an incentive. Our model schedules delivery of certain and uncertain demand and reduces fleet size while minimizing needed incentives.

2 - Optimal Quoting of Delivery Service in a Price and Time-Sensitive Market

Muhammed Ali Ulku, PhD Candidate, Management Sciences, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, maulku@engmail.uwaterloo.ca, James H. Bookbinder

We consider joint decisions on pricing and shipment-release policies for a transportation provider whose customers are sensitive to both price and delivery-time guarantee. For differential and for uniform pricing schemes, the profit rate is maximized through the choice of length of consolidation period. We also report on optimality structures when there are freight discounts.

3 - An Implicit Bidding Mechanism for Combinatorial Auctions- A Truckload Procurement Example

Richard Chen, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, United States of America, richchen@umich.edu, Amitabh Sinha, Amy Cohn, Damian Beil

We present an implicit bidding mechanism for fully enumerated combinatorial auctions. In our approach, the bidder's bid-generating functions are explicitly embedded within a mathematical program that is used to solve the winner-determination problem. We present extensive computational results for truckload procurement auctions to demonstrate the effectiveness of our approach.

4 - Solving Stochastic Combinatorial Truckload Procurement Auctions in Parallel

Shervin AhmadBeygi, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, United States of America, Shervin@umich.edu, Damian Beil, Amitabh Sinha, Richard Chen, Amy Cohn

We present a stochastic multi-commodity-flow formulation to solve the winner determination problem for combinatorial procurement auctions in which the carrier costs are uncertain. We exploit the problem structure in order to develop a solution approach based on Benders Decomposition which can be implemented within a parallel processing framework to improve the algorithm tractability.

■ MB57

O - Blue Room Prefunction

Green Supply Chains and Operational Excellence

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Lawrence V. Snyder, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, lvs2@lehigh.edu

1 - Extending the Horizons: Green Supply Chains as Driver of Operational Excellence

Charles Corbett, Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Box 951481, Los Angeles, CA, 90095-1481, United States of America, charles.corbett@anderson.ucla.edu

Companies worldwide are increasingly involved in green supply chains. Some companies are proactively encouraging better environmental practices among supply chain partners; other companies are experiencing pressure from customers or regulators. We will review examples of how supply chains in a wide range of sectors are becoming greener. We will see how greener supply chains are often also more profitable, even if these economic benefits can be difficult to predict in advance.

■ MB58

O - Capital

OR for Airlines at AD OPT

Sponsor: Aviation Applications
Sponsored Session

Chair: Norbert Lingaya, Manager of Operational Research, AD OPT, a Kronos division, 3535 Queen Mary Rd., Suite 605, Montreal, QC, H3V 1H8, Canada, Norbert.Lingaya@Kronos.com

1 - Using OR to Enable an Airline's Business Agility

Norbert Lingaya, Manager of Operational Research, AD OPT, a Kronos division, 3535 Queen Mary Rd., Suite 605, Montreal, QC, H3V 1H8, Canada, Norbert.Lingaya@Kronos.com

Traditionally, OR is used to build tools that help Airlines solve their complex combinatorial problems. This talk quickly reviews classic tools (Crew Pairings, Crew Rostering) as well new tools (Ressource Planning, Network Design)and then focuses on a new area meant to enable the Airline's business agility.

2 - Insight into an Airline's Strategic Resource Planning

Dominique Tourillon, AD OPT, a Kronos division, 3535 Queen Mary rd, suite 605, Montreal, QC, H3V 1H8, Canada, dominique.tourillon@kronos.com

In most airlines, strategic resource planning is a lengthy process performed manually or through the use of basic spreadsheets which involves tasks, such as building a training plan and ensuring sufficient crewmembers are qualified to meet forecasted flying and non-flying duties over a multi-year horizon. This presentation provides an overview of how AD OPT's Altitude Insight optimization solution can help airline planners make more informed decisions using a global solving approach.

3 - Local Influence, Global Impact

Remy Gauthier, AD OPT, a Kronos division, 3535 Queen Mary Rd, Suite 605, Montreal, QC, H3V 1H8, Canada, remy.gauthier@kronos.com

Airline carriers face many challenges. Aside from rising fuel costs, crew shortages, and increasingly complex rules and regulations, process re-engineering may be the next area that will influence the success and potential survival of all carriers. This presentation provides a high level view of how we intend to bridge the gap between the various planning silos that exist within airlines, and how small changes in approach can yield large benefits.

4 - The Repair Module - A Solver for Short-Term Planning

Carl Mitchelson, AD OPT, a Kronos division, 3535 Queen Mary Rd, Suite 605, Montreal, QC, H3V 1H8, Canada, Carl.Mitchelson@kronos.com

In the airline industry, some flexible carriers have to adapt their operations to many short-term disturbances to the flight schedule. We present a real-life problem whose objective is to repair at least cost the crewmembers' schedules over an horizon of a few days, given new aircraft routes and the set of modifications to the flight schedule. We focus on the operational constraints that have driven our approach towards solving the crew routes and crew schedules simultaneously.

■ MB59

O - Embassy Room

Revenue Management: Competition and Coordination

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Elodie Adida, Assistant Professor, University of Illinois at Chicago, MIE Department (MC 251) 3025 ERF, 842 W. Taylor St., Chicago, IL, 60607, United States of America, elodie@uic.edu

1 - Generalized Quantity Competition for Multiple Products and Loss of Efficiency

Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu, Jonathan Kluberg

We study quantity competition in oligopoly markets in order to understand when firms produce multiple products under a variety of constraints (i.e., capacity constraints), how "bad" the total profit and welfare in the market can become. We derive bounds that are independent of the constraints but rather depend on the number of firms, their market power and number of products.

2 - Strategic Experimentation in Social Networks

Asu Ozdaglar, MIT, 77 Massachusetts Avenue , 32-D630, Cambridge, MA, 02139, United States of America, asuman@mit.edu, Kostas Bimpikis, Daron Acemoglu

We study a model of strategic experimentation between agents connected through a social network. Each agent combines her private information with observations from her neighborhood to choose an action at every time period. We are interested in identifying structural properties of the network as well as conditions on prior beliefs of the agents about the state of the world that guarantee asymptotic learning, i.e. choosing the optimal action in the limit.

3 - A Stochastic Multiple Leader Stackelberg Model: Analysis, Computation, and Application

Victor de Miguel, Associate Professor, London Business School, Regents Park, London, UK, United Kingdom, avmiguel@london.edu

We study an oligopoly consisting of M leaders and N followers that supply a homogeneous product. Leaders choose their supply levels first, knowing the demand function only in distribution. Followers make their decisions after observing the leader supply levels and the realized demand function. We show the existence and uniqueness of equilibrium, propose a computational approach to find the equilibrium, and apply this framework to model competition in the telecommunication industry.

4 - Role of Capacity in a Joint Inventory Management and Pricing Game

Elodie Adida, Assistant Professor, University of Illinois at Chicago, MIE Department (MC 251) 3025 ERF, 842 W. Taylor St., Chicago, IL, 60607, United States of America, elodie@uic.edu, Georgia Perakis

We study a demand-based pricing and production model where two firms compete over a differentiated substitutable product. The firms are symmetric differing only by their production capacity. We consider both the decentralized Nash equilibrium game and a centrally controlled setting. We study the capacity effects on the firms, compare prices, production levels, profits and loss of efficiency between the firms in the two settings. We design a contract for capacity level decision making.

■ MB60

O - Hampton Room

Generating & Evaluating Railroad Hazardous Materials Routings

Sponsor: Railway Applications
Sponsored Session

Chair: Carl Van Dyke, Partner, Oliver Wyman, 212 Carnegie Center, 3rd Floor, Princeton, NJ, 08540, United States of America, Carl.VanDyke@oliverwyman.com

1 - Transportation Security and Rail Routing

Robert Fronczak, Assistant Vice President Environment & Haz Mat, Association of American Railroads, 50 F Street, N.W., Washington, DC, 20001, United States of America, rfronczak@aar.org

This presentation will discuss requirements in DOT's Pipeline and Hazardous Materials Safety Administration's (PHMSA) interim final rulemaking on rail routing published in April 2008. A risk model being developed to assist in compliance with the PHMSA rulemaking will be discussed as well. The presentation will also cover network operation issues associated with PHMSA's notice of proposed rulemaking on improving the safety of railroad tank car transportation of toxic inhalation hazard materials.

2 - A Comparison of Safety and Security Factors on Alternative Rail Routes

Theodore S. Glickman, Professor, The George Washington University, Decision Sciences Department, 415 Funger Hall, Washington, DC, 20052, United States of America, glickman@gwu.edu, Galen Evans, Ryan Engstrom, Nuala Cowan

The issue of how to route trains carrying highly hazardous materials is examined for a selected case study. Using public information on factors related to safety and security (where the concerns are release accidents and terrorist attacks, respectively), as well as profitability (where the concern is operating costs and revenues), a GIS is applied to a selected shipment scenario in order to evaluate and compare the factors. The implications of the results for risk management are discussed.

3 - Strategies for Rail Hazmat Routing Risk Assessment and Management

Michael Swain, Manager Car Scheduling, CSX Transportation, 500 Water Street, Jacksonville, FL, 32202, United States of America, michael_swain@csx.com, Suneil Kuthiala, Dharma Acharya

In order to comply with new federal regulations pertaining to hazmat car routings and reporting, new risk assessment tools are being developed. The process involved and the role of operations research and rail car movement simulation techniques in addressing the new federal regulations will be discussed.

4 - Hazardous Materials Route Generation and Evaluation

Carl Van Dyke, Partner, Oliver Wyman, 212 Carnegie Center, 3rd Floor, Princeton, NJ, 08540, United States of America, Carl.VanDyke@oliverwyman.com, Paul Stephens, Dave Hunt

New Federal regulations require that all railroads assess the routing of selected HazMat shipments with respect to 27 different attributes. This includes assessing both historic routings and proposed future routes. For future routes, up to 2 alternative routes must also be identified, and the "best" route selected. This talk will explore the algorithms and methods for finding and assessing these alternate routings.

■ MB61

O - Calvert Room

Advances in Dynamic Network Problems

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Avinash Unnikrishnan, University of Texas Austin, avinashu@gmail.com

1 - Multi-resolution Assignment and Loading of Transportation Activities (MALTA)

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Jorge Villalobos, Pitu Mirchandani

MALTA is a temporally and spatially scalable dynamic vehicular traffic simulation and assignment model that is based on network partitioning concepts and techniques for both mesoscopic traffic simulation and time-dependent shortest path algorithms. In this talk we present the overall model structure and the numerical experiment results on a test urban traffic network.

2 - System Optimal and User Equilibrium in CTM-based DTA

Georgios Kalafatas, Purdue University, United States of America, gkalafat@purdue.edu, Srinivas Peeta

The two most widely used traffic assignment objectives, the SO and the UE, have been recently modeled in CTM-based DTA model. In our research, we interpret the SO and UE routing patterns from a graph theoretic perspective by using the Graph Theoretic CTM (GT-CTM). Theoretical and practical insights are drawn for different traffic density conditions for the single destination DTA case.

3 - Inferring Link Flows Using Partial Flow Information: A Strategic Vehicle Sensor Deployment Approach

Srinivas Peeta, peeta@purdue.edu, Shou-Ren Hu

Current studies generally assume that full scale link traffic flow information is available for development of relevant traffic management strategies. However, such assumptions are unrealistic due to budgetary limitations of highway management agencies. We develop a basis approach to strategically deploy vehicle sensors so that link flows can be determined using information collected by some sensors. Numerical analysis is conducted to verify the merits of this approach.

■ MB62

O - Governor's Boardroom

Behavioral Models in Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

1 - On the Value of Psychological Elation and Disappointment Effects on Capacity and Pricing Decisions

Qian Liu, HKUST, Hong Kong - China, qianliu@ust.hk, Stephen Shum

We apply a model of disappointment proposed by Bell (1985) to customers' purchase decisions; that is, besides the economic payoff, customers also consider their psychlogical satisfaction into their decision making under uncertainty. We examine how such psychological satisfaction affects a firm's capacity and pricing decisions. The results are quite different from those under conventional expected utility theory.

2 - Pricing Access Services and Warranties

Ozge Sahin, University of Michigan, ozge@bus.umich.edu, Guillermo Gallego

We consider how consumer's uncertainty in the valuations and the amount they will consume impact the demand over time and how the firm can exploit consumer's uncertainty in pricing decisions. We investigate the optimal structure of the contracts that a firm should offer in industries that charge access fees to consumers. We provide guidelines on pricing access services and warranties if the consumers are facing time inconsistency and have different risk preferences.

3 - Consumer Waiting for End-of-period Discounts: Evidence From a Behavioral Game

Anton Ovchinnikov, Darden School of Business, University of Virginia, 100 Darden Blvd, Charlottesville, VA, 22903, United States of America, ovchinnikova@darden.virginia.edu

This paper presents a behavioral experiment. The seller varies the price to maximize the revenue, and the buyers decide to wait for a possible discount or buy early and guarantee the product. We discuss the case where human subjects play as buyers. How do they decide to wait-or-buy? How do subjects learn about the policy of the seller and other buyers? How do they react to the information the seller reveals?What information should the seller reveal? We discuss these and other related questions.

4 - Peer-induced Fairness and Pricing

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu, Teck Ho

We introduce the concept of peer-induced fairness because people have a drive to make social comparisons with their peers. We theoretically analyze and experimentally validate our model. We relate our findings to existing models of fairness and discuss implications for pricing.

■ MB63

O - Congressional B

Production and Manufacturing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Zheng Wang, Associate Professor, School of Automation, Southeast University, 2 Si Pai Lou, Nanjing, 210096, China, wangz@seu.edu.cn

1 - Stability of Time-delayed Queuing Networks

Zheng Wang, Associate Professor, School of Automation, Southeast University, 2 Si Pai Lou, Nanjing, 210096, China, wangz@seu.edu.cn

Networked manufacturing systems (NMS) should be modeled by a time-delayed queueing network (TDQN) instead of usual queueing networks, because the time-delay for material flow cannot be neglected. Stability condition of a TDQN is obtained based on the Lyapunov Theorem, for the situation of non-stationary customer arriving or dispatching processes; and a stabilization algorithm is also proposed. Based on the stability theory of TDQN, the production process of an NMS can be well controlled.

2 - Comparing DRS with APO Strategies in Manufacturing Systems

Li Sun, Graduate Research Assistant, University of Louisville, 305, JB Speed Building, Industrial Engineering Dept, Louisville, KY, 40292, United States of America, l0sun004@gwise.louisville.edu, Mark Spearman, Lijian Chen, Sunderesh Heragu

We compare a dynamic risk-based scheduling (DRS) strategy with the traditional advanced planning optimization (APO) strategy for scheduling the release of orders into a manufacturing system. Simulation and analytical models are used to estimate key performance measures of a manufacturing system processing multiple products under the two strategies. Results from the simulation models match well with those obtained from the analytical models. Often, it is beneficial to use the DRS strategy.

3 - Integrated Manufacturing and Distribution Scheduling

Eray Cakici, University of Arkansas, 4207 Bell Engineering Ctr, Fayetteville, AR, 72701, United States of America, ecakici@uark.edu, Scott Mason, Neil Geismar, John Fowler

We investigate production scheduling and batch delivery in the manufacturing and distribution phases of supply chains. The scheduling problem can be modeled as either parallel machines or a flexible flowshop. Products are delivered in batches by capacitated vehicles to multiple customers. Different inventory holding costs and job priorities are taken into account. Efficient mathematical modeling and near-optimal heuristic approaches are presented for minimizing total weighted completion time.

■ MB64

O - Congressional A

Routing and Logistics

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

1 - Approximations to the Average Length of Vehicle Routing Problems with Time Window Constraints

Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

Using asymptotic properties of vehicle routing problems and the average probability of successfully sequencing a customer with time windows a new expression to estimate VRP distances is developed. The increase in the number of routes when time constraints are added is modeled probabilistically. The approximation proposed is tested in instances with different customer spatial distributions, depot locations and number of customers.

2 - A RAMP Approach for the Facility Location Problem

Dorabela Gamboa, Polytechnic of Porto, ESTGF, Apt. 205, Felgueiras, 4610-156, Portugal, dgamboa@estgf.ipp.pt, Cesar Rego

Dual approaches have proved effective in computing lower bounds and solving a variety of facility location problems (FLP). We examine a dual RAMP algorithm for the uncapacitated FLP and present a computational study on standard and other particularly difficult instances that reveals an extremely good performance.

■ MB65

O - Council Room

Recent Developments in Call Center Staff Planning and Scheduling

Cluster: Scheduling in the Service Industry
Invited Session

Chair: Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu

1 - Arrival Rate Uncertainty and Its Forecasting with Application to Workforce Management

Haipeng Shen, Assistant Professor, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill, NC, 27599, United States of America, haipeng@email.unc.edu

Arrival rates of customers to call centers and other labor-intensive service operations are often random. We investigate statistical techniques for forecasting and updating such rates that account for this uncertainty. Implications for workforce management will also be discussed.

2 - Cross Training in Call Centers with Uncertain Arrivals and Global Service Level Agreements

Tom Robbins, Assistant Professor, East Carolina University, trrobbins@mac.com, Terry Harrison

We consider agent cross-training in call centers where arrival rates are uncertain and the call center is subject to a global service level constraint. We investigate the option of cross training a subset of agents so that they may serve calls from two separate projects, a process we refer to as partial pooling. We find that cross training a modest portion of the staff yields significant benefits.

3 - Real-time Staffing and Rostering of Virtual Call Centers

Matthew Keblis, Assistant Professor, Mays Business School, Texas A&M University, College Station, TX, 77843-4217, United States of America, MKeblis@mays.tamu.edu, Ying Li, William Stein

We present an approach to perform tactical planning in a virtual call center. Our approach combines staffing and rostering into one step, while eliminating scheduling altogether. This enables a more global optimization of the tactical planning problem. Our approach however is about more than simply combining process steps. It also leverages the inherent flexibility of the virtual call center model. A simulation study reveals the financial benefit of our approach.

4 - Intraday Schedule Updating in the Presence of Uncertain (and Corellated) Arrival Rates

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu, Ozgur Ozluk, Robert Saltzman

Agent schedules are typically created several weeks ahead of time. There is significant evidence suggesting that actual call arrival volumes early in day can provide valuable information about the distribution of volumes later in the day. We develop a framework for managers to make optimal intra-day resource adjustment decisions that take into account information that becomes available after the day begins. We also conduct empirical tests to demonstrate the value of this methodology.

■ MB66

O - Cabinet Room

Real-time Algorithms for Plan Adaptation

Cluster: Real-Time Systems
Invited Session

Chair: Stefan Bock, Professor, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, sbock@winfor.de

1 - Active Model Adjustment for Dynamic Decision Making: Generic Approaches and Simulation Experiments

Jörn Schönberger, Dr., University of Bremen, Bremen, Germany, jsb@uni-bremen.de, Herbert Kopfer

In a dynamic decision problem, once made decisions require revision or confirmation after the considered decision situation has changed. Rolling horizon planning consecutively re-solves a mathematical model and the model is updated reactively driven only by the changed problem data. Generic approaches to update the decision model actively by exploiting solution evaluation results to adjust parameters in the decision model are presented. The predominance of the active approach is demonstrated.

2 - Real-time Distribution of Perishable Goods Using Past Request Information to Forecast Future Demand

Francesco Ferrucci, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, fferrucci@winfor.de, Stefan Bock, Simon Goertz

This presentation introduces a real-world variant of the Dynamic Vehicle Routing Problem. Here, goods have to be delivered under extreme time pressure because of their high perishability. Thus, the minimization of service time, i.e., the time difference between request arrival and request delivery, has to be integrated into the objective function. A new real-time approach is proposed where forecasted demands are integrated into dynamic tour planning by the generation of artificial requests.

3 - Real-time Control of Long-distance-JiT Mass Manufacturing Processes

Stefan Bock, Professor, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, sbock@winfor.de

Automotive manufacturers tend to force their suppliers to offshore their production systems to low labor cost countries. Although this may reduce their procurement costs substantially, there is a significant increase in distance between manufacturer and supplier which creates the need for sophisticated real-time control systems at the manufacturer site. This presentation proposes a new real-time approach that integrates the scheduling problem of the painting shop into the sequencing problem.

■ MB67

O - Forum Room

Network Design Models

Sponsor: Location Analysis
Sponsored Session

Chair: Lian Qi, Missouri University of Science and Technology, 101 Fulton Hall, Rolla, MO, United States of America, lianqi@mst.edu

1 - A p-Robust Multi-commodity Network Design Model With Disruptions

Peng Peng, PhD Candidate, Lehigh University ISE Department,, 200 W.Packer Ave., Bethlehem, PA, 18015, United States of America, pep206@lehigh.edu, Lawrence V. Snyder

We study a multi-commodity network design problem in which random disruptions are modeled using scenarios. The model makes open/close decisions in the first stage and flow decisions in the second. We consider a bill-of-materials that specifies how input products are combined at each node. We propose a p-robust model which minimizes the nominal cost, while bounding the cost that can occur in each scenario. We also provide insights obtained from computational results.

2 - Facility Location Problems with Multi-level Capacity Restrictions and Flexible Demand

Joseph Geunes, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, geunes@ise.ufl.edu, Chase Rainwater, Edwin Romeijn

We consider a generalization of the capacitated facility location problem where facilities are grouped into sets and a fixed cost is incurred for the procurement of a set of facilities. Each facility set shares an aggregate capacity, and customers allow flexibility in delivery quantity. We discuss various optimization approaches including a decomposition of the problem into efficiently solvable subproblems that can be embedded in a large scale neighborhood search procedure.

3 - Sheltering Network Design and Resource Management Responding to Natural Disasters

Mingzhou Jin, Associate Professor, Mississippi State University, Department of Ind. and Sys. Eng., PO Box 9542, Mississippi State, MS, 39762, United States of America, MJin@ise.msstate.edu

Natural disasters usually have early warnings, which provide opportunities to deliver resources to shelters. We model the sheltering network design and resource management problem as a two-stage stochastic program. In the first stage the locations and capacity of permanent shelters are decided. In the second stage resources are shipped from distribution centers and other sources or from other shelters to the shelters in needs. The model also provides a plan to transport expected evacuees.

4 - Transitional Hydrogen Supply Chain Modeling

Scott Grasman, Associate Professor, Missouri S&T, 230 EMSE, Rolla, MO, 65409, United States of America, grasmans@mst.edu

This presentation highlights research that addresses the need for a viable transition to hydrogen infrastructure (and as a consequence, reduction in supply chain costs). These models attempt to capture the benefits of phased development, while addressing the questions related to early feasible introduction locations, and how the introduction of hydrogen technologies in these locations affects continued introduction of hydrogen technologies on a local, regional, and national basis.

■ MB68

O - Senate Room

Retailing

Sponsor: Marketing Science
Sponsored Session

Chair: Qin Zhang, Assistant Professor of Marketing, University of Texas at Dallas, SM 32, School of Managment, Richardson, TX, 75080, United States of America, zhangq@utdallas.edu

1 - Preference Minorities and the Internet

David Bell, Wharton School, 700 Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, davidb@wharton.upenn.edu, JeongHye Choi

Internet retailing is pervasive yet its value to individual shoppers is largely determined by the local offline context. We examine local customer adoption of a specialized online retailing service (Diapers.com) and find that demand first decreases then increases in the local proportion of customers who are matched to the service. In addition, we document a similar effect at the product level and compare the Internet demand patterns for nationally branded and specialty producuts.

2 - An Empirical Investigation of the Impact of Rapidly Increasing Gasoline Prices on Consumers Shopping

Yu Ma, Assistant Professor, University of Alberta, Business Building 4-30G, Edmonton, AB, T6G2R6, Canada, yu.ma@ualberta.ca, Dhruv Grewal, Dinesh Gauri

We obtain a Neilson panel data in Chicago area for two years (2006-2007), which tracks hundreds of shoppers' store visits and purchases in all major product categories. We then match a chronological Chicago gasoline prices data to the panel data by time. We document the impact of the increasing gasoline prices on consumer's shopping behavior, and explore potential solutions that can minimize the negative impact to the retailing industry.

3 - Too Close to be Similar: Product and Price Competition in Retail Gasoline Markets

P.B. (Seethu) Seetharaman, Professor of Marketing, Rice University, Jesse H. Jones Grad School of Management, McNair Hall, MS 531, Houston, TX, 77252, United States of America, seethu@rice.edu

We examine product and pricing decisions of retail gasoline stations. We analytically show that closely located retailers who face sufficient income dispersion across consumers in a local market will differentiate on product design and pricing strategies. Using empirical survey data on prices and characteristics representing 724 gasoline stations in St. Louis, and employing a multivariate logit model, we find strong support for the central implications of the theory.

4 - Store Loyalty as a Category-specific Trait C- What Drives It?

Qin Zhang, Assistant Professor of Marketing, University of Texas at Dallas, SM 32, School of Managment, Richardson, TX, 75080, United States of America, zhangq@utdallas.edu, Manish Gangwar, P.B. (Seethu) Seetharaman

The literature on store loyalty views a consumer as possessing store loyalty to a particular store for their overall grocery shopping needs. In this study, we show that store loyalty is a category-specific trait of a consumer instead. We call it Store-Category Loyalty (SCL). We propose a model to investigate the factors that can potentially affect a consumer's SCL. We estimate the model using purchase data of 1321 households across 288 grocery categories and 16 stores.

Interactive Session

■ Monday, 12:30pm - 1:30pm

Exhibit Hall

Chair: Pablo Durango-Cohen, Associate Professor, Northwestern University, 2145 Sheridan Road, Evanston, IL, United States of America, pdc@northwestern.edu

1 - A Study on Heuristics Routing and Seed Grouping Algorithm

Omer Faruk Baykoc, Gazi University, Maltepe, 06570, Ankara, Turkey, baykoc@gazi.edu.tr, Zelal Denli

In this study, execution of five various heuristics routings on order groups made up by seed algorithm has been carried out, as a result the best yielding strategy has been selected out of heuristics routing. As grouping strategy, heuristics seed algorithm which keeps the computerized process time shorter has been selected and whereupon heuristics routing strategies which are return, S-shaped, largest gap, composite and combined have been executed and average route distances have been evaluated.

2 - Dynamic Discrete Disaster Decision Simulation System (D4S2)

Shengnan Wu, Research Assistant, University of Pittsburgh, 1048 Benedum Hall, Industrial Engineering, Pittsburgh, PA, 15261, United States of America, SHW14@pitt.edu, Larry Shuman, Bopaya Bidanda, Matthew Kelley, Oleg Prokopyev, Ken Sochats, Carey Balaban

We have built a hybrid simulator (i.e., contains both agent-based and discrete event components) to assess the performance of disaster response systems. This rare-event simulation model has been validated in different manners. We also have developed an efficient, dynamic simulation optimization procedure to quickly locate good solutions for real time decision making during disasters.

3 - A Center for Innovation in Logistics Systems (CILS)

Greg Parlier, Senior Systems Analyst, SAIC, 6723 Odyssey Drive, Huntsville, AL, 35806, United States of America, GREG.H.PARLIER@saic.com

Fully engaged in the Global War on Terror, the US Army is also committed to a comprehensive and ambitious "Transformation" endeavor. An "analytical architecture" is presenred consisting of four complementary modeling approaches collectively referred to as Dynamic Strategic Logistics Planning. An organizational construct is presented to accelerate and sustain continual improvement for Army logistics and supply chain management - a "Center for Innovation in Logistics Systems".

4 - Freight Movement Model for Oklahoma: Methodology and Applications

Sandeep Srivathsan, Graduate Research Assistant, Oklahoma State University, 502 Engineering North, Stillwater, OK, 74078, United States of America, sandeep.srivathsan@okstate.edu, Guoqiang Shen, Charu Ojha, Saniye Aydin, Peerapol Sittivijan, Manjunath Kamath

We present a comprehensive methodology for predicting the flow of commodities by various modes into, out of, through and within the state (of Oklahoma). We outline various approaches that could be used for assigning freight flows to links in the transportation network (e.g. highway network). We also discuss how the Freight Movement Model could play a key role in infrastructure planning activities within the state by predicting freight flow patterns and supporting scenario analysis.

5 - What is Location Information Really Worth? A Competitive Analysis of the On-line TSP

F. Jordan Srour, PhD Candidate, Rotterdam School of Management, Erasmus University, Burg. Oudlaan 50, Rotterdam, 3062 PA, Netherlands, jsrour@rsm.nl, Rob Zuidwijk, Steef van de Velde

In studying a variant of the on-line TSP with release dates, characterized by the disclosure of a city's location at one point in time followed by the disclosure of that city's release date at a later point in time (yet in advance of the actual release date), we conclude that in certain scenarios advanced location information alone can yield an optimal solution.

6 - Contracts and Discounting Decisions

Kiran Panchamgam, PhD Candidate, Robert H. Smith School of Business, University of Maryland College Park, College Park, MD, 20742, United States of America, kpancham@rhsmith.umd.edu, Itir Karaesmen

We develop a stylized model with one retailer and one supplier to study the effects of various forms of contracts on the retailer's ordering and markdown pricing decisions, and the supplier's wholesale pricing decisions. Analytical results and are complemented with observations from extensive computational experiments.

7 - Cournot Competition in Power Markets under Uncertainty

Pavee Siriruk, Graduate Student, Auburn University, 420 N Dean Rd APT 222, Auburn, AL, 36830, United States of America, oatkum2@hotmail.com

Several oligopoly models have been proposed for representing strategic behavior in deregulated electricity markets, notable among which is Cournot model. The goal of this research is to provide analytical models, procedures based on generation system and load data for representing oligopoly. Specifically, uncertainty factors as well as their sensitivity analysis will be considered and show their effects on the market prices.

8 - Transdisciplinarity in Decision Sciences: A Discourse on Polymath-Renaissance Man Methodology

Orhan Guvenen, Professor/Institute Director, Bilkent University, INWOSEC, Ankara, TR, Turkey, gorhan@bilkent.edu.tr, Murat Hakan Ozturk

In the recent century, through the developments of analytical methods in Decision Sciences, reductive subset analysis has emerged as a main challenge in the analysis of socio-economic phenomena. In this study, we are going to explore the integrated fallicies in the theory of decision sciences ranging from information distortion to rationality concept.

9 - A Tolerance Design of Mixture Components with External Variables Using Response Surface Methods

Seong-Jun Kim, Kangnung National University, Department of Industrial and Systems Eng, Kangnung, Korea, Republic of, sjkim@kangnung.ac.kr, Jong-In Park, Myong K. (MK) Jeong

Performance variations in mixture products such as medicine, chemicals, and alloys can be caused by their components. To determine appropriate mixture tolerances is essential in maintaining the product quality. This paper proposes a new approach to finding optimum tolerances of mixture components. We use response surface methods for empirical modeling and investigating effects of external variables. Our technique is illustrated by example of a lithium-ion rechargeable battery design.

10 - Optimal Replenishment Policies with Inaccurate Information in Newsvendor Models

Lihui Bai, Assitant Professor, Valparaiso University, 1909 Chapel Drive, College of Business Administration, Valparaiso, IN, 46383, United States of America, lihui.bai@valpo.edu, Joseph Szmerekovsky, Jiang Zhang

Retailers may face ineffective store shelves replenishment, misplacement of store inventory, or inaccurate point of sale date, thus they could have inaccurate inventory or demand information when making inventory replenishment decisions. We develop a Newsvendor model and provide optimal replenishment policies that maximize the expected profits under various scenarios. Numerical examples show that the proposed policies are as simple as heuristics in the literature and are superior.

11 - Methodology and Implementation of Value-at-Risk Measures in Emerging Fixed-Income Markets with Infrequency

Gonzalo Cortazar, Professor, P. Universidad Catolica de Chile, Vicuna Mackenna 4860, Santiago, Chile, gcortaza@ing.puc.cl, Diether Beuermann, Alejandro Bernales

This paper proposes and implements a methodology to calculate Value-at-Risk (VaR) measures on fixed income portfolios with low frequency of transactions which make these risk measures difficult to calculate. We provide an empirical implementation of the methodology for the Chilean fixed income market. The proposed methodology seems to provide reliable VaR measures for thinly traded markets addressing an important issue for financial risk management in emerging markets.

12 - Determining Optimal Schedule Requirements for Green Hotel Renovations

Cara Dienes, PhD Student, Iowa State University, 3013 Black Engineering, Ames, IA, 50011, United States of America, cdienes@iastate.edu, Lizhi Wang, Zhaoyang Duan

With growing interest in green buildings and the need for renovations in the hospitality industry, there is potential for hotels to initiate green renovations of their structures. We use mixed integer programming to incorporate guest room renovation scheduling with revenue management to assist hotels in determining optimal scheduling requirements.

13 - Optimal Multiple Hostages Rescue Problem

Mong Shan Ee, Assistant Professor, University of Nottingham Malaysia Campus, Nottingham University Business School, Jalan Broga, Semenyih, 43500, Malaysia, Mong-Shan.EE@nottingham.edu.my, Seizo Ikuta, Fengbo Shi

This paper proposes a mathematical model for optimal multiple hostages rescue problem. The objective is to minimize the probability of a given number or more hostages being killed, where the given number is determined as the policy of the person in charge of the crisis.

14 - Operational Supply Chain Modelling in Disaster Response

Abbas Afshar, University of Maryland, 1173 Glenn Martin Hall, college park, md, 20742, United States of America, afshar@umd.edu, Masoud Hamedi, Ali Haghani

This research offers a mathematical model that describes the FEMA's supply chain operations in response to natural disasters. The model combines facility location problem, multimodal flow of relief commodities and unconventional vehicle routing with emergency-specific objective function and constraints to support the post-disaster operations of aid agencies.

15 - Improving Health Facility Access in Burkina Faso

Cara Cocking, University of Heidelberg, Department of Computer Science, INF 368, Heidelberg, 69120, Germany, cara.cocking@gmail.com

Using a model of discrete facility location—network design, we improve access to health facilities in Nouna, Burkina Faso. A budget is given for construction, and both facilities and roads may be built, with the goal of minimizing total travel costs. We develop novel solution techniques for this NP-hard problem.

16 - Scirus Topic Pages: New Publication Possibilities for INFORMS Members

Fred Phillips, Professor, Marshall Goldsmith School of Management, Alliant International University (San Diego), and Maastricht School of Management (The Netherlands), Alliant International University Bldg A, 10455 Pomerado Road, San Diego, CA, 92131, United States of America, fphillips@alliant.edu

Elsevier's Scirus is a moderated wiki for encyclopedia-style summaries of scientific topics. The presentation will outline Scirus' possibilities as a scholarly publication outlet. It will compare Scirus with Google's Knol. It will also describe the publisher's efforts to position Scirus as a peer-reviewed outlet that deserves consideration in e.g. university rank promotion decisions. The author is Consulting Editor to Elsevier for the "Management of Technology and Innovation" Scirus Topic Pages.

17 - Airport Gate Assignment: New Model and Implementation

Chendong Li, Texas Tech University, Compter Science Department, 8th & Boston, Lubbock, TX, 79409, United States of America, chendong.li@ttu.edu

In this paper, we study the Airport Gate Assignment Problem (AGAP) and propose a new model, implement it with Optimization Programming language (OPL). We construct experiments with the data obtained from Continental Airlines, Houston Gorge Bush Intercontinental Airport IAH, which demonstrate that our model is both energetic and effective.

18 - Design and Optimization of Runs Rules for Geometric Control Charts

Kamran Paynabar, PhD Pre-candidate, University of Michigan, Industrial and Operations Eng. Dept,, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, kamip@umich.edu, Judy Jin, Majid Aminnayeri

Geometric control charts (GCCs) have been effectively used for monitoring high yield processes. To improve the performance of Shewhart control charts in detecting small process changes, runs rules are widely used. However, the existing runs rules designed for Shewhart charts, cannot be directly used for GCCs due to the violation of the normality assumption. This research will present a new method for designing and optimizing runs rules for GCCs.

19 - DOE-Based Heuristics for Remanufacturing Reconfigurable Storage Requirements

Aysegul Topcu, Ph.D. Candidate, Northeastern University, 381 Commonwealth Ave. Apt. 6, Boston MA 02115, United States of America, topcu.a@neu.edu, James Benneyan, Thomas Cullinane

The design of facilities that house both manufacturing and remanufacturing operations is a vital component of supply chains. Significant variability in the number of re-usable parts retrieved from returned products contributes to fluctuations in storage capacity requirements. Simulation and experimental design were used to develop heuristics for identifying efficient remanufacturing storage reconfiguration policies that minimize total costs of internal, reconfigured, and external storage.

20 - Portfolio Optimization: A Scenario Generation Method Using Heteroskedasticity and Moment Matching

Erhan Deniz, PhD Candidate / Teaching Assistant, Rutgers University, 31 Redcliffe Ave., Highland Park, 08904, United States of America, erhan@eden.rutgers.edu, James T. Luxhöj

We present a portfolio management framework composed of a new scenario generation algorithm and a stochastic programming (SP) model. The algorithm is built on heteroskedastic models and moment matching approach to construct scenario trees representing the randomness in asset returns. The multi-stage SP model uses the generated scenario tree to maximize the expected final wealth and control risk exposure by the limitation of Conditional Value-at-Risk at each decision epoch over the scenario tree

21 - Modeling and Simulation of Business Processes and their Applications to the IT Service Processes

Genady Grabarnik, Researcher, T. J. Watson Research, IBM, 19 Skyline Dr, Hawthorne, NY, 10532, United States of America, genadyg@hotmail.com, Aaron Kershenbaum, Jay Benayon, Larisa Shwartz

IT System Management research considers the service as a business process. Business processes has graph structure, support a notion of synchronization and expose stochastic behavior. We model service as a BP graph with synchronization and stochastic properties, and simplify the BP based on stochastic reduction for the case that covers most of the practical applications. Simulation example illustrates the application of these methods to the evaluation and comparison of IT processes.

22 - Batch Scheduling with Distinct, Assignable Due Dates

Rui Zhang, PhD Candidate, McMaster University, 1280 Main Street West, Hamilton, ON, L7L6S6, Canada, zhangr6@mcmaster.ca

We study a batch scheduling problem with distinct, assignable due dates, in which our goal is to minimize the sum of weighted number of late jobs, due-date-assignment costs and batch-delivery costs. For three different cases, we propose a strong NP-hardness proof, a pseudo-polynomial algorithm, an FPTAS and a polynomial algorithm.

23 - E-mail Communication as a Paradigm for Quantifying Complex Network Evolution

Dean Malmgren, PhD Candidate, Northwestern University, 2145 Sheridan Rd., Evanston, IL, 60208, United States of America, r-malmgren@northwestern.edu, Julio Ottino, Luis Amaral

The existence of ubiquitous properties of complex networks across sociological, technological, and biological disciplines raises an important question: what can we learn from Mother Nature's design of these systems? We investigate this question with data from three universities that not only records e-mail communication patterns, but also records social affiliations. This data enables us to quantitatively investigate plausible mechanisms for social network evolution.

24 - Maximizing Advertisements Diffusion: A Simulation Study of The Dynamics of Mobile Viral Advertising

Jiang Wu, Dr, Huazhong University of Science and Technology, 1037 Luoyu Road, Wuhan, 430074, China, jiangwu.john@gmail.com

We propose a computational model to reconstruct the spreading of advertisements in social network and acquire implications about how to choose an initial set of people to maximize the performance of spreading advertisements. Also, we analyze the impacts of the network structures including topology, size and density and the initial selected number of targeted people on the dynamics of mobile viral advertising. We also run simulations in a real mobile-online social network.

25 - Multi Objective Decision Models for Informs Issues and Product Roadmaps

Ernest Forman, Professor, George Washington Universtity, Departement of Decision Sciences, Washington, DC, 20052, United States of America, forman@gwu.edu, Myron Hatcher, Thad Usowicz

Elicit issues and alternatives for important INFORMS decisions. Construct a multi-objective evaluation model for participants to evaluate at the meeting and to publish the model on the internet for the entire INFORMS membership following meeting. Present and elicit feedback about a new multi-objective optimization model for product roadmaps.

26 - Drawdowns Preceding Drawups in a Finite Time Horizon

Hongzhong Zhang, Graduate Student, CUNY, 365, 5th ave,, New York, NY, 10016, United States of America, hzhang3@gc.cuny.edu, Olympia Hadjiliadis

Drawdowns are increasingly being used as measures of risk in hedge-funds. We derive the probability of a drawdown preceding a drawup of equal or unequal units in a pre-specified time horizon. We assume a random walk model and discuss extensions to more general models including geometric Brownian motion.

27 - A Bin Packing Algorithm for Bus Crew Scheduling

Wenxin Qiao, University of Maryland-College Park, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States of America, wxqiao@umd.edu, Masoud Hamedi, Ali Haghani

The bus crew scheduling problem involves assigning bus work to drivers such that all pieces of works are covered and the operational cost is minimized. We propose a bin packing approach which uses a modified Best-Fit-Decreasing algorithm to solve the problem. A case study and numerical results are presented.

28 - Approximating Inpatient Census Distributions with Queuing Based Regression

James Broyles, Arizona State University, PO Box 875906, | Tempe, AZ, 85287-5906, United States of America, James.Broyles@asu.edu

Hospital inpatient census predictions are used for budgeting, staffing, and capacitating. Frequently, hospitals only know arrival rates and historical census at discrete times. This research creates a queuing theory based maximum likelihood regression model to predict long term inpatient census distributions with limited data input requirements.

29 - How do PMBOK & ICB Approach Projects?

Yasaman Khodadadegan, PhD Student, Arizona State University, Arizona State University, GWC502, Tempe, AZ, United States of America, ykhodada@asu.edu, Moeed Haghnevis, Homayoon Sajedi, Fateme Foroozanfar

This paper represents PMBOK and ICB elements to magnify their differences and similarities. It provides some insights to culminate project implementation by utilizing advantages of the models and removing their shortcomings. The possibility of extending social aspects of ICB to PMBOK and development of PMBOK tools to ICB is discussed.

30 - Optimal Location of Bluetooth Sensors for Collecting Travel Time Data

Mona Asudegi, Graduate Student, University of Maryland at College Park, 4307 Rowalt Drive,Apt 302, College Park, 20740, United States of America, asudegi@umd.edu, Ali Haghani, Abbas Afshar

This research aims at modeling and optimizing the location of a limited number of Bluetooth sensors over the transportation network in order to maximize data collection quality and minimize the installation cost.

31 - The Role of TRIZ in Increasing Productivity of Project Risk Management

Moeed Haghnevis, Graduate Student, PhD, Department of Industrial Engineering, Arizona State University, GWC502, Arizona State University, Tempe, AZ, 85287, United States of America, mhaghnev@asu.edu, Homayoon Sajedi, Yasaman Khodadadegan

This paper examines the mediatorial roles of TRIZ principles to improve PMBOK risk model and evaluate the interactions of those principles with each phase separately. The aim of this research is bonding TRIZ, as a supplementary tool, to risk management process in such a way that spells more productive results.

32 - Discrete Optimization Methods to Curate Metabolic Models

Vinay Satish Kumar, Graduate Research Assistant, The Pennsylvania State University, 147A Fenske Building, State College, PA, 16802, United States of America, vskumar@engr.psu.edu, Costas Maranas

Mathematical models of cellular metabolism have been built for describing metabolic processes. These models are incomplete with missing functionalities resulting in erroneous predictions of cellular behavior. We discuss discrete optimization methods to pinpoint deficiencies in these models and resolve them. First, we discuss methods to identify and resolve connectivity problems in these models. Then, we discuss a procedure to automatically reconcile model predictions with experimental data.

33 - Integer Program Optimization of Train Consisting Within a Complex Network

Steven Kolarz, University of Maryland, 7903 Orion Circle, Apt. 314C, Laurel, MD, 20724, United States of America, skolarz@gmail.com

In recent months the integrative role of passenger rail in national transport has become obvious. However, previous funding issues and current manufacturing leads prevent quick capacity increases. Through an IP approach, this research aims to tailor train consists to demand in order to allow car reassignment to more crowded trains.

34 - Multi-echelon Maintenance and Service Parts Inventory Policy Optimization: A Multiobjective Approach

Oscar Martinez, Research Associate, University of Central Florida, 4000 Central Florida Blv, Eng 2 room 312, Orlando, FL, 32816, United States of America, omartine@mail.ucf.edu, Christopher Geiger

Service parts inventories are maintained to support the maintenance function in maximizing equipment readiness. However, maintenance and service parts inventory policies are often optimized separately. We present a joint maintenance and service parts model for a two-echelon service parts supply system, followed by an empirical analysis of the model's performance.

35 - Online Algorithms for Scheduling Weighted Packets with Deadlines in a Bounded Buffer

Fei Li, Assistant Professor, George Mason University, 4400 University Drive MSN 4A5, Fairfax, VA, 22030, United States of America, lifei@cs.gmu.edu

We consider online scheduling of packets with deadlines in a bounded buffer. A buffer can store at most b packets. Each packet has a release date, a non-negative value, and an integer deadline. Only one packet is sent in a time step. Our objective is to maximize the total value gained by the packets sent by their deadlines. We present a deterministic 3-competitive and a randomized 2.618-competitive algorithms. The algorithmic framework and its analysis include several interesting features.

36 - MetModel GUI: Software for Building Optimization-based Models of Cellular Metabolism

Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu, Steve Fong, Seth Roberts, Wil Burns

MetModel GUI can be used to build and analyze linear programming-based models of cellular metabolism. The authors have designed and implemented a gap analysis algorithm, a tool for creating consistent models. Additional capabilities of the software include the ability to investigate the effects of gene and protein knockouts on the cell.

37 - Role of Trust in the E-Commerce Adoption on Virtual Community

Hyoung-Yong Lee, Assistant Professor, Hansung University, 389 Samseon-Dong 2-Ga,, Seongbuk-Gu, SEOUL, 136-792, Korea, Republic of, leemit@hansung.ac.kr, Hyunchul Ahn

Since the aim of the company is to make money, many virtual community operators seek to create revenue model, and they have interests in building E-Commerce in their communities. However, it is never easy to facilitate E-Commerce under the virtual communities. In order to understand and manage the activities of E-Commerce under the virtual community environment, this paper analyze trust, based on Technology Acceptance Model.

38 - Current Studies in Kaizen Event Effectiveness, Sustainability, and Programs

Wiljeana Glover, Virginia Tech, 365 Oaktree Blvd, Christiansburg, VA, 24073, United States of America, wjglover@vt.edu

A Kaizen event is a focused and structured improvement project, using a dedicated cross-functional team to improve a targeted work area, with specific goals, in an accelerated timeframe. This poster highlights projects that use qualitative and quantitative methods to understand the critical factors that influence Kaizen event outcome achievement and sustainability. The projects are a part of an ongoing Kaizen event field research study by Virginia Tech and Oregon State University.

39 - On the Dynamic Feedback Analysis of Non-profitable Hospital Promoting Competitive Ability

Xiaoyong Lu, Nanchang University, Nanchang University North Campus, Nanchang, China, kxxhz@hotmail.com

This article promulgates restriction factor that affects non-profitable hospital competitive ability and proposes the development upper limit principle. It has proposed eliminating principle which propose the effective dynamic management countermeasure and establish common goal, responsibility and benefit that eliminate balancing feedback restriction in various stages. We promote hospital competitive ability through realizing common goal between society and hospital, responsibility and benefit.

40 - Online Model Selection Embedded in Product Development for Improving Printer's Color Consistency

Chao-Lung Yang, PhD Candidate, Purdue University, 2043 Tampa Dr, West Lafayette IN 47906, United States of America, yang33@purdue.edu, Jan P. Allebach, George T. C. Chiu, Yuehwern Yih

Color consistency is crucial for printing quality of color laser printers. The tone curve stabilization model has been developed to compensate the printing deviation for improving color consistency. In order to embed the model implementation in the R&D stage, the online steady-state identification method was proposed to search an optimal model by utilizing data in the product life-test. The preliminary result shows the proposed procedure is able to locate a model by using economic size of data.

41 - Application of Multi-Criteria Dynamic Linear Programming Model to SCM of Crude Oil in Nigeria

Okesola M. Olusola, md/ceo, Oludoy Dynamix Consulting Limited, 8,Kafi Street,Off Awolowo Road, Alausa,Ikeja, Lagos, 234, Nigeria, okesolaj@yahoo.com

This paper presents a multi-criteria decision analysis of the supply chain management of crude oil in Nigeria with the objective to minimize the total cost of integrating activities such as discovery of oil and allocation of oil wells, acquiring equipments for exploration, production processes, distribution/transportation, and SML-T market demand forecast.

42 - Dependent Poisson Race Model and Its Application in Conjoint Choice Study

Shiling Ruan, Food And Drug Administration, 1350 Piccard Drive, HFZ 550, Rockville, MD, 20850, United States of America, shiling.ruan@fda.hhs.gov, Thomas Otter, Steven MacEachern, Angela Dean

The Poisson race model has long been used to model the decision making in psychology. A new class of Poisson race model which can be used to model dependence structure between alternatives has been developed for the conjoint choice data. This talk will discuss the formulation of the Poisson race model with a dependence structure for conjoint choice data with more than two alternatives. This model demonstrates better predictive performances as compared to the traditional choice models.

43 - Study on the Group-buying Auction

Jian Chen, Professor, Tsinghua University, School of Economics and Management, Beijing, 100084, China, jchen@tsinghua.edu.cn

The group-buying auction (GBA) is a new kind of dynamic pricing mechanism on the Internet. In this talk, we first analyze the group-buying auction under some assumptions and build an incomplete information dynamic game model to illustrate the bidders' bidding process. Then, we analyze the seller's pricing strategy with the GBA and the performance of both sides when the bidders collude. Finally, we extend our study to B2B commerce.

44 - Simulation-Based Preventive Maintenance Optimization

Dmitriy Belyi, University of Texas at Austin, 4306 Avenue A #107, Austin, TX, 78705, United States of America, dmitriy.belyi@gmail.com, Elmira Popova

This work addresses the problem of finding the minimal-cost preventive maintenance schedule for a single item. We develop an optimization algorithm that reduces the time effort to find the optimal schedule. This approach relies on the item having an increasing failure rate, which is typical, and employs a Gibbs sampling algorithm to simulate from the hazard rate distribution using real data. We then analyze the effectiveness of this approach on some generated and real data sets.

45 - Optimal Selection of Technology Transferor in Technology Chain Network

Jong-IL Lee, Yonsei University, 134 Shinchon-dong, Seodaemun-ku,, Information and Industrial Engineering, Seoul, Korea, Republic of, ljistar@yonsei.ac.kr, Bongju Jeong

This study proposes a procedural method for optimally selecting the technology transferor when a technology transferee needs to buy a specific technology. We develop a technology chain network where technology supplier, technology marketer, and technology transferee are informatively linked. The selection is made by maximizing the technology similarity index and minimizing the technology transfer costs. keywords : Technology Chain Network; Technology Transferor Selection; Technology Similarity

46 - A Risk-adjusted Scan Statistic for Non-homogeneous, Hence Non-binomial Dichotomous populations

Aysun Taseli, Northeastern University, 360 Hungtington Ave, 368 Snell Engineering Building, Boston, MA, 02115, United States of America, aysunt_qpl@yahoo.com

When a population can be partitioned into J sub-populations with non-identical risk probabilities, the number of cases can no longer be explained by a binomial distribution. A model adjustment to Kulldorff's scan statistic is proposed for such non-homogeneous dichotomous populations. The performance of these models, based on J-Bernoulli and J-Binomial distribution versus standard Bernoulli and Poisson models are investigated.

47 - Assessment of Project Management Office Capabilities

IMRAN DALWAI, MBA Candidate, Katz Graduate School of Business, Mervis Hall, Pittsburgh, PA, 15260, United States of America, imdalwai@katz.pitt.edu, Brian Butler

Projects are increasingly viewed as investments, driving development of Project Management Offices (PMOs). We propose an assessment process based on benchmarking PMOs engagement in five areas. Using examples from application of the process, we describe how it facilitates goal specification and provides an action dashboard for advancing Project Management maturity.

48 - A Study on EPR System in Reverse Supply Chain of Cellular Phone Industry in Korea

Kiman Kim, Yonsei University, 134 Shinchon-dong, Seodaemun-ku, Information and Industrial Engineering, Seoul, Korea, Republic of, kimkiman@yonsei.ac.kr, Kibum Kim

This study investigates the EPR(Extended Producer Responsibility) system in view of both government and industrial companies in reverse supply chain. The government eco-policy often conflicts with the goal of companies. We propose a mathematical model to find the optimal take-back rate and recycling rate which satisfies both sides. The cellular phone industry of Korea is analyzed to illustrate our findings Keywords : EPR, Reverse Supply Chain, Optimization, Cellular Phone Industry

49 Real-Time Available to Promise (ATP): The Solution Quality of a Stochastic Programming Model

Chien-Yu Chen, Assistant Professor, George Mason University, School of Management, 4400 University Dr., Fairfax, VA, 22030, United States of America, cchen8@gmu.edu

To support real-time order-promising, we develop a stochastic programming model to pre-allocate a critical resource over multiple demand channels and time periods. Both Benders decomposition and importance sampling techniques are applied to quickly obtain near-optimal solutions. We examine the solution quality by investigating the statistics of optimality gaps and solving times.

50 - A Portfolio Selection Strategy Using Genetic Algorithms

Miranda Montgomery, Clemson University Industrial Engineering Dept., 110 Freeman Hall, Clemson University, Clemson, SC, 29634, United States of America, montgo5@clemson.edu, Mary Beth Kurz

Using a Genetic Algorithm (GA), an artificial intelligence technique, this study proposes a portfolio selection strategy that will generate an optimal investment mix of assets using measures such as cost, risk, and return. This strategy will be compared to exact mathematical methods to assess its performance.

51 - Quantum Inspired Genetic Algorithms and Grammatical Evolution

Sean McGarraghy, Dr, University College Dublin, School of Business, Belfield, Dublin, Dublin 4, Ireland, sean.mcgarraghy@ucd.ie, Colm O'Dowd, Micheal Phelan

Modified Quantum Inspired Genetic Algorithms (QIGA) are developed, which outperform a standard Genetic Algorithm (GA) on a standard suite of benchmark problems, including the Knapsack problem and function optimization problems. This QIGA is used to replace - and again outperforms - a GA as the search engine in Grammatical Evolution (GE). The GE/QIGA with appropriate grammars is applied to the Supply Chain Beer Game and again shows improved performance in developing an optimal order policy.

52 - Accommodating Transmission Range Uncertainty in Deploying Wireless Ad Hoc Networks

Kangyuan Zhu, Research Assistant, University of Virginia, Department of Systems Eng,, University of Virginia, Charlottesville VA 22903, United States of America, kz3y@virginia.edu, Stephen Patek

It is typically assumed that nodes in wireless sensor networks have known transmission range while in practice it is highly uncertain a priori. This paper addresses a dynamic and sequential node deployment problem in which a robot would be responsible for maximizing the probability of network connectivity given probabilistic models of node's transmission ranges subject to (i) the number of available network nodes and (ii) the linear time/distance that can be operated by the robot or technician.

53 - Quantitative Evaluation of IT Risk and Loss

Bee Yew, Assistant Profesoor, Fayetteville State University, 1200 Murchison Rd, Fayetteville NC 28311, United States of America, byew@uncfsu.edu

Risk is defined to be the likely effect an IT asset will be successfully attacked during a time period. In our proposed model, the risk quantification model is a product of vulnerability, threat and the sum of asset value and loss of productivity. The Risk components include private information, loss productivity and impact on reputation and public trust. Vulnerability is the difference between an asset's protections and the force that can be applied against it.

Monday, 1:30pm - 3:00pm

■ MC01

M - Marriott Ballroom 3

Purchasing Behavior and Competition in Online Retailing

Sponsor: eBusiness
Sponsored Session

Chair: Daewon Sun, University of Notre Dame, 359 MCOB, Notre Dame, IN, 46556, United States of America, dsun@nd.edu

1 - Website Features and Online Shopping: How Technology Usage Impacts Consumer Demand

Mohammad Rahman, University of Calgary, 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, mohammad.rahman@haskayne.ucalgary.ca, Prabuddha De, Yu Hu

Today virtually all Internet companies provide advanced technological features such as search functions and recommendation systems on their websites. Despite the widespread adoption of search and recommendation technologies, empirical research that tackles the economic impact of these technologies is scarce. Does consumers' technology usage have an impact on consumer demand? How does this impact vary for different technologies and across different products? Our research studies these questions.

2 - Contracting on Consignment Sales

Jun Ru, University of Texas at Dallas, SOM3.224, 800 West Campbell Road, Richardson, TX, 75080, United States of America, jun.ru@utdallas.edu, Yunzeng Wang

Motivated by Amazon's online retailing, we study a consignment contract where the retailer charges a supplier a pre-specified percentage of the list price of the product sold to the market, and the supplier is allowed to choose the list price for its product. We build a game-theoretic model to demonstrate that managed under such a contract, the channel incurs a minimum loss of 26.4% in efficiency. We then propose an alternative contract to improve the channel performance.

3 - Price and Quantity Competition in Online Retailing: Amazon's Marketplace Contract

Daewon Sun, University of Notre Dame, 359 MCOB, Notre Dame, IN, 46556, United States of America, dsun@nd.edu, Xuying Zhao, Jennifer Ryan

We investigate the impact of Amazon's Marketplace contract, in which online retailers can list their products and ship customer orders. We formulate this problem as a three-channel competition model in which Amazon sells a given product, while an e-retailer sells the same product through both Amazon and her own online store. We model each channel as a newsvendor problem, with price and order quantity as decision variables, and we analyze the equilibrium behavior of the system.

■ MC02

M - Marriott Ballroom 2

Information Technology Evaluation, Impact, and Virtualization

Sponsor: Information Systems
Sponsored Session

Chair: Andrew Chen, University of Kansas, School of Business, Lawrence, KS, 66049, United States of America, achen@ku.edu

1 - The Impacts of Virtualization on IT Infrastructure: An Analysis Based on an SSME Framework

Minder Chen, Associate Professor, California State University, Channel Islands, One University Drive, Camarillo, CA, 93012, United States of America, minder.chen@csuci.edu

Gardner called virtualization the "highest-impact trend" for the information technology world through 2012. In our study, we will discuss various software virtualization approaches and their benefits. A service sciences, management, and engineering (SSME) framework has been used in guiding our analysis of virtualization technology. An IT Service standard, ITIL, is used in assessing the impacts of virtualization to IT services.

2 - The Impact of IT and Knowledge Management on Supply Chain Performance

Chandrasekar Subramaniam, Assistant Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC, 28223, United States of America, csubrama@uncc.edu, Yuan Niu

One of the major shifts in supply chain (SC) relationships is the emphasis on collaboration with SC partners. Despite this recognition of the role of SC collaboration, there is little research that theorizes an SC's KM capability. This paper proposes a framework relating IT capability and KM capability and their impact on SC performance. The contributions of our research include advancing the theory on SC value creation and improving our understanding of IT in supply chains.

3 - Structuring Preference Ranking Markets for Early Stage Emerging Technology Evaluation

Li Chen, University of Connecticut, 2100 Hillside Road Unit 1041, Storrs, CT, 06269, United States of America, li.chen@business.uconn.edu, Paulo Goes, James Marsden, John Zhang

Selection of early stage emerging technologies is a challenging decision. Recently, several large companies are interested in using information markets as preference aggregation and group decision-making tools to rank new technologies. We set up two internal preference markets with one market using an additional play-money incentive. Our analysis focus on participant and market behavior, dynamic preference aggregation, and market performance. Results indicate promising expectations.

■ MC03

M - Marriott Ballroom 1

Lot-size Problems in Inventory Management

Contributed Session

Chair: Mehmet Onal, University of Florida, Department of Industrial and Systems Eng., Gainesville, FL, 32611, United States of America, monal@ufl.edu

1 - Slowing Down Production Using Power of Two Scheduling

Amit Eynan, Professor, University of Richmond, 1 Gateway Rd, Richmond, VA, 23173, United States of America, aeynan@richmond.edu

Traditional lot sizing scheduling utilizes the nominal production rate as specified by the machine capacity. In recent years it became apparent that in presence of excess capacity slowing down the production rate and taking up available idle time reduces operating costs due mainly to inventory reduction. Available works considered various policies for slowing down but all assumed a common cycle time. This work explores the potential benefit of allowing multiple cycles using a power of two scheme

2 - Stochastic Dynamic Inventory Problem under Inbound Cargo Costs

Liqing Zhang, Texas A&M University, Industrial & Systems Engineering, College Station, TX, liqing@tamu.edu, Sila Cetinkaya

We study a single item, periodic review, stochastic dynamic inventory problem where the inventory replenishment cost includes a multiple set-up cost term representing the truck costs and capacities. We first propose a new replenishment policy called the (Q, s, S) policy. We examine the sufficient conditions under which this policy is optimal. Then, we investigate how various system parameters such as the fixed set-up cost and truck capacity affect the policy parameters.

3 - Manufacturing Parts Sourcing with Delayed Transportation Policy

Emre Sancak, MSc., Koc University, Rumelifeneri Yolu 34450 Sariyer, Istanbul, 34450, Turkey, esancak@ku.edu.tr, F. Sibel Salman

We optimize the multiple item lot-sizing problem of the manufacturer where the transportation costs from the suppliers are charged to the manufacturer. We show that delaying part of the shipment improves the cost of the manufacturer in the case of less-than full truckload. The effects of delaying parts on both cost and service levels are shown using data from a bus manufacturer. The effects of lead time uncertainty is also investigated.

4 - Blood Banking in India

Harshal Lowalekar, Student(Phd), Indian Institute Of Management,Ahmedabad, Vastrapur, Ahmedabad, Gj, 380015, India, harshal@iimahd.ernet.in, N. Ravichandran

We shall review the Operations of Blood Banks in India. We shall critically identify the decision making opportunities that exists in the Indian Blood Banks. We shall study the differences between the Contexts of Hospital Blood Banks and the Stand Alone Blood Banks. We shall provide a review of the previous work in the area of Blood Banking and the current practices in Indian Blood Banks. We shall also identify some issues that need scientific investigation in the context of Indian Blood Banks

5 - Perishable Inventories with Deterministic Lifetimes

Mehmet Onal, University of Florida, Department of Industrial and Systems Eng., Gainesville, FL, 32611, United States of America, monal@ufl.edu, Edwin Romeijn, Amar Sapra

We consider an extension to the basic economic lot size problem where we assume that products spoil after some number of periods and can not be sold. We present polynomial time algorithms to the problem assuming various inventory strategies and different consumer preferences.

■ MC05

M - Virginia B

Models and Methods for Congestion Pricing III

Cluster: Network Congestion and Congestion Management

Invited Session

Chair: Marco Nie, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, y-nie@northwestern.edu

1 - Congestion Pricing for a Freeway Considering Queue Spillbacks

Zhen (Sean) Qian, Doctoral Student, University of California Davis, One Shield Ave, Davis, CA, United States of America, zqian@ucdavis.edu, Michael Zhang

This paper proposes a method to compute the time-dependent marginal cost (MC) in a freeway network with multiple O-Ds but an unique path for each one. This method applies to situatuions when queues from one link can spill back to upstream links, and is implemented with the help of a dynamic loading procedure, from which the cumulative curves for each link are obtained to evaluate small variations in link travel times, which in turn provides the MC for congestion pricing in such a network.

2 - Dynamic Congestion Pricing: Models and Computational Methods

Terry Friesz, Marcus Professor, Penn State University, Department of Industrial & Mfg Engr., 305 Leonhard Bldg, University Park, PA, 16802, United States of America, tfriesz@psu.edu, Changhyun Kwon, Matthew Rigdon, Tae Il Kim

We provide a brief review of dynamic congestion pricing models. In particular, we discuss the dynamic efficient toll problem and the dynamic optimal toll problem with dynamic user equilibrium constraints. Some algorithms and numerical examples are also presented.

3 - Dynamic Congestion Pricing Strategies with Drivers' Stochastic Dynamic Behavior

Fan Yang, City University of New York (CUNY), fyang@ccny.cuny.edu

Drivers' behavior plays an important role in the success of a congestion pricing strategy. This study aims at providing insight on how to force the traffic system to evolve from the status quo to a stationary state of system optimal, considering a general drivers' stochastic and dynamic behavior adjustment process.

4 - Dynamic Pricing with Heterogeneous Users

Hani Mahmassani, Professor, Northwestern University, Transportation Center, Evanston, Il, 60208, United States of America, masmah@northwestern.edu, Jing Dong

This study presents a dynamic pricing scheme taking into consideration of heterogeneity in users' route choice behavior and in value of time (VOT). A multi-criterion traffic assignment model is adapted to achieve traffic management goal through time-dependent link pricing strategies.

5 - Bounding the Inefficiency of Price and Investment Competition in an Oligopoly Market

Feng Xiao, Postdoctoral Researcher, University of California Davis, Engr. III 1001, One Shields Avenue, Davis, CA, 95616, United States of America, sheffi2004@gmail.com

In service industries with congestion effects firms compete with each other by not only choosing prices but investments. In this paper oligopoly competition is studied where firms determine their price and investment simultaneously. General situations are considered including symmetric and asymmetric markets, concave and convex demand curves and various returns to scale in investment. Upper-bounds of efficiency loss are established when market is symmetric.

■ MC06

M - Virginia C

Auction Theory: In Honor of Mike Rothkopf

Cluster: Auctions

Invited Session

Chair: Wedad Elmaghraby, University of Maryland, College Park, MD, Wedad_Elmaghraby@rhsmith.umd.edu

1 - Combinatorial Auctions

Sasa Pekec, Duke University - The Fuqua School of Business, 1 Towerview Road, Durham, NC, 27708-0120, United States of America, pekec@duke.edu

Combinatorial auctions have been in focus of interdisciplinary research efforts combining economics, computer science and OR. Mike Rothkopf's ideas and research played a pioneering role in defining the area, making it interdisciplinary, and shaping research directions. In this talk I will review Mike's contributions and their impact on our current understanding of combinatorial auctions, as well as some of Mike's ideas that still seem to be ahead of currently fashionable research topics.

2 - Preemption and Jump Bidding

Vladimir Mares, Assistant Professor, Olin School of Business, One Brookings Drive, St. Louis, MO, 63105, United States of America, MARES@WUSTL.EDU

This paper constructs an integrated model of preemption and joint bidding in open auctions. The decision to discretely increase the price is endogenous and relies purely managing the flow of information among a bidder's competitors.In doing so they affect both the expected price and the allocation of the asset. Increased competition can actually strengthen these incentives. The paper characterizes optimal bidding plans and derives comparative statics.

3 - Mike Rothkopf's Recent Contributions in Charity Auctions
Peter Popkowski Leszczyc, University of Alberta, 4-20F School of Business, Edmonton, AB, T6G2R6, Canada, ppopkows@ualberta.ca

This talk will focus on some of Mike's latest contributions in the area of Charity Auctions. It discusses "Laura's" model of charitable bidding in auctions and presents important results from a number of controlled field experiments.

4 - Relative Performance Auctions
Octavian Carare, Assistant Professor, UT Dallas, 2604 N Floyd Rd, SM 3.1, Richardson, TX, United States of America, carare@utdallas.edu, Vladimir Mares

We analyze the behavior of bidders in auctions where the relative performance of bidders matters. We consider several bidding environments involving sequential and simultaneous auction procedures in which the bidders' payoffs are affected by the relative ranking of their auction winnings. Conditioning payoffs on relative performance is generally detrimental to efficiency.

■ MC07

M - Maryland A

Product Variety Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Muge Yayla-Kullu, Asst. Professor, Lally School of Mgmt. & Tech., RPI, 110 8th Street, Troy, NY, 12180, United States of America, yaylah@rpi.edu

1 - Empirical Examination of the Long Tail of Electronic Commerce
Serguei Netessine, The Wharton School, University of Pennsylvania, Philadelphia, PA, United States of America, netessin@wharton.upenn.edu, Tom Tan

Online distribution is posed to change the variety of products that is available to customers. The idea behind the "long tail" of electronic commerce is that consumers will demand more and more of products that currently have very little or no demand. Using data from an Internet video rental company we test this assertion empirically.

2 - Product Introduction Strategies for a New Market
Wenjun Gu, University of Illinois, 1206 S. Sixth St, Champaign, United States of America, wgu3@uiuc.edu, Dilip Chhajed

Traditional product design literature hasn't studied quality and price decisions when a firm sequentially extends its business from one market to two. In this paper we analyze various product introduction strategies; some involving introducing existing products which saves cost and some involving introducing customized products that are more targeted for the new market. We present the results and managerial insights for optimal product introduction strategies.

3 - Vertically Differentiated Product Line Design under Competition
Muge Yayla-Kullu, Asst. Professor, Lally School of Mgmt. & Tech., RPI, 110 8th Street, Troy, NY, 12180, United States of America, yaylah@rpi.edu, Ali Parlakturk, Jayashankar Swaminathan

In this paper, we study the firm's best response in terms of product line choice, capacity allocation and pricing decisions in the face of competition. We show that incorporating capacity limitation may dramatically change the product line decisions. In contrast to existing literature, competition may result in less supply in the market than the monopolist markets. Moreover, the average quality offered may decrease with firm entry to the market.

4 - Product-Line Competition: Customization vs Proliferation
Ali Parlakturk, Ali_Parlakturk@unc.edu, Haim Mendelson

We study a market with customers who have heterogeneous preferences for product attributes. We consider two types of firms that compete on price and product variety: A traditional firm, which chooses a limited set of product configurations, and a customizing firm, which can produce any configuration to order. The traditional firm carries product inventories and experiences a lead-time delay. The customizing firm does not carry inventory and its customers incur waiting costs.

■ MC08

M - Maryland B

Real Option Applications in Operations Management

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu

1 - Physical Commodity Trading in a Network and Its Impact on Prices
Victor Martinez de Albeniz, Assistant Professor, IESE Business School, Av. Pearson 21, Barcelona, 08034, Spain, valbeniz@iese.edu

We consider in this paper the trading of a single commodity in several locations which define a network. We model shipping capacity constraints through quadratic trading costs. We first analyze the basic strategy of a trader between two nodes, which affects prices in each node. This allows us to characterize the (stochastic) price evolution in the nodes over time. We use the model to analyze numerically the kerosene price differences between New York, Los Angeles and the Gulf Coast.

2 - Outsourcing Contract and Timing under Cost Uncertainty
Tao Yao, Assistant Professor, Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, taoyao@psu.edu, Bin Jiang, Yongma Moon

This paper studies outsourcing contract for firms with in-house capability in an environment of uncertain cost. We develop a real options model for valuation and optimal outsourcing timing of three type contracts, fixed-price, cost-plus, and gain-sharing. We study the impact of managerial flexibility on contract selection strategies.

3 - Valuing Adaptive Quality and Shutdown Options in Production Systems
Danko Turcic, Assistant Professor of Operations, Olin Business School, Washington University in St. Louis, 1 Brookings Drive, St. Louis, MO, 63130-4899, United States of America, danko.turcic@case.edu, Peter Ritchken

We consider two forms of operational flexibility in a production setting: the option to shut down production temporarily, and the option to control expected production yield through effort. The absolute values of both options are sensitive to costs and prices of finished goods, and they increase with price uncertainty. Their relative contribution to the value of production technology may increase or decrease as price uncertainty increases; sufficient conditions are provided for both.

4 - Optimal Commodity Trading with a Capacitated Storage Asset
Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu

This talk investigates the optimal inventory trading policy with a capacitated storage asset and discusses managerial insights related to (1) the meaning of high-low commodity prices, (2) the benefit of coordinating inventory trading and operational decisions, (3) the shares of the asset value that can be attributed to price uncertainty and deterministic variability (seasonality), and (4) the performance of a policy obtained by sequential reoptimizations of a deterministic model.

■ MC09

M - Maryland C

Joint Session QSR/CS: Decision Trees and Their Applications

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Tianyang Wang, McCombs School of Business, The University of Texas at Austin, IROM Department, McCombs School of Business, UT Austin, Austin, TX, 78712, United States of America, tianyang.wang@phd.mccombs.utexas.edu

1 - Posterior Preference Articulation Approach to Dual Response Surface Optimization
Dong-Hee Lee, Department of Industrial and Management Engineering, Pohang University of Science and Technology, Republic of Korea, princeps@postech.ac.kr, Kwang-Jae Kim, In-Jun Jeong

In dual response surface optimization, the mean and the standard deviation responses are often in conflict. To obtain a satisfactory compromise, a Decision Maker (DM)'s preference information on the tradeoffs between the responses should be incorporated into the problem. In most of the existing works, the DM expresses the subjective judgment on the responses through a preference parameter before the problem solving process, and then a single solution is obtained. In this work, we propose a posterior preference articulation approach to dual response surface optimization. The posterior preference articulation approach first finds a set of nondominated solutions without the DM's preference information, and then allows the DM to select the best one among the nondominated solutions.

2 - An Implied Binomial Tree Approach to Value Multi-factor Real Options

Tianyang Wang, McCombs School of Business, The University of Texas at Austin, IROM Department, McCombs School of Business, UT Austin, Austin, TX, 78712, United States of America, tianyang.wang@phd.mccombs.utexas.edu, James Dyer

This paper proposes a numerical algorithm for solving a multi-factor real options problem by approximating it with a single factor implied binomial tree. It provides a simple, computationally efficient and accurate way to price high dimensional real option problems with smooth, arbitrary distributions. For risk managers, it serves as a straight forward method for capital budgeting for projects involving flexibility.

■ MC10

M - Room 8206

Modeling Energy Markets at USDOE/FERC/USEPA

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Benjamin F. Hobbs, Schad Chair of Environmental Management, The Johns Hopkins University, Department Geography & Environ. Engineering, Baltimore, MD, 21218, United States of America, bhobbs@jhu.edu

1 - Optimal Transmission Switching

Emily Bartholomew Fisher, PhD Student, The Johns Hopkins University / Lawrence Berkeley National Laboratory, DoGEE, 313 Ames Hall, Baltimore, MD, 21218, United States of America, ebartho3@jhu.edu, Richard O'Neill, Michael Ferris

In this paper, we formulate the problem of finding an optimal generation dispatch and transmission topology to meet a specific inflexible load as a mixed integer program. Our model is a mixed-integer linear program because it employs binary variables to represent the state of the equipment and linear relationships to describe the physical system. We find that on the standard 118-bus IEEE test case a savings of 25 percent in system dispatch cost can be achieved.

2 - Analysis of Biomass Competition for Bioenergy and Biofuels Using U.S. EPA MARKAL Model

Ozge Kaplan, Research Fellow, U.S. EPA - Office of Research and Development, Mail Drop: E305-02, 109 T.W. Alexander Drive, Research Triangle Park, NC, 27711, United States of America, Kaplan.Ozge@epamail.epa.gov, Tim Johnson

This study examines how interactions between the bioenergy supply chain and larger energy system affect regional feedstock demand and distribution-related energy needs. The analysis combines a GIS assessment of regional variation in feedstock supply, transportation infrastructure, and biofuels demand with output from the U.S.EPA's MARKAL energy system model.

3 - Biofuels Analytical Activities at the U.S. Department of Energy

Zia Haq, Senior Analyst, US Department of Energy, 1000 Independence Avenue, SW, Mail Stop EE-2E, Washington, DC, 20585, United States of America, Zia.Haq@ee.doe.gov

Biofuels derived from cellulosic feedstocks have the potential to moderate the nation's dependence on imported oil, reduce greenhouse gas emissions, and revitalize rural economies. The Department of Energy is engaged in analytical activities that are focused on: resource assessment, economic analysis, sustainability impacts, and market assessment. This paper will provide an overview of these activities.

4 - EPA's Application of a Detailed Power Sector Model for Analysis of GHG Cap and Trade Proposals

Misha Adamantiades, Senior Analyst, US Environmental Protection Agency, 1200 Pennsylvania Avenue, 6204J, Washington, DC, 20460, United States of America, Adamantiades.Mikhail@epa.gov

This session will focus on U.S. EPA's application of the Integrated Planning Model, a detailed LP model of the U.S. power sector, in recently completed analyses of legislative proposals to reduce domestic emissions of GHGs. The session will highlight key modeling results, model assumptions, approach, and impacts of the analyses.

■ MC11

M - Room 8209

Joint Session ENRE/CS: Stochastic Optimization in Energy Systems

Sponsor: Energy, Natural Resources & the Environment/ Energy, Computing Society
Sponsored Session

Chair: Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

1 - Electricity Markets for Unpredictable and Uncertain Participants

Geoffrey Pritchard, University of Auckland, Private Bag 92019, Auckland, Au, New Zealand, g.pritchard@auckland.ac.nz, Andy Philpott, Golbon Zakeri

We discuss a stochastic-programming-based method for scheduling electric power generation subject to uncertainty. Such uncertainty may arise from either imperfect forecasting or moment-to-moment fluctuations, and on either the supply or the demand side. The method gives a system of locational marginal prices which reflect the uncertainty, and these may be used in a market settlement scheme in which payment is for energy only. We can show that this scheme is revenue-adequate in expectation.

2 - One Stage R&D Portfolio Optimization with an Application to Solid Oxide Fuel Cells

Lauren Hannah, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, lhannah@princeton.edu, Jeff Stewart, Warren Powell

This presentation gives a novel model for the one stage R&D portfolio problem, which simplifies to a stochastic combinatorial optimization problem with a noisy cost function and large integer constraint set. We give an original solution method to this problem, a stochastic gradient-based optimization algorithm. Theoretical results are given along with a numerical example for Solid Oxide Fuel Cell R&D. The results are compared to competing algorithms.

3 - Smart Markets for Water Resources

John Raffensperger, Senior Lecturer, University of Canterbury, Private Bag 4800, Department of Management, Christchurch, 8140, New Zealand, john.raffensperger@canterbury.ac.nz

Smart markets hold great promise to help solve the world's problems of water allocation, nutrient and sediment run-off, and impermeability from new development. In this presentation, I will describe practical solutions that rely on economics, hydrology and O.R. I will present a general framework for hydrological markets, discuss transaction costs, propose realistic institutional arrangements, and compare hydrological markets to the modern markets for electricity.

4 - A Dynamic Energy Resource Modeling System

Abraham George, Research Associate, Princeton University, Department of Oper Res and Financial Engg., Princeton, NJ, 08544, United States of America, ageorge@princeton.edu, Warren Powell

We describe a model that optimizes the allocation of energy from different sources to different types of demand on an hourly time scale, while deciding how much of different types of energy capacity should be added over a multi-decade horizon. A deterministic version of an aggregate model produces a linear program with millions of variables. We present an approximate dynamic programming model that closely matches optimal on deterministic problems while handling multiple forms of uncertainty.

■ MC12

M - Room 8212

Web and Network Mining

Cluster: Data Mining
Invited Session

Chair: Olivia Sheng, Presidential Professor, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States of America, Olivia.sheng@business.utah.edu

1 - Maintaining and Evolving a Taxonomy with Social Tagging

Harris Wu, Old Dominion University, hwu@odu.edu, Kurt Maly, Mohammed Zubair

Browsing large digital collections can benefit from well-maintained taxonomies. This presentation talks about how social tagging can be utilized systematically in maintaining and evolving a taxonomy: 1) to complement a taxonomy with new category entries, 2) to categorize items into the taxonomy.

2 - Marketing Campaign Optimization: An Interest Support Based Subspace Clustering Approach

Wei Gao, Fordham University, Graduate School of Bus Administration, New York, NY, United States of America, weigao@fordham.edu, Xiao Fang, Zhuo Yang, Olivia Sheng

Marketing campaign optimization finds groups of customers that could generate the maximal profits while considering the cost of campaign. The proposed approach uses particular heuristics to discover interesting subspace clusters more efficiently and selects a proper set of subspace clusters (i.e., groups of customers) as the solution to the campaign optimization problem. The experimental results show our approach is effective and efficient to discover the near-optimal solution.

3 - Predicting Vendors' Reliability in Search Results

Olivia Sheng, Presidential Professor, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States of America, Olivia.sheng@business.utah.edu, Zhongming Ma, Gautam Pant

A search engine provides two distinct types of results, organic and sponsored, and each of them uses different mechanisms for selecting and ranking relevant web pages. Vendors appearing in these results are expected to have varying reliability ratings (e.g., a satisfactory or unsatisfactory record based on overall customer experiences). In this paper we attempt to examine a vendor's reliability rating based on cues such as product price, type of result, and result index and page.

4 - Using Tags for Collaborative Filtering

Iljoo Kim, University of Utah, pactik@business.utah.edu, Gautam Pant, Olivia Sheng

While tagging has been widely deployed to support search and categorization applications, studies that investigate the use of tags for improving the performance of recommender systems are limited. We propose a modified collaborative-filtering recommendation system that uses tag-based profiling and present an empirical evaluation of the proposed system.

■ MC13

M - Room 8216

Data Mining Competition I

Sponsor: Data Mining
Sponsored Session

Chair: Nick Street, The University of Iowa, Iowa City, IA, nick-street@uiowa.edu

1 - Data Mining Competition

Nick Street, The University of Iowa, Iowa City IA, nick-street@uiowa.edu

In 2008 the Data Mining Section held the first INFORMS Data Mining Contest: The Antibiotic Protocol Case. The challenge was to identify patients at highest risk for developing an pneumonia during their hospital stay, and to design an optimal protocol for prophylactic antibiotic treatment. In this session, contest entrants will describe the approaches they took to this challenge.

■ MC14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - LINDO Systems, Inc. - Optimization Modeling

Mark Wiley, VP Marketing, LINDO Systems, Inc., 1415 North Dayton St., 1415 North Dayton Street, Chicago, IL, 60642, United States of America, mwiley@lindo.com

LINDO Systems will demonstrate the latest enhancements to LINDO API, LINGO and What'sBest - their popular linear, integer, quadratic, general nonlinear and global optimization tools. Find out how easy it is to: quickly build complex optimization models; effortlessly access data in Excel and databases; seamlessly embed optimization into your own applications.

2 - Maximal Software, Inc. - New Release of MPL Modeling System for Optimization with New and Enhanced Features

Bjarni Kristjansson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, Bjarni@maximalsoftware.com

We will be demonstrating the newest release of MPL, one of the fastest and most scalable modeling languages on the market today. The innovative OptiMax 2000 Component Library, which allows MPL models to be easily embedded into end-user applications, has been augmented to include several new objects and methods. The speed and scalability of the model generation has been greatly enhanced, and with the new 64-bit Itanium version capable of solving much larger models than ever before. Several new solvers have been added and existing solvers updated. Data access has been improved with new native drivers and now offers full XML/SOAP support for Internet connectivity.

■ MC15

M - Room 8219

Advances in Service Science

Sponsor: Service Science
Sponsored Session

Chair: Matthew Realff, Associate Professor, Georgia Tech, Ford ES&T Building, 311 Ferst Drive, Atlanta, GA, 30332, United States of America, matthew.realff@chbe.gatech.edu

1 - Comprehending Service Systems

Chris Tofts, Principal Researcher, HP, HP Labs, Filton Road, Bristol, BS34 8QZ, United Kingdom, chris.tofts@hp.com, Richard Taylor

To successfully design service systems all of the stakeholders must first comprehend them. There is a belief that the complex and concurrent development of services makes this either impossible or impractical. Unfortunately in the absence of comprehension it is certain that services will continue to be plagued with poor delivery and efficiency improvement. These challenges could be largely overcome by exploiting abstract models as a communication medium.

2 - Opportunities in Healthcare Systems Engineering

Ronald L. Rardin, White Distinguished Professor, University of Arkansas, Industrial Engineering, Bell 4169, Fayetteville, AR, 72762, United States of America, rrardin@uark.edu

Healthcare delivery in the United States is in a crisis of inconsistent and sometimes dismal quality, safety and efficiency, with exploding cost. While engineering is at the heart of many of the dramatic advances in medicine, the engineering that has been done on healthcare delivery processes and operations has had more limited impact. This presentation reviews the vast array of opportunities in such healthcare systems engineering.

3 - NSF and Research in Service Enterprises

Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

Service now accounts for approximately 80% of the U.S. economy. Research in understanding and promoting service enterprises is essential to the continued growth of the U.S. economy and the understanding of how this sector distinctly operates and interacts with other sectors. This presentation will discuss the efforts and funding opportunities at the National Science Foundation in this area.

■ MC16

M - Room 8222

Advances in Call Center Workforce Management

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Yongpin Zhou, Associate Professor, ISOM Department, Foster School of Business, University of Washington, Seattle, WA, 98195-3200, United States of America, yongpin@u.washington.edu

1 - Delay Estimation for Delay Announcements in Call Centers With Customer Abandonment

Rouba Ibrahim, Department of Industrial Engineering and Operations Research, Columbia University, New York, NY, 10027, United States of America, rei2101@columbia.edu, Ward Whitt

We use heavy-traffic limits and computer simulation to study the performance of alternative real-time delay estimators in overloaded multi-server queuing models, allowing customer abandonment. These delay estimates may be used to make delay announcements in call centers. We exploit established approximations for performance measures with a non-exponential abandonment-time distribution to obtain delay estimates that effectively cope with non-exponential abandonment-time distributions.

2 - Staffing Call Centers Using Fixed-queue-ratio and Simulation-based Optimization

Itay Gurvich, Columbia University, New York, NY, 10027, United States of America, ig2126@columbia.edu, Rouba Ibrahim, Zohar Feldman

We study call centers with multiple customer classes and multiple agent pools. Building on the Fixed-Queue-Ratio family of routing rules, we develop a simulation-based optimization procedure to solve the problem of minimizing staffing costs while maintaining pre-specified quality-of-service constraints of various types. We illustrate the performance of our procedure by applying it to realistic settings with time varying arrivals and staffing levels that are allowed to vary throughout the day.

3 - Staffing Call Centers with Differentiated Levels of Service

Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu, Assaf Zeevi

We consider a call center model with multiple customer classes and multiple server pools. Calls arrive randomly over time customers are impatient and may abandon the system before their service commences. The objective is to minimize staffing costs subject to some QoS constraints. We use duality theory to convert this constrained problem into an unconstrained formulation. The resulting prescription for the staffing level can be shown to be almost optimal in a suitable mathematical sense.

4 - Stochastic Shift Scheduling with Recourse

Noah Gans, Associate Professor, OPIM Department, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104-6340, United States of America, gans@wharton.upenn.edu, Yongpin Zhou, Nikolay Korolev, Alan McCord, Herbert Ristock, Haipeng Shen

Arrivals of customers to call centers and other consumer systems are often doubly stochastic. We develop forecast updating and workforce management scheduling techniques that account for this form of uncertainty and evaluate the cost and quality-of-service benefits they provide.

■ MC17

M - Room 8226

Journal of Quality Technology

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Dan Apley, Associate Professor, Northwestern University, Department of Industrial Engineering, Evanston, IL, 60208-3119, United States of America, apley@northwestern.edu

1 - Analysis of Optimization Experiments

James Delaney, Visiting Assistant Professor, Carnegie Mellon University, Baker Hall 132B, Department of Statistics, Pittsburgh, PA, 15213-3890, United States of America, jdelaney@stat.cmu.edu, Roshan Josep Vengazhiyil

For the purposes of analyzing optimization experiments, we propose methodology using the practical significance level, which is a quantity that a practitioner can easily specify. We also propose utilizing empirical Bayes estimation which accounts for the randomness in the observations. Interestingly, the mechanics of statistical testing can be viewed as an approximation to empirical Bayes estimation, but with a significance level in the range of 15—40%.

2 - A Weighted CUSUM Chart for Detecting Patterned Mean Shifts

Wei Jiang, Stevens Institute of Technology, Castle Point of Hudson, Hoboken, NJ, United States of America, wjiang@stevens.edu, Lianjie Shu, Kwok-Leung Tsui

Conventional control charts may perform poorly when monitoring sequences with dynamic shift patterns. This paper proposes a new weighted cumulative sum (WCUSUM) procedure by first estimating the dynamic mean of the sequence then using the estimates for weighting the incremental in the conventional CUSUM chart. It is found that the WCUSUM chart performs far superior to other charts for detecting small to moderate shifts when forecast recovery is present.

■ MC18

M - Room 8228

Joint Session QSR/CS: Recent Advances in Design, Analysis and Modeling of Computer Experiments

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

1 - Two-stage Group Screening for Computer Experiments

Thomas Santner, Professor, The Ohio State University, 1958 Neil Avenue, Cockins Hall 404, Columbus, OH, 43210, United States of America, tjs@stat.osu.edu, Hyejung Moon, Angela Dean

Experimentation using computer codes to simulate physical processes is used in many research fields. Such codes often have many inputs and are cpu intensive. We propose a two-stage group screening procedure to identifying active inputs. Stage 1 partitions the inputs into groups and identifies an output for each group; the it identifies active groups using main effect and total sensitivity indices. Stage 2 identifies active inputs from the individual inputs that comprise the active groups.

2 - G-Selc: Optimization by Sequential Elimination Using Genetic Algorithms and Gaussian Processes

C. F. Jeff Wu, Professor, Georgia Institute of Technology, 755 Fest Dr. NW, Atlanta, GA, United States of America, jeffwu@isye.gatech.edu

The Sequential Elimination of Level Combinations (SELC) algorithm by Mandal, Wu and Johnson (2006), though powerful, fails to extract substantial information from the data to guide the search efficiently as it is not based on statistical modeling. The proposed approach uses Gaussian Process modeling to improve upon SELC. Its performance is illustrated using test functions and on a real pharmaceutical data set for finding a group of chemical compounds with optimal properties.

3 - Effects of Warpage on Fatigue Reliability of Solder Bumps: Experimental and Analytical Studies

Ying Hung, Georgia Institute of Technology, 755 Ferst Dr. NW, Altanta, GA, yhung@isye.gatech.edu, C. F. Jeff Wu, Wei Tan, Charles Ume

Out-of-plane displacement has been a major thermomechanical reliability concern for electronic packages. In this research, the effect of initial PWB warpage on the low cycle thermal fatigue reliability of the solder bumps was evaluated from experimental thermal cycling tests and finite element results. Kriging model was used to predict solder bump fatigue life based on the initial PWB warpage, package locations, and solder bump materials.

4 - Sequential Quasi-Monte Carlo Sampling: Construction and Diverse Applications

Ben Haaland, Student, UW-Madison, 3818 Frosted Leaf Dr., Madison, WI, 53719, United States of America, benhaaland@hotmail.com, Peter Qian

Sequences of nested, extendable space filling designs are useful in statistics, computer science, and numerical analysis. Results for nesting and extending a class of designs with good uniformity properties, the (t,m,s)-nets and (t,s)-sequences, are presented. Applications and examples in numerical integration, design and modeling for computer experiments with multiple levels of accuracy and expense, and stochastic programming are given.

■ MC19

M - Lincoln 4

Game Theory and Decision Analysis: Alternative Approaches

Sponsor: Decision Analysis
Sponsored Session

Chair: Barry Cobb, Associate Professor, Virginia Military Institute, 335 Scott Shipp Hall, Lexington, VA, 24018, United States of America, cobbbr@vmi.edu

1 - Advances in Hypergame Theory

Russell R Vane III, IBM Global Business Services, 2102 Capston Circle, Herndon, VA, 20170, United States of America, russ@vaneteam.com

Hypergame Theory, using a cardinal value approach, explores more dimensions of the outguessing problem by constructing a model of perceptions. Adversaries are allowed to create new options unknown by their opponents to calculate the value of information. Hypergame Expected Value is proposed as a confidence indexed decision criteria.

2 - A Decision Analysis Approach to Solving the Signaling Game

Barry Cobb, Associate Professor, Virginia Military Institute, 335 Scott Shipp Hall, Lexington, VA, 24018, United States of America, cobbbr@vmi.edu, Atin Basu Choudhary

The decision analysis approach of van Binsbergen and Marx (2007) for determining Nash equilibria in extensive-form games is compared to a modified approach that models mixed strategies as decision tree chance nodes. This modified approach is compared to a traditional game-theoretic approach for solving the asymmetric signaling game.

3 - Effects-based Operations Planning as a Multi-criteria Decision Analysis Problem

Jouni Pousi, Researcher, Systems Analysis Laboratory, Helsinki University of Technology, Otakaari 1M, 02150 Espoo, Espoo FI, Finland, jouni.pousi@hut.fi, Kai Virtanen, Raimo P Hämäläinen

Effects-Based Operations (EBO) is a modern military planning concept that approaches the planning from a systems perspective by taking into account multiple goals of an operation. We present a new EBO planning process based on multi-criteria decision analysis. In the process, a system model and a method for evaluating effects are needed. We illustrate a case including a multi-criteria influence diagram.

■ MC20

M - Lincoln 3

Dynamic Programming Applications

Sponsor: Decision Analysis
Sponsored Session

Chair: Canan Ulu, University of Texas at Austin, 1 University Station, IROM, B6500, Austin, TX, 78712, United States of America, Canan.Ulu@mccombs.utexas.edu

1 - Irreversible Treatment Decisions under the Possibility of Improved Treatment Discoveries

Steven Shechter, Assistant Professor, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, steven.shechter@sauder.ubc.ca, Mark Roberts, Oguzhan Alagoz

We consider a patient with a degenerative disease who may take some currently available treatment which extends life but has significant consequences for quality of life (e.g., mastectomy). Moreover, the treatment is irreversible so that should a better treatment become available, the patient could no longer take advantage of it. We present an MDP that explicitly considers new treatment discovery in this context and how it may affect decisions regarding the available irreversible treatment.

2 - Dynamic Programming for Efficient Container Inspection Policies

Noam Goldberg, Rutgers University, 640 Bartholomew Rd, Piscataway, United States of America, ngoldberg@rutcor.rutgers.edu, Paul Kantor, Jonathan Word, Endre Boros

We consider the problem of optimally combining any given set of stochastically independent diagnostic tests into an inspection system that maximizes detection subject to a budget constraint. Our inspection policies can be represented as mixtures of decision trees. We present a dynamic programming algorithm that enumerates all efficient, undominated, inspection policies. Our approach directly solves the bicriterion optimization problem, allowing for sensitivity analysis.

3 - The Adoption of Multiple Dependent Technologies

Soo-Haeng Cho, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, soohaeng@andrew.cmu.edu, Kevin McCardle

A firm often makes an adoption decision regarding an improvement of one technology depending on changes in other technologies. While the literature has attributed the slow adoption of an innovation mainly to uncertainties outside the firm, this paper shows that the economic dependence among multiple types of technologies that inherently defines cost relationships inside the firm can significantly influence the timing of adoption. We support results with evidence from the semiconductor industry.

4 - Repeat Purchase Decisions in Technology Adoption

Canan Ulu, University of Texas at Austin, 1 University Station, IROM, B6500, Austin, TX, 78712, United States of America, Canan.Ulu@mccombs.utexas.edu, James Smith

Consumers contemplating replacing a technology they own with a new one need to think about future adoption decisions and uncertainties about future innovations. We formulate this problem as a dynamic programming model and study its structural properties: What changes in benefits and costs make the consumer better off? Decreases in costs and increases in benefits are good for the consumer, but how is she willing to trade off between increased costs and increased benefits (or decreases in both)?

■ MC21

M - Lincoln 2

Joint Session Computational Biology/CS: Protein Structure

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Carl Kingsford, Assistant Professor, University of Maryland, College Park, Department of Computer Science, 3113 Biomolecular Sciences Bldg #296, College Park, MD, 20742, United States of America, carlk@umiacs.umd.edu

1 - Protein Structure Prediction by Linear Programming

Jinbo Xu, Assistant Professor, Toyota Technological Institute at Chicago, 1427 East 60th Street, Chicago, IL, 60637, United States of America, j3xu@tti-c.org

This talk will present a linear programming approach to protein threading, one of the most successful methods for protein structure prediction. The LP approach can empirically solve the protein threading problem within polynomial-time, although this problem is NP-hard. A protein structure prediction package, RAPTOR, has been developed based on this LP approach. RAPTOR is one of the best prediction programs in two consecutive CASP (Critical Assessment of Protein Structure Prediction) events.

2 - Automatic Detection of Influenza Reassortments

Carl Kingsford, Assistant Professor, University of Maryland, College Park, Department of Computer Science, 3113 Biomolecular Sciences Bldg #296, College Park, MD, 20742, United States of America, carlk@cs.umd.edu

When a single host is infected by two strains of influenza simultaneously, the genomes of the progeny viruses can be a mixture of those strains. We present a novel framework for comparing weighted ensembles of phylogenetic trees to detect such reassortment events. The method accounts for uncertainty in the phylogenetic reconstructions when detecting disagreements between the trees for different influenza segments by reducing the problem to finding maximum and maximal bicliques.

3 - Residue-residue Hydrophobic Contact Prediction for Alpha-helical Proteins Via MILP Optimization

Christodoulos Floudas, Stephen C. Macaleer '63 Professor in Engineering and Applied Science, Princeton University, Department of Chemical Engineering, Princeton, NJ, 08544, United States of America, floudas@titan.princeton.edu

A new optimization-based method is presented to predict the hydrophobic residue contacts in alpha-helical proteins. These residue contacts are highly useful in narrowing down the conformational space searched by protein structure prediction algorithms. The proposed approach uses a high resolution distance dependent force field to calculate the interaction energy between different residues of a protein.

4 - New Methods for Modeling Biomolecular Structures

Christopher Langmead, Assistant Professor, Carnegie Mellon University, cjl@cs.cmu.edu

The structural dynamics of proteins mediate biological function. These dynamics are most often studied using molecular dynamics simulation, which is extremely expensive. We present a fast and accurate alternative to MD that can be used to study the thermodynamics of biomolecular systems. Our method uses Markov Random Fields and Generalized Belief Propagation to perform free energy calculations. We present results relevant to: i) protein design, and ii) the rational design of drugs and proteins.

■ MC22

M - Lincoln 1

Contracts and Policies in Supply Chain Management

Contributed Session

Chair: Sean Zhou, Assistant Professor, Chinese University of Hong Kong, Department SE&EM, Hong Kong, China, zhoux@se.cuhk.edu.hk

1 - Joint Price-delivery Decision in Three Stage Supply Chain

Jungkyu Kim, Postech, San 31, Hyoja, Pohang, 790-784, Korea, Republic of, m819@postech.ac.kr, Yushin Hong

We investigate pricing and ordering policies maximizing an average joint profit in three stage supply chain consisting of a single manufacturer, a single wholesaler and multiple retailers. Demand for retailers is linearly decreasing functions of a retail price and each retailer places orders according to EOQ policy. A mathematical model is formulated and a solution procedure is developed to determine the optimal policy.

2 - Quantity Flexibility Contracts and Buy Backs for Relational Contracting

Michaela Isabel Hoehn, Dipl.-Math., WHU - Otto Beisheim School of Management, Burgplatz 2, Vallendar, 56179, Germany, michaela.hoehn@whu.edu, Arnd Huchzermeier, Martin A. Lariviere

This paper studies a two-firm supply chain, where repeated transactions via supply contracts and continued quality-improvement efforts are governed by a relational contract. We are able to characterize an optimal relational contract, i.e., to develop policies for supplier and buyer that structure investments in quality and flexibility in a way that no other self-enforcing contract generates higher expected joint surplus. We examine both quantity-based and price-based returns mechanisms.

3 - Capacity Allocation Policy Impact on Order Fulfillment Performance

Amir-Behzad Samii, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, absamii@mit.edu, Prashant Yadav, Richard Pibernik

The standard and the theft nesting capacity allocation policies are commonly used by airlines and other companies that regularly ration a perishable resource among different customer classes. We derive exact expressions for different order fulfillment performance measures of the individual customer classes and the overall system, under no-nesting (as reference) and both nesting policies. These expressions determine the conditions under which one nesting allocation performs better than the other.

4 - Socially Responsible Practices in the Supply Chain and Stakeholder Expectations

Amrou Awaysheh, Assistant Professor of Operations Management, Instituto de Empresa (IE) Business School Maria de Molina, 12 Madrid, Madrid, 28006, Spain, amrou.awaysheh@ie.edu, Robert D Klassen

A firm can engage in a number of different socially responsible practices that can impact different members of its supply chain. This presentation examines how supply chain structure impacts stakeholders' expectations of firm's involvement in various socially responsible practices within a supply chain context. Results from a national Canadian survey and an archival source are combined to examine the level to which this alignment of expectations and practices impacts performance.

5 - Reverse Auction Procurement with Flexible Noncompetitive Contracts

Sean Zhou, Assistant Professor, Chinese University of Hong Kong, Department SE&EM, Hong Kong, China, zhoux@se.cuhk.edu.hk, Zhijie Tao, Nianbing Zhang, Gangshu Cai

We consider the case of a buyer who wants to procure multiple units of a certain product from a group of potential suppliers. The buyer adopts a hybrid procurement mechanism, in which she first offers some flexible noncompetitive contracts to suppliers followed by a reverse auction. We show that the suppliers may prefer accepting the flexible noncompetitive offers to declining them and joining the auction. Also, the buyer can benefit from offering such kind of contracts to suppliers.

■ MC23

M - Lincoln 5

Queueing Systems with Heavy Tails

Sponsor: Applied Probability
Sponsored Session

Chair: Hayriye Ayhan, Associate Professor, Geogia Institute of Technology, School of ISyE, Atlanta, GA, 30332-0205, United States of America, hayriye.ayhan@isye.gatech.edu

1 - Large Deviations for Random Walks under Subexponentiality: The Big-jump Domain

Ton Dieker, Georgia Institute of Technology, School of ISyE, Atlanta, GA, 30332-0205, United States of America, ton.dieker@isye.gatech.edu, Denis Denisov, Vsevolod Shneer

Stimulated by applications to internet traffic modeling and insurance mathematics, distributions with heavy tails have been widely studied over the past decades. This talk addresses a fundamental large-deviation problem for random walks with heavy-tailed step-size distributions. Our investigations are motivated by the so-called single-server busy period problem with heavy tails, which will also be discussed.

2 - Evaluating SRPT Based Policies for Parallel Queues

Douglas Down, Associate Professor, McMaster University, Department of Copmputer and Software, Hamilton, ON, L8S 4l7, Canada, downd@univmail.cis.mcmaster.ca

We consider the problem of routing jobs to parallel queues where the service time of a job is known on arrival. For various routing strategies, we develop approximations (based on recent results identifying fluid limits for the SRPT discipline in a single queue) to evaluate the performance when SRPT is used as the local scheduling policy. Using these approximations, we compare such policies to other (non-SRPT based) policies, with emphasis on the case when the service times are heavy-tailed.

3 - Rare-event Simulation for Heavy-tailed Multi-server Queues

Jingchen Liu, Harvard University, 1 Oxford Street, Cambridge, MA, 02138, United States of America, jcliu@stat.harvard.edu, Jose Blanchet, Peter W. Glynn

I will present the first provably efficient simulation algorithm for steady-state estimation of long delays in a positive recurrent two-server queue with heavy-tailed service requirement. In such systems, long delays are usually caused by one or two customers who have extremely large service requirement and block the servers for long time. We propose a three-step program to design the algorithm and prove its efficiency.

4 - Machine Scheduling Problems in the Presence of Highly Variable Resource Demands

Ana Radovanovic, Research Scientist, Google Inc., 76 Ninth Avenue, New York, NY, 10011, United States of America, anaradovanovic@google.com

We observe a scheduling problem where a stream of different types of users arrive to the system requesting resources (cpu, ram, disk) for some random amount of time. User requests are served by a single, assigned available machine from the large pool. Our goal is to design a dynamic scheduling policy that performs well, i.e., minimizes job loss rate due to system's inability to provide resources, in the presence of highly variable users' demand.

■ MC24

M - Lincoln 6

Joint Session CS/ Optimization: Computational Integer Programming

Sponsor: Computing Society, Optimization
Sponsored Session

Chair: Jeff Linderoth, University of Wisconsin Madison, 1513 University Avenue, Madison, WI, United States of America, linderoth@wisc.edu

1 - Challenges in Exact Linear and Integer Programming: Exact Precision Linear Algebra

Dan Steffy, Georgia Institute of Technology, dsteffy@isye.gatech.edu, William Cook

A successful approach to solving linear programming problems exactly has been to solve the problems with increasing levels of fixed precision, checking the final basis in exact arithmetic and then doing additional pivots if necessary. This work is a computational study comparing different techniques for the core element of our exact computation: solving sparse rational systems of linear equations exactly.

2 - Strong Branching Disjunctive Cuts for MIP

Mustafa Kilinc, PhD Student, University of Wisconsin-Madison, kilinc@wisc.edu, Jeff Linderoth, Andrew Miller

Strong Branching is an effective branching technique that can significantly reduce the size of branch-and-bound tree and the solution time for MIP algorithms. In this talk, we demonstrate how to effectively use "discarded" information from strong branching to create disjunctive cutting planes. Computational results reveal that the tree size can be effectively reduced using these inequalities.

3 - Flexible Isomorphism Pruning

James Ostrowski, Lehigh University, jao204@lehigh.edu, Jeff Linderoth, Francois Margot

Isomorphism Pruning is an extremely powerful symmetry breaking tool when applied to integer programs. However, Isomorphism Pruning has the limitation that the algorithm must use a restricted choice of branching variables during the search. In this talk, we show how remove this limitation—-modifying isomorphism pruning to allow for complete flexibility in the choice of branching variable. Computational results showing the benefit of this flexibility will be given.

4 - A Pseudocost-based Tree Size Estimation Method for Mixed Integer Programs

Wasu Glankwamdee, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, wag3@lehigh.edu, Jeffrey Linderoth

We describe a mechanism to estimate the size of the search tree resulting from a branch-and-bound method for solving MIP. Pseudocosts are used as a key ingredient in estimation procedure. The method can be used as the search progress, and does not require knowledge of feasible solution values in order to make estimates. Computational results on a wide variety of instances will be given and show that the method compares favorably to other methods in the literature.

■ MC25

M - Lincoln 6A

Joint Session CS/TELCOM: Network Design and Optimization

Sponsor: Computing Society, Telecommunications
Sponsored Session

Chair: Eli Olinick, Associate Professor, SMU, EMIS Department, PO Box 750123, Dallas, TX, 75275, United States of America, olinick@engr.smu.edu

1 - An Optimization Based Algorithm for Designing WLANs for Multi-story Buildings

Jason Kratz, Graduate Student, Southern Methodist University, Dallas, TX, United States of America, jkratz@mail.smu.edu

This manuscript presents a set of optimization models and algorithms to design a wireless local area network for a multistory building. Our algorithm selects the location and frequency assignment of access points in an attempt to maximize the expected network capacity. Our algorithm has been empirically tested on three buildings on the campus of Southern Methodist University. Comparison of our designs with those developed by local IT personnel yielded improvements of 20%, 33%, and 33%.

2 - A Column Generation Heuristic for Traffic Grooming in Wavelength-Routed Optical Networks.

Sanjeewa Naranpanawe, SAS Institute Inc., 100 SAS Campus Drive, Cary, NC, 27513, United States of America, Sanjeewa.Naranpanawe@sas.com, Chelliah Sriskandarajah, Rakesh Gupta, Milind Dawande

We consider the problem of traffic grooming in all-optical networks with the objective of maximizing traffic subject to constraints on the number of transceivers at each node, the link load, and the capacity of each lightpath. Based on the structural properties of the problem, we propose a heuristic based on column generation and summarize the results from an extensive computational study.

3 - Heuristics for the Minimum-cost Ring-cover Problem

Eli Olinick, Associate Professor, SMU, EMIS Department, PO Box 750123, Dallas, TX, 75275, United States of America, olinick@engr.smu.edu

The minimum-cost ring-cover problem is an important and difficult optimization problem arising in the design of reliable, high-speed telecommunications networks. We present an integer-programming formulation for this problem and an empirical analysis of a heuristic for solving it based on column generation.

4 - Dual-Connected Steiner Trees and their Application to Reliable Video Broadcasts

Dave Allen, Verizon Network & Technology, 2400 N Glenville Rd, Richardson, TX, 75082, United States of America, dave.allen1@verizon.com, Peter Kubat

Recent deployment of ROADM (Reconfigurable Optical Add-Drop Multiplexers) in medium/long haul telecom networks has allowed a cost efficient distribution of broadcast video channels via a simple tree topology. Models for such a broadcast node/link failure protected network are developed and solved for minimum cost.

■ MC26

M - Lincoln 5A

Open-Source Solutions for Real-World Problems

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)

Sponsored Session

Chair: Matthew Saltzman, Department of Mathematical Sciences, Clemson University, Clemson, SC, United States of America, mjs@clemson.edu

1 - PLOT: A Tool for Developing POM Alternatives via Integer Programming

Raphael Laufer, Systems Planning and Anlysis, Inc., 2001 North Beauregard Street, Alexandria, VA, rlaufer@spa.com, Joel Durgavich, Stephen Gossin, Zachary Firth, Leon Simms, Dennis Guzik

Every other year, each of the nation's armed services must submit a proposed 6-year budget subject to various spending constraints and political requirements. The goal is maximizing benefit under these constraints, and given that some of the constraints are "fuzzy" the need exists for both sensitivity analyses and the development of alternative solutions.

2 - A Northwest and Delta Airlines Merger Analysis

Dan Larsen, Student, University of Cincinnati, 707 W Martin Luther King Dr, #711E, Cincinnati, OH, 45220, United States of America, asel_dan@msn.com

This past April, Northwest and Delta Airlines have announced their intent to merge. Is keeping their seven existing hubs realistic? By utilizing open source software (namely, COIN-OR) I wish to evaluate an optimal network structure for the combined airline, given current fuel prices. The data source is public data provided by the DOT.

3 - The Java Simulation Library in Designing and Optimizing a Supply-Chain Simulation Model

Hugh Medal, PhD Student, University of Arkansas, 4207 Bell Engineering Center, Industrial Engineering Department, Fayetteville, AR, 72701, United States of America, hmedal@uark.edu, Manuel Rossetti

We demonstrate the use of the Java Simulation Library (JSL) through the entire process of optimizing a supply-chain simulation model. We introduce the unique features of the JSL and its useful framework for supply-chain, transportation logistics, and inventory modeling. We next outline the statistical features of the JSL and how they facilitate simulation-based optimization. Finally, we discuss oppurtunities for users to easily extend existing simulation-based optimization capabilities.

■ MC27

M - Washington 1A

Some New Developments in Markov Decision Processes and Approximate Dynamic Programming

Sponsor: Applied Probability

Sponsored Session

Chair: Spyros Reveliotis, Associate Professor, ISyE, Georgia Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, spyros.reveliotis@isye.gatech.edu

1 - On Polynomial Cases of the Unichain Classification Problem for Markov Decision Processes

Eugene Feinberg, Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY, 11794, United States of America, efeinberg@notes.cc.sunysb.edu, Fenghsu Yang

The unichain classification problem detects whether a finite state and action MDP is unichain under all deterministic policies. As shown by John Tsitsiklis, this problem is NP-hard. This paper provides polynomial algorithms for the unichain classification for an MDP with either a state that is recurrent under all deterministic policies or with a state that is absorbing under some action.

2 - Approximate Stochastic Dynamic Programming for Resource Management with Partial Observations

Edwin Chong, Professor, Colorado State University, 1373 Campus Delivery, Fort Collins, CO, 80523-1373, United States of America, Edwin.Chong@colostate.edu

Recent progress in approximation methods for solving partially observable Markov decision problems has encouraged the formulation and solution of a wide variety of resource management problems using this optimization framework. In this talk, we describe methods based on Bellman's dynamic programming principle and approximations of the cost-to-go. We focus on Monte Carlo sampling methods. We also show several recent examples involving sensor resource management problems.

3 - Customized Learning Algorithms for Episodic Tasks with Acyclic State Spaces

Spyros Reveliotis, Associate Professor, ISyE, Georgia Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, spyros.reveliotis@isye.gatech.edu, Theologos Bountourelis

We present a Probably Approximately Correct (PAC) learning algorithm for reinforcement learning tasks that evolve episodically over acyclic state spaces. In addition, we offer a number of algorithmic enhancements that streamline the implementation of the algorithm and render it efficient from a practical standpoint. Finally, a series of computational experiments demonstrate the efficacy of the proposed implementation and the gains attained compared to the typically used Q-learning algorithm.

4 - Approximate Dynamic Programming in the Presence of Rare Events

Shie Mannor, Assistant Professor, McGill University, McConnell Engineering Building, Rm. 525, 3480 University Street, Montreal, QC, H3A-2A7, Canada, shie.mannor@mcgill.ca, Doina Precup, Jordan Frank

We consider approximate dynamic programming in an environment in which rare significant events occur independently of the actions selected by the controlling agent. Assuming access to a simulator, in which the rare event probabilities can be artificially altered, we introduce algorithms for policy evaluation, using both tabular and function approximation representations of the value function. We present empirical performance of the algorithms on a large network planning task.

■ MC28

M - Washington 1

Adaptive Inventory Control

Cluster: Online Decision Making

Invited Session

Chair: Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

1 - Adaptive Inventory Control with Demand Feedback

Justin Azadivar, University of California, Berkeley, Department of Industrial Engineering, jazad@ieor.berkeley.edu, Max Shen, Peng Li

We examine inventory control and optimization methods for situations where the demand varies in response to previous inventory control decisions and demands. We model this using a satisfaction model, and extend to models based on separate communities with internal communication mechanisms.

2 - Approximate Dynamic Programming for Serial Multi-echelon Systems with Economies of Scale

Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, Wei Xie

The value function of a serial systems with economies of scale is very complex and the underlying policies are not structured. We present a computational study based on algorithms that combine Monte-Carlo sampling and optimization. Various approximations to the value function are discussed.

3 - Adaptive Methods for Inventory Control

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu, Sumit Kunnumkal

We describe a generic adaptive approach to compute the optimal projection levels in a number of inventory control problems. Our approach requires only samples of the demand random variables and it continues to work when the demand random variables are censored by the inventory availability.

4 - An Approximate Dynamic Programming Approach to a Production-inventory Problem

Christiane Barz, University of Chicago, Graduate School of Business, Chicago, IL, 60637, barz@uchicago.edu, Dan Adelman

We present an approximate dynamic programming (ADP) approach to a deterministic production-inventory control problem in which not all states are reachable from every other state. We address the technical difficulties in applying ADP to resolve this issue, and discuss theoretical and numerical results.

■ MC29

M - Washington 2

Panel Discussion: The Industry Job Search

Cluster: Job Placement Service

Invited Session

Chair: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu

1 - Panel Discussion: Industry Job Search

Moderator: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu, Panelists: Kamal Jain, Valerie Tardif, Afi Harrington, Dennis Baer

The panel will lead an informal discussion concerning the industry interview process, the appropriate steps to take during the job search, and the challenges that may be faced along the way. Time will be provided for questions and answers.

■ MC30

M - Washington 4

Modeling and Simulation - Assessing and Enhancing Capabilities

Sponsor: Military Applications

Sponsored Session

Chair: Niki Goerger, LTC, USMA, MADN-SE, Mahan Hall BLDG 752, West Point, NY, 10996, United States of America, niki.goerger@usma.edu

1 - Integrated Soldier Situational Awareness/ Search and Target Acquisition Modeling

John Willis, LTC, United States Military Academy, Department of Systems Engineering, Mahan Hall, West Point, NY, 10996, United States of America, john.willis@usma.edu

This work seeks to identify capability gaps and Soldier M&S analysis needs for the interrelated concepts of Situational Awareness (SA) and Search and Target Acquisition (STA). Our research objectives are to: (1) Identify and evaluate Soldier SA and STA representation within current M&S; (2) Develop an understanding of the interrelationships between Soldier SA and STA; and (3) Develop algorithms and implementations to represent SA and its impacts on STA with a focus on IWARS, OOS, and COMBATXXI.

2 - Bringing Geospatially Enriched Environments into Simulation for Unmanned Ground Vehicle Assessment

Suzanne Delong, US Army ERDC, ATTN:GM-M, 3909 Halls Ferry Road, Vicksburg, MS, 39180, United States of America, suzanne.delong@usma.edu, Joyce Nagle, Niki Goerger

Geospatially enriched synthetic environments are needed for development and assessment of unmanned ground vehicle performance to support sensor fusion and sense making. How can the high fidelity/resolution environment achieved via high performance computing be integrated to inform simulations addressing critical questions? This presentation will address the investigation of a multi-resolution modeling capability and results and lessons learned in developing an experiment for proof of concept.

3 - Overview of MATREX

Tom Hurt, US Army RDECOM, Fort Belvoir,, VA, United States of America, tom.hurt@us.army.mil, Chris Metivier

The Modeling Architecture for Technology, Research, and EXperimentation (MATREX) Program is a key distributed modeling and simulation environment in the US Army. It provides a unifying M&S architecture, supporting tools, and infrastructure to ease integration and use of multi-resolution multi-fidelity live, virtual, and constructive applications. The MATREX program's adaptable environment and tools support Systems of Systems design and development from requirements through test and integration.

4 - The Dynamic Capability Assessment Model: A Complex Capabilities-based Planning and Asset Management

Ted Thomas, Booz Allen Hamilton, 6703 Odyssey Dr, Suite 200, Huntsville, AL, 35806, United States of America, thomas_theodore@bah.com

The Dynamic Capability Assessment Model (DCAM) is an analytic modeling and visualization platform that allows decision makers to align their current and planned decisions, investments, and project schedules to best meet organizational goals. DCAM allows decision makers to perform visual "what-if" analyses on construction timelines, organizational moves, and other activities, enabling them to predict outcomes and the status of various installations based upon a set of planned actions.

■ MC31

M - Washington 5

Navy Workforce Management

Sponsor: The Practice Section of INFORMS

Sponsored Session

Chair: David Cashbaugh, Director, NPRST, 5720 Integrity Drive, Millington, TN, 38055, United States of America, david.cashbaugh@navy.mil

1 - FUTURE: Force Utilization through Unit Readiness and Efficiency

Tanja Blackstone, Economist, NPRST, 5720 Integrity Drive, Millington, TN, 38055, United States of America, tanja.blackstone@navy.mil, David Cashbaugh

FUTURE is an integrated system of decision support tools (DSTs) that will enable resource allocation decisions at the enterprise, unit and individuals levels. FUTURE is designed to provide a validated virtual DST that simulates the impacts of individual, unit, and Navy decisions on cost and readiness includes what-if simulation functionality.

2 - Simulation Modeling and Analysis of the Street-to-first-contract-renewal Supply Chain

Mehdi Amini, Professor, University of Memphis, Memphis, TN, United States of America, mamini@memphis.edu, Thomas Jones, Rodney Myers, Tanja Blackstone, Michael Racer, David Cashbaugh

Approaches applied for understanding and improvement of traditional supply chain with focus on products and services are also shown to be effective in studying the "human" supply chain. We present a simulation modeling and analysis approah to undrstand and improve the behavior of Navy's street-to-first-contrcat-renewal supply chain for AMEK job family. This supply chain is responsible for recruiting, training, distribution, placement, and contrcat renewal of sailors.

3 - OptForce™: Strategic Workforce Optimization and Diversity Planning

Jay April, Chief Development Officer, OptTek Systems, Inc., 1919 Seventh Street, Boulder, CO, 80302, United States of America, april@OptTek.com, Fred Glover, James Kelly, Marco Better

This presentation describes the simulation optimization technology being developed under a National Science Foundation SBIR Phase II award, projected to be used to support strategic workforce optimization and enhance diversity planning and management. The listener will learn how the system supports the cost-effective achievement of workforce readiness, diversity goals and objectives, improvements to workforce capabilities and performance, and enhanced business performance.

4 - Simulation Toolset for Experimental Environment Research (STEER)

Thomas Jones, NPRST-2222, Memphis, TN, thomas.jones4@navy.mil

STEER is an agent-based simulation platform that uses multiple incentive structures to align individual readiness and resource allocation decisions with organizational Navy objectives. Using an integrated system of agent based simulation-optimization analysis tools, STEER is designed to quantify the impact of varying market-based personnel policies on individual, unit, and enterprise behavior.

■ MC32

M - Washington 6

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research

Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Towards a Single European Sky

Yael Grushka-Cockayne, London Business School, Regent's Park, London, United Kingdom, ygrushka.phd2003@london.edu, Bert De Reyck

We describe an integrated decision-making framework and model for supporting the unification of the fragmented European air traffic management systems, developed to aid Eurocontrol in its vital role in the construction of a Single European Sky. Combining multi-criteria decision analysis with large-scale optimization, our model facilitates the process by which the numerous European aviation stakeholders evaluate and select technological enhancements. We take into account multiple objectives and potential disagreements and differing priorities among stakeholders.

2 - Using OR to make Urgent Sourcing Decisions in a Distressed Supplier Environment

Erica Klampfl, Technical Leader, Ford Research & Advanced Engineering, Systems Analytics & Env. Sciences Department, RIC Bldg, MD #2122, 2101 Village Rd., Dearborn, MI, 48124, United States of America, eklampfl@ford.com, Yakov Fradkin, Chip McDaniel, Michael Wolcott

Ford was tasked with determining the best sourcing footprint for its $1.5 billion Automotive Components Holdings, LLC Interiors business. This extensive undertaking required a complete re-engineering of the supply footprint of 42 high-volume product lines over 26 major manufacturing processes and more than 50 potential supplier sites. We present a decision support tool and novel approach to solve the underlying large-scale Mixed Integer Nonlinear Program that resulted in savings of approximately $40 million in upfront investment over the previously preferred alternative.

■ MC33

M - Johnson

Surgical Planning

Sponsor: Health Applications Section

Sponsored Session

Chair: Michael Carter, Mechanical & Industrial Engineering, University of Toronto, 5 King's College Rd., Toronto, ON, M5S3G8, Canada, carter@mie.utoronto.ca

1 - A Generalised Perioperative Simulation-based Decision Support Tool

Daphne Sniekers, University of Toronto, Mechanical and Industrial Engineering, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, daphne.sniekers@utoronto.ca, Michael Carter

The perioperative process of three Ontario hospitals has been modelled from decision to operative to discharge. The models simulate patient flow and allows the use to evaluate a variety of strategic decisions in an effort to improve key measures such as procedure volume, cancellation rate and utilisation. Common process flow characteristics between hospitals are compiled in an effort to build a reusable base model for any hospital.

2 - You Can Do It, We Can Help: An OR Toolkit for Patient Scheduling

Sherry Weaver, Haskayne School of Business, University of Calgary, 2500 University Drive NW, Calgary, AB, T2N1N4, Canada, sherry.weaver@haskayne.ucalgary.ca, Michael Carter, Tom Noseworthy

You are familiar with this scenario: after developing a successful simulation/DSS for one location, you're asked to create a similar system for a slightly dissimilar location. We're in the fortunate situation of knowing we'll be asked to create similar patient scheduling systems at multiple facilities performing hip/knee arthroplasty. Hence, our goal is to create a flexible 'OR toolkit' for efficient implementation across multiple sites. Lessons 'learned' and 'learning still' will be presented.

3 - Factors Affecting the Turnover Times between Surgeries

David P. Strum, Associate Professor, Hospital University of Pennsylvania, 680 Dulles, Hospital U of Pennsylvania, 3400 Spruce Street, Philadelphia, PA, 19104, United States of America, strumdp@uphas.upenn.edu, Luis G. Vargas

Surgical scheduling is complicated by variability inherent in the turnover times (TT) between surgeries. We investigated TT with the goal to describe variability in TT and the associated factors that might be predicted, controlled, or altered to improve surgical scheduling. Our results suggest numerous factors affect turnover times and knowledge of the sources of variability in TT are important to improve surgical scheduling and reduce sub-optimal utilization of costly operating rooms.

4 - Decision Support Tool for Childhood Immunization Catch-up Scheduling

Faram Engineer, Georgia Tech, School of Industrial and, Systems Engineering, Atlanta, GA, 30332, United States of America, fenginee@isye.gatech.edu, Pinar Keskinocak, Larry Pickering

We developed a decision support tool incorporating a dynamic programming algorithm to help providers and caretakers in constructing catch-up schedules for childhood immunization. These schedules ensure that a child continues to receive timely coverage against vaccine preventable diseases if one or more doses have been delayed. The tool is available for free download from the CDC website.

■ MC34

M - Jefferson

Innovations in the Modeling of Health Care

Sponsor: Health Applications Section

Sponsored Session

Chair: Chris P. Lee, Assistant Professor, The Wharton School, 3730 Walnut St., University of Pennsylvania, Philadelphia, PA, 19104, United States of America, cpclee@wharton.upenn.edu

1 - Modeling Proton Beam Allocation at a Cancer Treatment Center

Min Wang, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, mwang13@gsb.columbia.edu, Chris P. Lee, Sergei Savin

Proton cancer therapy has a high facility cost requiring a high utilization to maintain profitability. We consider the problem of allocating and switching proton beam time among multiple treatment rooms to maximize throughput at a large proton center. We develop a deterministic version of the problem as a mixed integer programming model and a heuristic algorithm for solving it. For the stochastic version, we incorporate uncertainty in patient arrivals and the duration of patient prepping.

2 - Capacity Investment under Competition: Evidence from US Hospitals

Diwas Kc, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104, United States of America, diwas@wharton.upenn.edu, Christian Terwiesch, Chris P. Lee

Operations Management theory suggests that competition tends to spur capacity investment. We test this theory in the context of healthcare delivery using capacity and demand data from a cross-section of US hospitals.

3 - Ambulance Diversion in Emergency Departments: The Role of Hospital Capacity

Sarang Deo, Northwestern University, s-deo@kellogg.northwestern.edu, Wuqin Lin, Gad Allon

Emergency department (ED) overcrowding and consequent ambulance diversion is one of the most pressing healthcare delivery problems in the US. In this paper we develop a two-stage queuing model to study the impact of structural factors such as the size and utilization of the hospital and the size of the ED on ambulance diversion status of the ED. We then test the key insights from our model using cross-sectional data on about 300 EDs in California and find moderate evidence for our results.

4 - A Dynamic Index Policy for Liver Allocation System

Fatih Safa Erenay, University of Wisconsin-Madison, Madison, WI, United States of America, erenay@wisc.edu, Mustafa Akan, Oguzhan Alagoz, Baris Ata

We propose a more efficient liver allocation system considering patient preferences, where efficiency is measured by number of wasted organs or total quality adjusted life years. We capture the dynamics of disease evolution by a fluid model, whose solution leads to an intuitive dynamic index policy for assigning livers. We compare the proposed policy with current liver allocation policy by using a simulation model and real data, which shows that our proposed policy outperforms the current one.

■ MC35

M - Jackson

Teaching Project Management and Management Science

Sponsor: INFORM-ED

Sponsored Session

Chair: Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu

1 - A Long Strange Trip: My 4 Year Odyssey Teaching Project Management

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu

The first semester that I taught an MBA course in project management was an absolute disaster. After a series of changes, both radical and incremental, the same course is now one of the most popular and highly rated in our entire MBA program. In this session, I'll describe the experience of re-making this class, with a special emphasis on the use of case studies to connect the "soft" aspects of project management practice to the "hard" OR/Project Scheduling methods that are so familiar to us.

2 - A New Paradigm for Project Management Education

Gary Mitchell, Assistant Professor of Operations Management, Pamplin School of Business, University of Portland, 5000 N. Willamette Boulevard, Portland, OR, 97203, United States of America, mitchelg@up.edu

In recent years, project management (PM) has become increasingly important to organizations of all types. An effective PM course relates to all business disciplines and therefore is likely to have a greater appeal than most MS courses. In this presentation, we discuss how PM may be the perfect context for introducing business students to MS tools that support and encourage the critical thinking a project manager needs, while stimulating greater interest in other MS courses.

3 - An Update on the Status of OR/MS in Undergraduate Business Curricula

Susan Palocsay, Professor of Computer Information Systems and Management Science, James Madison University, CIS & MS Department, MSC 0202, Harrisonburg, VA, 22807, United States of America, palocssw@jmu.edu, Ina Markham, Scott Stevens

In 2003, AACSB International approved a new set of standards for accreditation of business programs that include a requirement for coverage of "statistical data analysis and management science." We discuss trends for OR/MS in undergraduate business curricula since the standards' revision, including student and faculty perception of its relevance and increased use of Excel-based tools in other business disciplines.

■ MC37

M - T. Marshall Ballroom West

Tutorial: Personalization and Recommender Systems

Cluster: Tutorials

Invited Session

Chair: Alexander Tuzhilin, New York University. Stern School of Business., 44 W 4TH ST #8-92, New York, NY, United States of America, atuzhili@stern.nyu.edu

1 - Personalization and Recommender Systems

Alexander Tuzhilin, New York University. Stern School of Business., 44 W 4TH ST #8-92, New York, NY, United States of America, atuzhili@stern.nyu.edu, Zan Huang, Gediminas Adomavicius

In this tutorial, we present an overview of the personalization field and review different types of personalization. We also discuss the general personalization process and position the field of recommender systems as an integral part of this process. We review the field of recommender systems by describing a number of "traditional" recommendation approaches and their extensions. Finally, we discuss several future research directions for personalization and recommender systems, including integrated personalization process, data acquisition for recommender systems, advanced modeling of user preferences, other model-based techniques for recommendation, evaluation of recommender systems, recommendation flexibility and scalability, and trust and privacy issues in recommender systems.

■ MC38

M - Tyler

Discrete Optimization: Theory and Algorithms

Sponsor: Optimization/ Discrete Optimization

Sponsored Session

Chair: Hanif Sherali, University Distinguished Professor, Virginia Tech, 250 Durham Hall, ISE Department (0118), Blacksburg, VA, 24061, United States of America, hanifs@vt.edu

1 - Dynamic Lagrangian Dual and Reduced RLT Constructs for Solving 0-1 Mixed-integer Programs

Cole Smith, Associate Professor, ISE, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, j.cole.smith@gmail.com

We enhance the strength of Lagrangian relaxations for solving mixed-integer programs, by dynamically augmenting the Lagrangian dual with cuts induced from a disjunction implied by partial branch-and-bound enumeration. These cuts are also obtainable via an appropriate Reformulation-Linearization Technique (RLT) representation. We exploit the strength inherent in such higher-dimensional RLT reformulations, and thus also limit the number of variables controlled by subgradient optimization.

2 - Maximizing a Class of Submodular Utility Functions

Shabbir Ahmed, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, sahmed@isye.gatech.edu, Alper Atamturk

We report polyhedral results for a class of combinatorial optimization problems involving submodular utility maximization. Strong valid inequalities are derived by lifting lower dimensional inequalities. By exploiting special structure, we provide a complete characterization of the lifting function and its subadditive approximation. Computational experiments with capital budgeting problems show the effectiveness of the derived inequalities within a branch-and-cut approach.

3 - Two-stage Robust Network Design with Uncertain Capacities

Alper Atamturk, University of California, 4175 Etcheverry Hall MC 1777, Berkeley, CA, United States of America, atamturk@berkeley.edu, Muhong Zhang

In this talk we consider a two-stage robust network design problem with uncertain capacities. We give a characterization of the feasible region for the first stage and discuss the separation problem under a budget uncertainty set. Numerical experiments will be presented.

4 - Symmetry Compatible Formulations Via Objective Perturbations and Hierarchical Constraints

Ahmed Ghoniem, Virginia Tech, Durham 250 (0118), Blacksburg, VA, 24060, United States of America, aghoniem@vt.edu, Hanif Sherali

We discuss how hierarchical constraints can be combined with objective perturbations in a nonpreemptive multiobjective framework in order to defeat symmetry in combinatorial optimization problems. We also present the concept of symmetry compatible formulations and its relationship with these two symmetry-defeating paradigms. Computations for selected applications are presented.

■ MC39

M - Truman

KLIC: Knowledge Networks and the Emergence of New Technologies (Sloan Session)

Sponsor: Technology Management
Sponsored Session

Chair: Erica Fuchs, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131E, Pittsburgh, PA, 15213, United States of America, erhf@andrew.cmu.edu

1 - The Evolution and Performance of Research Groups

Francisco Veloso, Associate Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131D, Pittsburgh, PA, 15213, United States of America, fveloso@cmu.edu, Leonardo Reyes-Gonzalez

This work analyzes how research groups (RGs) in institutions are formed and evolve. We characterize RGs by looking at co-authorship and assessing the strength and cohesiveness of ties among authors over time, both within and across institutions. With this technique, we track the movement of researchers across co-authorship groups and assess how science self-organizes over several decades and across entire scientific fields. We then explore how the nature of RG relates to performance and impact.

2 - Institutional Environments & Network Emergence: The Case of Human Embryonic Stem Cell Research

Jeff Furman, Assistant Professor, Boston University, 595 Commonwealth Ave - 653a, Boston, MA, 02215, United States of America, furman@bu.edu, Fiona Murray

This paper examines the role of institutional environments on the emergence of scientific networks. Specifically, we consider the case of human embryonic stem cell (hESC) research. We exploit the fact that key research materials are subject to different IP restrictions in the US and Europe to examine the relationship between institutional environments and the growth and structure of the hESC research communities.

3 - The Role of DARPA in Seeding and Encouraging New Technology Trajectories

Erica Fuchs, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131E, Pittsburgh, PA, 15213, United States of America, erhf@andrew.cmu.edu

This study unpacks how DARPA leverages social networks among technologists to seed and encourage new technology trajectories in the computing industry. The results show how DARPA (1) facilitates brainstorming sessions among thought leaders, (2) provides seed funding to unconnected researchers working on related projects, (3) brings funded researchers together to discuss their results, and (4) acting as third party validation of new technologies to latter-stage funding agencies and industry.

4 - Collaboration Matters: Evidence from the US-Japan Inventor Survey

John Walsh, Professor, Georgia Institute of Technology, Public Policy, 685 Cherry St, Atlanta, GA, 30332, United States of America, john.walsh@pubpolicy.gatech.edu, Sadao Nagaoka

Using the US-Japan inventor surveys, we examine collaboration patterns across the two countries, and how the innovation process varies by industry and organization. We find invention draws heavily on outside sources and is often a cooperative activity, much more than bibliometric data suggests. Furthermore, the degree of cooperation is broadly similar across the two countries. We also find, using the US data, that collaboration is associated with patent value and commercialization.

■ MC40

M - Taylor

Stochastic Dominance And Applications

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu

1 - Inverse Cutting Plane Methods for Problems with Second Order Stochastic Dominance Constraints

Andrzej Ruszczynski, Professor, Rutgers University, 94 Rockefeller Road, Piscataway, NJ, 08854, United States of America, rusz@business.rutgers.edu, Darinka Dentcheva

We propose new cutting plane methods for solving optimization problems with second order stochastic dominance constraints. The methods are based on the inverse formulation of stochastic dominance constraints using Lorenz functions. Convergence of the methods is proved for general probability distributions. In the case of discrete distributions convergence is finite, without the assumption of equal probabilities of the realizations. Comparison with primal cutting plane methods is provided.

2 - An Algorithm for Optimization Problems with Stochastic Order Constraints Induced by Linear Recourse

Dimitri Drapkin, Faculty of Mathematics, University of Duisburg-Essen, Duisburg, Forsthausweg 2, 47057 Duisburg, Duisburg, Germany, drapkin@freenet.de, Ruediger Schultz

We derive a cutting plane decomposition method for stochastic programs with first-order dominance constraints induced by linear recourse models with continuous variables in the second stage. Computational results indicate that our method is favorable over the application of general-purpose mixed-integer linear programming solvers.

3 - Robust Stochastic Dominance Constraints

Darinka Dentcheva, Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, darinka.dentcheva@stevens.edu, Andrzej Ruszczynski

We introduce a new preference relation in the space of random variables, which we call robust stochastic dominance. We consider stochastic optimization problems where risk-aversion is expressed by a robust stochastic dominance constraint. These are composite semi-infinite optimization problems with constraints on compositions of measures of risk and utility functions. We develop necessary and sufficient conditions of optimality for such optimization problems.

4 - A Cutting Surface Method for Linear Programs with Linear Stochastic Dominance Constraints

Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu, Tito Homem-de-Mello

We study linear optimization problems with multi-dimensional linear-positive-second-order-stochastic-dominance constraints. By using the polyhedral properties of the second-order-linear dominance condition we present a cutting-surface algorithm, and show its finite convergence. We present a novel branch-and-cut algorithm for finding the cut by combining ideas from concave minimization with those from binary integer programming.

■ MC41

M - Taft

New Product Development

Contributed Session

Chair: Jie Xu, Northwestern University, 2145 Sheridan Road, Rm C210, Evanston, IL, 60208, United States of America, jie.xu@u.northwestern.edu

1 - Optimal Investment Policy with Rental Bids in Rent-to-Own Industry

Soheil Sibdari, Charlton College of Business, University of Massachusetts, North Dartmouth, MA, 02747, ssibdari@umassd.edu, Michael H. Anderson

In this study, we address product investment decisions that a firm faces in rent-to-own industry. In a rent-to-own industry, customers arrive according to a random process and request one unit of the product to rent and possibly own it after making all payments. At the time of request, if the product is available in stock, the firm accepts the bid and rents it to the customer. If not, the firm should make a decision of whether to purchase the product and rent it to the customer or reject the bid. The bid has two characteristics of contract duration and payment type using which the periodic payments will be calculated. In this paper, we use a dynamic programming model to address this problem and determine the firm's optimal decision.

2 - Quality Dynamics of Multi-generation Products

Gokhan Dogan, PhD Student, MIT Sloan School of Management, 30 Wadsworth Street E53-364, Cambridge, MA, 02138, United States of America, gdogan@mit.edu, Nelson Repenning

Quality problems of multi-generation products (such as cars or construction equipment) discovered after the start of production are carried over to next generation. We empirically investigate the impact of these carry-over problems on product quality and find that the impact is substantial. We also analyze the consequences of different problem solving policies that utilize carry-over problem information.

3 - NPD Scheduling: An Experimental Investigation of Hybrid Iterative Design Modes

Michael Hoeck, Professor, TU Freiberg, Department of Operations Management, Lessingstrasse 45, Freiberg, 09596, Germany, michael.hoeck@bwl.tu-freiberg.de, Yvonne Busshoff

Our contribution in this paper is twofold. First, we show how design iterations can be modeled modifying the Multi-Mode Resource-Constrained Project Scheduling Problem (MRCPSP) - a standard project scheduling model. Based on the MRCPSP we then perform an experimental investigation to analyze the benefits of hybrid design iterations, i.e. a combination of parallel, sequential or overlapping iterations considering multiple constraints.

4 - Joint Product Line and Supply Chain Design

Jie Xu, Northwestern University, 2145 Sheridan Road, Rm C210, Evanston, IL, 60208, United States of America, jie.xu@u.northwestern.edu, Wallace Hopp, Barry L Nelson

Platform design, in which modular components are added to platforms to produce a family of products, is widely used to provide product variety efficiently. An important strategic question is how to structure the product family (e.g., many platforms with few component options or vice versa). We find that different supply chain structures lead to qualitatively different optimal product lines.

■ MC42

M - McKinley

Joint Session CS/HAS: OR Applications in Metabolic and Regulatory Networks

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)
Sponsored Session

Chair: Allen Holder, Trinity University, One Trinity Place, San Antonio, TX, United States of America, aholder@trinity.edu

1 - Simulating Metamotifs

Leonardo B. Lopes, Assistant Professor, University of Arizona, Systems & Industrial Eng. Department, 1127 E. North Campus Drive, Tucson, AZ, 85721, United States of America, leo@sie.arizona.edu, Weini Zhang

We present a Matlab framework for describing and simulating networks of Motifs and analyzing their behavior. The framework also searches for networks that reproduce a desired behavior.

2 - Signal Transduction Network Inference from Double Causal Experimental Evidence

Bhaskar DasGupta, Associate Professor, University of Illinois at Chicago, 851 South Morgan Street, Chicago, IL, 60607, United States of America, dasgupta@bert.cs.uic.edu, Reka Albert, Riccardo Dondi, Sema Kachalo, Eduardo Sontag, Alex Zelikovsky, Kelly Westbrooks, Ranran Zhang

We introduce a new method of combined synthesis and inference of biological signal transduction networks. We validate the biological usability of our approach by successfully applying it to a previously published signal transduction network and by using it to synthesize and simplify a novel network corresponding to activation induced cell death in large granular lymphocyte leukemia.

3 - Investigating Cycles in Metabolic Networks

Tim Nunamaker, Trinity University, 1 Trinity Pl 1818, San Antonio, TX, United States of America, Timothy.Nunamaker@Trinity.edu

We construct a metabolic network for E. coli and interpret the behavior of cycles within the network. A graph is constructed by connecting all pairs of reactions in which the first reaction produces a resource and the second reaction consumes it. A cycle is a subgraph in which a closed path can be identified, allowing amy reaction to process a finite quantity of resources infinitely many times. We attempt to classify cycles according to unique characteristics and trends.

4 - Degeneracy in Flux Balanced Analysis

Allen Holder, Trinity University, One Trinity Place, San Antonio, TX, United States of America, aholder@trinity.edu

Flux Balance Analysis provides a computational tool to understand a metabolic network under constant growth. The underlying optimization model is commonly degenerate, something we explore mathematically and computationally. We further highlight the mapping between environment and growth by introducing a minimal environment.

■ MC43

M - Balcony D

Disruptions Risks in Various Industries

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: M. Johnny Rungtusanatham, Associate Professor, University of Minnesota, 3-150 CSOM, 321 19th Ave S, Minneapolis, MN, 55455, United States of America, rung0002@umn.edu

1 - Analysis of Disruption Risks in a Food Supply Chain

Monika Weishaeupl, Research Assistant, Vienna University of Economics and Business Administration, Nordbergstr. 15, Vienna, AT, 1090, Austria, monika.weishaeupl@wu-wien.ac.at, Heidrun Rosic, Werner Jammernegg

We consider the disruption risks in a food supply chain where raw material is perishable and only available during a limited time period but the final product is a durable good. Using dynamic process simulation we analyze alternative strategies for mitigating the impacts of disruption risks with respect to cost and service level. Examples of strategies are decentralization of production and warehousing and other sourcing options.

2 - Multiple Risk Perspectives and Decision Making Within the U.S. Imported Food Inspection System

Jaime Frittman, Analyst, ANSER, 2900 South Quincy Street, Suite 800, Arlington, VA, 22206, United States of America, jgivens2103@comcast.net, Georganne John, Nicki Borkowski, Art Pyster, Annette Pacella, Clarke Ansel

As concerns about the safety of imported foods grow, a systems view of the federal imported food inspection process, stakeholders, and their risk-based decision making may improve the understanding of current port inspection capabilities. This paper summarizes data from literature reviews, case study examinations, and stakeholder interviews to describe stakeholders' risk perspectives and how their perspectives influence inspection decisions at U.S. ports of entry.

3 - A Risk-informed Decision Framework for Hurricane Protection and Coastal Planning

Martin Schultz, Environmental Engineer, Engineer Research and Development Center, US Army Corps of Engineers, 3909 Halls Ferry Road, Vicksburg, MS, 39180, United States of America, Martin.T.Schultz@usace.army.mil, Burton Suedel, Jongbum Kim, Igor Linkov, Greg Kiker, Todd Bridges

A risk-informed decision framework for selecting hurricane system protection alternatives for the Louisiana Coastal Protection and Restoration (LACPR) project is described. Multicriteria decision analysis techniques are used to rank candidate plans and optimize the level of risk reduction achieved considering uncertainty in selected planning assumptions and the diversity of stakeholder preferences. Lessons learned from the practice of applying these techniques will be discussed.

4 - Evaluation of Urban Chemical Disaster Emergency Evacuation Strategies

Scott Parr, Student, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, 33431, United States of America, sparr1@fau.edu

A subsection area of a major metropolitan area was simulated using the software program AIMSUN in order to test emergency evacuation techniques employed by the city and state localities. This is due to the high level risk of man made disastrous eventualities. The goal of this project focuses on the development of a traffic simulation model in order to integrate an emergency preparedness plan in order to effectively determine the best strategies to use for evacuation.

5 - A Taxonomy of Risk Mitigation Strategies

Scott Ellis, Assistant Professor, Clemson University, 101 Sirrine Hall, Clemson, SC, United States of America, ellis9@clemson.edu, Aleda Roth, M. Johnny Rungtusanatham

Extant research suggests that buying firms simultaneously adopt multiple risk mitigation tactics to minimize the threat of supply disruption. In this study, we investigate buyers' simultaneous use of inventory positioning, contingency planning, and relationship management tactics and develop a taxonomy of risk mitigation strategies. Further, we examine how buyers' demographics, product attributes, supply market factors, and perceptions of supply risk vary across risk mitigation strategies.

■ MC44

M - Balcony C

Supply Chain Management of Perishable Items

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu

1 - A Simulation Approach for Inventory Management at Hacettepe University Hospitals' Blood Center

Banu Yuksel-Ozkaya, Hacettepe University, Department of Industrial Engineering, Ankara, 06800, Turkey, byuksel@hacettepe.edu.tr, Murat Caner Testik, Salih Aksu, Osman Ilhami Ozcebe, Volkan Sonmez

Necessity for an effective management of blood banks, emerge from the short life times for components of blood and the uncertainty of the supply from donors. Apart from these, unsatisfied demand and disposal of blood components (at the end of their lifetimes) are vital, from both humanitarian and cost points of view. In this study, we analyze the blood inventory management of Hacettepe University Hospitals' Blood Center using simulation techniques and discuss improvement recommendations.

2 - Renewal Strategies for Perishable Products with Random Demand and Dynamic Pricing

Amar Sapra, Assistant Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States of America, sapra.amar@gmail.com, Li-Ming Chen

We consider joint inventory control and pricing decisions for a perishable item with random demand and lost-sales. The demand in a period depends on both age of the inventory and price. We develop three different models with increasing flexibility. In the first model, the replenishment frequency is determined in advance and is fixed during the planning horizon. This assumption is relaxed in the second model. In the third model, we allow partial disposal when excessive inventory is on-hand.

3 - Improving Platelet Supply Chain Management at Stanford Blood Center (SBC)

Yenho Thomas Chung, Stanford University, 334 Olmsted Rd #139, Stanford, CA, 94305, United States of America, yhthomas@stanford.edu, Feryal Erhun

Managing platelet supply chains is a challenging task due to many demand and supply uncertainties. In early 2006, SBC was struggling with a perishability rate of around 20%. We study demand and supply processes of SBC. Through a set of improvements on collection schedule, contract execution, and operational inefficiencies we decrease the perishability rate to 13%. We focus on the incentive misalignment between SBC and hospitals that it serves to study general contracting issues on platelets.

■ MC45

M - Balcony B

Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Julie Simmons Ivy, North Carolina State University, ISE Department, Campus Box 7906, Raleigh, NC, 27695, United States of America, jsivy@ncsu.edu

1 - The Impact of Changes in Demand Variability on Logistics Strategy with Two Modes of Supply

Ana Vila-Parrish, North Carolina State University, 400 Daniels Hall, Campus Box 7906, Raleigh, NC, United States of America, anita.vilaparrish@gmail.com, Julie Simmons Ivy, Russell E. King

We consider a make-to-order firm, with a geographically distant supplier, that decides the order quantity for each of two supply modes on a periodic basis. We explore the relationship of product life cycle demand characteristics, through the use of Markovian demand process, and the impact on ordering strategies using a Markov decision process.

2 - Operational Decisions in Inventory Models with Unknown Demand and Unobserved Lost Sales

Arnab Bisi, Assistant Professor of Management, Purdue University, 403 W. State Street, West Lafayette, IN, 47907, United States of America, abisi@purdue.edu, Surya Tokdar, Maqbool Dada

We study optimal ordering policies in dynamic inventory problems with censored demand data. We address storable and perishable inventory models over finite horizon as well as perishable model over infinite horizon. For Weibull and exponential demand distributions, we compute the optimal policies and develop managerial insights. The implications of scalability for the censored newsvendor problem is discussed.

3 - Product Line Selection and Inventory Control for Correlated Products

Mabel C. Chou, National University of Singapore, 1 Business Link, BIZ 1, Singapore, mabelchou@nus.edu.sg, Hua Tao

Many companies now offer hundreds, if not thousands, of SKUs in order to compete in the market place. High correlations may exist among the utilities of these products due to common attributes among them, and these correlations may affect the customer's choice and the resulting sale of each product. Based on a model which addresses an inherent limitation of the popular Multinomial Logit model, we consider such correlations in making the product line selection and inventory control decisions.

4 - Managing Time-based Contracts with Delayed Payments

Dharma Kwon, Assistant Professor, University of Illinois at Urbana-Champaign, Department of Business Administration, Champaign, IL, 61820, United States of America, hyokjon.kwon.2008@anderson.ucla.edu, Steven Lippman, Kevin McCardle, Chris Tang

Some manufacturers impose a time-based contract on their suppliers under which each supplier is paid only when all of the suppliers have completed their tasks. We set up a model with one manufacturer and two suppliers and study the impact of the time-based contract on each supplier's effort level and on the manufacturer's profit. When the suppliers' completion times are uncertain, the time-based contract is more profitable if and only if the manufacturer's project is sufficiently small.

■ MC46

M - Balcony A

The After-Market Supply Chain

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Vishal Agrawal, PhD Student, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, gth767p@mail.gatech.edu

1 - Warranty Inventory Optimization with Visibility into the Reverse Channel

John Khawam, PhD Candidate, Stanford University, 380 Panama Street, Terman 371, Stanford, CA, 94305, United States of America, jkhawam@stanford.edu, Warren H. Hausman

In warranty inventory management, customers return allegedly malfunctioning products for replacement or credit. Useful products may be recovered through testing and/or remanufacturing. We formulate both exact and heuristic dynamic programming models for this situation to minimize system costs. We also explore the effects of visibility in the reverse channel.

2 - Enhancing Flexibility by Integrating Product Recovery in Spare Parts Procurement

Karl Inderfurth, Professor, University of Magdeburg, Universitaetsplatz 2, Magdeburg, D-39106, Germany, Karl.Inderfurth@WW.Uni-Magdeburg.DE, Rainer Kleber

Product recovery gains increasing importance in spare parts acquisition, especially during the service period after end-of-production. Considering product recovery in addition to traditional procurement options (final order, extra production) makes the underlying stochastic dynamic planning problem highly complex. An efficient heuristic for problem solving is developed and used to evaluate and measure the contribution to procurement flexibility that can be expected from product recovery.

3 - Installed Base Management with Deterministic Obsolescence

Cerag Pince, PhD Candidate, Erasmus University Rotterdam, Room H09-06, Burg. Oudlaan 50, PO Box 1738, Rotterdam, DR, 3000, Netherlands, pince@few.eur.nl, Rommert Dekker

For slow moving items using install base information may lead to very accurate forecasts of time and magnitude of sudden drops in demand rate. When such characteristics are known in advance, prior action can be taken to remove excess stocks in order to adjust the new inventory position. We consider a continuous review inventory system in which the demand rate can shift to a lower state at a deterministic time point and propose approximate solutions for the optimal time to remove excess stocks.

4 - Leasing & Selling: The Environmental Implications of Product Recovery & Marketing Strategies

Vishal Agrawal, PhD Student, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, gth767p@mail.gatech.edu, Mark Ferguson, Beril Toktay, Valerie Thomas

We evaluate the environmental implications of the lease versus sell decision based on the total environmental impact in the life cycle of the product. We extend the results on durable goods from the economics literature and on closed-

loop supply chains in the operations literature. We find the optimal recovery, disposition & remarketing strategies under both leasing and selling. Next we examine conditions under which each strategy is both profitable and environmentally superior.

■ MC47

M - Hoover

2008 Pierskalla Prize Finalists

Sponsor: Health Applications Section
Sponsored Session

Chair: Jay Rosenberger, Assistant Professor, The University of Texas at Arlington, PO Box 19017, Arlington, TX, 76019, United States of America, jrosenbe@uta.edu

1 - Patient Flow in an ICU

Edieal Pinker, Simon School, University of Rochester, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Gregory Dobson, Hsiao-Hui Lee

Many ICUs face overcrowding.One response is to bump ICU patients to other departments to make room for new patient arrivals. Bumping clearly has the potential to reduce care quality. We develop a stochastic model of a single ICU with patient bumping to enable planners to predict performance, under differing capacity and arrival patterns. We develop a aggregation-disaggregation algorithm that enables us to track the system time for each patient despite the high dimensionality of the problem.

2 - Reserving Capacity for Urgent Patients in Primary Care

Gregory Dobson, Simon School of Business, University of Rochester, Rochester, NY, United States of America, dobson@simon.rochester.edu, Edieal Pinker

We examine the common practice of reserving slots for urgent patients in a primary care practice. Using a stochastic "dam" model of appointment scheduling, we optimize system performance accounting for revenue and the two service quality measures as a function of the number of reserved slots for urgent patients. Our results suggest that, performance may improve if no slots are reserved for urgent patients.

3 - Division of Labor in a Medical Office Practice

Edieal Pinker, Simon School, University of Rochester, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Gregory Dobson

This paper examines the staffing, division of labor, and resulting profitability of primary care physician practices based on data from a sample of these practices. We test two hypotheses: H1) controlling for staff size, greater delegation through the use of more staff types will decrease the throughput of visits, and H2) controlling for staff size, income per unit time generated by the practice is decreasing in the number of staff types. We find evidence supporting both hypotheses.

4 - Solving Beam-Angle Selection and Dose Optimization Simultaneously via High-Throughput Computing

Hao Zhang, University of Wisconsin-Madison, 922 Erin St. Apt. 4, Madison, WI, United States of America, haoz@cae.wisc.edu, Leyuan Shi, Robert Meyer, Warren D'Souza

We provide a framework for integrating two stages of Radiation Treatment Planning (RTP): Beam Angle Selection (BAS) and Dose Optimization (DO). Alternative BAS and DO algorithms or commercial RTP software and clinical experience can be embedded within the framework. Automated BAS and improved dose distribution are achieved within the framework. Computational efficiency is achieved by utilizing High-Throughput Computing (HTC) via the Condor system.

■ MC48

M - Coolidge

Joint Session TMS/NPD: Discussion Panel: Meet the Editors and Ask Them Questions

Sponsor: Technology Management, New Product Development
Sponsored Session

Moderator: Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu

1 - MS Department Editor of "R&D and Innovation"

Panelist: Christoph Loch, Professor of Technology Management, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France, Christoph.LOCH@insead.edu

Meet the department editor of "R&D and Inovation" of Mnanagement Science

2 - Christian Terwiesch - New Product Development, R&D, and Project Management

Panelist: Christian Terwiesch, The Wharton School, University of Pennsylvania, Philadelphia, PA, United States of America, terwiesch@wharton.upenn.edu

Meet the department editor of the New Product Development, R&D, and Project Management department at POM.

3 - Cheryl Gaimon - Management of Technology

Panelist: Cheryl Gaimon, Georgia Institute of Technology, 800 West Peachtree St NW, Atlanta, GA, 30308, United States of America, cheryl.gaimon@mgt.gatech.edu

Meet the department editor of the Management of Technology department at POM.

4 - Olav Sorenson - Organizations and Social Networks

Panelist: Olav Sorenson, Rotman School, University of Toronto, 50 Prince Arthur Ave, Toronto, ON, M5S3E6, Canada, olav.sorenson@rotman.utoronto.ca

Meet the department editor of the Organizations and social Networks department at Management Science.

5 - Journal Reviews at Management Science and POMS

Panelist: Vish Krishnan, Professor of Innovation, Technology & Operations, University of California at San Diego, Rady School of Management, Otterson Hall, Room 3S144 9500 Gilman Dr, La Jolla, CA, 92093-0553, United States of America, vkrishnan@ucsd.edu

In this panel, we review our editorial philosophy at POMS and how it is different from Management Science.

■ MC49

M - Harding

Dynamic Data Driven Adaptive Multi-scale Simulation (DDDAMS)

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Young-Jun Son, Associate Professor, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, son@sie.arizona.edu

1 - A Combined Optimization-simulation Approach for Computing Order Promising Parameters

Yingjie Lan, PhD Candidate, University of Maryland, 7323 Parkwood Ct Apt 204, Falls Church, 22042, United States of America, ylan@rhsmith.umd.edu, Michael Ball, Michael Fu

We develop an optimization model for computing certain order promising parameters, e.g. delivery date. The core model is an integer program, but a simulation is used to evaluate part of the objective function, which is an expected value. We evaluate alternate solution approaches including a cross-entropy approach.

2 - Dynamical Data Driven Integrated Simulation and Optimization for Wildfire Containment

Lewis Ntaimo, Assistant Professor, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ntaimo@tamu.edu, Xiaolin Hu

We present a DDDAS simulation and optimization framework for wildland fire containment called DEVS-FIRE. DEVS-FIRE integrates fire behavior simulation for generating fire spread scenarios, stochastic programming for initial attack to compute the optimal mix of firefighting resources to deploy to multiple bases, and then which of the resources to dispatch to multiple fire scenarios, and fire suppression simulation to evaluate the dispatch plans under realistic firefighting tactics.

3 - Dynamic-data-driven Adaptive Multi-scale Simulation for Control of Manufacturing Enterprises

Nurcin Koyuncu, PhD Candidate, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, koyuncu@email.arizona.edu, Young-Jun Son

Our goal is to adaptively adjust the fidelity of a simulation model against available computational resources. Four algorithms are embedded into a simulation model to perform data filtering, fidelity selection, fidelity assignment, and task generation. Grid computing and Web Services are used for computational resources management and inter-operable communications among distributed software components. The proposed approach is applied for control of distributed manufacturing enterprises.

■ MC50

M - Wilson C

Computational Integer Programming III

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - Test-and-prune: A Parallelized Algorithm for Solving Bi-level Optimization Problems

Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu, Duncan Callaway, Oleg Gusikhin, Richard Chen, Ada Barlatt

We have recently developed a new algorithm, Test-and-Prune, for solving a broad class of bi-level optimization problems. In this talk, we extend this algorithm to take advantage of parallel computing resources. Examples are given from a range of application areas.

2 - Revisiting the Constraint Activating Outer Polar Method

Samid Hoda, Tepper School of Business, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, shoda@andrew.cmu.edu, Egon Balas, Francois Margot

We examine the performance of the Constraint Activating Outer Polar Method (CAOPM) on a small testbed of 0-1 programs. The CAOPM is a method for solving 0-1 programs that starts with a subset of the problem constraints that defines a bounded relaxation of the feasible region. It then adds only as many of the remaining problem constraints as are needed to find a relaxation that lies within the outer polar of the integer hull. The best feasible solution found is an optimal solution to the problem.

3 - Using Analytic Centers to Find Feasible Solutions in Mixed Integer Programming

Joe Naoum-Sawaya, University of Waterloo, Management Sciences Department, University of Waterloo, 200 University A, Waterloo, ON, N2L3G1, Canada, jnaoumsa@uwaterloo.ca, Samir Elhedhli

We present an algorithm for finding feasible solutions for MIPs based on the notion of analytic centers. The algorithm searches along two line segments connecting the analytic center and two extreme points. Cuts related to the violated constraints are added to shift the analytic center until a feasible integer solution is found. The algorithm is tested on a set of problems from MIPLIB. Results showed that our algorithm outperforms the feasibility pump in a number of instances.

4 - Large-scale Column Generation Approaches for Solving QPMIPs Arising from Cancer Treatment

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Kyungduck Cha

We describe a column generation scheme that was designed for solving intractable large-scale quadratic mixed integer programs arising from cancer treatment. Problem characteristics will be described and computational results and their clinical significance on real patient data will be analyzed.

■ MC51

M - Wilson B

Joint Session IS/CS: Digital Goods and Markets: Emerging Models and New Frontiers I

Sponsor: Information Systems, Computing Society
Sponsored Session

Chair: Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu

1 - On the Temporal Nature of Sales to Rank Relationships in the Music Industry

Ramnath Chellappa, Associate Professor, Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, ram@bus.emory.edu, Conny Karnes

Recently, a significant amount of work in IS, economics and marketing has used the relationship suggested by Chevalier and Goolsbee (2003) to impute demand from the relative sales-rank of a product in its category. However many industries, in particular the music industry are subject to temporal changes suggesting that the sales to rank relationship may not be fixed. Our research examines factors that define this relationship post digitization.

2 - Unbundling Information Goods: An Empirical Analysis of Consumer Created Custom CDs

Jesse Bockstedt, George Mason University, 4400 University Drive, Fairfax, VA, 22030, United States of America, jesse.bockstedt@gmail.com, Kim Huat Goh

We perform an empirical analysis of over 25,000 consumer-created custom CDs to gain insights into consumer behavior in the context of unbundling and customized bundling of information goods. We find that slight differences in the pricing scheme have a dramatic impact on the distribution of bundle sizes. We also analyze the bundle contents to determine whether consumers tend to create bundles of hits or "long tail" songs. This paper provides insights for selling unbundled information goods.

3 - Measuring Product Competition in Online Retailers from Revealed Preferences of Online Recommendation

Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu, H. Michelle Chen, Prabhudev Konana

This study investigates differentiated product competition for consumer consideration and choice in online retailers. We find that despite the greater product variety suggested by the Long Tail in online retailers, more than half of the purchase decisions are made by consumers considering two or fewer alternatives. The results show that being first considered by consumers plays a dominant role in product competition, and that pricing strategies only influence product competition for choice.

■ MC52

M - Wilson A

Coordination in Closed-Loop Supply Chains

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Grit Walther, Technische Universität Braunschweig, Katharinenstr. 3, Braunschweig, 38106, Germany, g.walther@tu-bs.de

1 - Sharing Responsibility for Product Take-Back Across the Supply Chain

Brian Jacobs, Georgia Tech, 800 W. Peachtree NW, Atlanta, GA, 30308, United States of America, brian.jacobs@mgt.gatech.edu, Ravi Subramanian

We use a two-echelon model to determine the impacts of EPR collection and recycling mandates on profits for integrated and decentralized supply chains. We demonstrate how the sharing of EPR program costs between the echelons can move a decentralized chain closer to the coordinated profit benchmark. We propose a social welfare construct that considers consumer surplus, supply chain profits, and environmental externalities to aid the social planner in assessing the effectiveness of EPR programs.

2 - Optimal Acquisition and Sorting Policies for Remanufacturing over a Finite Planning Horizon

Yihao Lu, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States of America, lyihao@ecs.umass.edu, Ana Muriel

The objective is to minimize the total acquisition, remanufacturing and inventory holding costs to satisfy a given demand over the planning horizon. A more restrictive sorting policy requires a higher acquisition cost, but a lower remanufacturing cost. While the remanufacturing cost increases with time as the product ages, the acquisition cost decreases. We show the existence of a single optimal acquisition and sorting policy, and the procedure to achieve this optimum.

3 - Coordination of Recycling Networks

Grit Walther, Technische Universität Braunschweig, Katharinenstr. 3, Braunschweig, 38106, Germany, g.walther@tu-bs.de, Thomas S. Spengler, Eberhard Schmid

A decentralized negotiation mechanism is presented allowing independent recycling companies to assign tasks within recycling networks. Thereby, contracts are negotiated between a focal company and recycling companies with minimum data exchange. The negotiation approach is implemented via Lagrangian relaxation and subgradient optimization. Applicability of the mechanism is shown and performance is tested on a numerical study based on real-world data. Managerial insights are derived.

■ MC53

M - Nathan Hale- Wardman Tower

Optimal Trading and Portfolio Management

Sponsor: Financial Services
Sponsored Session

Chair: Aparna Gupta, Decision Science & Engineering Department, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States of America, guptaa@rpi.edu

1 - Robustness and Sensitivity Analysis of Risk Measurement Procedures

Romain Deguest, IEOR Dep - Columbia University, 500 West 120th Street, NYC, NY, 10027, United States of America, rd2304@columbia.edu, Rama Cont, Giacomo Scandolo

Measuring the risk of a portfolio involves two steps: estimating its loss distribution from data and computing a risk measure which summarizes its risk. We define the notion of risk measurement procedure, which includes those two steps, study the robustness of risk measurement procedures and their sensitivity to a change in the data set. We illustrate a conflict between subadditivity and robustness and show in particular that using historical VaR leads to a robust procedure.

2 - A Robust Dynamic Programming Approach to Buying a Large Block of Security with Adaptive Safe Price

Ye Lu, MIT, 77 Mass. Ave. E40-130, Cambridge, MA, 02139, United States of America, yelu@MIT.EDU, Asu Ozdaglar, David Simchi-Levi

We consider the problem of dynamically trading a security over a finite time horizon. We assume that a trader has a "safe price" for the security, which is the highest price that the trader is willing to pay for this security in each time period. We show that the greedy policy is not always optimal and provide conditions under which the greedy policy is optimal. We also provide bounds on the performance of the greedy policy relative to the performance of the optimal policy.

3 - Optimal Market-Making with Risk Aversion

Miao Song, MIT, 77 Mass. Ave. Room 1-235, Cambridge, MA, United States of America, msong@mit.edu, Kan Huang, David Simchi-Levi

Market-makers have the obligation to trade fixed amounts of securities at quoted bid or ask prices, and their inventories are exposed to the potential loss when the market price moves in an undesirable direction. One approach to reduce the risk brought by price uncertainty is to adjust the inventory at the price of losing potential spread gain. Using stochastic dynamic programming, we show that a threshold inventory control policy is optimal with respect to an exponential utility criterion.

4 - Impact of Incomplete Information on Optimal Dynamic Portfolio

Haleh Valian, PhD candidate, Rutgers University, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States of America, valian@rci.rutgers.edu, Davood Golmohammadi, Mohsen Jafari

This paper examines the impact of uncertainty about parameters of asset pricing model on the dynamic portfolio decision. The state of this system is estimated from noisy observations by applying filtering theory. Moreover, the sequence of optimal actions of an agent who takes the error of predicted variables into account is compared to an agent who is blind to it. The result shows that uncertainty of parameters usually induces risk averse agents to choose the higher trading volume.

■ MC54

M - Congressional - Wardman Tower

Modeling and Managing Security Risk for Complex Systems

Cluster: Risk Security
Invited Session

Chair: Seth Guikema, Assistant Professor, Johns Hopkins University, Department of Geography and, Environmental Engineering, Baltimore, MD, 21218, United States of America, sguikema@jhu.edu

1 - Mitigation Assessment of Water Supply Systems for Insufficient Fire Flows: A Multi-objective Approach

Lufthansa Kanta, Graduate Assistant Teaching, Texas A&M University, College Station, 603 Southwest Parkway, Apt. 32, College Station, TX, 77840, United States of America, lufthansa_kanta@neo.tamu.edu, Emily Zechman, Kelly Brumbelow

Effective mitigation strategies for urban fire events for water distribution systems (WDS) are developed using an evolutionary multiobjective optimization-simulation framework. An elitist non-dominated sorting genetic algorithm is applied with a little modification. The objectives considered are minimizing fire damages, minimizing water quality deficiencies, and minimizing the cost of mitigation. A set of Pareto-optimal solutions is generated to understand the trade-offs between the objectives.

2 - An Agent-based Simulation-Optimization Framework for Water Distribution Threat Management

Emily Zechman, Assistant Professor, Texas A&M University, Zachry Department of Civil Engineering, 3136 TAMU, College Station, TX, 77843-3136, United States of America, ezechman@civil.tamu.edu

The development of management strategies for contamination threats in water distribution systems can be informed through the use of a simulation-optimization framework. Agent-based and mechanistic models are coupled to capture the dynamic interactions between managers' operation decisions, consumers' water consumption choices and contaminant transport in the network for evaluating consumer exposure. Optimization methods are applied to identify response plans to protect public health.

3 - Risk Classification and Uncertainty Propagation for Water Distribution System Contamination Events

Kelly Brumbelow, Assistant Professor, Texas A&M University, Zachry Department of Civil Engineering, 3136 TAMU, College Station, TX, 77843-3136, United States of America, kbrumbelow@civil.tamu.edu, Jacob Torres, Seth Guikema

A risk classification scheme is employed for identifying vulnerable water distribution system (WDS) components subject to a malevolent water contamination event. This is followed by an uncertainty analysis for quantifying uncertainties in WDS input data. A few inputs include: demands, tank levels, and contaminant quantity. It is shown that reasonable uncertainties in model inputs produce high variability in contamination exposure levels, requiring greater resources for effective mitigation.

4 - Multicriteria Security System Performance Assessment Using Fuzzy Logic

William McGill, Assistant Professor, Penn State University, 307B IST Building, State College, PA, 16801, United States of America, wmcgill@ist.psu.edu

Modern security problems focus on sensibly allocating resources to decrease the magnitude of potential threats, decrease the chances of adversary success given an attempt, or minimize loss following a successful attack. This talk describes a model that approximates the true relationship between defensive capabilities and probability of adversary success using techniques from fuzzy logic. A simple example demonstrating the proposed model to support decision making accompanies this discussion.

■ MC55

M - Embassy- Wardman Tower

Resource Allocation in Radio and Wireless Networks

Sponsor: Telecommunications
Sponsored Session

Chair: Vidyadhar Kulkarni, University of North Carolina, 209 Smith Building, CB# 3260, Chapel Hill, NC, 27599, United States of America, vkulkarn@email.unc.edu

1 - Opportunistic Spectrum Access in Cognitive Radio Networks

Xin Liu, Assistant Professor, University of California, Davis, One Shields Ave., Davis, CA, 95616, United States of America, liu@cs.ucdavis.edu

Cognitive radio is a promising technology to mitigate spectrum shortage in wireless communications. It enables secondary users to opportunistically access low-occupancy primary spectral bands while protecting the legacy primary users. In this talk, we present a medium access scheme for secondary users that dynamically adapt their transmission and sensing strategies to maximize their channel access time while limiting collision with primary users.

2 - Large Deviations of Queues Served by a Wireless Channel

Alexander Stolyar, Bell Labs, Alcatel-Lucent, 600 Mountain Ave, 2C-322, Murray Hill, NJ, 07974, United States of America, stolyar@research.bell-labs.com

Multiple queues, each with own input flow, are served by a wireless channel whose capacity varies randomly and asynchronously with respect to different queues. The problem is to find a scheduling algorithm that optimally controls large deviations of the queues, namely maximizes the minimum (weighted) exponential decay rates of the queues' distribution tails. We prove optimality of the simple and parsimonious "exponential" (EXP) scheduling rule.

3 - An Index Policy for Scheduling Users in a Wireless Cell

Nomesh Bolia, UNC Chapel Hill, 210 Smith Bldg, UNC, Chapel Hill, NC, United States of America, nomesh@email.unc.edu, Vidyadhar Kulkarni

We consider resource allocation for data transfer between the base station and users with finite data queues within a cell of a wireless telecommunication network. We derive an index policy that is stable and attempts to minimize congestion. The index policy is based on a closed form index for every user derived using a policy improvement approach based on Markov Decision Processes. We compare its performance with existing policies through simulation.

4 - Scheduling Despite Inexact Job Size Information

Adam Wierman, Assistant Professor, California Institute of Technology, 1200 E. California Blvd, Pasadena, CA, 91125, United States of America, adamw@caltech.edu, Misja Nuyens

Motivated by the optimality of Shortest Remaining Processing Time (SRPT) for mean response time, many computer systems have begun to "favor small jobs". However, rarely do computer systems have knowledge of exact remaining sizes. In this paper, we prove new results characterizing the impact of inexact job size information on the performance of SRPT and related policies.

■ MC56

O - Blue Room

Freight Transportation Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Michel Gendreau, Professor, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michelg@crt.umontreal.ca

1 - Network Design for Two-echelon City Logistics System

Claudio Sterle, PhD, University, Via Claudio, Napoli, 80125, Italy, claudio.sterle@unina.it, Teodor Gabriel Crainic, Antonio Sforza

The freight distribution is one of the most challenging issue of the city logistics. In this work we propose several formulations for a two-echelon city logistic system where we want to determine the number and locations of intermodal platforms and additional facilities, "satellites", where freights are transferred and aggregated on small trucks, in order to minimize the effects of freight transportation in urban areas. We will also provide a discussion about possible solution approaches.

2 - An Integrated Evaluation Platform for Regional Planning Methods for Freight Transportation Systems

Rajeev Namboothiri, Post-Doctoral Research Fellow, CIRRELT, Universite de Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, rajeev@crt.umontreal.ca, Teodor Gabriel Crainic, Michel Gendreau, Jean Damay

This talk presents an evaluation platform dedicated to strategic regional planning of freight transportation systems. We develop methodologies to perform an actual multimodal, multi-product freight transportation system simulation. These tools efficiently model the different components of these systems, and their complex interactions. They provide a realistic representation of the current state of the system, and serve as a comprehensive analysis tool for system state changes in the future.

3 - Procurement Order Consolidation: A Case Study

Suzanne Marcotte, Professor, Department Management & Technology, ESG, UQAM, CP 8888, centre ville, Montréal, QC, H3C 3P8, Canada, Suzanne.Marcotte@cirrelt.ca, Teodor Gabriel Crainic, Matthias Takouda, Walter Rei

In this paper, we present a case study on the integration of operations research models within the purchasing management process of a retail company. In order to achieve economy of scale within the demand-driven and total cost trade-off paradigms of supply chain management, we propose the consolidation of small orders shipments into container loads to be shipped together. This is effectively obtained by inserting a decision aid system based on bin packing models into the order-release process.

4 - Modeling Collaboration among Rail Carriers in Transporting Goods Arriving on Spot Markets

Elise Miller-Hooks, Associate Professor, University of Maryland, Department of Civil & Environmental Engin., 1173 Glenn Martin Hall, College Park, MD, 20742, United States of America, elisemh@umd.edu, April Kuo

Concepts of collaborative decision-making are incorporated within a combinatorial auction-based framework to support competing rail carriers operating within an alliance in co-transporting one-off loads arriving on spot markets. A train space leasing problem is also addressed. The proposed techniques aid in forming profitable trains that might otherwise have been underutilized and permit carriers to compete with truck transport on the spot market.

■ MC57

O - Blue Room Prefunction

Panel Discussion: Funding Opportunities from the Government Agencies

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Serguei Netessine, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, netessine@wharton.upenn.edu

1 - Funding Opportunities from the Government Agencies

Moderator: Donald Hearn, Optimization and Discrete Mathematics Program Manager, Airforce Office of Scientific Research, 875 North Randolph Street, Suite 325, Room 3112, Arlington, VA, 22203, United States of America, donald.hearn@afosr.af.mil, Panelists; Cerry Klein, Grace Peng, Teresa Zayas-Caban

We will discuss the funding opportunities for the junior faculty from the leading agencies. The panelists are program directors from National Science Foundation, National Institute of Health, Agency for Healthcare Research and Quality, and Airforce Office of Scientific Research. The panel will discuss the areas that they fund, explain how the funding process works, and describe strategies for writing winning proposals. Part of the panel will be dedicated to discussion with the audience.

■ MC58

O - Capital

Joint Session AAS/TSL: Aviation System Performance Analysis I

Sponsor: Aviation Applications, Transportation Science & Logistics
Sponsored Session

Chair: Andrew Churchill, Graduate Research Assistant, University of Maryland, 1173 Martin Hall, College Park, MD, 20742, United States of America, churchil@umd.edu

1 - Simulation and Validation of Airport Capacity Models

Amy Kim, Student, University of California, Berkeley, 107D McLaughlin Hall, Berkeley, CA, 94720, United States of America, amy_kim@berkeley.edu

Development of a new airport capacity model is under consideration by the FAA; however, this requires a better understanding of existing models and how their predictions compare to empirical information. Runway operations are simulated using computer models. Empirical data is then used to estimate runway capacity under a given set of conditions. The goal is to compare the simulated capacity results with one another, and with empirical data results, to determine sources of inconsistencies.

2 - Value of Flight Cancellation and Cancellation Decision Modeling

Jing Xiong, Phd Candidate, University of California, Berkeley, NEXTOR, 107E McLaughlin Hall, Berkeley, CA, 94720, United States of America, jingxiong@berkeley.edu, Mark Hansen

Current studies are focused on flight delays to assess the performance of the National Airspace System (NAS). However, flight cancellations should be studied to consummate delay metrics. In this study, we will explore Ground Delay Program (GDP) post operation data to infer the relative value of cancellations in terms of delay savings. Two cancellation metrics are developed for this purpose. In addition, we model flight cancellation decisions with a discrete choice model.

3 - Continuum Modeling of Aircraft Flows in Queues

David Lovell, Associate Professor, University of Maryland, 1173 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, lovell@umd.edu, Kleoniki Vlachou

To build quickly executing macroscopic models of airspace flows in a queuing network, we explore the adaptation of tools from continuum modeling. The flows in the national airspace system are not sufficient to warrant a direct interpretation as fluid flow. Instead, we explore the use of fluid approximations by considering aircraft as divisible objects whose flow in the system carries stochastic implications. We test these ideas on the DELAYS queuing model and a diffusion model.

4 - Examining the Aggregate Relationship between Aircraft Load Factor and Cancellation Rate

Andrew Churchill, Graduate Research Assistant, University of Maryland, 1173 Martin Hall, College Park, MD, 20742, United States of America, churchil@umd.edu, Michael Ball, Shin-Lai Tien, David Lovell

Given the swift increase in aircraft load factors in the United States over the past several years, carriers are increasingly faced with fewer options for accommodating passenger demand during irregular operations. In this work, we

seek to examine the use of decreased flight cancellations as a mechanism for coping with increased load factors. To this end, we use regression models to examine both nationwide and market-specific data to estimate the strength of this trend.

■ MC59

O - Embassy Room

New Frontiers in Pricing and Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu

1 - Estimating Primary Demand for Substitutable Products from Sales Transaction Data

Garrett van Ryzin, Professor, Columbia University, 412 Uris Hall, NY, NY, 10027, United States of America, gjv1@columbia.edu, Gustavo Vulcano, Richard Ratliff

We consider an approach for estimating substitute and lost retail demand when only sales transaction data are available and not all products are available in all periods. The problem we consider is how to jointly estimate the parameters of a choice model and arrival rates using only sales transaction data. We develop an efficient algorithm based on estimating "primary" (first-choice) demand and illustrate it on two industry data sets.

2 - A Bilevel Model for Media Pricing and Broadcasting

Patrice Marcotte, Professor, University of Montreal, C.P. 6128, Succursale Centre-ville, Montreal, QC, Canada, marcotte@iro.umontreal.ca, Nicolas Chan, Gilles Savard

We consider the problem of jointly determining the price and schedule of advertising spots faced by a media broadcaster, where customers are heterogeneous with respect to their performance (audience) requests. We propose a bilevel programming formulation of the problem, whose difficulty comes from the presence of upper level constraints and discrete lower level variables. We analyze its structure, describe solution algorithms, and present numerical results.

3 - Are Restrictions on Low Fare Customers Beneficial?

Vijay Desai, PhD Candidate, Industrial Engineering and Operations Research Department, Rm. 313, SEAS, Columbia University, 500 West 120th Street, New York, NY, 10027, United States of America, vvd2101@columbia.edu, Guillermo Gallego

We consider the network revenue management problem with MNL as consumer choice behavior model. We assume the consumer's utility function depends on schedule quality and price. By analyzing the DP value function we can show that the revenue is monotonically increasing in schedule quality. This result suggests that imposing artificial restrictions on lower fare customers like 14 day advance purchase, weekend stay are actually detrimental to revenue. We explore other extensions of this model.

■ MC60

O - Hampton Room

Railyard Simulation and Tools for Crew Assignments

Sponsor: Railway Applications
Sponsored Session

Chair: Kamalesh Somani, Manager Operations Research, CSX Transportation, 3019 Warrington Street, Jacksonville, FL, 32254, United States of America, Kamalesh_Somani@CSX.com

1 - Win-win on Regular Work Assignments for Union and Carrier

Scott Setser, Dir Crew Plng & Utilization, CSX Transportation, Inc., 116 Druid Street, Jacksonville, FL, 32254, United States of America, Scott_Setser@csx.com

Railroad manpower is impacted by employee mark-offs. Providing regular work assignments with set rest days allows for improved quality of life for crews and requires fewer railroad employees to run equal or better performing trains. This opportunity requires better tools to advertised "Assigned-Jobs", because of crew penalty payments and train performance issues, due to the labor agreement.

2 - Yard Simulation Optimizer: A Decision Support System for Intermodal Yard Planning

Rob Girardot, Dir Network Simplification, CSX Intermodal, Inc., 301 West Bay Street, Jacksonville, FL, 32202, United States of America, Rob_Girardot@csx.com, Michael Gatto

CSX has developed a decision support system for intermodal yards that can be used for designing yard layouts, improving yard layouts, understanding and testing yard processes, and capacity planning. This talk will describe the modeling, algorithmic, and animation components of this system, and give the demonstration of this system applied to a CSX yard.

3 - Extensible Simulation Framework for Railyard Operations

David Ciemnoczolowski, Union Pacific Railroad, DDCIEMNO@UP.COM

Simulation provides an excellent framework for analyzing impacts of operational rules, yard design, and service design. Unfortunately, railyard operations do not readily fit into the classic server/queue network typically assumed in discrete-event simulation. In this talk, we will outline an extensible simulation approach using plug-in modules to evaluate different control policies.

■ MC61

O - Calvert Room

Public Transit I

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Luca Quadrifoglio, Assistant Professor, Texas A&M University, CE/TTI Bldg., Room 301I, College Station, TX, 77843-3136, United States of America, lquadrifoglio@civil.tamu.edu

1 - Reducing Bus Bunching

Donald Eisenstein, Donald.Eisenstein@ChicagoGSB.edu, John J. Bartholdi

Transportation systems such as buses suffer from what is commonly known as "bunching", resulting in long and variable wait times. We explore a new way to help reduce bunching.

2 - RealTime Control Strategies for Transit Operations on a Corridor with Vehicles' Capacity Constraints

Ricardo Giesen, Assistant Professor, Universidad Catolica de Chile, Vicuna Mackenna 4860, Transport Engineering and Logistics, Santiago, RM, 6904411, Chile, giesen@ing.puc.cl, Felipe Delgado, Juan Carlos Munoz, Aldo Cipriano

We present a math programming model to update operational plans on a transit corridor, based on real-time information about demands and travel times, which considers additional waiting time at stops due to vehicles' capacity constraints. The performance of proposed strategies is simulated on high demand scenarios, and the benefits are discussed.

3 - Optimal Route Spacing and Headway of a Transit Network for Analyzing Hierarchy Structure

Junsik Park, Post-doctoral Researcher, University of Texas at Austin, 1 University Station C 1761, ECJ Hall 6.508, Austin, TX, 78712, United States of America, forejs@paran.com, Travis Waller

Optimal route spacing and headway can be decided to minimize the total cost of a transit network. At the optimal route spacing and headway, the total cost of a transit network can be simplified in a form of travel cost plus non-travel cost. The hierarchical structure of a transit network was analyzed using the simplified total cost function of a transit network. This study shows the condition when a hierarchical transit network is more efficient than a transit network without hierarchy.

4 - A Methodology to Derive the Critical Demand Density for Designing and Operating Feeder Transit Services

Xiugang Li, Zachry Department of Civil Engineering, Texas A&M University, College Station TX, li_xiugang@tamu.edu, Luca Quadrifoglio

We study the impact on productivity of specific operating practices currently used by PAratransit providers. We investigate the effect of using a zoning vs. a no zoning strategy and time window settings on performance measures such as total trip miles, deadhead miles and fleet size. We conduct this study through a simulation model of the operations for a provider in Los Angeles County.

■ MC62

O - Governor's Boardroom

Revenue Management Applications

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Nagihan Comez, Bilkent University, Bilkent, Ankara, 06800, Turkey, comez@bilkent.edu.tr

1 - Dynamic Cruise Ship Revenue Management

Bacel Maddah, American University of Beirut, School of Engineering, PO Box 11-0236, Beirut, 1107-2020, Lebanon, bm05@aub.edu.lb, Lama Moussawi

This paper analyzes a two-dimensional cruise ship revenue management problem, where customers arrive in groups and request one cabin of a particular category and a number of lifeboat seats. Accepting a family on board requires two resources: Cabins and lifeboat seats. The decision is to accept/reject a request. We formulate this problem as a discrete time dynamic program. We propose several heuritics, compare their performance and make recommendations.

2 - Advertising Inventory Allocation Based on Multi-Objective Optimization

Jimmy Yang, Yahoo! Inc., 4401 Great America Parkway, Santa Clara, CA, 95054, United States of America, jianyang@yahoo-inc.com, John Tomlin

Allocation of advertising inventory is one of the critical issues in revenue management for media industry. Given a set of advertising demand, a media company must decide how to allocate limited inventory to achieve certain business objectives. This research reviews various allocation objectives and different approaches to optimize for these objectives. A framework based on multi-objective optimization is developed to test different objectives and analyze the trade-off.

3 - Revenue Management in the Parking Industry

Kostas Triantis, Professor, Virginia Tech, 7054 Haycock Road, Falls Church, VA, 22043-2311, United States of America, triantis@vt.edu

This research explores how revenue management (RM) principles would integrate into a parking system, and how advanced reservations, coupled with dynamic pricing (based on booking limits) could be used to maximize parking revenue. Furthermore, it evaluates how the application of RM in the parking industry and within urban parking districts can mitigate traffic congestion.

4 - Joint Dynamic Pricing of Multiple Perishable Products under Consumer Choice

Yalcin Akcay, Turkey, yakcay@ku.edu.tr, Susan Xu, Harihara Prasad Natarajan

We consider a dynamic pricing problem facing a firm that sells given initial inventories of multiple substitutable products over a finite horizon. Product demands are linked through consumer choice processes, depending on the nature of product differentiation. We formulate this joint dynamic pricing problem as a stochastic dynamic program and characterize the optimal prices.

■ MC63

O - Congressional B

Transportation Logistics and Energy Supply Chain

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yueyue Fan, Assistant Professor, University of California, Department of Civil Engineering, Davis, CA, 95616, United States of America, yyfan@ucdavis.edu

1 - Optimal Design of Storage Facility in Bio-ethanol Supply Chain under Uncertainty

Yongxi Huang, Graduate Student, University of California, Institute of Transportation Studies, Davis, 95616, United States of America, yxhuang@ucdavis.edu, Yueyue Fan

The design of ethanol production system using biomass is subjected to feedstock seasonality and highly uncertain future demands. A multistage stochastic model is proposed in this paper for optimal design and operation of biorefineries as well as storage facilities for both feestocks and fuels, in order to enhance the system reliability and efficiency of the entire ethanol supply chain.

2 - Optimizing Biofuel Transportation and Refinery Locations in Illinois

Seungmo Kang, Postdoctoral Fellow, University of Illinois at Urbana-Champaign, Department of Civil & Environmental Engineering, Urbana, IL, 61801, United States of America, skang2@uiuc.edu, Hayri Onal, Umit Tursun, Jurgen Scheffran, Yanfeng Ouyang

We find the optimal locations and capacities of new biofuel refineries in Illinois, including expansion of the existing facilities, using a MIP facility location model. The model minimizes the total cost of crop production and harvesting, transportation costs between farms, refineries and consumers, and processing costs at the refineries. This problem is solved by both CPLEX and a customized Lagrangian relaxation algorithm. Numerical results are presented.

3 - Optimal Allocation of Multiple Biomass Resources for Biofuel Production in the United States

Nathan Parker, Graduate Student Researcher, University of California, Davis, Institute of Transportation Studies, Davis, CA, 95616, United States of America, ncparker@ucdavis.edu, Yueyue Fan

In this talk, we will present how multiple biomass resources, including energy crops and biowastes, could be optimally allocated for biofuel production in the United States for two policy goals. First, we will estimate the supply of biofuels as an economic substitute for petroleum fuel. Second, we will estimate the potential for climate change mitigation through biofuels. We consider the costs and climate impacts of the entire fuel supply chain from the feedstock to the end users.

4 - Management of Logistics Planning

Björnar Aas, Molde University College, Britvegen 2, Molde, 6402, Norway, bjornar.aas@himolde.no, Stein W. Wallace

We propose a conceptual framework for management of logistics planning. Logistics problems are gradually becoming more complex and the proposed framework contributes to a better understanding of logistics management as a subject. We believe that the application of the proposed framework could lead to more cost-efficient logistics planning. A case study from the oil-and gas industry is presented.

■ MC64

O - Congressional A

Transportation Network Design

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Xuesong Zhou, Assistant Professor, University of Utah, 122 South Central Campus Dr., Salt Lake City, UT, 84112, United States of America, zhou@eng.utah.edu

1 - Dynamic Traveler Response Modeling and Robust Network Design for Seismic Risk Analysis of Tansportation

Xuesong Zhou, Assistant Professor, University of Utah, 122 South Central Campus Dr., Salt Lake City, UT, 84112, United States of America, zhou@eng.utah.edu, Hyun-chan Kim

Earthquakes could significantly impact road network capacity and further change spatial and temporal traffic demand patterns. Based on a case study in the Salt Lake City metropolitan area, we first present a day-to-day demand adjustment model to capture the traveler behavior in a damaged transportation network, and then discuss how to use a robust network design tool to enhance existing infrastructure systems so as to minimize expected structural risk and post-earthquake traffic delays.

2 - Reformulating and Solving Discrete Network Design Problem via an Active Set Technique

Lihui Zhang, University of Florida, 2777 SW Archer Rd, Apt. V106, Gainesville, FL, 32608, United States of America, zhanglh0@ufl.edu, Yafeng Yin, Siriphong Lawphongpanich

This paper addresses an equilibrium discrete network design problem that is to improve the performance of a highway network by construction of new links and expansion of existing links. The problem is formulated as a new mathematical program with complementarity constraints, solved by an active set approach. Numerical experiments are carried out to demonstrate and validate the formulation and solution approach

3 - Stochastic and Dynamic Shipper Carrier Network Design Problem

Avinash Unnikrishnan, Graduate Student, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, avinash@mail.utexas.edu, Travis Waller

The focus of this work is to determine the optimal storage capacity to be installed on transshipment nodes by shippers in a dynamic shipper carrier network under stochastic demand. A two stage mathematical program with recourse formulation is developed where in the first stage, the shipper decides the optimal capacity to be installed on transshipment nodes. In the second stage, the shipper chooses a routing strategy based on the realized demand.

4 - A Descent Method for Bi-level Dynamic Transportation Network Design Problem

Dung-Ying Lin, UT Austin, 1 University Station, C1761, Department of Civil Engineering, Austin, TX, 78712, United States of America, dylin@mail.utexas.edu, Travis Waller

To efficiently solve the bi-level dynamic network design problem, we develop a descent method that finds the system-wide gradient in a network with multiple origins and destinations. The method finds the rational direction that decreases the upper-level objective while maintaining the feasibility of the lower-level program. The proposed techniques can be further extended to calibrate dynamic traffic assignment or determine dynamic tolls.

■ MC65

O - Council Room

Joint Session Scheduling in SI/HAS: Scheduling in Health Care Delivery Systems

Cluster: Scheduling in the Service Industry, Health Applications Section
Invited Session

Chair: Shelly Qu, Assistant Professor, North Carolina A&T State University, ISE Department, NC A&T State Univ., 1601 E. Market Street, Greensboro, NC, 27411, United States of America, xqu@ncat.edu

1 - Yield Management in Health Care Clinics with Open Access Scheduling

Linda LaGanga, Director of Quality Systems & Operational Excellence, Mental Health Center of Denver, 4141 East Dickenson Place, Denver, CO, 80222, United States of America, linda.laganga@mhcd.org, Stephen Lawrence

We extend our previous yield-management results in health-care clinics to allow open-access scheduling. We develop an optimizing algorithm that allows a mix of both same-day open access appointments and longer-term forward appointments. Our algorithm maximizes clinic utility by trading off the benefits of clinic productivity with the costs of patient waiting and clinic overtime. Results demonstrate the optimum mix of open-access and long-term appointments under a variety of conditions.

2 - Patient/ Physician Scheduling and Routing to Improving Spatial Access for Outpatient Specialty Care

Nan Kong, Assistant Professor, Purdue University, 206 S. Martin Jischke Dr., West Lafayette, IN, United States of America, nkong@purdue.edu, Peter Fabri

Cost containment and workforce utilization typically involve healthcare access regionalization and hospital location analysis. Little attention has been given to conceptualize geographic access in the era of greater delivery mobilization. As a result, many outpatients encounter huge travel burden. We present several routing and scheduling models to distribute outpatient specialty care dynamically in a network. Our initial aim is to minimize patient travel distance and time.

3 - Stochastic Surgery Scheduling Problem under Capacity Constraints

Daiki Min, Purdue University, 315 N. Grant Street, West Lafayette, IN, United States of America, dmin@purdue.edu, Yuehwern Yih

The objective of this study is to investigate the stochastic optimization model which determines an optimal surgery schedule of elective patients with consideration of uncertain surgery activity. The sample average approximation (SAA) method is used for obtaining an optimal surgery schedule with respect to minimizing the total cost that consists of patients-related costs and overtime cost. A computational study is presented to evaluate the significance of the stochastic surgery scheduling model.

4 - Evaluation of Direct-to-pharmacy Strategy Using Simulation of Pharmaceutical Supply Chain

Lisa Niziolek, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907, United States of America, tieman@purdue.edu, Yuehwern Yih

In pharmaceutical supply chains, most products flow through wholesalers. Although wholesalers provide services to drug makers and pharmacies, drug makers may consider selling directly to pharmacies. Using a simulation model, we evaluate the impact of bypassing wholesalers on performance measures, including service level and costs. Sensitivity analysis will determine how performance measures vary given changes to parameters such as demand variation, production reliability, and product mix.

■ MC66

O - Cabinet Room

Dynamic Routing and Logistics under Real-Time ITS Information

Cluster: Real-Time Systems
Invited Session

Chair: Alper E. Murat, Assistant Professor, PhD, Department of Industrial and Manufacturing Engineering, Wayne State University, 4815 Fourth Street, Detroit, MI, 48202, United States of America, amurat@wayne.edu

1 - Dynamic Vehicle Routing under Real-time Congestion and Incident Information for JIT Logistics

Ali R. Guner, PhD Candidate, Wayne State University, 4815 Fourth St., Detroit, MI, 48202, United States of America, ali@aguner.com, Ratna Babu Chinnam, Alper E. Murat

We propose a dynamic vehicle routing model in stochastic nonstationary road networks which integrates recurring and incident-based nonrecurring congestion models using real-time traffic and incident information. We illustrate the effectiveness of jointly modeling recurring and nonrecurring congestion in reducing travel time delay and variability. Our results are illustrated on a real case study from Southeast Michigan region.

2 - Dynamic Freight Routing on Air-road Intermodal Network Using Real-time Congestion Information

Farshid Azadian, PhD Candidate, Wayne State University, f_azadian@wayne.edu, Alper E. Murat, Ratna Babu Chinnam

This paper addresses routing of time-sensitive freight shipments subject to congestion on the road network and flight departure delays. We propose a stochastic dynamic routing model on the road-air inter-modal network. Routing decisions include selecting between alternative airports and flights based on real-time data on road traffic and flight delays. We illustrate the application of our modal with an air cargo routing in the Michigan-Ohio road-air inter-modal network

3 - Real-time Traffic Rerouting in an Electrical Analog Platform

Md. Ashfaque-Ur Rahman, MSE Candidate, Grand Valley State University, 32 Winter Ave SW, Winter Hall, Apt#241, Grand Rapids, MI, 49504, United States of America, auvibuet@yahoo.com, Charles Standridge, PhD, Shabbir Choudhuri, PhD

When an incident happens in a major highway, traffic is detoured to the arteries whose capacities are lower. So congestion occurs. Monitoring the detour route based on real-time information is necessary to avoid major disruption in the overall network. The situation calls for continuous evaluation of the surrounding network and real time rerouting. An electrical analog of the road network is developed to find the lowest cost path that is independent of the map complexity.

4 - Modeling Traffic Incidents for Dynamic Vehicle Routing Applications

Ali R. Guner, PhD Candidate, Wayne State University, 4815 Fourth St., Detroit, MI, 48202, United States of America, ali@aguner.com, Ratna Babu Chinnam, Alper E. Murat

Non recurring incidents critically impact travel time in transportation networks. Literature mostly considers recurring congestion as the main source of travel time delay. We compare and contrast existing nonrecurring congestion delay models with data from real incidents on transportation networks. We also offer new compact incident delay models for efficient and effective representation.

■ MC67

O - Forum Room

Location and Allocation Analysis - Research and Industrial Applications

Sponsor: Location Analysis
Sponsored Session

Chair: Hongzhong Jia, Researcher, Microsoft, 1065 La Avenida St., Mountain View, CA, 94043, United States of America, billjia@microsoft.com

1 - Facility Location for Emergency Evacuation

Rongbing Huang, York University, 4700 Keele Street, Toronto, ON, M3J1P3, Canada, rhuang@yorku.ca, Mozart Menezes, Seokjin Kim

In the p-median and p-center problems, people take advantage of the facility located at the same site. However, in the situation of some natural disasters like hurricane Katrina, the whole city may become functionless. Therefore, customers can't rely on the facility located at the same place. We compare this problem with the p-median and p-center problems and analyze the problem on some simple networks. An efficient algorithm is provided for the problem on the general network.

2 - A Bilevel Model for Preventive Healthcare Facility Network Design with Congestion

Yue Zhang, PhD Candidate, McGill Unviersity, 1001 Sherbrooke Street West, Montreal, QC, H3A 1G5, Canada, yue.zhang3@mail.mcgill.ca, Vedat Verter, Patrice Marcotte, Oded Berman

This paper provides a methodology for designing a network of preventive healthcare facilities so as to maximize participation. To determine the number of open facilities and the location of each facility, we formulate the problem as a bilevel optimization model. A heuristic solution procedure is provided. A real life application (breast cancer screening centers in Montreal) is examined at last, and the impacts of capacity pooling are discussed.

3 - Quantification of Railway Infrastructure Decisions
Thomas Schlechte, Research Assistant, Zuse Institute Berlin, Takustrasse 7, Berlin, 14195, Germany, schlechte@zib.de, Ralf Borndoerfer

This talk focuses on the macroscopic track allocation problem, which consists in finding a conflict free set of train routes of maximum value in a given railway network. We present how the construction of optimal or saturated timetables by integer programming techniques can be used to support and quantifiy main railway infrastructure decisions. All experiments are performed on a part of German long distance area; tttplib.zib.de provides these simplified realistic data sets.

4 - Using Location Modeling Framework to Optimally Distribute Traffic and Storage Usage for Web Services
Hongzhong Jia, Researcher, Microsoft, 1065 La Avenida St., Mountain View, CA, 94043, United States of America, billjia@microsoft.com

A web service often needs to host numerous users that store and access their online data. To provide services, the hardware is purchased and configured as nodes, each hosting a number of users. Built at different times, the nodes have distinct traffic processing capability and storage capacity. We present a modeling framework to allocate the user traffic and storage across the heterogeneous nodes. The framework enables the web services to achieve the maximal capacity and the best performance.

■ MC68

O - Senate Room

Optimal Advertising and Pricing for Information Goods

Sponsor: Marketing Science
Sponsored Session

Chair: Brian Ratchford, University of Texas at Dallas, 800 West Campbell Rd., SM32, Richardson, TX, 75080, United States of America, btr051000@utdallas.edu

1 - Product Form Bundling: Implications for Marketing Digital Products
Nevena Koukova, Assistant Professor, Lehigh University, nek205@lehigh.edu, P. K. Kannan, Brian Ratchford

Marketing of information media in digital form or bundled with the conventional form has become increasingly common in product categories such as books, newspapers and music. As the content is common to both forms, the attractiveness to consumers of acquiring both is relatively low. However, the forms often have advantages over one another in specific usage situations. We find that emphasizing such usage situations increases the intent to purchase both forms as long as the second is discounted.

2 - Optimal Advertising Policy in the Presence of Pre-Launch Effects
Dongling Huang, Assistant Professor, Renssalear Polytechnic Institute, Lally School of Management, Rensselaer Polytechnic Institute, Troy, NY, 12180, United States of America, huangd3@rpi.edu

In this paper we investigate the optimal advertising policy in a monopolistic market where advertising starts before the product's launch in order to generate interest in the product under consideration. We show that the optimal advertising policy may be increasing during the pre-launch period, but decreasing in the post-launch period. The majority of the literature shows that when pre-launch effect is not considered, optimal advertising policy is either decreasing or increasing monotonically.

3 - Scaling Response Parameters: A Multivariate Probit Approach
Sri Duvvuri, Assistant Professor, University of Iowa, S348 PBB, Iowa City, IA, 52245, United States of America, sri-duvvuri@uiowa.edu, Minakshi Trivedi, Karthik Sridhar

This research compares consumer response parameters across categories and different regions. In specifying random coefficient choice models, the variation in the mean responses is taken into account while the variation in the variances is ignored. Recently, studies have explored the implications of this assumption and point out that a comparison of estimated parameters across segments and/or data sets might confound the results. We investigate these issues using a multivariate probit model.

4 - The Evolution of Competition Between Online and Offline Sellers
Brian Ratchford, University of Texas at Dallas, 800 West Campbell Rd., SM32, Richardson, TX, 75080, United States of America, btr051000@utdallas.edu

Employing survey data on consumer behavior and actual data on prices from several periods between 2000 and 2007, this paper examines the evolution of competition between different seller types in the book and CD markets. The evidence indicates that competition between online and offline sellers (the latter have tended to add online channels) is at least as intense as competition within a given format.

Monday, 4:30pm - 6:00pm

■ MD01

M - Marriott Ballroom 3

Peer-to-Peer Networks

Sponsor: eBusiness
Sponsored Session

Chair: Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu

1 - Digital Distribution: The Impact of New Digital Distribution Channels on Internet Piracy
Michael Smith, Associate Professor, Heinz School-CMU, mds@cmu.edu, Rahul Telang, Samita Dhanasobhon

Digital piracy has concern among content creators that if consumers have access to freely available pirated content, they will no longer have an incentive to purchase content through legitimate channels. We test the impact of legitimate digital distribution channels on piracy demand. Our results suggest that the addition of digital distribution channels reduce the demand for pirated content.

2 - Dynamic Referrals in Peer-to-Peer Media Distribution
Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Yong Tan, Peng Han

Product diffusion in P2P is unique because free riders - users who download content from others in the network without redistributing it to others - can create a supply constraint that results in the incomplete fulfillment of generated demand. P2P firms offer distribution referrals, i.e. payments to users who distribute content to others, to provide users with incentives to distribute content. In this paper, we study a P2P firm's optimal referral strategy.

3 - Peer-to-Peer File Sharing and the Market for Digital Information Goods
Andres Hervas-Drane, PhD Candidate, Harvard Business School / UAB, 6 Mount Auburn St. Apt. 6, Cambridge, MA, 02138, United States of America, andresonline@gmail.com, Ramon Casadesus-Masanell

We study competitive interaction between two alternative models of digital content distribution: peer-to-peer (p2p) file sharing and centralized client-server distribution. We present a stylized model of p2p file sharing to analyze the optimal strategy of a profit-maximizing firm, such as Apple, that offers content at positive prices. We show that the firm may be better off setting high prices, allowing the network to survive, and that the p2p network may work more efficiently in its presence.

4 - Indirect Reciprocity in Contributions to a Peer-to-Peer Sharing Network- An Empirical Analysis
Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu, Yun Huang, Wenjing Duan, Andrew Whinston

This study assesses the influence of indirect reciprocity on individual contribution to a P2P network. We find that users show strong indirect reciprocity when they first join the P2P network. However, their level of indirect reciprocity decreases as the individual gains more experience. The phenomenon is consistent with findings from economic experiments, suggesting that individuals in the P2P network learn over time to become more economic oriented.

■ MD02

M - Marriott Ballroom 2

Production Process in Supply Chain Management

Contributed Session

Chair: Jin-Kyu Park, Assistant Professor, Florida International University, 10555 W. Flager St. EC 3121, Miami, FL, 33174, United States of America, kyupark@fiu.edu

1 - Supply Chain Coordination under Yield Uncertainty
Yu Tang, Washington University, 1 Brookings Drive, St Louis, MO, 63130, United States of America, ytang@wustl.edu

We consider a supply chain with a single manufacturer and a single supplier with yield uncertainty at the supplier's production process. We investigate supply chain coordination issues under deterministic demand and stochastic demand. We show that a cost sharing or a shortage penalty contract can achieve supply chain coordination when demand is deterministic. We study a full pay back scheme and several contingent payment schemes and show that none of them can coordinate the supply chain.

2 - Production and Design Outsourcing in Supply Chain Management

Jun Shan, PhD candidate, Hong Kong University of Science and Technology, Department of IELM, HKUST, Clear Water Bay, Kowloon, Hong Kong, Hong Kong - China, jshan@ust.hk, Kaijie Zhu

We consider the problem that a firm is launching a product to the market. The firm can decide whether it should outsource only the production work or both production and design works to an offshore manufacturer due to cost advantages. And it will set price and design level both of which are assumed factors influencing demand. The problem is studied based on a sequential game framework. We compare system performances and identify the best choice for both players under different situations.

3 - Optimal Control of an Assembly System with Demand for the End Product and Intermediate Components

Oben Ceryan, PhD Candidate, University of Michigan, 1205 Beal Ave. 1710 IOE, Ann Arbor, MI, 48109, United States of America, oceryan@umich.edu, Yoram Koren, Izak Duenyas

We study a two-stage assembly system with demand for the intermediate components as well as the end product. The manufacturer has the option to accept or reject a demand for any of the components in addition to having admission control for the product. We characterize the optimal production, assembly and admission policy. Since the optimal policy structure is rather complex, we also propose an effective heuristic that is easy to implement and robust over a range of problem sizes and parameters.

4 - Production Fragmentation in a Global Supply Chain

Renato de Matta, Associate Professor, University of Iowa, 108 PBB, Iowa City, IA, 52242, United States of America, renato-dematta@uiowa.edu, Tan Miller

Fragmentation divides an integrated production system into specialized and distinguishable units to perform various phases of production. In this study, we formulate a model that finds tax efficient countries where to locate those units and sets intra-company transfer prices between units such that the total global after-tax profit is maximized. We discuss the managerial implications of our results, and the potential applications and benefits of the model.

5 - The Impact of Product Architecture on Firm's Supplier-choice Behavior

Jin-Kyu Park, Assistant Professor, Florida International University, 10555 W. Flager St. EC 3121, Miami, FL, 33174, United States of America, kyupark@fiu.edu

This study's goal is to investigate the consequences of the change of PA (product architecture) from modular to integral on firm's behavior regarding internal/external supplier choice. This study draws on TCE, RBV, and performance feedback model. Given that most previous relevant literature focuses on exploring the impact of PA change from integral to modular on firm's supplier choice strategy, this study is believed to be very valuable.

■ MD03

M - Marriott Ballroom 1

Inventory Systems

Contributed Session

Chair: Ozden Engin Cakici, PhD Candidate, Simon School of Business, Univ. of Rochester, Carol G Simon Hall 4-349, Rochester, NY, 14627, United States of America, engin.cakici@simon.rochester.edu

1 - Analytical Description of the Classes in an ABC Inventory System

Robert E. Stanford, Professor, UAB School of Business, Department of FEQM, 1150 Tenth Avenue South, Birmingham, AL, 35294, United States of America, stanford@uab.edu

We extend the results of our earlier analysis of optimal class structure in an ABC inventory system, and present algebraic descriptions of the proportions of system items optimally assigned to each class. The derived proportions are expressed in terms of the fundamantal parameter in the system's Distribution-by Value curve.

2 - Periodic Review Lost-sales Inventory Models with Constant Lead Times of Any Length

Marco Bijvank, VU University Amsterdam, De Boelelaan 1081a, Amsterdam, 1081HV, Netherlands, mbijvank@few.vu.nl, Soren G. Johansen

Contrary to almost all literature on lost-sales inventory models we allow constant lead times of any length instead of integer multiples of the review period. Such a model can be used to determine the optimal review period length. We consider a pure base-stock policy and a policy with a restriction on the maximum order size. Numerical results show that the latter policy performs within 1% from the optimal cost. We also propose an approximation procedure to determine the base-stock levels.

3 - Economic Impact of RFID in Hospital Setting

Ozden Engin Cakici, PhD Candidate, Simon School of Business, Univ. of Rochester, Carol G Simon Hall 4-349, Rochester, NY, 14627, United States of America, engin.cakici@simon.rochester.edu, Abraham Seidmann, Harry Groenevelt

Our research focuses on identifying the economic impacts of Radio Frequency Identification (RFID) technology on inventory management in hospital setting. We present new models that explain why the adoption of RFID technology in clinical settings is growing rapidly and why it has a high cost reduction potential relative to the commonly used barcodes.

■ MD05

M - Virginia B

Dynamic User Equilibrium

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu

1 - Dynamic Traffic Assignment for Operations Planning

Andy Chow, Postdoc Scholar, California PATH, 1357 S. 46th Street, Richmond Field Station, Bldg 452, Richmond, CA, 94804, United States of America, ahfchow@path.berkeley.edu, Xuegang (Jeff) Ban

This paper investigates the development and application of dynamic traffic assignment for real world traffic operations planning. We particularly highlight some theoretical features and limitations of DTA models (e.g. existence of user equilibrium, path-based and link-based formulations, and approximation schemes for solving large-scale problems) and the ways we tackle the challenges. The findings can also support further analysis and model development in this area.

2 - Dynamic Traffic Assignment and the Route-link Consistency Issue

Hillel Bar-Gera, Dr., Ben-Gurion University, 5038 S. Hardy Dr., #2095, Tempe, AZ, 85282, United States of America, bargera@bgu.ac.il, Michal Blumberg, Shmuel Rahamim

Most macroscopic dynamic traffic assignment models focus either on traffic flow behavior or on flow propagation along trajectories. Each approach suffers from consistency issues, which will be illustrated by specific examples. As an alternative, we propose to integrate the two approaches using "anticipated arrival order" combined with LWR flow behavior.

3 - Dual Time Scale Dynamic User Equilibria with Demand Growth: Formulation and a Convergent Algorithm

Terry Friesz, Marcus Professor, Penn State University, Department of Industrial & Mfg Engr., 305 Leonhard Bldg, University Park, PA, 16802, United States of America, tfriesz@psu.edu, Matthew Rigdon, Changhyun Kwon, Tae Il Kim

We approximate the dynamic network loading problem by a system of ordinary differential equations. This approximation is used in conjunction with a fixed point algorithm to solve the dynamic user equilibrium problem. Some numerical examples are presented.

4 - A Link-node Complementarity DUE Model with Departure Time Choice

Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu

We present a link-node complementarity model for dynamic user equilibrium (DUE) with departure time choice. The departure time choice is modeled by introducing penalty functions for late/early arrivals in the link-node fashion. Numerical results are provided to show the performance of the model.

■ MD06

M - Virginia C

Energy Auctions: In Honor of Mike Rothkopf

Cluster: Auctions
Invited Session

Chair: Wedad Elmaghraby, University of Maryland, College Park, MD, Wedad_Elmaghraby@rhsmith.umd.edu

1 - Equilibrium Prices in Power Exchanges with Non-convex Bids

Richard O'Neill, Federal Energy Regulatory Commission, 888 First St NE, Washington, DC, 20426, United States of America, Richard.ONeill@ferc.gov, Paul M. Sotkiewicz, Michael H. Rothkopf

We show uniform, linear prices in power exchange markets, such as in the Amsterdam Power Exchange (APX) Day-Ahead market or the Nord Pool Elspot market, that allow non-convex, "fill or kill" block bids by market participants may not result in an equilibrium in an economic sense, nor do they maximize surplus to market participants. We propose, as an alternative, a multi-part, discriminatory pricing mechanism that results in a market equilibrium in an economic sense and maximizes surplus for market participants. These multi-part prices do not require proceeds from outside the market to be implemented. In addition, we propose algorithms to ensure the use of linear prices for market clearing where feasible, and if not feasible, prices that minimize deviations from linear prices. We also describe a simple pro rata method for implementing the discriminatory multi-part prices, and discuss the degrees of freedom in pricing ordered by the prices proposed through the use of simple examples.

2 - Auction Design in Regulated Electric Power Markets: Problems Past and Future

Benjamin F. Hobbs, Schad Chair of Environmental Management, The Johns Hopkins University, Department Geography & Environ. Engineering, Baltimore, MD, 21218, United States of America, bhobbs@jhu.edu, Richard O'Neill

The core of power markets in the US consists of centrally-administered day-ahead and real-time auctions for energy and ancillary services. Auctions are also important for long-term energy and power contracts. We discuss problems that our colleague Michael Rothkopf worked on as a consultant to FERC, and review future challenges.

3 - Economic Analysis of the Right of First Refusal

Shehzad Wadalawala, swadalawala@gmail.com, Shmuel Oren

Right of First Refusal (ROFR) in an auction provides its owner the opportunity to match a third party's winning offer. We analyze the economic consequences of such a right and show possible negative consequences on sellers' revenue and on social welfare due to suppression of competition. We also describe circumstances where an ROFR is beneficial and should be awarded as part of a contract negotiation.

■ MD07

M - Maryland A

On Timing in OM: Product Development, Supply Chain, and Product Allocation

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Opher Baron, University of Toronto, 105 St. George Street, Toronto, ON, M5S3E6, Canada, Opher.Baron@Rotman.Utoronto.Ca

1 - Improving Production Yield through Learning by Doing and Knowledge Sharing

Hasan Arslan, Suffolk University, Boston, MA, 02108, United States of America, harslan@suffolk.edu, Thomas Roemer, Ali Yassine

We address the production ramp-up for products with low initial yields. Our principal focus is on when to switch over from pilot to full production. We distinguish between process focused firms, who strive for a high degree of similarity between product lines, such as Intel's copy exactly strategy and skill focused firms, whose strength lie in their employees' skills of learning autonomously. We show that switch-over decisions must consider future margins and the focus orientation of the firm.

2 - Capacity and Inventory Control in a Two-Stage Supply Chain with Limited Information Sharing

Fikri Karaesmen, Koc University, Rumeli Feneri Yolu, Istanbul, 34450, Turkey, fkaraesmen@ku.edu.tr, Alper Altan, Selcuk Karabati

We consider a decentralized supply chain consisting of a retailer and a supplier. The retailer faces a Poisson demand process whose rate is price-sensitive and employs a base-stock inventory policy. The supplier operates a capacitated production system modeled by a queue. Optimal capacity, inventory and pricing decisions in this supply chain and their impacts are investigated under the assumption that some cost parameters are not common knowledge.

3 - Incentives for Transshipment in a Decentralized Supply Chain

Jing Shao, University of British Columbia, Box 524, 6335 Thunderbird Crescent, Vancouver, BC, V6T 2G9, Canada, jing.shao@sauder.ubc.ca, Harish Krishnan, S. Thomas McCormick

We investigate the incentives for transshipment in a decentralized supply chain, where a monopoly manufacturer sells through competing retailers. We find when the wholesale price is endogenous, the manufacturer and retailers' incentives for transhipment depends on the transhipment price. When the transshipment decisions are also endogenous, transhipment may not happen, and whether the manufacturer and retailers benefit from transshipment depends on their control of transshipment decisions.

4 - Strategies for an M/G/1 Make-to-stock Queue Serving Different Markets

Baris Balcioglu, University of Toronto, 5 Kings College Rd, Toronto, ON, Canada, baris@mie.utoronto.ca, Hossein Abouee Mehrizi, Opher Baron

For an M/G/1 queue serving an identical product to distinguishable and prioritized markets we choose product dispatching and base-stock levels when inventory is decentralized or centralized. We provide exact analysis (optimal base-stock levels and cost) for a decentralized policy demonstrating, numerically, its effectiveness. For a centralized system we approximate the inventory-rationing and the strict-priority policies and showing numerically that inventory rationing is more effective.

■ MD08

M - Maryland B

Linkages Between Risk, Financial and Operational Performance

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Nitin Joglekar, Boston University, 595 Commonwealth Avenue, Boston, MA 02215, United States of America, joglekar@bu.edu

1 - Market Value of Flexibility: Evidence from the Clean Energy Industry

Jane Davies, Boston University, 595 Commonwealth Avenue, Boston, MA, 02215, United States of America, jdavies@bu.edu, Nitin Joglekar

We develop a framework that links market value of firms with a variety of flexibility measures. We test this framework using evidence from 200 clean energy firms. Results indicate that slack - a measure of liquidity that can create ex-post options - is significantly associated with value. Other flexibility constructs, such as operational responsiveness and R&D investment are selectively associated with value depending on whether a firm is in the mature or in the growth phase of its lifecycle.

2 - Can Stock Price Movements Inform Operational Improvement Efforts? Evidence from the Airline Industry

Kamalini Ramdas, Associate Professor, University of Virginia, 189 FOB, 100 DArden Blvd, Charlottesville, VA, 22902, United States of America, RamdasK@Darden.virginia.edu, Marc Lipson, Wei Li, Jonathan Williams

We investigate the use of stock price movements as a source of valuable information on where operations managers should focus their improvement efforts, and demonstrate our approach in the context of airline service quality. Airlines measure service quality along several dimensions. Using 16 years of monthly panel data for the nine major U.S. air carriers, we examine the impact on their stock prices of deviations from predicted performance along each dimension of service quality.

3 - Hedging New Product Development Contests

Edward Anderson, Associate Professor, The University of Texas at Austin, McCombs School of Business, 1 University Station, B6500, CBA 5.202, Austin, TX, 78712-0212, United States of America, Edward.Anderson@mccombs.utexas.edu, Saurabh Bansal

In this paper, we develop an analytic model of a firm that employs a contest for a component of a new product development effort. The firm, however, may hedge this contest with a simultaneous internal NPD effort to protect against the case in which the best solution of the contest is of insufficient quality. We characterize the situations under which such hedging will occur as well as the potential benefits to be realized from a hedging strategy.

■ MD09

M - Maryland C

Joint Session QSR/CS: PHM, Sensors, RFID

Sponsor: Quality, Statistics and Reliability, Computing Society Sponsored Session

Chair: Abe Zeid, Professor, Northeastern University, MIE Dept, 334SN, 360 Huntington Ave., Boston, MA, 02115, United States of America, Zeid@coe.neu.edu

Co-Chair: Sagar Kamarthi, Department of Industrial and Mechanical Engineering, Northeastern University, 360 Snell Engineering, Boston, MA, 02115, sagar@coe.neu.edu

1 - IC-Card System's Technical Simulation Model Analysis

Donghun Yoon, Keio University, Graduate School of Media and Governance, 5322 Endo Fujisawa, Kanagawa, 252-8520, Japan, nature@sfc.keio.ac.jp

IC-Card provides a means of effecting business transactions in a flexible,secure,standard way with minimal human intervention. It has been applied to various fields: the traffic IC-Card(Suica,Pasmo,Mobile),Electronic Money(Edy),Credit Card,ID Card. This paper describes IC-Card system's efficient improvement direction by theoretical study of IC-Card system's technical simulation model analysis. This study would contribute to scientific reaserch and enhance the value of IC-Card system model study.

2 - Overview of Controlled Accelerated Degradation Techniques of Hard Disk Drives for Diagnostics and Prognostics

Tarun Kothia, Department of Industrial and Mechanical Engineering, Northeastern University, 360 Snell Engineering, Boston, MA, 02115, kothia.t@neu.edu, Abe Zeid, Sagar Kamarthi

Hard disk drives (HDD) are complex electromechanical devices that can suffer performance degradation or failures due to a single event or a combination of events occurring over time. The Mean Time Between Failure (MTBF) of a HDD which is closely associated with its useful life is typically about 208,926 Hours. Diagnostics and prognostics studies of HDD performance usually require degrading them quicker than their normal useful lives. The key issue here is not to "kill" a HDD instantly, but instead gradually over a reasonable period of time, so we can collect degradation performance data over a short period of time. If we consider mechanical failure of HDD, performance data is usually measured in terms of the vibration characteristics of the HDD, namely amplitude and frequency. Various techniques of accelerating the "death" of HDD have been reported in the literature. They are temperature, voltage, dust particles, and scratch on platter surface. This paper reviews the methodology of each technique, its advantages, and disadvantages. The paper also reports some results using some of these techniques in our sensors research lab at Northeastern University.

3 - Towards an Analytical Model to Assess Read-rate Probabilities in RFID Systems

Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu

We present a statistical model based on modified Friis free space equation to estimate read-rates of RFID systems in multiple environments. Experimental results show that the model capture the read rate probabilities and trends.

4 - Sensors in the Emergency Department: Opportunities for Applications in Decision-making

David Claudio, PhD Candidate, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, dave.claudio@psu.edu, Erica Fields, Gul Kremer, Andris Freivalds

Many researches have described the successful implementation of sensors in health care. This article reviews the reported applications of sensing technology in the Emergency Department. In addition, it reviews several studies on how nurses make decisions and proposes new ideas on how RFID technology can aid nurses in the decision-making process under dynamic environments.

■ MD10

M - Room 8206

Models and Methods in Energy Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Steve Gabriel, Associate Professor, University of Maryland, 1143 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, sgabriel@umd.edu

1 - A Benders Method for Solving Stochastic Complementarity Problems with an Application in Energy

David Fuller, Professor, University of Waterloo, Department of Management Sciences, Waterloo, ON, N2L 3G1, Canada, dfuller@engmail.uwaterloo.ca, Steve Gabriel

We present a Benders decomposition method to solve stochastic complementarity problems. The master and subproblem are complementarity problems that are solved iteratively until a convergence gap is sufficiently close to zero. As well as details of the method, numerical results are provided, based on an electric power market model of Hobbs [2001] but with added stochastic elements. The results validate the approach and indicate dramatic improvements in solution times.

2 - Solving MPEC Problems for Electricity Markets Using Disjunctive Constraints and Linearization

Florian Leuthold, Dresden University of Technology, Chair of Energy Economics, Dresden, 01062, Germany, Florian.Leuthold@tu-dresden.de, Steve Gabriel

In this paper, we present a mathematical formulation in order to solve a Stackelberg game for a network constrained electricity market. We assume that there is one strategic player. The resulting MPEC is reformulated as MIP by using disjunctive constraints and by parameterizing the output decision of the strategic player. We report computational results for a stylized Western European grid with realistic data assigning market power to the French company EDF.

3 - Analyzing Future Investments and Developments in the Natural Gas Market with the World Gas Model

Ruud Egging, PhD Candidate, University of Maryland, 3401 Chatham Road, Hyattsville, MD, 20783, United States of America, regging@umd.edu, Steve Gabriel, Franziska Holz, Christian Von Hirschhausen

WGM is a fully parameterized multi-period complementarity model covering 98% of world gas production and consumption and allowing capacity investments in liquefied natural gas terminals, pipelines and storage. We analyze contemporary and future developments in the global natural gas market, including the possible establishment of a gas cartel, for the impact on gas importing countries in terms of consumption and prices; alternative trade flows that may develop; and the impact on investments..

4 - The Haiku Electricity Market Model

Anthony Paul, Program Fellow, RFF, 1616 P St, NW, Washington, DC, 20036, United States of America, paul@rff.org, Richard Sweeney, Steve Gabriel

The Haiku Electricity Market Model is a highly parameterized model of the US electricity sector with endogenous components for investment in generation capacity and pollution abatement technology, electricity prices and demand, interregional power trading, fuel markets, and pollution allowance markets. The model, presented here, is designed for policy analysis, particularly for environmental and climate policies.

■ MD11

M - Room 8209

Optimization Issues in Energy Systems

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Panos Pardalos, Distinguished Professor, University of Florida, 303 Weil Hall, ISE Department, Gainesville, FL, 32611, United States of America, pardalos@cao.ise.ufl.edu

1 - Electricity Portfolio Optimization for Public Services: A Case Study

Steffen Rebennack, University of Florida, 303 Weil, Gainesville, FL, United States of America, steffen@ufl.edu, Panos Pardalos, Josef Kallrath

We discuss a portfolio optimization problem occurring in the energy market. Given is an electricity distributor of a local which has to decide how much energy has to be produced in its own power plant, how much has to be bought from the spot market and from open supply contracts. This decision problem is formulated as a mixed integer linear programming problem and implemented in GAMS modeling language.

2 - Monte Carlo Evolutionary Policy Iteration with Applications to Energy R&D Portfolio Optimization

Lauren Hannah, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, lhannah@princeton.edu, Warren Powell

This presentation extends Evolutionary Policy Iteration, a technique for solving Markov Decision Processes, to optimization of a noisy cost function over a finite decision set. A sampling regime and proof of convergence are given. EPI-MC is used in the context of energy R&D portfolio optimization. It is compared numerically on this problem to other algorithms.

3 - Optimization of Fuel Contract Management and Maintenance Scheduling for Thermal Plants

Niko Iliadis, Engineering Analyst, EnerCoRD, Plastira street 4, Nea Smyrni, Athens, 171 21, Greece, Niko.Iliadis@EnerCoRD.com, Raphael Chabar, Sergio Granville, Mario Pereira

This work presents a tool that determines, in an integrated approach, the optimal dispatch and maintenance schedule strategy of thermal power plants while considering the specifications of Take or Pay contracts. Electricity purchase and selling at the spot market and a detailed modelling of the power plant are considered during the optimization. The problem is time-coupled, multi-stage with stochastic electricity spot prices. The methodology applied is Stochastic Dual Dynamic Programming (SDDP).

4 - A Review on Stochastic Optimization Algorithms for Power Systems Optimization

Steffen Rebennack, University of Florida, 303 Weil, Gainesville, FL, United States of America, steffen@ufl.edu

We provide a review of the existing algorithms that treat stochastically the problem of power systems operation optimization for a centrally dispatched (cost minimization) and a locally dispatched in a liberalized market (revenue maximization).

■ MD12

M - Room 8212

Applied Data Analysis and Optimization: Real Problems - Practical Solutions

Cluster: Data Mining
Invited Session

Chair: Sumit Sarkar, UT Dallas, 3.422 SOM, 800 West Campbell Road, Richardson, TX, 75080, United States of America, sumit@utdallas.edu

Co-Chair: Sameep Mehta, Research Staff Member, IBM Research, India, IBM India Research Lab, ISID Campus,, Plot 4 Sector C Vasant Kunj, New Delhi, 110070, India, sameepmehta@in.ibm.com

1 - Real Time Transaction Scheduler for Scheduling Services Based on Client and Service Characteristics

Sameep Mehta, IBM India Research Lab, IBM India Research lab, Institutional Area, Block C, Vasant Kunj, New Delhi, India, sameep99@gmail.com, Sameep Mehta, Gyana Parija, Vikas Kedia

We focus on developing real time transaction scheduler which simultaneously takes into account client profile and service characteristics and provides differentiated QoS.The system will be useful in various domains like FSS,Retail and Disaster Management(DM).The client profile captures importance of the client eg, preferred customers.Similarly,service characteristics captures profitability(FSS),criticality(DM)etc.Real life constraints like fairness,starvation etc are taken into account.

2 - Recent Advances in Remote Sensing Data Mining: Small Learning Sample Case

Raju Vatsavai, Research Scientist, Oak Ridge National Laboratory, PO.Box 2008. MS-6017, Oak Ridge, TN, 37831, United States of America, vatsavairr@ornl.gov, Budhendra Bhaduri

We present a review of recent advances in remote sensing (RS) data mining, especially in the area of classification with few training samples. Recently significant efforts were placed on methods that use large number of unlabeled samples in conjunction with small number of labeled samples (aka semi-supervised learning). Here we present various extensions of semi-supervised learning, including spatial and multi-source cases, along with classification results on real RS images.

3 - Mining Censored Data and Occurrence Time Prediction

Young Ryu, University of Texas at Dallas, School of Management, SM33, 800 West Campbell Road, Richardson, TX, 75080, United States of America, ryoung@utdallas.edu

There exist few data mining models utilizing censored observations. Presented are mathematical models and a neural net model for event occurrence time prediction with a mixture of complete and right censored observations.

4 - Improving Web-site Structure to Facilitate Effective User Navigation

Min Chen, University of Texas at Dallas, 800 West Campbell Road, School of Management, SM33, Richardson, TX, 75080, United States of America, min.chen@student.utdallas.edu

It has been long recognized that designing usable Web sites is not a trivial task. In this paper, we propose an integer programming model to improve the navigation effectiveness of a Web site while minimizing unnecessary changes to its structure, as it bears business or organizational logics. Thus, our approach can be applied for Web site maintenance on a regular basis. The test results show that we can provide significant improvements over the site structure by introducing very few changes.

■ MD13

M - Room 8216

Data Mining Competition II

Sponsor: Data Mining
Sponsored Session

Chair: Patricia Cerrito, University of Louisville, pcerrito@louisville.edu

1 - Data Mining Competition

Nick Street, The University of Iowa, Iowa City IA, nick-street@uiowa.edu

In 2008 the Data Mining Section held the first INFORMS Data Mining Contest: The Antibiotic Protocol Case. The challenge was to identify patients at highest risk for developing an pneumonia during their hospital stay, and to design an optimal protocol for prophylactic antibiotic treatment. In this session, contest entrants will describe the approaches they took to this challenge.

■ MD14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - ILOG, Inc. - ILOG CP Optimizer: Model and Automatically Solve Your Detailed Scheduling Problems

Dider Vidal, Senior Product Manager, Optimization ILOG SA, 9 Rue de Verdun, Gentilly Ile-de-France 94253, France, dvidal@ilog.fr

Learn how to use ILOG CP Optimizer 2.0 to solve detailed scheduling problems with finite capacity resources and reservoirs. An interval-based modeling framework supports compact models that do not grow with increasing time granularity, providing excellent performance. We present results comparing CP Optimizer - using default settings - against specialized algorithms on several benchmarks from scheduling literature.

2 - Lumina Decision Systems, Inc. - Analytica: What it Does that Spreadsheets Can't

Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com

A rare chance to see Analytica demonstrated by its originator: Experienced analysts prefer Analytica to spreadsheets because of its visual influence diagrams, Intelligent Arrays, fast Monte Carlo, and scalability. Users say that they can build, verify, and analyze models in a quarter to half the time it takes with a spreadsheet.

■ MD15

M - Room 8219

Hospitality Services

Sponsor: Service Science
Sponsored Session

Chair: Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu

1 - Forecasting Demand in Hotel Food and Beverage Outlets

Gary Thompson, Professor, Cornell University, 352 Statler Hall, Ithaca, NY, 14853, United States of America, gmt1@cornell.edu

We look at whether lodging properties can use occupancy data to improve demand forecast accuracy in their food and beverage outlets, using 4 hotels with a total of 41 outlet & day part combinations. We examine 27 forecasting methods, which we test using an 8 week holdback. In 34 cases, the best forecast originated with one of the models incorporating occupancy, and the accuracy improved over 14% on average. Our findings will be of interest to food and beverage managers in lodging properties.

2 - Opaque Versus Transparent Product Pricing

Chris Anderson, Cornell University, School of Hotel Administration, Ithaca, NY, 14850, United States of America, cka9@cornell.edu, Kristine Xie

We investigate differences in consumer purchasing behavior via choice models for purchasing channels of differing levels of product opaqueness.

3 - Service Design for Changing Markets

Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu, Michael Dixon

In the context of service design, both operations and marketing managers have to be aware of shifting trends in market preferences and have to work together to coordinate the "what" and the "how" of the service concept. In this study we use both CMR data and discrete choice modeling methodology to uncover difference in preferences over time between existing loyal and potentially loyal customers. Implications for service design are discussed.

4 - Revenue Management and the Knowledgeable Consumer – Application of Discrete-Choice Analysis

Leo MacDonald, Assistant Professor, Kennesaw State University, Coles College of Business, 1000 Chastain Road, Kennesaw, GA, 30144, United States of America, lmacdon4@kennesaw.edu, Chris Anderson, Rohit Verma

Service providers continue to face more knowledgeable consumers, created in part by online channels. It is critical that service providers understand the consumer's purchase decision process to asses services and amenities, as well as setting the right price controls. We develop a discrete choice model using a combination of revealed and stated preference data. We present the results and insights generated from the model, and how the results can enhance revenue management.

■ MD16

M - Room 8222

Staffing and Routing in Call Centers

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu

1 - A Chance-constrained Optimization Approach to Call-center Staffing

Itay Gurvich, Columbia University, New York, NY, 10027, United States of America, ig2126@columbia.edu, Tolga Tezcan

We consider the problem of staffing call-centers with multiple customer classes and agent types operating under quality-of-service constraints. We introduce a chance-constrained optimization approach that takes into account the imminent uncertainty of the forecasted arrival rates. The optimization problem that we construct reduces to a simple non-linear program with a relatively small number of constraints. We show that our solution is asymptotically optimal in an appropriate sense.

2 - Call Routing Strategies in the Presence of Servers with Heterogeneous Performance Attributes

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu, Yongpin Zhou, Kevin Ross

Call center models have focused on measures of customer waiting time. However, recent research has revealed that First Call Resolution is also a critical measure of quality and satisfaction. We develop a framework for multiple queues and agent types, with each agent type having different characteristics across different queues. We propose routing rules and conduct empirical tests, showing that these rules can be used to increase FCR while simultaneously decreasing waiting times.

3 - Fair Dynamic Routing Policies in Large-scale Service Systems with Heterogeneous Servers

Mor Armony, Associate Professor, NYU, 44 West 4th Street, New York, NY, 10012, United States of America, marmony@stern.nyu.edu, Amy Ward

Call centers typically have many agents answering calls with different speeds. A key control issue that arises is how to route calls to agents. It has been shown that routing calls to the fastest agent first asymptotically minimizes steady-state customer waiting times. Unfortunately, this policy penalizes the faster agents by keeping them busy at all times. We address the question of how to optimize system performance subject to fairness with respect to server utilization.

4 - A Policy for Dynamic Outsourcing in Call Centers

Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu, Levent Kocaga

Call centers often experience times when all agents are busy. Customers are then unhappy, because they are forced to wait. Hence it is natural for the call center to consider paying to outsource calls during overloaded periods. We address the question of how to dynamically outsource calls in order to minimize average cost.

■ MD17

M - Room 8226

Design of Experiments: The Science and Art of Efficient Data Collection

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

1 - Nested Maximin Latin Hypercube Designs

Gijs Rennen, Tilburg University, Room K 531, PO Box 90153, Tilburg, 5000 LE, Netherlands, g.rennen@gmail.com

Latin hypercube designs (LHDs) play an important role in building metamodels for computer simulation models. To obtain data with good space-filling properties, the maximin criterion is commonly used i.e. the objective is to obtain an LHD of n points in k dimensions for which the minimal distance between any pair of points is maximized. In some situations, we however want two space-filling LHDs where one is a subset of the other. These nested LHDs will be the main topic of this presentation.

2 - STRONG: A Design-of-experiment-based Simulation Optimization Framework

Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu, Kuohao Chang

STRONG is a newly developed DOE-based simulation optimization framework. It has nice convergence guarantee and does not require human intervention in the process. We will present a general version of STRONG which relaxes the normal assumption of the responses (compared to the traditional response surface methodology) to any general distribution with bounded second moment.

3 - Two-stage Group Screening for Detection of Interactions in Experiments

Angela Dean, Professor, The Ohio State University, Department of Statistics, Cockins Hall, Columbus, OH, 43210, United States of America, amd@stat.osu.edu, Susan Lewis

A key tool for product improvement is the exploitation of interactions between control factors, which can be set in product specification, and noise factors, which cannot. The strategy of two-stage group screening will be discussed, with the goal of identifying control-by-noise interactions with high probability. Web-based software will be described for elicitation of information from subject specialists. Group screening methodology will be illustrated through an experiment run at Jaguar Cars.

4 - Listing Unique Fractional Factorial Designs

Abhishek Shrivatsava, Texas A&M University, Industrial and Systems Engineering, 3131 TAMU, College Station, TX, 77843, United States of America, akshriv@tamu.edu, Yu Ding

Fractional factorial designs are a popular choice for designing experiments. Choosing a design requires searching among all the statistically distinct designs. We provide a method for efficiently enumerating 2-level designs distinct under relabeling of factor, level and run labels. We use a graph to model each design and provide a sufficient condition for checking isomorphism of two designs. We also provide an efficient algorithm for generating non-isomorphic designs.

■ MD18

M - Room 8228

Curriculum Development in QSR

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu

1 - Some Ideas on the Advanced Quality Control Course

Jianjun Shi, The Carolyn J. Stewart Chair Professor, Georgia Institute of Technology, 765 Ferst Drive, Room 214, Atlanta, GA, 30332-0205, United States of America, jshi33@isye.gatech.edu

Advanced quality control is an important course in a IE graduate curriculum. Though the course is routinely offered in different universities, there are not much standard contents or coverage among different programs. This presentation presents some AQC course outlines in different IE programs. Some ideas for the course design will be presented for further discussion.

2 - Sensor Data Characterization

Soundar Kumara, Allen E. Pearce/Allen M. Pearce Chaired Professor, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, skumara@psu.edu

In this talk the importance of sensor data analysis and real-time aspects as important components of quality control curriculum will be discussed. Ideas on the aspects of real time signal characterization will be presented.

3 - Traditional and Evolution of the Quality Curriculum

George Runger, Professor, Arizona State University, runger@asu.edu

A review of elements of quality curriculum and the basis for these elements will be presented. Prevailing trends in industry and academics and the effect on the change to the curriculum will be discussed.

■ MD19

M - Lincoln 4

Tutorial: Some Future Directions in Vehicle Routing Research

Cluster: Tutorials
Invited Session

Chair: Bruce Golden, University of Maryland, Van Munching Hall, College Park, MD, United States of America, bgolden@rhsmith.umd.edu

1 - Some Future Directions in Vehicle Routing Research

Bruce Golden, University of Maryland, Van Munching Hall, College Park, MD, United States of America, bgolden@rhsmith.umd.edu, Ed Wasil, Chris Groer

In this tutorial, we discuss some of our recent work in vehicle routing. First, we discuss two multi-period vehicle routing problems. The first arises in the small package shipping industry. The second is important in the utility industry. In addition, we present a cooperative parallel algorithm for generating high quality vehicle routing solutions.

■ MD20

M - Lincoln 3

Decision Analysis Society Awards

Sponsor: Decision Analysis
Sponsored Session

Chair: Craig Kirkwood, Arizona State University, Department of Supply Chain Management, W. P. Carey School of Business, Tempe, AZ, 85287-4706, United States of America, craig.kirkwood@asu.edu

1 - Practice Award

Karen Jenni, Insight Decisions LLC, 1616 17th Street, Suite 268, Denver, CO, 80202, United States of America, kjenni@insightdecisions.com

The Decision Analysis Society Practice Award competition is to recognize, promote, and publicize good decision analysis practice. We will recognize the winner and finalists for the 2008 Practice Award.

2 - Student Paper Award

Robert Clemen, Professor, Duke University, Fuqua School of Business, PO Box 90120, Durham, NC, 27708, United States of America, clemen@mail.duke.edu

The Decision Analysis Student Paper Award is given annually to the best decision analysis paper by a student author, as judged by a panel of the INFORMS Decision Analysis Society. Students who did not complete their PhD prior to May 1, 2007 are eligible for this year's competition.

3 - Decision Analysis Publication Award

James Dyer, Professor, University of Texas-Austin, MSIS Dept, 1 University Sta Stop B6500, Austin, TX, 78712-0212, United States of America, j.dyer@mccombs.utexas.edu

The Decision Analysis Publication Award is given annually to the best decision analysis article or book published two years earlier. To be considered for this year's award, a work must have been published during 2006. The intent of the award is to recognize the best publication in decision analysis, broadly defined — including theoretical work on decision analysis methodology, descriptions of applications, and/or experimental studies.

4 - Frank P. Ramsey Medal

Ralph Keeney, Research Professor, Duke University, Fuqua School of Business, 101 Lombard Street Suite #704W, San Francisco, CA, 94111, United States of America, keeneyr@aol.com

The Frank P. Ramsey Medal is the highest award of the Decision Analysis Society, and it recognizes distinguished contributions to the field of decision analysis. The medal is named in honor of Frank Plumpton Ramsey, a Cambridge University mathematician who was one of the pioneers of decision theory in the 20th century.

■ MD21

M - Lincoln 2

Joint Session Computational Biology/CS: Sequence Analysis

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Michael Brudno, Assistant Professor, University of Toronto, 10 King's College Rd, Pratt Bldg 283, Toronto, ON, M5R2Z2, Canada, brudno@cs.toronto.edu

1 - Parameter Estimation for RNA Folding

Chuong Do, Graduate Student, Stanford University, Stanford, CA, 94305, chuongdo@stanford.edu

A key element in developing accurate computational tools for RNA secondary structure prediction is the development of accurate scoring functions for distinguishing correct secondary structures from incorrect suboptimal structures. Traditionally, parameter estimation in RNA thermodynamic models have relied primarily on optical melting experiments, though in recent years, statistical approaches to parameter learning for RNA folders have gained in popularity. In this talk, we describe techniques for estimation of folding parameters for RNA secondary structured prediction from known RNA secondary structures using methods from convex optimization. In particular, we describe simple dual coordinate ascent algorithms for learning RNA folding models efficiently on single-processor machines.

2 - Learning Parameters for Sequence Alignment from Partial Examples

John Kececioglu, The University of Arizona, Department of Computer Science, Tucson, AZ, 85721-0077, United States of America, kece@cs.arizona.edu

A rigorous way to compute parameter values that are appropriate for aligning biological sequences is through inverse parametric sequence alignment. We extend prior work on inverse parametric alignment to partial examples, which contain regions where the alignment is left unspecified, and to an improved formulation based on minimizing the average error between the score of an example and the score of an optimal alignment.

3 - Ab Initio Whole Genome Shotgun Assembly

Paul Medvedev, University of Toronto, Deparment of Computer Science, 10 King's College Road, Room 3302, Toronto, ON, M5S3G4, Canada, pashadag@cs.toronto.edu, Michael Brudno

Next Generation Sequencing (NGS) technologies are capable of reading millions of short DNA sequences both quickly and cheaply. In this talk, we give a novel network flow-based algorithm for ab-initio genome assembly. By taking advantage of the high coverage provided by NGS, it accurately estimates the copy counts of repeats in a genome. We also give a second algorithm that combines the predicted copy-counts with mate-pair data in order to assemble the reads into contigs.

4 - Discovering Structural Genome Variation

Michael Brudno, Assistant Professor, University of Toronto, 10 King's College Rd, Pratt Bldg 283, Toronto, ON, M5R2Z2, Canada, brudno@cs.toronto.edu, Seunghak Lee, Elango Cheran

Structural genomic variants have come to the forefront as a significant source of variation in the human population. We expand on the clone-end sequencing approach for detecting structural variants by building an automated, probabilistic framework. Our approach does not rely on an a priori determined mapping of all reads to the reference. Instead, we build a framework for finding the most probable assignment of clones to potential structural variants based on their similarity to other clones.

■ MD22

M - Lincoln 1

Models and Application in Scheduling

Contributed Session

Chair: Erick Moreno Centeno, PhD Student, UC Berkeley, Department of IEOR, 4141 Etcheverry Hall, Mail Code 1777, Berkeley, CA, 94720, United States of America, erick_moreno@berkeley.edu

1 - Long Term Care Access: The True Cause of Hospital Congestion?

Jonathan Patrick, Assistant Professor, University of Ottawa, 55 Laurier ave, Ottawa, ON, K1S2M8, Canada, patrick@telfer.uottawa.ca

Poor access to long term care facilities has resulted in a significant portion of non-critical patients occupying hospital beds greatly hampering the hospital's ability to function effectively. We present a Markov decision model of long term care access in the Ottawa region. This is a complex problem due to multiple demand categories competing for the same beds spread out in multiple facilities. Patient preference and urgency of need both play a significant part in the decision process.

2 - Space Search Formulations based on Job Interference for the Job-shop Scheduling Problem

Chandrasekhar Ganduri, Ohio University, 270 Stocker Center, Athens, OH, 45701, United States of America, ganduri@bobcat.ent.ohiou.edu, Dusan Sormaz

Space search is a well known paradigm in AI and heuristic state evaluation functions (SEFs) form the basis for applying space search. The formulation of the algorithm for construction of partial schedules based on job addition is described. Different SEFs formulated in terms of job interference are proposed. Job interference is based on overlapping operations of different jobs on same machine. Measures for quantifying job interference and procedures for interference resolution are described.

3 - A Fuzzy Preventive Maintenance Scheduling in Labor Limited Systems

Emin Gundogar, Professor, Sakarya University, Muhendislik Fak. Esentepe, Kampus Serdivan, Adapazari, SA, 54187, Turkey, gun@sakarya.edu.tr, Baha Guney, Fuat Simsir, Imdat Taymaz

Preventive Maintenance (PM) is a vital function in manufacturing systems in order not to disturb production systems with frequent and severe failures. PM activities should be done on time as planned. This could be achieved easily with enough labor resource. In this study, PM activities are scheduled using fuzzy priority under labor limited case where performance criteria is set as minimum deviation from PM plan.

4 - A Network Flow-based Relaxation of the Split Delivery Vehicle Routing Problem

Erick Moreno Centeno, PhD Student, UC Berkeley, Department of IEOR, 4141 Etcheverry Hall, Mail Code 1777, Berkeley, CA, 94720, United States of America, erick_moreno@berkeley.edu, Moshe Dror, Alper Atamturk

We examine a progressive sequence of relaxations of the generic Vehicle Routing Problem (VRP) as Split Delivery Routing problems (SDVRP). In particular, we show that relaxing the SDVRP constraints impeding commodity transfers between the vehicles leads to a new interpretation for the SDVRP. Moreover, the new SDVRP relaxation generates very tight bounds and can be solved relatively fast.

■ MD23

M - Lincoln 5

Joint Session AP/Minority Issues: Queueing Systems

Sponsor: Applied Probability, Minority Issues

Sponsored Session

Chair: Mark Lewis, Associate Professor, School of Operations Research and Information Engineering, Cornell University, 226 Rhode Hall, Ithaca, NY, 14850, United States of America, mark.lewis@cornell.edu

1 - Queues with Collaborative Flexible Servers

Hayriye Ayhan, Associate Professor, Georgia Institute of Technology, School of ISyE, 326 Groseclose Building, Atlanta, GA, 30332-0205, United States of America, hayhan@isye.gatech.edu, Sigrun Andradottir, Douglas Down

Consider a tandem queueing network with two stations, two flexible servers, infinite supply of jobs in front of station 1, infinite room for completed jobs after station 2, and finite buffer between the stations. We assume that the servers can work together, but they become less efficient when they collaborate. Our objective is to determine how the optimal dynamic server assignment policy depends on how well the servers work together.

2 - Allocating Flexible Servers with Switching Costs and Switching Times

Maria Mayorga, Assistant Professor, Clemson University, Department of Industrial Engineering, 146 Freeman Hall, Clemson, SC, 29634-0920, United States of America, MAYORGA@exchange.clemson.edu

We model a tandem queuing system allocating flexible servers to maximize throughput or minimize costs. In the collaborative case with switching costs we characterize the structure of the optimal policy, and present sensitivity analysis to show how the structure of the optimal policy changes. Our results show that the policy losses its monotone structure in the case that holding costs at the first station are higher. We also approximate the optimal policy when switching times are introduced.

3 - The Variability Adjusted Flexibility Index for Flexible Queueing Systems

Douglas Down, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4L7, Canada, downd@mcmaster.ca, Sigrun Andradottir, Hayriye Ayhan

One reason for introducing flexibility (through server cross-training) is to cope with variability. We introduce the Variability Adjusted Flexibility Index (VAFI) to evaluate cross-training schemes. This index takes variability directly into account. Using the VAFI, we demonstrate when it is important to consider variability when making cross-training decisions.

4 - The c-mu Rule with Abandonments

Mark Lewis, Associate Professor, School of Operations Research and Information Engineering, Cornell University, 226 Rhode Hall, Ithaca, NY, 14850, United States of America, mark.lewis@cornell.edu, Douglas Down

We consider the problem of allocating a single server to two parallel queues. Customers that arrive to each queue abandon if they have not begun service after an exponential amount of time. Conditions under which a c-mu type rule is optimal are presented.

■ MD24

M - Lincoln 6

Computational Methods and Applications for Large-Scale Optimization Problems

Sponsor: Computing Society

Sponsored Session

Chair: Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu

1 - Fast and Robust Techniques for the Euclidean p-Median Problem

Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu, Allen Holder

We discuss new solution techniques for the p-median problem, with the goal being to improve the solution time and quality of current techniques. In particular, we hybridize the discrete Lloyd algorithm and the vertex substitution heuristic. We also compare three starting point techniques and present a new solution method that provides consistently good results when appropriately initialized.

2 - Large-Scale Quaratic Integer Programming Problems

Panos Pardalos, Distinguished Professor, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, pardalos@ufl.edu

In this talk we are going to present computational results using exact algorithms and heuristics for large-scale quadratic 0-1 problems.

3 - Dynamic Programming Based Inequalities for the Multi-Item Capacitated Lot-sizing Problem

Esra Buyuktahtakin, PhD Candidate, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, United States of America, iesra@ufl.edu, Joseph Hartman, J. Cole Smith

Iterative solutions of dynamic programming formulations for the CLSP are used to generate valid inequalities for the integer programming formulation of its multi-item version. The inequalities essentially capture convex and concave envelopes of intermediate-stage value functions, and can be lifted by examining potential state information at future stages. A set of experiments are presented to illustrate the computational efficiency of the inequalities.

4 - Making Dark Shadows with Linear Programming

Robert Vanderbei, Professor, Princeton University, E-226 E-Quad, Princeton, NJ, 08544, United States of America, rvdb@Princeton.EDU

A leading concept for NASA's upcoming planet-finding telescope involves placing an occulter 70,000 km in front of a 4m telescope. The purpose of the occulter is to block the bright starlight thereby enabling the telescope to image planets orbiting the blocked star. But, diffraction effects prevent a simple circular occulter from providing a fully dark shadow—-a specially shaped occulter is required. I will explain how this shape-optimization problem can be solved with linear programming.

■ MD25

M - Lincoln 6A

Computational Decision and Behavioral Analysis

Sponsor: Computing Society
Sponsored Session

Chair: Cole Smith, Associate Professor, ISE, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, j.cole.smith@gmail.com

1 - Specifying Team Sizes with Interdependent Tasks and Nonlinear Sharing Functions

Ronald Askin, Professor and Chair, Arizona State University, Tempe, AZ, United States of America, Ron.Askin@asu.edu, Liangjie Xue

We consider the problem of determining the optimal sizes of task teams for projects with multiple, interdependent tasks. Based on task requirements, nonlinear worksharing functions are used to define cumulative team efficiency as a function of team size. Computational results demonstrate the performance of several strategies and allocation methods for various project configurations and task characteristics.

2 - Dynamic Modeling of Human Decisions Using Decision Field Theory

Andres Abad, University of Michigan, Department of Industrial, and Operations Engineering, Ann Arbor, MI, 48109, United States of America, agabad@umich.edu, Young-Jun Son, Judy Jin

This research aims to extend the decision field theory to model the dynamic characteristics of human decision processes. The inherent linkage between the statistical classifier design and the expected attention weights is at the first time investigated. An adaptive estimation of the expected attention weights is also presented based on sequentially observed human decisions.

3 - Integrated Human Decision Making and Planning Model for Emergency Evacuation Crowd Simulation

Young-Jun Son, Associate Professor, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, son@sie.arizona.edu, Judy Jin, Seungho Lee

An integrated Belief-Desire-Intention (BDI) modeling framework is proposed for human decision behavior, which involve Bayesian belief network, Decision-Field-Theory, and probabilistic depth first search technique. Attributes of the model are reverse-engineered from human experiments conducted in CAVE. The proposed BDI model is demonstrated for human's evacuation behaviors under a terrorist bomb attack. The environment and agents are implemented in AnyLogic agent-based simulation software.

■ MD26

M - Lincoln 5A

New Additions to Existing Projects in COIN-OR

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Kipp Martin, University of Chicago, 5807 South Woodlawn, Chicago, IL, United States of America, kipp.martin@chicagogsb.edu

1 - Developing Applications Based on CHiPPS

Yan Xu, SAS Institute Inc., SAS Campus Drive, Cary, NC, 27519, United States of America, Yan.Xu@sas.com, Ted Ralphs, Laszlo Ladanyi, Matthew Saltzman

CHiPPS is the COIN-OR Open Parallel Search Framework, a framework for implementing parallel algorithms based on tree search. The current CHiPPS architecture consists of three layers: ALPS, BiCePS and BLIS. In this talk, first we briefly introduce the main concepts of CHiPPS, then we use VRP/TSP as an example to show how to develop specific applicatoins based on CHiPPS.

2 - Calculating Spare Hessian Using Algorithmic Differentiation

Brad Bell, Principal Mathematician, APL University of Washington, 1013 NE 40th Street, Seattle, WA, 98105-6698, United States of America, bradbell@seanet.com

The CppAD package can use the fact that a Hessian is sparse to reduce the work necessary to calculate the Hessian. We will review how multiple columns of a sparse Hessian can be computed with the same work as one column. CppAD uses the greedy distance two graph coloring algorithm to group columns that can be computed together. We will review this algorithm and some speed tests of the sparse Hessian calculation. Finally we will suggest some ways in which this calculation can be improved.

3 - Modeling Stochastic Programs in COIN FlopC++ and Smi

Alan King, IBM Research, PO Box 218, Yorktown Heights, NY, 10598, United States of America, kingaj@us.ibm.com, Michal Kaut, Tim Hultberg

We present an overview of our proposal for modeling stochastic programs using the combined capabilities of the FlopC++ and Smi packages from COIN-OR.

4 - Recent Developments in OSiL/SE

Horand Gassmann, Professor, Dalhousie University, Faculty of Management, 6100 University Avenue, Halifax, NS, B3H 3J5, Canada, Horand.Gassmann@Dal.Ca, Robert Fourer, Kipp Martin, Jun Ma, Huan-Yuan Sheng

OSiL is an XML schema for the formulation of a large class of mathematical programming problems. This talk concerns recent advances in the description of stochastic programs. Also described are a parser, internal data objects and a rudimentary implementation of a decomposition algorithm.

■ MD27

M - Washington 1A

Performance of Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Wuqin Lin, Kellogg School of Management, 2001 Sheridan Rd, Evanston, IL, 60091, United States of America, wuqin-lin@kellogg.northwestern.edu

1 - Utility-Maximizing Resource Control: Diffusion Limit and Asymptotic Optimality for a Two-Bottleneck

David D. Yao, IEOR Department Columbia University, New York, NY, 10027, yao@columbia.edu, Hengqing Ye

We study a stochastic network that consists of two servers shared by two classes of jobs under heavy traffic. The real-time allocation of the service capacity among the job classes takes the form of a solution to an optimization problem that maximizes a utility function. We derive the diffusion limit of the network and establish its asymptotic optimality. It also highlights the key issues involved in multiple bottlenecks.

2 - Environment-dependent Ordering Policies in a Production-inventory System in a Random Environment

Keqi Yan, SAS Institute Inc., 500 SAS Campus Dr., Cary, 27513, United States of America, Keqi.Yan@sas.com, Vidyadhar Kulkarni

We study a general production-inventory system where production and demand rates are modulated by a random environment process. When orders from external suppliers are needed, the order quantities can be depend on the state of the environment at the time of order placement. We study the limiting behavior of this system and derive a general stochastic decomposition property in a matrix form. We develop a method to compute the optimal ordering policies that minimize the long run average costs.

3 - An Approximation Model for Sojourn Time Distributions in Multi-server Queueing Networks

Kevin Gue, Associate Professor, Auburn University, Department of Industrial and Systems Eng, Auburn, AL, 36830, United States of America, kevin.gue@auburn.edu, Hyun Ho Kim

We develop an approximation model for the sojourn time distribution of customers or jobs arriving to a multi-server queueing network. The model accepts general interarrival and service times, and is based on the characteristics of phase-type distributions. Distributions produced by the model agree well with those produced by simulation for a variety of serial and general networks. We offer some potential uses of the model in retail order fulfillment systems.

■ MD28

M - Washington 1

Dynamic Revenue Management

Cluster: Online Decision Making
Invited Session
Chair: Paat Rusmevichientong, paatrus@cornell.edu

1 - An Adaptive Algorithm for Dynamic Assortment Optimization
Paat Rusmevichientong, paatrus@cornell.edu, Max Shen, David Shmoys

We consider the problem of dynamic assortment optimization. In our model, a retailer does not have any prior knowledge about the demand for each product, and must learn the demand by offering different product assortments and observing customer purchases. We propose an adaptive algorithm that integrates demand learning with assortment optimization, and establish convergence properties of the algorithm. Numerical results validate the performance of the algorithm.

2 - Dynamic Pricing Using Scenario Based Optimization
Ruben Lobel, rlobel@mit.edu, Georgia Perakis

We discuss a dynamic pricing problem under fixed capacities. Demand is a function of the price with uncertain parameters. We develop a scenario based optimization model to find a closed-loop pricing strategy that maximizes revenue robustly, without making distributional assumptions on the uncertainty. We provide a bound on the number of scenario samples that achieve a desired confidence level for this solution. We also present numerical results to support our findings.

3 - Approximate Solutions for the Capacity Allocation Problem-Performance and Computation
Thiam Lee, Columbia University, 500W 120th Street, MC 4704, New York, NY, thl2102@columbia.edu, Woonghee Tim Huh, Retsef Levi

We define a new class of solutions for the airline flight capacity allocation problem with independent demands and non-monotonic demand arrivals, and prove for them performance bounds relative to an optimal one. We show an algorithm that obtains from demand samples an instance from this class with high probability. Furthermore, the number of samples required to obtain, with a certain confidence probability, a solution of a desired performance level is polynomial in the parameters.

4 - Demand Learning and Dynamic Pricing for Events
Masoud Talebian, Columbia University, 325 Mudd Bldg, NY, NY, 10027, United States of America, mt2251@columbia.edu, Guillermo Gallego

We consider a revenue management model for events where the capacity provider knows from historical data the premium/discount relative to the core value for different seats in the venue and the customers' elasticity. The provider only has a prior about the market size, and does not know the core value that customers assign to the show. We show how the provider should update his prior based on the market response, and update his prices to maximize expected revenues over a rolling horizon.

■ MD29

M - Washington 2

Tutorial: Expressive Commerce and Its Application to Sourcing: Experiences from Conducting over $40 Billion of Generalized Combinatorial Auctions

Cluster: Tutorials
Invited Session
Chair: Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu

1 - Expressive Commerce and Its Application to Sourcing: Experiences from Conducting over $40 Billion of Generalized Combinatorial Auctions
Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu

I will discuss a generalization of combinatorial and multi-attribute auctions which we call expressive commerce. Here supply and demand are expressed in drastically greater detail than in traditional electronic auctions, and are algorithmically cleared. This creates a Pareto efficiency improvement in the allocation (aka win-win). I will share our experiences from CombineNet, Inc. of hosting over $40 billion of such transactions over the last eight years in the domain of strategic sourcing, yielding over $5 billion in savings. I will tie in very recent pertinent game theory on a few of the topics. For example, any form of added expressiveness can only increase efficiency. Topics include: -Natural bidding languages that made combinatorial auctions practical here. -The ways by which expressive bidding increases efficiency. -Scalability of state-of-the-art winner determination algorithms. -Expressiveness by the bid taker, and associated scenario navigation capabilities. These enable the bid taker to make the allocation implementable, express preferences, help internal stakeholder alignment, and obtain a quantitative understanding of the tradeoffs available in the supply chain. -How we use winner determination to automatically (re-)engineer the entire (multi-level) supply chain. -How we use winner determination to automatically configure the items to be sourced. -How incumbency and other special considerations can/should be treated.

■ MD30

M - Washington 4

Modeling Military Systems

Sponsor: Military Applications
Sponsored Session
Chair: Andrew Hall, LTC, United States Army, 4760 N 40th St, Arlington, Va, United States of America, ahall@rhsmith.umd.edu

1 - Optimal Army Officer Retirement
Andrew Hall, LTC, United States Army, 4760 N 40th St, Arlington, Va, 22207, United States of America, Andrew.O.Hall@us.army.mil

We model an Army officer's decision to retire as an optimal stopping problem. We solve the resulting Markov Decision Process by dynamic programming, linear programming and simulation. Previous results suggested an optimal retirement point for Lieutenant Colonels at 23 years. Our results suggest a shift in the optimal retirement point to 20 years. We explore manpower planning and policy implications of shifting retirement behavior and possible mitigation strategies.

2 - The Use of Spies in Strategic Situations
Scott Provan, Professor, Univiversity of North Carolina, Department of Stat. and Operations Research, CB#3260, Chapel Hill, NC, 27599, United States of America, Scott_Provan@UNC.edu

The use of spies is a valuable tool in strategic situations, and it is important to gain a deeper understanding of the underlying framework of spying. We study the use of spies in 2-person matrix games. We formulate the context of a spying in such games, and model a number of situations involving single or multiple types of spies, spies for one or both sides, and the use of decoy strategies to mislead spies. Computational studies indicate the advantage of using spies under various scenarios.

3 - The Aviation Weather Routing Tool: A Decision Support System for Manned/Unmanned Aircraft Routing
David Knapp, Chief, Atmospheric Modeling Applications Branch, Army Research Laboratory, AMSRD-ARL-CI-EM, Bldg 1622, Rm 112A, White Sands Missile Range, NM, 88002-5501, United States of America, dknapp@arl.army.mil, Andrew Butler, David Marlin, Edward Measure, David Sauter, Terry Jameson

A decision support system has been developed to improve the routing of manned/unmanned aircraft systems around adverse weather conditions to improve mission success rates. The Aviation Weather Routing Tool (AWRT) addresses the complexity of forecasting flight route weather impacts on aircraft by implementing an automated route optimization capability to determine the best route(s) to a target area, loitering waypoints, or desired destination point with the lowest enroute weather hazards risk.

4 - Weather for Combat Models: Methodology, Techniques and Results
Richard Shirkey, Dr., Army Research Laboratory, Attn: AMSRD-ARL-CI-EM, WSMR, NM, 88002, United States of America, rshirkey@arl.army.mil

Techniques have been developed that allow significant improvement in weather effects and impacts for combat models. Parametric curves were constructed to represent infrared sensors acquiring targets under specified weather conditions in conjunction with environmental impact thresholds for determination of go/no-go weather situations for platforms or systems. We found that the wargame realism was increased without impacting run time. Results were verified using AWARS.

■ MD31

M - Washington 5

Searching for Distressed Persons II

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: John Frost, Information/Search Planning Specialist, U. S. Coast Guard, Office of Search and Rescue, Suite 3106, 2100 Second St. SW, Washington, DC, 20593-0001, United States of America, John.R.Frost@uscg.mil

1 - History of Operations Research Applied to Search and Rescue
John Frost, Information/Search Planning Specialist, U. S. Coast Guard, Office of Search and Rescue, Suite 3106, 2100 Second St. SW, Washington, DC, 20593-0001, United States of America, John.R.Frost@uscg.mil

This presentation reviews the application of operations research, and search theory in particular, to search and rescue since search theory's initial development during the Second World War.

2 - Planning with Multiple SRUs in SAROPS
Thomas Kratzke, Senior Analyst, Metron, Inc., Reston, VA, United States of America, tkratzke@metsci.com

When assigning rectangular search areas to multiple Search units, one is faced with a large set of constraints. For example, there is a relatively small number of dimensions for each rectangle, and some of the rectangles cannot overlap. In this talk, we discuss the constraints, and the algorithm that we used to find good rectangles for the SRUs.

3 - Applying Optimal Search Theory to Inland SAR: Steve Fossett Case Study
Colleen Keller, Senior Analyst, Metron, Inc, 512 Via de la Valle, Suite 301, Solana Beach, CA, 92075, United States of America, keller@ca.metsci.com, Mark Anderson

Steve Fossett, a famous adventurer, disappeared during a solo pleasure flight in a light aircraft on 3 September 2007 in a remote area of Nevada. An intense search was conducted by both private parties and multiple government agencies. This paper describes an independent effort to aid the on-going search using probabilistic search theory and optimization techniques.

■ MD32

M - Washington 6

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Route Designs for Delivery of Optical Scan Voting Machines
Michael J. Fry, University of Cincinnati, Jeffrey W. Ohlmann

The 2002 Help America Vote Act required election boards to move to electronic voting by 2006. This change greatly increases the operational complexities of administering elections. We describe our work with Hamilton County, Ohio, to (1) solve a vehicle routing problem with time windows problem to deliver optical scanning voting machines; and (2) modify the means in which poll workers choose machine delivery times in order to gain greater flexibility in our solutions.

2 - An Integrated Outbound Logistics Model for Frito-Lay: Coordinating Aggregate Level Production and Distribution Decisions
Sila Cetinkaya, Associate Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77840-3131, United States of America, sila@tamu.edu, Halit Uster, Gopal Easwaran, Burcu Keskin

We describe research results that are aimed at improving Frito-Lay's outbound logistics activities via simultaneous optimization of inventory and transportation decisions. We develop an integrated lot-sizing and vehicle routing model with explicit plant-to-store delivery considerations. We present an iterative solution approach that builds on decomposing the model into lot-sizing and routing components. We demonstrate that plant-to-store deliveries, along with efficient inventory and transportation decisions, present a significant opportunity for cost savings.

■ MD33

M - Johnson

Matching Demand with Supply in Health Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Sergei Savin, Associate Professor, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, svs30@columbia.edu

1 - Appointment Scheduling with Discrete Random Durations
Mehmet Begen, PhD Candidate, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Maurice Queyranne

We determine optimal appointment times for a given sequence of jobs (medical procedures) on a single processor (operating room, examination facility), to minimize the expected total underage and overage costs when each job has a random duration given by its discrete probability distribution. A simple condition on the cost rates implies that the objective function is submodular and L-convex. Then there exists an optimal appointment schedule which is integer and can be found in polynomial time.

2 - Batching Behavior in an Emergency Department
Hsiao-Hui Lee, PhD Student, Simon School, 711 University Park, Rochester, NY, 14620, United States of America, hsiao-hui.lee@simon.rochester.edu, Vera Tilson, Arvind Sainathan, Gregory Dobson

We model, as a continuous time Markov Chain, resident and attending physicians in and Emergency Department to understand how their decisions to batch work affect both the throughput of the operation and the flow time of patients. Examples include residents batching patient exams before presenting to an attending, and attendings batching the work to access labs, listen to presentations, or see patients after the residents' presentations.

3 - Optimal Outpatient Appointment Scheduling
Ger Koole, VU University Amsterdam, De Boelelaan 1081a, Amsterdam, ZH, 1081 HV, Netherlands, koole@few.vu.nl

We consider outpatient appointment scheduling. We show a local search procedure that converges to the optimal schedule with a weighted average of expected waiting times of patients, idle time of the doctor and tardiness as an objective. We allow for no-shows to happen. For certain combinations of parameters we find the well-known Bailey-Welch rule as optimal appointment schedule.

4 - The "Nurseboy Problem": Nurse Staffing in the Presence of Absenteeism
Sergei Savin, Associate Professor, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, svs30@columbia.edu, Linda Green, Nicos Savva

Unpredictable patient volumes and needs make the identification of effective nurse staffing levels a major challenge for hospitals. This problem is compounded by significant levels of nurse absenteeism which can lead to high costs due to overtime and/or deterioration in patient care. We develop a nurse staffing model which incorporates absenteeism and propose effective staffing policies under several scenarios corresponding to different hospital environments.

■ MD34

M - Jefferson

Applications of Markov Decision Processes (MDPs) in Healthcare

Sponsor: Health Applications Section
Sponsored Session

Chair: Murat Kurt, Doctoral Student, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, 15217, United States of America, muk7@pitt.edu

1 - Which Waiting Lists Should an End-stage Liver Disease Patient Join?
Gorkem Saka, Health Economist, Merck Research Labs, 1122 Station Square Blvd., Lansdale, PA, 19446, United States of America, gorkem_saka@merck.com, Oguzhan Alagoz, Mark Roberts, Lisa Maillart, Andrew Schaefer

Each end-stage liver disease patient joins at least one waiting list in order to be eligible for cadaveric liver offers. However, patients have the right to join several waiting lists, a practice referred to as "multiple listing". We analyze the question of where a patient should list in order to maximize her total life expectancy under certain conditions. We model this problem as an MDP. We propose a modified branch-and-bound algorithm to solve the problem and provide numerical results.

2 - Are Living-donor Liver Transplants Timed to Maximize Life Expectancy?

Sepehr Nemati Proon, PhD Student, University of Pittsburgh, 1048 Benedum Hall, Department of Industrial Engineering, Pittsburgh, PA, 15261, United States of America, sepehr.nemati@gmail.com, Mark Roberts, Burhaneddin Sandikci, Andrew Schaefer

The major clinical decision in living-donor liver transplantation is the appropriate time to transplant. We use a Markov decision process model parameterized with clinical data to optimize the timing of the transplant decision for a given end-stage liver disease patient with a living-donor. We compare the timing decision suggested by this model, which maximizes patient's total discounted life expectancy, to the actual transplant decision of the patient and present the results for 721 patients.

3 - Inverse MDP Optimization for Determining Living-donor Liver Transplantation Rewards

Zeynep Erkin, PhD Student, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, zeyneperkin@yahoo.com, Lisa Maillart, Matthew Bailey, Andrew Schaefer

A Markov decision process model for determining the optimal timing of a living-donor liver transplant to maximize patient life expectancy has been well-studied in the literature. Current practice, however, appears to be suboptimal. Therefore, we examine alternative reward structures under which current practice is optimal. To generate the new rewards, we solve a linear program that minimizes the distance between the data-estimated reward vectors and the new reward vectors.

4 - The Optimal Timing of Statin Initiation for Patients with Type 2 Diabetes

Murat Kurt, Doctoral Student, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, 15217, United States of America, muk7@pitt.edu, Andrew Schaefer, Nilay Shah, Steven Smith, Brian Denton

Lipid abnormalities increase the risk of coronary heart disease (CHD) and stroke for patients with Type 2 diabetes and can be treated by statins with some potential side effects. We formulate the optimal timing of statin initiation problem as an infinite-horizon Markov decision process. We present several structural properties of the model and compare individualized treatment policies between patients with varying risk factors. We also present computational results based on clinical data.

■ MD35

M - Jackson

Teaching Project Management

Sponsor: INFORM-ED
Sponsored Session

Chair: Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu

1 - Teaching a Case-based Project Management Course

Bert De Reyck, London Business School, Regents Park, London, United Kingdom, bdereyck@london.edu

In 2000 I launched a Project Management course at London Business School, amid scepticism about its suitability in a business school environment. 8 years later, the course attracts more than 200 MBA students each year, making it one of the largest electives, and consistently tops the rankings for evaluation scores. An essential ingredient of this success is the fact that the course is case-based, using real-life projects as a means to present project management frameworks and techniques.

2 - RESCON: A Classroom MFC Application for the RCPSP

Filip Deblaere, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, BE-3000, Belgium, Filip.Deblaere@econ.kuleuven.be, Erik Demeulemeester, Willy Herroelen

RESCON is an educational software tool for solving and visualizing the resource-constrained project scheduling problem. It has been developed in Microsoft Visual C++ 6.0 and has a window-based user interface. The tool visualizes project networks, project schedules, resource profiles and Gantt charts. Problem instances can either be read in from files or created manually using the GUI. Project schedules can then be calculated using a variety of exact and heuristic solution procedures.

3 - Teaching Goldratt's Critical Chain: The Academic Debate, Open Questions and Numerical Examples

Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu, Joseph Szmerekovsky

Goldratt's Critical Chain (1997) has been popular in our business schools but a subject of disagreement among our scholars. We survey the literature on the pros/cons of Critical Chain Project Management and discuss strategies for holding this debate with students. Second, we share questions that students ask during the reading, but as far as we know, have not been answered by scholars. Finally, we present numerical examples to reinforce the concepts and highlight complications Goldratt ignored.

■ MD37

M - T. Marshall Ballroom West

Tutorial: Cooperative and Noncooperative Games for Capacity Planning and Scheduling

Cluster: Tutorials
Invited Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Cooperative and Noncooperative Games for Capacity Planning and Scheduling

Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Zhixin Liu

This tutorial provides an overview of cooperative and noncooperative games for capacity planning and scheduling decisions. For both cooperative and noncooperative games, we present some basic definitions and concepts, review the recent literature, and discuss our own current research. The discussion of the literature of cooperative games includes sequencing games, models of outsourcing operations, and economic lot-sizing and schedule planning games. Our research considers a combined capacity planning and scheduling problem where a supplier allocates capacity to distributors, who may then cooperate to share their capacity allocations and resubmit revised orders. The discussion of the literature of noncooperative games includes capacity allocation mechanisms based on order sizes and sales, incentives for truth telling, models of decentralized versus centralized decision making, and auction mechanisms for capacity allocation. Our research develops an auction mechanism to allocate capacity to various agents with jobs that can be scheduled profitably; depending upon the choice of market good in the auction, there may be some flexibility in converting the allocated capacity into a feasible schedule. We also provide a discussion of future research directions, where we identify several issues that can be studied using new cooperative and noncooperative games.

■ MD38

M - Tyler

Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu

1 - Enhanced Lift-and-project Cuts from the LP Simplex Tableau

Egon Balas, Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, eb17@andrew.cmu.edu, Pierre Bonami

We revisit the Balas-Perregaard procedure for generating lift-and-project cuts from the LP simplex tableau, with new details and several generalizations. We discuss computational experience with several variants of the procedure.

2 - Continuing Work on Provably Tight Knapsack Formulations

Dan Bienstock, Professor, Columbia University, Department of IEOR, 500 West 120th St., New York, NY, 10027, United States of America, dano@columbia.edu

We present continuing work on formulations for knapsack problems that guarantee a provably tight bound, regardless of the objective vector.

3 - Basis Reduction and Integer Programming Approaches to Number Partitioning

Bala Krishnamoorthy, Washington State University, PO Box 643113 WSU, Pullman, WA, 99164-3113, United States of America, bkrishna@math.wsu.edu, William Webb, Nathan Moyer

The Number Partitioning Problem (NPP) is to divide n numbers in to two subsets, the difference of whose sums is minimized. We propose a mixed integer program (MIP) model for NPP, for which we consider basis reduction (BR) based reformulations. Second, we describe transformations of NPP to the shortest vector problem (SVP), which we tackle using BR algorithms. Third, we propose a heuristic called truncated NPP, where we solve an NPP instance with the last several digits of the numbers truncated.

4 - On the Size of the Enumeration Tree in Integer Programming Reformulation Techniques

Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu, Mustafa Tural

We give an upper bound in the size of the enumeration tree in Integer Programming reformulation techniques. As a corollary we show that for almost all IPs, where the coefficients are drawn from from a sufficiently large interval, the size of the enumeration tree for ordinary (i.e. branching on unit variables) branch-and-bound is at most 1.

■ MD39

M - Truman

Network Design

Sponsor: Optimization/ Networks
Sponsored Session

Chair: MohammadTaghi Hajiaghayi, Senior Researcher, AT&T Labs-Research, Rm: C225, 180 Park Ave., Florham Park, NJ, 08904, United States of America, hajiagha@mit.edu

1 - The Directed Pairs Connection Problem

Guy Kortsarz, Rutgers University, Buisness and Science Building, Pen and T, Camden, NJ, United States of America, guyk@camden.rutgers.edu, Zeev Nutov, Moran Feldman

We deal with the problem of connecting a collection of pairs in a directed graph at minimum cost. More generally given a number k the goal is to connect at least k of the pairs at minimum cost. We give improved results for both problems.

2 - Two-stage Robust Network Design with Exponential Scenarios

Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu, Rohit Khandekar, MohammadReza Salavatipour, Guy Kortsarz

We study two-stage robust variants of network design problems. We focus on the case of {\em exponentially many} scenarios given implicitly. We present the first constant-factor approximation algorithms for the two-stage robust Steiner tree and robust uncapacitated facility location problems and an $O(\log n)$-approximation for robust Steiner forest problem. We conclude our results by several inapproximability results for these problems.

3 - Graph Augmentation Problems

Samir Khuller, Professor and Associate Chair, University of Maryland, Department Of Computer Science, College Park, MD, 20742, United States of America, samir@cs.umd.edu

This is a survey talk on a basic problem referred to as the Augmentation Problem. You are given a spanning tree of a graph G=(V,E) and we would like to select a subset of the edges of G, to add to T, to make T 2-connected. We consider several different variations - we may require 2-vertex connectivity, or 2-edge connectivity. The edges of G may be unweighted or weighted. The complexity of the problem varies from polynomial to NP-hard depending on the assumptions.

4 - Minimizing Movement

Amin Sayedi, Carnegie Mellon University, 5000 Forbes Ave, Tepper School of Business, PhD program, Pittsburgh, PA, 15213, United States of America, ssayedir@andrew.cmu.edu, MohammadTaghi Hajiaghayi, Erik Demaine, Shayan Oveisgharan, Morteza Zadimoghaddam, Hamid Mahini

We give approximation algorithms and inapproximability results for a class of movement problems. In general, these problems involve planning the coordinated motion of a large collection of objects (representing anything from a robot swarm or firefighter team to map labels or network messages) to achieve a global property of the network while minimizing the maximum or average movement.

■ MD40

M - Taylor

Stochastic Programming and Applications

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Lewis Ntaimo, Assistant Professor, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ntaimo@tamu.edu

1 - A Stochastic Programming Model for the Feature Selection Problem

Clara Novoa, Assistant Professor, Texas State University - San Marcos, 601 University Dr, San Marcos, TX, 78666, United States of America, cn17@txstate.edu

We present a stochastic programming model to address the feature selection problem. A column generation approach is proposed to choose solutions that minimize the expected distortion and have subsets of features whose size is significantly lower than the original feature set. Since the classification or clustering phase is a time consuming one, we study the feature selection problem sampling over subsets of the original data set.

2 - New Development in Searching for Markovian Particles

Nedialko Dimitrov, Postdoctoral Fellow, The University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, ned.dimitrov@gmail.com, David Morton, Constantine Caramanis

We consider the classical problem of searching for a particle moving via a Markov chain. In particular, we consider both discrete search effort and continuous search effort under several objective functions including maximizing the probability of finding the particle in T time steps and minimizing the expected time to find the particle.

3 - Finite Dimensional Approach to Stochastic Approximation in Hilbert Space

Ankur Kulkarni, PhD Student, University of Illinois at Urbana-Champaign, Urbana, United States of America, akulkar3@uiuc.edu, Vivek Borkar

We address a convex stoch prog where the underlying probability measure is not necessarily a counting measure and provide a stochastic approximation algorithm for the same. The stoch prog has a random variable as solution, making the stochastic approximation infinite dimensional and unimplementable. Assuming the solution to lie in a Hilbert space we give a new finite dimensional approach that is soundly justifiable and computationally efficient. Bounds on the dimensionality needed are provided.

4 - MIP Approaches to Joint Chance-Constrained Programs with Random Technology Matrices

Matthew Tanner, PhD Student, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, mtanner@tamu.edu, Lewis Ntaimo

A joint chance-constrained program with discretely distributed random parameters can be reformulated as an MIP. We present two methods for solving this problem to optimality and give computational results. The first method is a new class of cutting planes called IIS cuts, which are derived from irreducibly infeasible subsets of the constraints of the problem. The second method is a metaheuristic based on a reformulation of the problem that has a finite number of feasible solutions.

■ MD41

M - Taft

Tools and Models for Product Development

Contributed Session

Chair: Lu (Wendy) Xu, IEMS Department, Northwestern University, C210 IEMS Department, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, wendy-xu@northwestern.edu

1 - System Components Bundling

Kunpeng Li, Utica College, 1600 Burrstone Road, Utica, NY, 13502, United States of America, kli@utica.edu, Dilip Chhajed

We study two prevailing production models in the computer-based industries, the integrated model and the non-integrated model. In the integrated model, a firm designs and manufactures both the hardware and the software of a product. In the non-integrated model, the software is provided by an independent software firm. Consumers have different perceptions towards product quality and variety from the two models. We study optimal model strategies and examine the characteristics of the two models.

2 - Quantitative Models for Evaluating Disruptive Technologies

Chialin Chen, Queen's University, Queen's School of Business, Kingston, ON, K7L 3N6, Canada, cchen@business.queensu.ca, Lucy Q. Liu

We develop quantitative models to analyze the market conditions that favor the introduction of a disruptive technology with the considerations of consumer valuations, costs for production and R&D, and product performance improvements over time. Our analyses show some interesting patterns of designing and positioning existing and disruptive technologies by established and new firms.

3 - Bridge Positioning is a Tool to Optimize Resources

Rajesh Srivastava, Director, Dimat, 2/9/12, Bluemoon,Bhawaninagar,Marol, Mumbai, India, srivastava@vsnl.net

Companies should try and get the highest level of fit between the USP and the UCP of the product / brand they are promoting. Bridge Positioning can play an important role in bridging the gap between customer perception and product USP by relying more on UCP than USP based positioning statement. The study further focused on how bridge positioning can be validated in terms of consumer intention to purchase.

4 - Assessing the Benefits of Integrated Vehicle Life Cycle Planning

Lu (Wendy) Xu, IEMS Department, Northwestern University, C210 IEMS Department, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, wendy-xu@northwestern.edu, Wallace Hopp, Jonathan Owen, Barry L Nelson

Decisions are made at different stages of vehicle life cycle to address different metrics. They interact with each other. We present a Markovian decision process model to access the value of integrating decisions at portfolio planning and product assignment stages. We use analytical and numerical results to show that incorporating the impact of decisions later in the life cycle enables more sophisticated decisions at upstream stages, and therefore gives better response to demand uncertainty.

■ MD42

M - McKinley

Joint Session CS/HAS: Bioinformatics

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)
Sponsored Session

Chair: J E Beasley, Brunel University, Mathematical Sciences, Uxbridge, United Kingdom, John.Beasley@brunel.ac.uk

1 - Multiple Instance Learning Via Margin Maximization

Erhun Kundakcioglu, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, erhun@ufl.edu, Onur Seref, Panos Pardalos, Cole Smith

Multiple instance learning (MIL) refers to classification of unseen bags based on the labeled bags of instances as the training data. We first consider the margin maximization problem for multiple instance data and prove that the problem is NP-hard. We also propose solution methods and present computational results on publicly available data sets.

2 - Protein Folding Type Prediction via MILP

Fadime Uney Yuksektepe, PhD Candidate, Koc University, College of Engineering, Rumelifeneri yolu, Sariyer, Istanbul, 34450, Turkey, funey@ku.edu.tr, Metin Turkay

In this study, a three-stage mixed-integer programming (MIP) based hyper-box enclosure method is presented for protein folding type prediction. The performance of this method is tested on distinct protein folding type benchmark data sets. Leave-one-out (jack-knife) test results shows that proposed approach is efficient.

3 - A Large-scale Computational Model for DNA Sequencing Problems

Kapil Gupta, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, kgupta@isye.gatech.edu, Eva Lee

Recent years have witnessed a large number of innovations in the field of bioinformatics, as exemplified by the Human Genome Project. Consequently, the rapid increase in the amount of sequence data requires efficient algorithms to analyze and make important discoveries in this exciting field. The talk will present Integer Programming models to address this need. Computational results involving column generation and cutting planes on large-scale sequence analysis problems will be discussed.

4 - An Optimization Model for Metabolic Pathways

J E Beasley, Brunel University, Mathematical Sciences, Uxbridge, United Kingdom, John.Beasley@brunel.ac.uk, F Planes

We present an integer-programming based optimisation model for metabolic pathways. Given a source compound, and a target compound, this model is capable of recovering the complete experimentally determined pathway reported in the literature. Computational results are reported for 40 metabolic pathways associated with E. Coli.

■ MD43

M - Balcony D

OR and Strategy I

Cluster: OR and Strategy
Invited Session

Chair: Peter Bell, Professor, Management Science and Information Systems, Richard Ivey School of Business, University of Western Ontario, London, ON, N6A 3K7, Canada, PBell@ivey.uwo.ca

1 - Influence of OR Practices to Drive Corporate Strategic Choices at Procter & Gamble

Glenn Wegryn, Associate Director, Product Supply Analytics, The Procter & Gamble Company, 2 Procter & Gamble Plaza, TN-5-328, Cincinnati, OH, 45202, United States of America, wegryn.gw@pg.com

The speaker will discuss the practical use of O.R. methods, including decision analysis, optimization and simulation, to drive high-value, strategic-level decisions for P&G. Examples will be drawn from supply chain integration in an acquisition, new manufacturing plant investment decisions and brand name decision-making.

2 - Applications of Operations Research to Strategic Policy

Richard Staats, Department Head, MITRE, Box 1232, McLean, VA, 22101, United States of America, rstaats@mitre.org

The development and application of strategy stands at the pinnacle of decision-making in governments and private organizations, but, while the applications of Operations Research (OR) to business processes and portfolio management are legion, the application of OR to the development and implementation of strategic policy is less well documented. This paper explores some OR techniques and approaches that are pertinent to a wide variety of policy and strategy developments and instantiations.

3 - OR and Strategy

Peter Bell, Professor, Management Science and Information Systems, Richard Ivey School of Business, University of Western Ontario, London, ON, N6A 3K7, Canada, PBell@ivey.uwo.ca

This presentation presents results from a longitudinal study of Edelman Prize finalist applications from both the corporate and not-for-profit sectors and suggests a number of different ways that OR work can be linked to an organization's strategy.

■ MD44

M - Balcony C

Risk Assessment

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Risk Assessment and Critical Asset Analysis for Power Grids

Farnaz Farzan, Graduate Student, Rutgers, The State University of New Jersey, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States of America, FARNAZFN@eden.rutgers.edu, Ali Rezvani, Kaveh Akram, Mohsen Jafari

We consider the problem of quantifying cyber-attack-related risk in power grids and critical asset identification.Risk is defined as a function of consequence,threat and vulnerability.The consequence assessment is available through existing tools for power grids.The likelihood of threat is taken to be one.The vulnerability assessment includes an attack map in which the reachablity of a node,possible further progress, and the minimum penetration needed for a successful attack are determined.

2 - Modeling Market Share Risk in the Event of Supply Chain Disruption

Mahesh M V, Doctoral Student, IIM Bangalore, Bannerghatta Road, Bangalore, 560076, India, maheshm04@iimb.ernet.in

The paper develops a framework for the modeling and analysis of impact of supply chain disruptive events on the market share of firms in product markets. Evidence from multiple case studies suggest that supply chain disruption would lead to market share loss.The model thus looks at the competitiveness angle in the case of disrption risk in supply chains. The product market is characterised and risk management decisions are presented in such cases.

3 - Emergency Medical Service System Design with Risk Measures

Nilay Noyan, Assistant Professor, SABANCI University, Faculty of Engineering and Natural, Sciences, Orhanli Tuzla., Istanbul, 34956, Turkey, nnoyan@sabanciuniv.edu

The stochastic nature of emergency service requests is a critical issue in constructing models representing real life emergency medical service (EMS) systems. We consider EMS system design models where the network coverage is quantified using risk measures on random unmet demands. In particular, we describe stochastic optimization models involving integrated chance constraints introduced by Klein Haneveld (1986), and dominance constraints introduced by Dentcheva and Ruszczynski (2003).

■ MD45

M - Balcony B

Inventory Management in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Lawrence V. Snyder, Assistant Professor, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, larry.snyder@lehigh.edu

1 - Finding Near-optimal (r,nQ,T) Policies is Not Harder Than Solving Single-stage Problems

Kevin Shang, Duke University, Fuqua School of Business, Durham, NC, United States of America, khshang@duke.edu, Sean Zhou

We consider a periodic-review, serial inventory system in which each stage implements an echelon (r,nQ,T) policy. Two types of fixed costs are considered: one is associated with producing a batch, and the other is associated with each inventory review. The objective is to find policy parameters such that the total supply chain cost per period is minimized. We propose a near-optimal heuristic by solving a series of single-stage problems with the original problem data.

2 - Spare Parts End of Life Inventory Problem

Morteza Pourakbar, PhD Candidate, Erasmus University Rotterdam, 3000 DR, Rotterdam, Netherlands, pourakbar@few.eur.nl, Rommert Dekker

We consider an appliance manufacturer problem of controlling the inventory of spare parts in the final phase, which begins when the production of the part is discontinued and ends when the last service contract expires. We consider the possibility of an alternative policy such as swapping the defected part. We develop an optimal solution approach to find final order quantity and time to switch to the alternative policy simultaneously.

3 - Capacity Competition in Multi-indentured Service Supply Chain

Sang-Hyun Kim, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, sang.kim@yale.edu, Morris Cohen, Serguei Netessine

We study a setting in which multiple firms providing different components of a product face investment decisions that impact after-sales service performance. In particular, each component provider can invest in either service capacity or spare parts inventory. A product-level service requirement demanded by the customer creates an externality among firms that drives strategic behavior. We contrast between the efficiencies of two commonly observed contracts under this environment.

4 - A Scalable Heuristic for Base-stock Levels in Multi-echelon Distribution Systems

Zumbul Bulut, zub205@lehigh.edu, Ying Rong, Lawrence V. Snyder

We construct a decomposable upper bound for the optimal cost of distribution systems with stochastic demand managed with a continuous-review base-stock policy and FIFO allocation rule. By simplifying the upper bound construction procedure and by utilizing the risk-pooling effect, we propose a heuristic for approximating the base-stock levels of all locations. Our heuristic outperforms other recent heuristics on most test instances with average cost 0.81% higher than the optimal cost.

■ MD46

M - Balcony A

Information Sharing Models in Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

1 - Buying from the Babbling Newsvendor: Availability Information and Cheap Talk

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Achal Bassamboo

Provision of real-time information by a firm to its customers has become prevalent in recent years in both the service and retail sectors. In this paper, we study a retail operations model where customers are strategic in both their actions and in the way they interpret information, while the retailer is strategic in the way it provides information. This paper focuses on the ability (or the lack thereof) to communicate credibly unverifiable information.

2 - On the Value of Commitment and Availability Guarantees when Selling to Strategic Consumer

Fuqiang Zhang, Assistant Professor, Washington University, Olin Business School, St. Louis, MO, United States of America, FZhang22@wustl.edu, Xuanming Su

The possibility of stockouts discourages patronage when consumers incur a sunk cost before visiting the store. We formulate a rational expectations game to model this situation. We find that commitment and availability guarantees are useful strategies that can increase the seller's profits.

3 - Trust and Trustworthiness in Forecast Information Sharing

Ozalp Ozer, Stanford University, Stanford, CA, United States of America, oozer@stanford.edu, Kay-Yut Chen, Yanchong Zheng

We examine the problem of a supplier soliciting forecast information from a manufacturer who has private information about future demand, and has an incentive to exaggerate. Standard theory predicts that asking for forecast will result in a "babbling equilibrium" in which no information will be exchanged. However, laboratory experiments revealed that parties exchange information far better than predicted. We propose a behavioral theory and model to explain this phenomenon.

■ MD47

M - Hoover

2008 Pierskalla Prize Finalists

Sponsor: Health Applications Section
Sponsored Session

Chair: Brian Denton, Assistant Professor, Edward P. Fitts Department of Industrial & Systems Engineering, North Carolina State University, 111 Lampe Drive, Raleigh, NC, 27695-7906, United States of America, bdenton@ncsu.edu

1 - Bonder Scholarship: Estimating the Patient's Price of Privacy in Liver Transplantation

Burhaneddin Sandikci, The University of Pittsburgh, Pittsburgh, PA, bus2+@pitt.edu

The end-stage liver disease patients in the United States join a waiting list for cadaveric liver transplantation. The details of the composition of this list are only partially available to the public. We call the loss associated with having suboptimal accept/reject decisions due to incomplete information as the price of privacy. We present different models (for an individual patient) to estimate the patient's price of privacy. We also present numerical results parameterized by clinical data.

2 - Novel Optimization Models for Abnormal Brain Activity Classification

Art Chaovaitwongse, Assistant Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, 08854, United States of America, wchaoval@rci.rutgers.edu, Ya-Ju Fan, Rajesh Sachdeo

This paper proposes a new classification technique, called Support Feature Machine (SFM), for multidimensional time series data. The proposed technique was applied to the classification of abnormal brain activity represented in electroencephalograms (EEGs). The idea is to optimize the electrode selection such that the selected electrodes show a good separability between two classes. The results suggest that the proposed technique can be used in practical settings of brain diagnosis.

3 - Optimal Design of a Pharmaceutical Price-Volume Agreement

Hui Zhang, Lakehead University, 955 Oliver Rd, Thunder Bay, ON, P7B 5E1, Canada, hzhang2@lakeheadu.ca, Greg Zaric

Price-volume agreements are commonly negotiated between drug manufacturers and third-party payers for drugs. In one form of price-volume agreement a drug manufacturer pays a rebate to the payer on a portion of sales in excess of a specified sales threshold. We examine the optimal design of such an agreement under two different assumptions about pricing, each under complete and asymmetric information about the mean demand.

■ MD48

M - Coolidge

Joint SessionTMS/NPD: TMS Distinguished Speaker: Carliss Baldwin (HBS)

Sponsor: Technology Management, New Product Development
Sponsored Session

Chair: Sebastian Fixson, Babson College, Tomasso Hall 226, Babson Park, MA, 02457, United States of America, sfixson@babson.edu

1 - A Design-centric View of the Economy

Carliss Baldwin, Professor, Harvard Business School, Baker Library 355, Boston, MA, United States of America, cbaldwin@hbs.edu

Designs are the instructions based on knowledge that turn resources into things that people use and value. All goods and services have designs, and a new design lies behind every innovation. I argue that designs - sometimes called recipes (Nelson and Winter) or prescriptive knowledge (Mokyr) - are a special kind of knowledge deserving of focused attention by scholars of innovation. In the first place, all innovation rests on new designs. An innovation is, by definition, a new design that has been realized, that is, turned into a new product or process. In the second place, designs have observable structures (architecture). Their structure can be mapped in terms of hierarchies of modules with coordinating interfaces. Design structure influences (but is also influenced by) the organization of firms and the economy, including the location and design of transactions. Thirdly, the unit of change or innovation is not an entire product, process or system, but a module within the product, process or system. Modules are "units of a larger system whose elements are powerfully connected among themselves and relatively weakly connected to elements in other units." Thus it is relatively easy to substitute one module design for another without changing other parts of the system. As a result, modules carry option value, which in turn provides incentives for to invest resources in innovative effort. Investigating the modular structure of designs, the option value of modules, and how different institutions support or impede the evolution of complex designs is an exciting, open avenue of inquiry in the study of technological change and innovation.

■ MD49

M - Harding

Monte Carlo Methods in Information Management and Computer Interface Design

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Peter Haas, IBM Almaden Research Center, 650 Harry Raod, San Jose, CA, United States of America, peterh@almaden.ibm.com

1 - Advances in Processing SQL Queries on Probabilistic Data

Christopher Re, University of Washington, Computer Science Department, Seattle, WA, United States of America, chrisre@cs.washington.edu, Dan Suciu

A SQL query over a relational database returns a set of answers (tuples), which in practice can be often be quite large: hundreds or thousands of tuples. When the relational data is probabilistic, then the SQL system needs to compute for each answer tuple a probability. This computation is expensive, because it requires running a Monte Carlo simulation, and needs be repeated for each tuple in the answer. This work presents two methods for speeding up the SQL processor.

2 - Optimizing Touch-screen Keyboards for Human Performance and Learning

Barton Smith, Manager, Collaboration Science, IBM Research, 650 Harry Road, San Jose, CA, 95120, United States of America, basmith@almaden.ibm.com, Shumin Zhai

To increase the efficiency of text input on the increasingly powerful and ubiquitous hand-held devices, we have found near optimal layouts for letter positions on touch-screen keyboards using a Metropolis Monte Carlo Method. The objective functions used in the simulations included a term that models the input speed for expert users and was based on empirically-determined letter pair frequencies from collections of sampled text. Substantial text input speed improvements were obtained.

3 - A Monte Carlo Approach to Information Recovery

Jun Yang, Professor, Duke University, Durham, Durham, NC, 27708, United States of America, junyang@cs-duke.edu, Haixun Wang, Junyi Xie, Yuguo Chen, Philip S. Yu

Recently, we have witnessed a surge of interest in noisy and incomplete data. An approach for recovering information from such data should incorporate prior knowledge, even if it has complex forms that do not admit closed-form solutions. Moreover, the approach should quantify uncertainties and correlations in the recovered data. We present such an approach based on Monte Carlo sampling, and illustrate it in the contexts of noisy sensor data and privacy-preserving data publishing.

4 - MCDB: A Monte Carlo Approach to Handling Uncertainty in Database Systems

Chris Jermaine, University of Florida, Computer and Info Sciences and Eng. Dept, Gainesville, FL, 32611, United States of America, cjermain@cise.ufl.edu

MCDB is a database system that allows a user to attach distributions to database records, to represent uncertainty that is present within the records. To answer queries, MCDB generates many database instances using those distributions, and runs the underlying query over each of them to measure the effect of the uncertainty on the query result. MCDB's Monte Carlo approach allows specification of arbitrary distributions and estimation of arbitrary functionals of the query-result distribution.

■ MD50

M - Wilson C

Computational Integer Programming IV

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Todd Easton, Associate Professor, Kansas State University, 2021 Durland Hall, Manhattan, KS, 66506, United States of America, teaston@ksu.edu

1 - A Parallel Branch-and-cut Algorithm for Solving Dense Market-share Instances

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Sid Maheshwary

In this talk, we will describe a parallel branch-and-cut algorithm involving cutting planes derived from the conflict hypergraphs of a 0/1 integer program. Aggregated branching and separation heuristics are developed. Applications to dense MIP instances arising from market-share will be presented.

2 - Randomization and Rounding Heuristics for Finding Feasible Solutions of General Integer Programs

Mahdi Namazifar, PhD Student, University of Wisconsin-Madison, 3239 Mechanical Eng. Building, 1513 University Av., Madison, WI, 53706, United States of America, namazifar@wisc.edu, Andrew Miller

Finding integer feasible solutions for a general mixed integer program (MIP) is far from trivial. In this research we seek to find feasible solutions by rounding randomly generated points of the polyhedron defined by an LP relaxation. We generate these points in such a way that they are likely to be "close" to the optimal solution of the LP relaxation, and therefore of good quality. The initial results show that this method could be promising for many MIPs.

3 - UAV Routing with Limited Fuel Burn Variance

Siriwat Visoldilokpun, PhD Student, University of Texas at Arlington, PO Box 19017, The University of Texas at Arlington, Arlington, TX, 76019, United States of America, siriwatvi@yahoo.com, Jay Rosenberger

We present a branch-and-cut-and-price algorithm for a UAV routing problem in which we limit variance of fuel consumption. The problem is modeled as a set-partitioning problem with a quadratic constraint. The pricing sub-problem generates new routes by solving a constrained shortest path problem. We show that the quadratic constraint can be reduced to a single knapsack constraint. We propose a new class of valid inequalities to encourage integrality. Finally, computational results are discussed.

4 - The Fobenius Number and the Unbounded Knapsack Problem

Ping Heidi Huang, Research Scientist, Regenstrief Center for Healthcare Engineering, Purdue University, West Lafayette, IN, 47907, United States of America, huang74@purdue.edu, Thomas L. Morin

For the unbounded knapsack problem, turnpike theorems specify a lower bound on optimally loading at least one unit of the best item (the one with the highest bang-for-buck ratio). They can be used for problem preprocessing. Their successive applications reduce the problem size, and thus lower the computational requirement. We consider loading not only the best but also the second best item to achieve even smaller bounds. The new theorems are based upon a classical result on the Frobenius number.

■ MD51

M - Wilson B

Policy Issues in Information Systems

Sponsor: Information Systems
Sponsored Session

Chair: Subhajyoti Bandyopadhyay, University of Florida, Warrington College of Business, Gainesville, FL, United States of America, shubho.bandyopadhyay@cba.ufl.edu

1 - Net Neutrality, Broadband Market Coverage, and Innovations at the Edge

Hong Guo, University of Florida, 351 STZ, PO Box 117169, Gainesville, FL, 32611, United States of America, guohong@ufl.edu, Subhajyoti Bandyopadhyay, Hsing Cheng

The policy debate of net neutrality has the potential to alter the dynamics of accessing online content in U.S. How net neutrality affects broadband market coverage and innovations at the edge are crucial issues. We propose a game theoretical model with the ISP serving as the intermediary between content providers and consumers. We perform a two-sided market analysis to investigate how the regulation (Net Neutrality) will affect innovations and market coverage on the two sides of the market.

2 - Transfer of Security Breach Information

Jackie Rees, Purdue University, 100 S. Grant Street, West Lafayette, IN, 47907, United States of America, jrees@purdue.edu, Karthik Kannan, Ta-Wei Wang

This paper examines whether the security breach information announced by news articles is transferred within industry, supply chain, and / or within affiliated companies. After exploring the existence of information transfer, we further investigate why some non-breached firms are more seriously affected than others.

3 - Digitizing and Sharing Health Records

Zafer Ozdemir, Assistant Professor, Miami University, 319 Upham Hall, Oxford, OH, 45056, United States of America, ozdemir@muohio.edu, Subhajyoti Bandyopadhyay

Electronic health records (EHR) have an enormous potential to improve the safety, quality, and efficiency of health care. The availability of complete patient health information at the point of care delivery can prevent many errors and adverse events from occurring. Unfortunately, the adoption of EHR has been lagging in the U.S. In this research we investigate the economic policies that can help facilitate adoption by medical providers, as well as the welfare implications of these policies.

4 - The Impact of Digital Technologies on Government Cultural Policy

Sean Marston, Ph D Student, University of Florida, PO Box 117169, Gainesville, FL, 32611-7150, United States of America, sean.marston@cba.ufl.edu, Juan Feng, Hsing Cheng, Gary Koehler

The advances in digital technology create new avenues, such as the internet, for consumers to access foreign entertainment programs bypassing the government protection methods. We build a unified analytical framework to study the impact of digital technology on traditional cultural protection policies, including quota, tariff and subsidy.

■ MD52

M - Wilson A

New and Remanufactured Product Management

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session

Chair: Ana Muriel, Associate Professor, University of Massachusetts Amherst, 160 Governors Drive, Amherst, MA, 01003, United States of America, muriel@ecs.umass.edu

1 - Transient and Steady State Profitability of New/Remanufactured Product Substitution

Ana Muriel, Associate Professor, University of Massachusetts Amherst, 160 Governors Drive, Amherst, MA, 01003, United States of America, muriel@ecs.umass.edu, Yue Jin, Yihao Lu

We investigate the profitability of offering remanufactured products for a monopoly firm in single-period and steady state, multi-period settings. We identify when customer segmentation drives the remanufacturing decision, so that the firm benefits from offering new products as remanufactured. While in the single period model the substitution decision depends solely on the new product cost, it depends on the weighted average of manufacturing and remanufacturing cost in the steady state.

2 - Optimal Prices and Production Rate in a Closed Loop Supply Chain under Heavy Traffic

Sarah Ryan, Professor, Iowa State, Ames, IA, 50011, United States of America, smryan@iastate.edu, Ananda Weerasinghe, Lizhi Wang, Arka Ghosh

We analyze a simple queuing network model of a manufacturing and remanufacturing firm. Long run average cost is minimized by setting the price ratio of remanufactured to new products to induce heavy traffic and then solving a diffusion control problem for the asymptotically optimal production rate. A similar analysis applies to minimizing infinite horizon discounted cost. Numerical results show how various parameters affect the optimal decisions.

3 - On Product Life and Remanufacturability in a Manufacturer-service Provider Supply Chain

Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu, Sasidhar Malladi

We model and analyze the economic relationships among the levels of product life and remanufacturing under the framework of a manufacturer/remanufacturer and a service provider who utilizes the manufacturer's product to provide service to his/her customers. We also discuss the economic impact of various environmental regulations on the aforementioned supply chain in terms of product life, remanufacturability, and profitability.

■ MD53

M - Nathan Hale- Wardman Tower

Trading & Technology in Markets

Sponsor: Financial Services
Sponsored Session

Chair: Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

1 - Trading Content Access and Reuse Rights to Support Social Production Models for Culture Goods

Karl Reiner Lang, Professor, Baruch College, CUNY, Zicklin School of Business, 55 Lexington Ave, B11-220, New York, NY, 10010-5585, United States of America, Karl_Lang@baruch.cuny.edu, Roumen Vragov, Richard Shang

Using Web 2.0 technologies producers and consumers of digital culture goods increasingly collaborate in co-creating new products. We present an electronic market design that supports social production models for cultural content and study experimentally the economic impacts of trading products with different content access and reuse licensing arrangements.

2 - Adverse SOX Disclosures and Persistent Portfolio Underperformance

Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

Portfolios made up of companies disclosing SOX corporate governance weaknesses in the period 2003-07 underperform the market. Mandatory disclosures began with 2005 10Ks of firms valued $75 million+. Noncompliant firms performed in line with an equal weighted index before 2005, but underperform after. Firms that fail to remediate and disclose material weaknesses in their 2006 10Ks have annual returns 29% below an index benchmark. Firms that remediate underperform by 22% annually.

3 - Shareholder Returns Reactions to IT Standard Setting Events

Eric Walden, Professor, Texas Tech University, Rawls College of Business, Box 42101, Lubbock, TX, 79409, United States of America, eric.walden@ttu.edu

Using the event study methodology on a sample of 789 standard setting events, we test the hypothesis, and find it true, that increasing the number of firms participating in a standard setting initiative decreases the systematic risk of each firm but increases the unsystematic risk to each firm.

■ MD54

M - Congressional - Wardman Tower

Joint Session Risk/DA/Homeland: Game Theory and Homeland Security

Cluster: Risk Security, Decision Analysis, and Homeland Security
Invited Session

Chair: Jun Zhuang, Assistant Professor, Department of Industrial and Systems Engineering, University at Buffalo, The State University of New York, Buffalo, NY, 14260, United States of America, jzhuang@buffalo.edu

1 - A Game-theoretic Model for Jamming Radio-controlled Improvised Explosive Devices

Kyle Lin, Associate Professor, Naval Postgraduate School, 1411 Cunningham Rd, Monterey, CA, 93943, United States of America, kylin@nps.edu, Yu-Chu Shen

An electronic jammer can emit electromagnetic energy to interfere with radio signals that detonate improvised explosive devices. Due to power and other constraints, the jammer often needs to select which radio frequencies to interfere with. This presentation discusses a game-theoretic model to solve this problem.

2 - Constrained Defense Allocations for Multiple Targets

Susan Martonosi, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, martonosi@hmc.edu, Eugene Quan

The decision of how to allocate limited security resources to defend several potential targets for attack is an important problem in homeland security. We consider a two-target game involving an attacker and defender, who must choose at what levels to attack/defend each target, subject to budget constraints. We show how the attacker's/defender's respective decisions to attack/defend neither, one or both targets depend on the size of their respective budgets and other game parameters.

3 - How Many Containers to Inspect to Deter Terrorist Attacks

Naraphorn Haphuriwat, Research Assistant, University of Wisconsin-Madison, 3237 Mechanical Engineering Building, 1513 University Avenue, Madison, WI, 53706, United States of America, naraphoh@cae.wisc.edu, Vicki Bier

This research project aims to construct a model for identifying the optimal number of containers to inspect in order to minimize the defender's expected loss, using game theory. We consider multiple types of attackers; each deciding whether to smuggle a particular type of weapon into the U.S. Results show that with a sufficiently high detection probability (and a sufficiently high smuggling cost to the attacker), attackers can be deterred with less than one hundred percent inspection.

4 - Modeling Secrecy and Deception in a Multiple-period Attacker-defender Signaling Game

Jun Zhuang, Assistant Professor, Department of Industrial and Systems Engineering, University at Buffalo, The State University of New York, Buffalo, NY, 14260, United States of America, jzhuang@buffalo.edu, Vicki Bier, Oguzhan Alagoz

In this work, we apply game theory to model strategies of secrecy and deception in a multiple-period, attacker-defender, resource-allocation and signaling game with incomplete information. Our model provides insights into the balance between capital and expense for defensive investments, and shows how defenders can achieve more cost-effective security through secrecy and deception in a multiple-period game. We solve our model using numerical dynamic programming methods.

■ MD55

M - Embassy- Wardman Tower

Security and Resilience in Telecommunications Networks

Sponsor: Telecommunications
Sponsored Session

Chair: Louis A (Tony) Cox, Jr., TCoxDenver@aol.com

1 - A Risk Analysis Model for Internet Security Management for Organizations

Soumyo D. Moitra, Professor, IIM Calcutta, Diamond Harbour Road, Joka, Kolkata, WB, 700104, India, sdmoitra@hotmail.com

This paper proposes a model that would help an organization achieve an optimal network security. The model considers the patterns of Internet crimes against organizations and postulates a relationship between security measures and incidence of cyber attacks. The model balances the reduction in the expected damage caused to the organization's systems with the cost of the network security. An illustrative example is provided. The model can be implemented quite easily by organizations.

2 - The Network Restoration Ratio and Meshiness

John Klincewicz, Principal Member of Technical Staff, AT&T Labs, 200 South Laurel Avenue, Room D5-3C06, Middletown, NJ, 07748, United States of America, klincewicz@att.com, Herbert Shulman

Given a set of nodes and traffic demands, an important problem is to find a minimum cost topology (links and link capacities) that can carry the traffic under normal and failure conditions. In our investigation, we studied the relationship between "Restoration Ratio", a measure of overbuild, and Average Node Degree, a measure of "meshiness." In this talk, we describe a number of interesting empirical results relating these two measures, based on an analysis of a large number of networks.

3 - Risk Analysis of Internet Interconnection Architecture

Dohoon Kim, Professor, Kyung Hee University, School of Business, Hoegi-dong 1, Dongdaemoon-gu, Seoul, 130-701, Korea, Republic of, dyohaan@khu.ac.kr

This paper studies a way to increase stability and reliability of the Internet interconnection network. First, we summarize various interconnection options. Then, conducted is a series of experiments to identify the weakest point of the current Internet interconnection system. Based on our simulation results, we present not only the guidelines for a robust interconnection architecture, but also a risk analysis framework to evaluate pros and cons of interconnection alternatives.

4 - Game Theory Models of Telecommunications Networks Resilient Against Terrorist Attacks

Louis A (Tony) Cox, Jr., TCoxDenver@aol.com

How successfully can telecommunications networks withstand deliberate attacks by intelligent agents? Although optical networks can now be designed that quickly reroute traffic around affected areas, network operators may lack incentives to build them. Network owners and users may both benefit from binding commitments to make larger investments in network resiliency.

■ MD56

O - Blue Room

Freight Management

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman OK 73019, United States of America, yguan@ou.edu

1 - A Study of Crane Scheduling for Berth Allocation

Kang-Hung Yang, PhD Student, University of Oklahoma, 114 W. Constitiution St. Apt. G, Norman, OK, 73072, United States of America, kang_yang@ou.edu, Zhili Zhou, Yongpei Guan

Berth allocation and crane scheduling are two relevant research topics for container terminal operations. Most past researches focused on either berth allocation or crane scheduling. In this talk, we study incorporating crane scheduling into berth allocation problem. We study a mathematical model for the problem and develop algorithms that include heuristics and exact solution approaches. Experiments show the effectiveness of our approach compared with the one obtained by a commercial software.

2 - An Integrated Routing and Capacity Management Model for Rail Operations

Pavankumar Murali, Doctoral Student, USC, 3715 McClintock Ave, GER 240, Univ. of Southern California, Los Angeles, CA, 90089-0193, United States of America, pmurali@usc.edu, Fernando Ordonez, Maged Dessouky

We present an integer programming model to route & schedule trains through a network, based on expected travel times, to minimize delays. Aggregation techniques are employed to maintain the tractability of the model while routing trains over large complex networks. Delay estimation equations for the aggregated sections of a network are developed using simulation. This integrated routing & capacity management model is validated using a railway network in Los Angeles with the actual daily traffic.

3 - Data Mining for the Development of A Global Port-to-port Commodity Movement Database

Jiahui Wang, University of Oklahoma, 202 W Boyd St., Room 216, Norman, OK, 73071, United States of America, jiahuiwang@ou.edu

A clear understanding of the containerized freight flow movement from ports to ports is critically important. This paper starts with a comprehensive survey of containerized freight databases available in the USA. Secondly, the paper applies a simple data mining model in containerized freight movement project. Some useful software packages, such as TransCAD in GIS, MatLab in math, Access in database are also discussed with respect to their relative merits in data mining and integration.

4 - Modeling the Effects of a Transportation Security Incident upon the Marine Transportation System

David Kelton, Professor, University of Cincinnati, Department of Quant. Analysis & Ops. Mgmt., Cincinnati, OH, 45221-0139, United States of America, david.kelton@uc.edu, Edward Pidgeon, Gerald Brown, Jeff Kline

We simulate US west-coast container ports with an eye toward the effect of incapacitation or degradation of one or several ports. If a ship's destination port is down, the shipper's economic self interest determines an alternate port. We include container unloading, storage, and landside transport to one-digit ZIP codes. Outputs include demurrage, time delays, and utilizations. Several transportation security incidents are modeled and their effects are measured.

■ MD57

O - Blue Room Prefunction

Panel Discussion: Early Career Tips for Tenure and Promotion

Sponsor: Junior Faculty Interest Group
Sponsored Session

Chair: Eylem Tekin, Assistant Professor, Texas A&M University, Industrial and Systems Engineering, College Station, TX, 77843, United States of America, eylem@tamu.edu

1 - Early Career Tips for Tenure and Promotion

Moderator; Mark Ferguson, Associate Professor, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, Mark.Ferguson@mgt.gatech.edu, Panelists: Serguei Netessine, Max Shen, Karen Smilowitz, Esma Gel

In this panel session, we will discuss the expectations that junior faculty in engineering and business schools face. The panelists will share their own experiences regarding the tenure process. The goal of the panel is to highlight the measures with respect to publications, service, teaching and time management issues, and provide effective strategies to be successful in the tenure process. Part of the panel will be dedicated to interactive discussion with the audience.

■ MD58

O - Capital

Joint Session AAS/TSL: Aviation System Performance Analysis II

Sponsor: Aviation Applications, Transportation Science & Logistics
Sponsored Session

Chair: Mark Hansen, Professor, U.C. Berkeley, 114 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, mhansen@ce.berkeley.edu

1 - Measuring and Modeling National Airspace System Level of Service

Tasos Nikoleris, PhD Student, U.C. Berkeley, 107 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, nikoleris@berkeley.edu, Mark Hansen, Jing Xiong

In this paper we introduce an alternative delay metric, Daily Average Flight Time Index, which avoids shortcomings in measuring delays, and can be decomposed into different flight phase components. We then employ this metric to model day to day variation in NAS level of service. First, we consider the impacts of weather forecast errors. Second, we investigate how casual factors contribute to delay in different flight phases.

2 - Impact of Convective Weather on Outages of NAS Equipment

Jasenka Rakas, Institute of Transportation Studies, 107 McLaughlin Hall, Berkeley, CA, United States of America, jrakas@ce.berkeley.edu, Zhuolun Yao

The safety and operability of airports and airspace depends on the functionality of critical automation, surveillance, navigation and landing systems equipment. Weather is one of the main contributors to equipment outages, specifically lightning strikes. This study analyzes the impact of convective weather on service interruptions of equipment related to the National Airspace System (NAS) so that resources can be directed at the facilities found to be most vulnerable.

3 - Fast-time Simulation of the Benefits of the FAA's Operational Evolution Partnership

Joseph Post, Manager, Modeling and Simulation, FAA/ATO-P, 800 Independence Avenue, SW, Washington, DC, 20591, United States of America, Joseph.Post@faa.gov, Kimberly Noonan, John Gulding, James Bonn, Daniel Murphy

The FAA uses computer models to quantify the impact of planned investments on the performance of the National Airspace System (NAS). NASPAC, the principle system-wide model in use, is a discrete-event simulation which represents the NAS as a network of airport and airspace queues. The authors present the results of a simulation study of the projected benefits to NAS users of the Operational Evolution Partnership (OEP), the Agency's modernization plan.

4 - Passenger Flow Simulation Model in A Complex Networked Transportation System

Danyi Wang, Metron Aviation Inc., 45300 Catalina Ct., Dulles, VA, 20166, United States of America, wang@metronaviation.com, George Donohue, Bert Hackney, Lance Sherry

This paper describes a passenger flow simulation which captures the asymmetric and unique passenger trip on-time performance and reflects the complexity and significance of the impact of a small set of cancelled flights and missed connections on passenger trip delays. It measures system performance from the flying public's view. Furthermore, it enables researchers to conduct experiments outside the range of historical data.

■ MD59

O - Embassy Room

Pricing Issues and Applications

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Victor Araman, AUB/NYU, 44 West Fourth Street, New York, NY, Lebanon, varaman@stern.nyu.edu

1 - Clearing Pricing Optimization at Zara

Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States of America, fcaro@anderson.ucla.edu, Jeremie Gallien

As part of an ongoing collaboration with Spain-based retailer Zara, we address the problem of deciding the price markdowns during clearance sales. We have approached the pricing problem by formulating two models, one to forecast demand during clearance sales, and the other to optimize the markdown decisions with a finite horizon in mind. The main challenge in the forecasting model has been to overcome the lack of pricing data due to Zara's single-price policy during the regular season.

2 - Computing Bid-prices for Revenue Management under Customer Choice Behavior

Gustavo Vulcano, Stern School of Business, New York University, 44 West Fourth St, Suite 8-76, New York, NY, 10012, United States of America, gvulcano@stern.nyu.edu, Juan Manuel Chaneton

We develop a stochastic approximation algorithm to compute bid prices for network revenue management, accounting explicitly for choice behavior effects. Our numerical experiments show that the approach has interesting potential.

3 - Dynamic Pricing with Reluctant Customers

Victor Araman, AUB/NYU, 44 West Fourth Street, New York, NY, Lebanon, varaman@stern.nyu.edu

Products proliferation and market competition make the consumer more reluctant in buying a new item. We study in this work how retail companies can benefit from available information about reluctant customers to adjust their prices accordingly. We assume a Poisson arrival of customers interested in some item who will spend a positive amount of time before deciding whether to buy or not. We compare such model to that of a generic one where customers are revealed only when they buy the item.

4 - Dynamic Assortment Planning

Rene Caldentey, Stern School of Business, New York University, New York, NY, rcaldent@stern.nyu.edu, Felipe Caro

We investigate optimal assortment planning strategies for a retailer with limited shelf space. The retailer can choose among basic and fashion items with low and high risk (and return) respectively. Our motivation is in the apparel industry, and we explicitly model the vogue as a stochastic process that the retailer tries to follow. The objective is to maximize the long-term value of the retail business by dynamically adjusting the menu of products on display.

■ MD60

O - Hampton Room

Hot Topics in Rail OR

Sponsor: Railway Applications
Sponsored Session

Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Disruption Management at Netherlands Railways

Dennis Huisman, OR Consultant & Assistant Professor, Netherlands Railways & Erasmus University Rotterdam, Econometric Institute, PO Box 1738, Rotterdam, ZH, 3000DR, Netherlands, huisman@few.eur.nl, Leo Kroon, Gabor Maroti, Daniel Potthoff, Lars Nielsen

On the Dutch railway network, there are about 20 disruptions per day. The infrastructure manager is responsible for modifying the timetable. However, the rolling stock circulation and the crew schedules are the responsibility of the operators, of which Netherlands Railways is the largest one. We will discuss several, recently developed, methods to re-schedule rolling stock and crew. Finally, we will show some computational experiments on real-world instances.

2 - Real-time Railcar Scheduling

Shankara Kuppa, Systems Engineer, Union Pacific Railroad, 1400 Douglas Street MC 580, Omaha, NE, 68179, United States of America, skuppa@up.com, David Ciemnoczolowski

Car scheduling is one of the core operations of a railroad. Many constraints exist on routing cars on trains, including terminal capacities, restrictions on length and weight of trains, etc. Given a schedule for trains, we use a multicommodity flow approach to routing cars on trains while jointly considering block definitions and real-time exceptions. We will present case-studies of the application of the approach.

3 - A Hybrid Algorithm and Compaction Process for Railcar Movement Reconstruction

Ingrid Schultze, Sr Mgr Rail Industry Analysis, Union Pacific Railroad, 1400 Douglas St. Stop 1350, Omaha, NE, 68179, United States of America, ischultze@up.com, John Ransom, Chris Sanford, John Gray

Charged with accurate reconstruction of railcar movement over select rail corridors, a Union Pacific team supporting regulatory compliance initiatives developed a hybrid algorithm and compaction process capable of routing over 10.5 million railcars in less than one hour while adhering to historical event reportings.

■ MD61

O - Calvert Room

Public Transit II

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Nicholas Lownes, Assistant Professor, University of Connecticut, 261 Glenbrook Road U 2037, Storrs, CT, United States of America, nlownes@engr.uconn.edu

1 - Connecting a Fixed Guideway System to the Network
Nicholas Lownes, Assistant Professor, University of Connecticut, 261 Glenbrook Road U 2037, Storrs, CT, United States of America, nlownes@engr.uconn.edu, Wei (David) Fan

Fixed-guideway transit systems (heavy, light, commuter rail and BRT systems) have in many places led to improvements in not only mobility, but in social cohesion and economic development. To harness these benefits the fixed-guideway system must be well connected to the existing network and the served communities. This paper investigates the sensitivity of circulator/distributor routing to operator and user costs.

2 - A Math Programming Approach for Designing Express Services on a High Demand Transit Corridor
Ricardo Giesen, Assistant Professor, Universidad Catòlica de Chile, Vicuna Mackenna 4860, Transport Engineering and Logistics, Santiago, RM, 6904411, Chile, giesen@ing.puc.cl, Carola Leiva, Juan Carlos Munoz

We study the design of express services on a high-demand transit corridor. We present a mathematical programming based method for obtaining the best express services to provide on a corridor. We determine the set of routes and their frequencies that would minimize the expected total costs for a given origin-destination demand matrix.

3 - Stochastic Transit Assignment with Boarding Decisions
Mark Hickman, University of Arizona, Civil Engineering, PO Box 210072, Tucson, AZ, 85721-0072, United States of America, mhickman@email.arizona.edu

We consider the current state-of-the-art in both deterministic and stochastic models for transit assignment. Recent deterministic transit assignment methods have explicitly considered passenger "boarding strategies", where the passenger will decide whether to board a vehicle only when that vehicle arrives. We examine extensions of this framework to stochastic transit assignment methods.

■ MD62

O - Governor's Boardroom

Panel Discussion: Marketing Science and Revenue Management, Contrast and Commonality (Joint Session Pricing and Revenue Mang/ Marketing)

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Robert Shumsky, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States of America, robert.shumsky@dartmouth.edu

1 - Marketing Science and Revenue Management, Contrast and Commonality
Moderator: Robert Shumsky, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States of America, robert.shumsky@dartmouth.edu, Panelists: Guillermo Gallego, Eyal Biyalogorsky, Steven Shugan, Ioana Popescu

Those who identify themselves as "Marketing Science" and "Revenue Management" professionals often are working on the same set of problems. Yet historically the two fields have seen relatively little overlap in research methods, journal publishing, and conference participation. Lately, however, the two fields seem to be growing closer. We bring together representatives of both fields to discuss the historical roots of the two fields, current research styles, and future directions.

■ MD63

O - Congressional B

Sloan: Planning Problems in the Transportation Industries

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Alan Erera, Associate Professor, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, Ga, United States of America, alan.erera@isye.gatech.edu

1 - Perishable Product Transportation with Costly Observation
Tae Su Cheong, PhD Student, Georgia Institute of Technology, H. Milton Stewart School of ISyE, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, tcheong3@gatech.edu, Chelsea C. White, III

We investigate the value of knowing freight status in the movement from an origin to a destination through intermediate points in the cold-chain logistics. Freight status can be observed at each intermediate point for a cost. At each intermediate point, freight may be returned to the origin, or can continue toward the destination. We model the problem as partially observed MDP.

2 - Pups vs. Vans: Trailer Mix Decisions for LTL Linehaul Operations
J. Antonio Carbajal, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, 30332, United States of America, gtg107u@mail.gatech.edu, Alan Erera, Martin Savelsbergh

LTL carriers can attain cost savings by correctly identifying the types of trailer equipment to use on different linehaul service lanes. To date, research has focused on short haul mix problems. Given a load plan, we investigate models to determine which direct trailer moves should be loaded with pups (28' trailers) and which with vans (53' trailers). We attempt to specify the simplest nontrivial problem and present an arc-based IP formulation. Computational results are shown for test instances.

3 - Base Location and Fleet Allocation for a Per-seat, On-demand Air Transportation Service
Gizem Keysan, Georgia Institute of Technology, 58 6th Street NE, Unit 2201, Atlanta, GA, 30308, United States of America, gkeysan@isye.gatech.edu, George Nemhauser, Martin Savelsbergh

We address the problem of expanding an air transportation busines that operates without published flight schedules. At the tactical level, the airports in which new facilities will be opened are determined together with fleet allocations while the daily flight schedules are constructed at the operational level. We use an integrated model that determines the flight scheduling as well as the facility locations, and use this model in an incremental fashion to open the facilities gradually in time.

4 - Day-differentiated Load Planning for LTL Carriers
Mike Hewitt, Georgia Institute of Technology, Atlanta, GA, 30332-0205, mhewitt@isye.gatech.edu, Alan Erera, Martin Savelsbergh

We consider an extension of the traditional load planning problem faced by LTL carriers, namely the generation of day-of-week differentiated load plans, which are necessary to remain competitive in the current market. We investigate heuristics that utilize exact optimization and present results indicating significant savings for a national carrier.

■ MD64

O - Congressional A

Network Modeling and Information Provision

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Alexander Paz, Assistant Professor, University of Nevada, Las Vegas, College of Civil and Environmental Engin, 4505 Maryland Parkway, PO Box 454015, Las Vegas, NV, 89154-4015, United States of America, apaz@purdue.edu

1 - Accounting for Information Collection in the Stochastic System-Optimum Network Assignment Problem
Natalia Ruiz, UT Austin, 6.204 ECJ Hall, 1 University Station C1761, Austin, TX, United States of America, natiruizjuri@gmail.com, Travis Waller

This work introduces solution methodologies for stochastic system-optimum network assignment problems under uncertainty which take into account the collection and distribution of information by the system's assets. The proposed solution techniques are based on previously developed mathematical formulations. They include optimal algorithms and heuristic methods, which are discussed along with the potential applications of the novel concepts.

2 - Integrated Corridor Management: A Case Study
Alexander Paz, Assistant Professor, University of Nevada, Las Vegas, College of Civil and Environmental Engin, 4505 Maryland Parkway, PO Box 454015, Las Vegas, NV, 89154-4015, United States of America, apaz@purdue.edu, Yi-Chang Chiu

The objective of the Integrated Corridor Management (ICM) initiative is to demonstrate how Intelligent Transportation Systems technologies can efficiently and proactively enhance the movement of people and goods in major transportation corridors. The ICM initiative seeks the coordination of individual network operations between parallel facilities creating an interconnected system capable of cross network travel management. Simulation results illustrate the potential benefits of ICM.

3 - Network Equilibrium and Design under Information Provision
Avinash Unnikrishnan, Graduate Student, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, avinash@mail.utexas.edu, Travis Waller

The focus of this work is to determine analytical network equilibrium and design formulations which account for online information provision. Frank Wolfe based solution methods will be discussed where the sub-problems involve calculating online shortest paths.

4 - Optimization Models to Characterize the Broadcast Capacity of Vehicular Ad Hoc Networks
Lili Du, Rensselaer Polytechnic Institute, Troy, NY, dul@rpi.edu, Shivkumar Kalyanaraman, Satish Ukkusuri, Wilfredo Yushimito Del Valle

This study defines the maximum successful concurrent transmissions as the broadcast capacity of vehicular ad hoc networks (VANET). Integer Programming (IP) and statistical models are developed to explore the maximum concurrent successful receivers or transmitters in VANET. Response surface and linear regression technologies are applied to build the statistical models.

■ MD65

O - Council Room

Sloan: Scheduling Challenges in the Healthcare Industry

Cluster: Scheduling in the Service Industry
Invited Session

Chair: Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu

1 - Industry Studies and Healthcare Scheduling
Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu

What is Industry Studies? What roles does it play in healthcare scheduling? How is healthcare different from other industries, in the role that Operations Research can play in solving challenging problems? We address these questions in the context of our work in scheduling healthcare personnel, focusing on both the algorithmic approach and the underlying problem definition.

2 - A Case Study of a Simulation-based Decision Support Tool
Michael Carter, Mechanical & Industrial Engineering, University of Toronto, 5 King's College Rd., Toronto, ON, M5S3G8, Canada, carter@mie.utoronto.ca

We describe work that was done for Hamilton Health Sciences in the 2006-07. The hospital opened a new cardiac operating room in 2006 and they decided to use operations research methods and simulation to determine the best method for planning the surgical schedule. Major issues included the availability of resources such as ICU beds, ward beds and nursing staff. The paper discusses the application as well as the considerable post-implementation effort.

3 - Multi-OR Surgery Scheduling Problem with Surgeon Constraints
Andrew Schaefer, Associate Professor, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, schaefer@pitt.edu, Hari Balasubramanian, Sakine Batun, Brian Denton, Todd Huschka

Allocation and scheduling of surgeries in a multiple operating room (OR) environment is one of the important operational problems in hospitals. For this problem, we present a stochastic programming model with surgeon constraints, setup times and uncertain surgery durations. We consider performance measures such as fixed cost of opening ORs, overtime and surgeon idle time. We present computational results based on real data.

4 - Home Healthcare Scheduling and Routing
Sarah Root, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, seroot@uark.edu, Edosa Aibangbee

In this talk, we present models which integrate the scheduling and routing of home healthcare workers. We present this as an extension of the VRP, where healthcare workers have different skill levels and can only serve patients for whom they have an adequate care-taking ability. Initial models and computational results are presented, along with directions for future research that draw from our observations with the Center for Innovation in Healthcare Logistics.

■ MD66

O - Cabinet Room

Real-time Fleet Management Problems

Cluster: Real-Time Systems
Invited Session

Chair: Frédéric Semet, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, Frederic.Semet@univ-valenciennes.fr

1 - A Coevolutionary Genetic Algorithm for Dynamic Vehicle Routing
Michel Gendreau, Professor, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michelg@crt.umontreal.ca, Mohamed Barkaoui

The quality of the convergence process in genetic algorithms depends on the specific choice of strategies and combinations of operators. In this talk, we address this problem by introducing a new approach that uses the concept of coevolution. Application of this approach will be presented for the dynamic vehicle routing problem with time windows.Comparisons with classical genetic algorithms will be presented w.r.t. to the robustness and the quality of the solutions produced.

2 - Using Incompatibilities to Reduce Search Space for Selective and Dynamic VRPs
Aziz Moukrim, Université de Technologies de Compiègne - CNRS UMR 6599 Heudiasyc, Centre de Recherches de Royallieu, Compiègne, Fr, 60205, France, aziz.moukrim@utc.fr, Hermann Bouly

We present a solution method for a specific selective vehicle routing problem for a real life application. An Iterative Destruction/Construction Heuristic is used for solution's improvement. Some pre-processing methods reduce the search space. These methods are based on the use of concepts like incompatibilities and required customers. These concepts help finding better solutions and are usefull for dynamic VRPs.

3 - Management of a Fleet of Tow Trucks in Real-time
Eric Duchenne, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, eric.duchenne@univ-valenciennes.fr, Frédéric Semet

When a fleet of tow trucks has to be managed in real-time, a key question is the selection of the pending call to which a free tow truck is assigned. In this talk we show how this problem can be modeled and we propose various approaches for its solution.

4 - Management of a Fleet of Trucks For a Mail-order Company
Frédéric Semet, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, Frederic.Semet@univ-valenciennes.fr, Amine Lamine, François Clautiaux, Said Hanafi, El-ghazali Talbi

In this talk, we describe a distribution problem faced by a mail-order company at a regional level. From a central depot routes has to be designed to serve at set P of distribution points and a set H of customer homes. While points in P remain the same and must be served by the same vehicles, H varies from day to day. We propose a new algorithmic approach based on a decomposition of the problem to handle the demand variations over the time-horizon.

■ MD67

O - Forum Room

Location Analysis

Sponsor: Location Analysis
Sponsored Session

Chair: Leyla Ozsen, San Francisco State University, 1600 Holloway Ave. BUS 310, San Francisco, CA, 94132, United States of America, leyla_ozsen@mac.com

1 - Capacitated Facility Location Problems with Single Source Constraints and Flexible Customer Demand

Chase Rainwater, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States of America, crainwa@ufl.edu, Joseph Geunes, Edwin Romeijn

We consider a generalization of the capacitated facility location problem, where customers permit delivery quantity flexibility within specified ranges. While the supplier's revenue increases in delivery quantity (possibly as a nonlinear function of the quantity supplied), the resulting profit-maximization problem is complicated by capacity limits and supply cost structures. We propose a branch-and-price algorithm, which leads to an interesting class of nonlinear knapsack pricing problems.

2 - Protection and Interdiction of Facilities: A Stochastic Model

Federico Liberatore, PhD Student, Kent Business School, University of Kent, Canterbury, CT2 7WS, United Kingdom, fl51@kent.ac.uk, Mark Daskin, Paola Scaparra

The objective of the Stochastic R-Interdiction Median Problem with Fortification is to optimally locate defensive resources among facilities in order to minimize the worst-case impact of a random number of intentional disruptions of the facilities. A bound based optimal algorithm and some heuristic-concentration type heuristics are illustrated and compared.

3 - A Capacitated Model for the Simultaneous Optimization of Facility Location and Inventory Decisions

Burcu Keskin, Assistant Professor, University of Alabama, Operations Management, Tuscaloosa, AL, United States of America, bkeskin@cba.ua.edu, Sila Cetinkaya, Halit Uster

Recent research has indicated substantial benefits with the integration of facility location and inventory decisions. Motivated by these results, we consider a two-stage integrated facility location and inventory problem while taking total logistics costs and real-life capacity restrictions into account. We model the problem as a nonlinear mixed integer program and develop efficient solution approaches. We present numerical results that illustrate the benefits of integrated decision making.

4 - Benefits of Supply Chain Integration

Leyla Ozsen, San Francisco State University, 1600 Holloway Ave. BUS 310, San Francisco, CA, 94132, United States of America, leyla_ozsen@mac.com

We present managerial insights on the benefits of supply chain integration based on the extensive computational experiments conducted by solving integrated location-inventory, location-routing, and location-inventory-routing problems.

■ MD68

O - Senate Room

Sloan Industry Studies: Marketing New Technologies and Managing Brands in the Automotive Industry

Sponsor: Marketing Science
Sponsored Session

Chair: Janell D. Townsend, Assistant Professor, Oakland University, 348 Elliott Hall, Rochester, MI, 48114, United States of America, townsend@oakland.edu

1 - Repeat Adopters and Adoption Patterns for Second Generation Automobiles

Kwong Chan, Assistant Professor, University of Massachusetts Amherst, 121 Presidents Drive, Amherst, MA, 01002, United States of America, kwongchan@mktg.umass.edu

A second product generation is offered to two adopter populations: repeat adopters, who consist of innovative adopters that purchased the first generation product, and a larger market of imitative new-adopters that did not. This study models social connections between adopters of second generation automobiles to test for cross-adopter influence. The findings indicate purchase by new adopters of a second generation automobile is accelerated by repeat adopters and to a lesser extent, new adopters.

2 - Product Repositioning and Brand Inertia: The US Automobile Market

Sengun Yeniyurt, Assistant Professor, Rutgers University, Rutgers Business School, 94 Rockafeller Road, Piscataway, NJ, 08854, United States of America, yeniyurt@business.rutgers.edu, S. Chan Choi, Janell D. Townsend

This study investigates factors affecting brand inertia in brand positioning changes over time. A longitudinal perceptual map is generated to track changes in brand positions of 24 major automotive brands competing in the U.S. between 1997 and 2005. The effects of marketing efforts on changes in brand positioning, moderated by brand familiarity, are then estimated using an econometric model.

3 - Information Acceleration for Alternative Fuel Vehicles

Rosanna Garcia, Northeastern University, Hayden Hall, Room 202, Boston, MA, 02115, United States of America, r.garcia@neu.edu

Automobile manufacturers are interested in what drives consumers to purchase alternative fuel vehicles. However, consumers are unable to provide informed choice decisions on unfamiliar technologies. Marketing managers have looked at how multi-media technological advancements can be utilized to develop a method for introducing consumers to these innovations. This method is known as information acceleration. This is an NSF sponsored project MUSES:Environmental Policy, Auto Design & Materials Flow.

4 - Brand Magic: How Brand Strength Magnifies Market Based Investments

Janell D. Townsend, Assistant Professor, Oakland University, 348 Elliott Hall, Rochester, MI, 48114, United States of America, townsend@oakland.edu, Sengun Yeniyurt, Rajendra Srivastava

Brand strength is derived from market based investments. It has also been proposed that brand strength can be leveraged to enhance the productivity of marketing spend, resulting in superior performance. No single study has examined a complete longitudinal model of the role of brand strength in brand performance. We examine these effects in the U.S. automotive market with a large data set spanning all major brands from 1997-2003, and based on over 40,000 observations.

Tuesday, 8:00am - 9:30am

■ TA01

M - Marriott Ballroom 3

Business Intelligence for eBusiness

Sponsor: eBusiness
Sponsored Session

Chair: Catherine Yang, UC Davis, yiyang@ucdavis.edu

1 - Analysis of Business Process Models in Enterprise Web Services

Mabel T. Kung, Professor, Mihaylo College of Business and Economics, California State University at Fullerton, Fullerton, CA, 92834, United States of America, mkung@fullerton.edu, Ronald Armstrong

This paper reports a series of process-based models for the development of e-Business using enterprise software applications. Our framework focuses on the guidelines for traditional users to identify the structural conflicts in integrating web services.

2 - Multi-agent Based Knowledge Discovery in a Distributed Environment - a Concurrent Logic Approach

Zhangxi Lin, Associate Professor, Texas Tech University, CAABI Research Center, Lubbock, TX, 79416, United States of America, Zhangxi.Lin@ttu.edu

This paper proposes a new approach to knowledge discovery in a distributed eBusiness system using multi-agent techniques. Guided by the needs from local knowledge base reasoning, each agent can autonomously initiate the sessions with others to acquire the mostly wanted information in order to reach its data analytic objectives. The case-based reasoning and multi-value logic methods are employed. The approach has the potential to be applied to anti money laundering.

3 - Web User Behavioral Profiling for User Identification

Catherine Yang, UC Davis, yiyang@ucdavis.edu

In this paper, we propose a simple, yet powerful approach to profile users Web browsing behavior for the purpose of user identification. The importance of being able to identify users can be significant given a wide variety of applications in electronic commerce, such as product recommendation, personalized advertising, etc. We create user profiles capturing the strength of users behavioral patterns, which can be used as behavior signatures to help in identifying users.

■ TA03

M - Marriott Ballroom 1

Dantzig Memorial I

Cluster: Dantzig Memorial
Invited Session

Chair: Richard Cottle, Department of Management Science and Engineering, Stanford University, Stanford, CA, 94305-4026, United States of America, rwc@stanford.edu

1 - George Dantzig Crosses the Potomac River, Twice!

Saul Gass, Professor Emeritus, University of Maryland, 8809 Maxwell Drive, Potomac, MD, 20854, United States of America, sgass@rhsmith.umd.edu

We recount how General George started his career in 1941 working for the U.S. Air Force's Combat Analysis Division, Pentagon, during World War II, and his return in 1946 as Chief Mathematician of the Air Force's Project SCOOP, the birth place of linear programming and the simplex method. George had been drawn into battle by his Pentagon colleagues who challenged him to figure out how the Air Force could mechanize its planning process in a world of desk calculators and IBM accounting equipment.

2 - 57 Years of Close Encounters with George

Harold W. Kuhn, Department of Mathematics, Fine Hall, Washington Road, Princeton, NJ, 08544, United States of America, kuhn@math.princeton.edu

A personal account of eleven encounters with George Dantzig over 57 years. These range from a meeting in his office at Project SCOOP in the summer of 1948 to preparing a citation for his Linear Programming and Extensions as one of the Princeton University Press's Notable Centenary Titles in 2005.

3 - GBD and Uncertainty

John Birge, Professor, Chicago Graduate School of Business, University of Chicago, Chicago, 60637, United States of America, john.birge@chicagogsb.edu

While George Dantzig's pioneering work and subsequent contributions to linear programming under uncertainty are widely known, his first contributions to stochastic optimization preceded but foreshadowed his development of programming in a linear structure. This talk will explore those early connections.

■ TA04

M - Delaware B

Panel Discussion: Should the Electoral College Stay, Be Reformed, or Be Abolished?

Cluster: Public Policy: Operations Research in the Public Sector: Change We Can Believe In!
Invited Session

Moderator: Alex Belenky

1 - Should the Electoral College Stay, Be Reformed, or Be Abolished?

Panelists: Arnie Barnett, Ed Kaplan, Nathan Ritchey, Vincy Fon, Paul Edelman, Jonathan Hodge, Nicholas Miller

Since its creation in 1787, the Electoral College has remained the most mysterious mechanism for electing a President of a country. There is no consensus among mathematicians, systems scientists, and political scientists studying the Electoral College on whether it can satisfactorily serve the U.S. in the 21st century, especially after two close elections in 2000 and in 2004. Discussions of the Electoral College in the media are mostly those on opinions about this unique election mechanism and are not based either on its established quantitative features or on its true merits and obvious deficiencies, leaving them unknown or unclear to an overwhelming majority of the electorate. This session aims at demonstrating how OR can help the media communicate to the voters in a simple manner what is really known about key Electoral College quantitative features, as well as at spotlighting unsolved systems problems associated with analyzing this controversial election mechanism.

■ TA05

M - Virginia B

Nonlinear Programming: Algorithms and Applications

Sponsor: Optimization/ Nonlinear Optimization
Sponsored Session

Chair: Hande Benson, Assistant Professor, Drexel University, 3141 Chestnut Street, Philadelphia, PA, 19104, United States of America, hvb22@drexel.edu

1 - Infeasibility Detection in Nonlinear Programming

Frank Curtis, Postdoctoral Researcher, New York University, 251 Mercer Street, New York, NY, 10012, United States of America, curtis@cims.nyu.edu, Jorge Nocedal, Richard Byrd

Optimization algorithms, which are primarily designed to solve feasible problem instances, can behave inefficiently when applied to infeasible problems. Meaningful termination points are those minimizing a feasibility measure, but convergence to such points can be exceedingly slow. In this talk we present a SQP penalty method that provides fast convergence guarantees for both feasible and infeasible problems by transitioning continuously between the goals of optimality and feasibility.

2 - On Local 1.5-Q-superlinear Convergence of the Primal-dual Exterior-point Method

Igor Griva, George Mason University, 4400 University Dr, Fairfax, VA, United States of America, igriva@gmu.edu, Roman Polyak

We introduce a primal-dual exterior-point method (EPM) for optimization problems with both inequality and equality constraints. Every iteration the algorithms solves a primal-dual linear system of equations. We show that under the standard second-order optimality condition the EPM method generates a sequence, which converges to the primal-dual solution with an asymptotic 1.5-Q-superlinear rate.

3 - On the Local Quadratic Convergence of the Primal-dual Augmented Lagrangian Method

Roman Polyak, Professor, George Mason University, 4400 University Drive, Fairfax, VA, United States of America, rpolyak@gmu.edu

We introduce the Primal-Dual Augmented Lagrangian (PDAL) method for optimization problems with equality constraints. Each step of the PDAL requires solving the primal-dual linear system of equations. We show that under the standard second-order optimality condition the PDAL method generates a sequence, which converges to the primal-dual solution with asymptotic quadratic rate.

4 - Bilevel Programming for Biofuel Production Problems

Xiangrong Liu, Student, Drexel University, 3141 Chestnut Street, Philadelphia, PA, 19104, United States of America, xl35@drexel.edu

This paper presents a discrete bilevel optimization model for decision-making in biofuel production. In the upper level problem, the government finds the optimal tax credits to provide farms enough incentives to produce biofuel while the farms allocate their lands to different usages in the lower level problem. We propose to use techniques from nonsmooth nonlinear optimization. Computational results are provided on a numerical example from literature.

■ TA06

M - Virginia C

Auctions in Marketing - Bidding Strategy

Cluster: Auctions
Invited Session

Chair: Peter Popkowski Leszczyc, University of Alberta, 4-20F School of Business, Edmonton, AB, T6G2R6, Canada, ppopkows@ualberta.ca

1 - When Zero Search Cost is Too High: What Does it Take to Make Consumers Search?

Peter Popkowski Leszczyc, University of Alberta, 4-20F School of Business, Edmonton, AB, T6G2R6, Canada, ppopkows@ualberta.ca, Ernan Haruvy

We examine individual choice between pairs of simultaneous auctions that are identical or differ on: (1) direct incentives to search, (2) shipping costs, (3) minimum starting bid, (4) duration and (5) secret reserve. We investigate the extent to which individuals choose optimally over pairs of simultaneous auctions, and what influences these outcomes. Results show that while most individuals do not optimize and switch between auctions, they can be made to search with the appropriate incentives.

2 - An Empirical Investigation of Suppliers' Participation Behavior at B2B Auctions

Xin Wang, Brandeis University, 415 South Street, Waltham, MA, United States of America, xinwang@brandeis.edu, Donglei Qiu

Using actual B2B auction data on automobile parts and a count-data survival model, we study suppliers' participation behavior over time and identify the factors that influence such behavior. Our results indicate that suppliers' past attendance behavior, heterogeneity and their competence in providing low and complete quotes significantly influence participation decisions. Though completeness of a quote is required to win an auction, its role is not as important as that of providing a low price.

■ TA07

M - Maryland A

Supplier Diversification

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Dan Adelman, Professor of Operations Management, University of Chicago, Graduate School of Business, 5807 South Woodlawn Avenue, Chicago, IL, 60422, United States of America, dan.adelman@chicagogsb.edu

1 - Procurement Auctions with Uncertain Demand and Supplier Capacity Investment

Cuihong Li, University of Connecticut, 2100 Hillside Rd, Storrs, CT, United States of America, Cuihong.Li@business.uconn.edu, Alan Scheller-Wolf

We consider a buyer who sources a customized item via an online procurement auction. The buyer faces uncertain demand and the winning supplier has to invest in capacity. While the commonly used open descending price auction provides an efficient process to negotiate the price, it ignores the allocation of demand and capacity risks. We examine the performance of such auction with the buyer offering price-only push vs. pull contracts. We also compare such auctions with optimal auction mechanisms.

2 - Infinite Horizon Strategies for Replenishment Systems with a General Pool of Suppliers

Nan Yang, Assistant Professor, Cornell University, 310 Sage Hall, Cornell University, Ithaca, NY, 14853, United States of America, ny38@cornell.edu, Awi Federgruen

We characterize the structure of optimal infinite horizon strategies in replenishment systems, with an arbitrary pool of suppliers with distinct prices and yield characteristics. We design exact solution methods as well as simple but accurate heuristics.

3 - Competition and Diversification in Supply Chains

Shanshan Wang, PhD Student of Management Science/Operation Management, University of Chicago, Graduate School of Business, 5807 South Woodlawn Avenue, CHICAGO, IL, 60637, United States of America, swang5@chicagogsb.edu, Dan Adelman

In this paper, we consider a decentralized supply chain with multiple unreliable suppliers and one buyer. We study conditions that elicit the buyer to diversify her orders across suppliers, and the effect of competition between suppliers on this behavior.

■ TA08

M - Maryland B

Research in the Finance-Operations Interface

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Ravi Anupindi, Ross School of Business, University of Michigan, 701 Tappan Avenue, Ann Arbor, MI, United States of America, anupindi@umich.edu

1 - Operational Models with Risk Hedging Constraints

Rene Caldentey, Stern School of Business, New York University, New York, NY, rcaldent@stern.nyu.edu, Martin Haugh, Leon Valdes

We consider the problem of maximizing the profits of a corporation when these profits depend in part on movements in the financial markets and/or economic indices. We propose a methodology for the optimal selection of dynamic operating and financial hedging strategies when the decision maker is risk averse. Risk aversion is imposed through constraints on the feasible policies. We identify circumstances in operational and financial decisions can be effectively decoupled.

2 - Integrated Optimization of Procurement, Processing and Trade of Commodities in a Network Environment

Sripad Devalkar, PhD Candidate, Ross School of Business, University of Michigan, 701 Tappan Street, Ann Arbor, MI, 48108, United States of America, devalkar@bus.umich.edu, Amitabh Sinha, Ravi Anupindi

We consider an integrated optimization problem for a firm involved in procurement, processing and trade of commodities in a network environment. We derive optimal policies for the firm when the processed commodity(ies) are sold using futures instruments. We also derive an upper bound on the value function using Lagrangian relaxation and quantify the performance of myopic policies.

3 - Unit-Contingent Electricity Swap and Asymmetric Information About Plant Outage

Owen Wu, University of Michigan, Ann Arbor, MI, owenwu@bus.umich.edu, Volodymyr Babich

We price a unit-contingent swap contract between an electricity distributor and a power plant, where the power plant's operational status is its private information, and characterize the Bayesian Nash equilibrium in an inspection game between them. We show that the plant's misrepresenting its status could benefit both the plant and the distributor because this reallocates the risk between the two parties in a way that the unit-contingent contract cannot.

4 - Inventory Investment and Sales Reporting for Publicly Traded Firms

Guoming Lai, Tepper School of Business, Carnegie Mellon Univ, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, guomingl@andrew.cmu.edu, Lin Nan, Laurens Debo

We study a two-period inventory management problem with correlated demand. The inventory manager's compensation is partially based on the firm's stock price which is influenced by the reported sales revenues. With better information about the "real" demand, the manager may manipulate the stock price by shipping more than the real demand to downstream customers and reporting higher than real sales revenues.

■ TA09

M - Maryland C

Technometrics Journal Sponsored Session

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: William Notz, Ohio State University, Columbus, OH, United States of America, notz.1@osu.edu

1 - Practical Design of Generalized Likelihood Ratio Control Charts for Autocorrelated Data

Giovanna Capizzi, Associate Professor, Department of Statistical Sciences - University of Padua, via Cesare Battisti 241/243, Padua, PD, 35121, Italy, capizzi@stat.unipd.it, Guido Masarotto

We present a practical approach to the implementation of Generalized Likelihood Ratio control charts for monitoring an autoregressive and moving average process when only a Phase I sample is available. The approach, based on automatic identification, estimates the control limits via stochastic approximation using bootstrap resampling. Thus, it is able to take into account the uncertainty about the underlying model even when only a few Phase I observations are available.

2 - A Change Point Approach for Phase I Analysis in Multistage Processes

Fugee Tsung, Professor, Hong Kong University of Science and Technology, clear water bay, Kowloon, Hong Kong, Hong Kong, HK, China, season@ust.hk, Changliang Zou

We study the Phase I analysis of a multistage process where the input of the current process stage may be highly related to the output(s) of the earlier stage(s). We propose a change-point approach which integrates the classical binary segmentation test with the directional information based on the state-space model for testing the stability of a batch of historical data. We show that the proposed approach consistently outperforms existing methods for multistage processes.

■ TA10

M - Room 8206

Current Practices and Optimization Research for Integrating Electricity Markets: Energy and Transmission Issues I

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Marcelino Madrigal, Senior Energy Specialist, The World Bank, 1818 H St NW, Washington, DC, 20433, United States of America, marcelino_madrigal@yahoo.ca

1 - Congestion Management of Interregional Electricity Markets: Review of Methodologies and a Proposal

Marcelino Madrigal, Senior Energy Specialist, The World Bank, 1818 H St NW, Washington, DC, 20433, United States of America, marcelino_madrigal@yahoo.ca, José A. Aguado, William Rosehart

This presentation will summarize the scope of the panel, and will review methodologies for interregional electricity market trading and congestion management. Following, a particular proposal of the integration of a forward market with a balancing (spot) market based on nodal pricing will be presented. The interaction of TSOs belonging to adjacent markets is efficiently taken into account through a decentralized Optimal Power Flow solved by interior point methods.

2 - Modeling European Electricity Market Integration: A Minefield for Operations Researcher

Florian Leuthold, Dresden University of Technology, Chair of Energy Economics, Dresden, 01062, Germany, Florian.Leuthold@tu-dresden.de

Should transmission and energy markets be separated or integrated? Which incentive structure is needed for investing in transmission and generation? To which extend some players might be able to transfer their regional market power into an integrated market? Each of the mentioned issues is important for Europe. However, we report specific problems in terms of modelling and algorithms such as solving large scale nonlinear and mixed integer optimization, or non-convex problems.

3 - Electricity Integration Models Used in Europe After 12 Years of Market Experience

Queijo G. Gumersindo, Red Electrica, Paseo del Conde de los Gaitanes, 177, Alcobendas (Madrid), 28109, Spain, gumer@ree.es

The conference gives a general overview of congestion management and integration European models and describes the functioning of three specific interconnections that summarizes most frequently used: • Interconnection Spain - France a model of physical explicit auctions for congestion management • Iberian Market: a model of market splitting integration • Trilateral Agreement France-Belgium-Netherlands: a model of market coupling integration.

4 - Operations Research for Investment Analysis in Integrated & Fast-growing Electricity-gas Markets

Niko Iliadis, Engineering Analyst, EnerCoRD, Plastira Street 4, Nea Smyrni, Athens, 171 21, Greece, Niko.Iliadis@EnerCoRD.com, Luiz Augusto Barroso

We discuss available optimization techniques and tools for regional integration of electricity-gas markets in Latin America. For example, energy swaps with LNG are more economical than point to point gas pipelines. An example is the gas export from Brazil to Chile without gas or pipeline: Chile purchases electricity from Brazil for delivery in Argentina (via the Brazil-Argentina DC link), this power displaces gas-fired generation in Argentina, which frees up gas supply to be shipped to Chile.

■ TA11

M - Room 8209

Climate Change I: Integrated Assessment Models

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Erin Baker, University of Massachusetts, Amherst, 220 ELab, Amherst, MA, United States of America, edbaker@ecs.umass.edu

1 - Integrated Assessment Models

John Weyant, Stanford University, weyant@stanford.edu

In this talk I will give an overview of the state of the art in Integrated Assessment Modeling.

2 - The MiniCAM Integrated Assessment Model

Jae Edmonds, Laboratory Fellow and Chief Scientist, Pacific Northwest National Laboratory, Joint Global Change Research Institute a, 8400 Baltimore Avenue, Suite 201, College Park, MD, 20740-2496, United States of America, jae@pnl.gov

This presentation will describe the MiniCAM Integrated Assessment Model and present results from its analysis of the interplay between bioenergy, stabilization of CO2 concentrations, agriculture and land-use change emissions.

3 - Managing the Transition to Climate Stabilization

Rich Richels, The Electric Power Research Institute, RRichels@epri.com.

This paper explores the emissions, energy, and economic implications of alternative greenhouse gas stabilization levels using the MERGE model.

4 - Greenhouse Gas Stabilization Scenarios from the Climate Change Science Program

Leon Clarke, Senior Research Economist, Pacific Northwest National Laboratory, 8400 Baltimore Avenue, Suite 201, College Park, MD, 20817, United States of America, leon.clarke@pnl.gov

Consideration of optimal long-term policy to address climate change requires models that link the socioeconomic and technological drivers of greenhouse gas emissions with key elements of the Earth system. This paper provides an overview of recent stabilization scenarios conducted by three integrated assessment modeling teams for the U.S. Climate Change Science Program. The scenarios explore the emissions, energy, and economic implications of alternative greenhouse gas stabilization levels.

■ TA12

M - Room 8212

Data Mining Applications in Business

Sponsor: Data Mining
Sponsored Session

Chair: Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu

1 - An Automated and Data-driven Bidding Strategy for Online Auctions

Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu

We develop a dynamic forward-looking model for price in competing auctions, incorporating dynamic auction features and its competitive environment. Then, maximizing consumer surplus, we build a bidding framework around this model that determines three decision points: the best auction, bid-time and bid-amount. We compare our strategy to early and last-minute bidding and find that it extracts considerably higher surplus.

2 - Enhancing Customer Service Support: A Text Mining and Machine Scheduling Model

Yilu Zhou, George Washington University, 2201 G St. NW, Suite 515, Washington, DC, 20052, United States of America, yzhou@gwu.edu, Moshe Dror

To achieve high customer satisfaction, information requests from a customer need to be delivered to the right expert efficiently. We research the problem of finding the right expert for processing customer request in large organizations. Our framework integrates text mining and machine scheduling techniques. The text mining module estimates the processing time for each job request on each customer-contact employee. It serves as a front end of optimizing scheduling of customer request.

3 - Mining Market Basket Data Using Bayesian Networks

Srinivas Prasad, Decision Sciences, School of Business, The George Washington University, Washington, DC, United States of America, prasad@gwu.edu, Sanal Mazvancheryl, Xiaojun Li, Pradeep Rau

We address the problem of assessing cross category associations from market basket data using Bayesian Networks. Specifically, we study how associations across categories vary based on marketing mix activities and demographics. The data set we employ is an IRI market basket data set that contains transactions including 22 categories over 2 years for 500 panelists. Bayesian Networks are learned from this data and are used to identify the underlying dependencies across product categories.

4 - Call Center Modeling: A Bayesian State Space Approach

Tevfik Aktekin, Department of Decision Sciences, Funger, 2201 G Street, NW, Washington, 20052, United States of America, taktekin@gwu.edu, Refik Soyer

In this paper, we consider an extension of state space models proposed by Weinberg et al. (2006) for daily call arrivals with changing rates. We introduce a Bayesian Poisson state space model on the the original count data and develop sequential inference for the model. In so doing, we discuss computational issues associated with sequential updating of the model parameters and provide one day ahead predictive distributions for the daily call arrivals.

■ TA13

M - Room 8216

Journal of Quality Technology: Data and Knowledge Engineering for Quality

Sponsor: Data Mining
Sponsored Session

Chair: George Runger, Arizona State University, George.Runger@asu.edu

1 - Causation-based T2 Decomposition for Multivariate Process Monitoring and Diagnosis

Jing Li, Assistant Professor, Arizona State University, jing.li.8@asu.edu

Successful application of SPC for monitoring and diagnosis in complex manufacturing systems is a challenging problem due to the excessive number of process/ product variables and the intricate relationships among them. This paper proposes a methodology to integrate causal modeling with SPC, proven to have enhanced interpretability and diagnostic power.

2 - Feature Selection for High-dimensional, Complex Models

Saylisse Davila, Graduate Student, Arizona State University, Tempe, AZ, 85787-5906, United States of America, saylisse.davila@asu.edu

Learning a function that relates inputs to outputs is the objective of supervised learning. As data sets become more extensive, the supervised learning task becomes more complex. Feature selection is one of the typical strategies used to address this increased complexity in the model building process and respond to the curse of dimensionality. A robust feature selection method that can handle mixed (categorical and numerical) data, nonlinear relationships, interactions, and is insensitive to data quality such as missing values is important for many applications. We will present a methodology for feature selection for such cases. Our method uses simulated, artificial data to generate a compact subset of non-redundant features. We will illustrate its effectiveness and computational ease on several simulated scenarios.

■ TA14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - TranSystems - Heuristic Modeling of Complex Decision Logic

Ben Fuqua, Associate VP, TranSystems, 222 So. Riverside Plaza, Ste. 2320, Chicago, IL, 60606, jbfuqua@transystems.com, Rainer Dronzek

This engaging team will demonstrate how simulation and modeling can help illustrate solutions to the complex decisions you as an audience member may face in your daily work. The presentation will be dynamic and centered around your questions and areas of interest. If you want to understand how simulation and modeling can work for you - don't miss this session.

2 - River Logic, Inc. - Integrated Business Planning with Enterprise Optimizer (EO)

Brian Downs, Director of Consulting Services, River Logic, Inc., 8350 N Central Expressway, Suite 1500, Dallas, TX, 75206, bdowns@riverlogic.com

This tutorial will provide an introduction to Enterprise Optimizer (EO), the leading platform for Integrated Business Planning (IBP). Using EO's intuitive drag and drop modeling interface, we will demonstrate how models of any business process can be developed without equation management, while simultaneously producing audit-quality financial reports. EO's unique capability to simultaneously model process and financial outcomes allows OR practitioners to quickly deliver an integrated, holistic model of the enterprise that aligns S&OP with the company's financial goals.

■ TA15

M - Room 8219

Dynamics of Value Creation

Sponsor: Service Science
Sponsored Session

Chair: Majid Iqbal, Gartner, 4501 N Fairfax Rd, Arlington, VA, 22203, United States of America, majid.iqbal@gartner.com

1 - Model Visioning: Business Simulation for Big Pursuits

David Bridgeland, Chief Business Architect, Global Business Transformation, Unisys Corporation, 20545 Tidewater Court, Sterling, VA, 20165, United States of America, david.bridgeland@unisys.com

Many organizations acquire services via large contracts, contracts of $100 million or more. The vendors of these large contracts include systems integrators, outsourcers, and others. Traditionally vendors pursue large contracts with written proposals and oral demonstrations. A new technique shows great promise: model visioning. Model visioning is the creation of a custom-built business simulation for a big pursuit. The simulation shows decision makers why one's approach is best.

2 - Risk Management in Complex Service Systems- Getting the Dynamics Right

Richard Taylor, Principal Researcher, HP Laboratories Bristol, Filton Road, Bristol, UK, BS24 8QZ, United Kingdom, richard.taylor@hp.com, Chris Tofts

Risk management is a continuous issue for organisations implementing and supporting complex service systems. Get it wrong and an organisation can be faced with massive losses. Get it wrong, and valuable commercial and development opportunities will be lost. Understanding the dynamics of risk in service systems is critical. We will discuss how this problem can be approached, and illustrate our approach through the use of examples from public and private service systems.

■ TA16

M - Room 8222

Service Operations

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Omar Besbes, Assistant Professor, The Wharton School, University of Pennsylvania, 3730 Walnut Street, 545 JMHH, Philadelphia, PA, 19104, United States of America, obesbes@wharton.upenn.edu

1 - Service Dynamics under Repeated Interactions

Sam Aflaki, PhD Candidate, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, Sam.AFLAKI@insead.edu, Ioana Popescu

We model a dynamic service relationship where the provider can adjust the service level in each period and customers decide to renew the service contract based on previous experiences and future expectations. We characterize the firm's optimal strategies under various customer behavior models. In particular, we consider the effect of gain/loss asymmetry on (a) the evolution of overall perception of service quality and (b) the decision making process for the renewal of the service contract.

2 - How Heavy Should Traffic Be? Revenue Optimization with Non-linear Delay Costs

Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu, Sunil Kumar

We study the impact of non-linear delay costs on pricing and capacity decisions of a firm modeled as a single- or multi-server queue. In a large market setting, we derive conditions for the system to approach heavy traffic, and the rate at which it does so. This rate is the traditional 1/Sqrt(n) only for linear delay costs. For convex costs, the optimal regime is heavier, and is one where single and multi-server systems behave identically.

3 - Linking Customer Satisfaction with Future Willingness-to-pay

Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu, Ramnath Vaidyanathan

We study how the ex-post seat value perceived by a patron attending an event in a theater/stadium drives his/her future willingness to pay. Using a proprietary dataset collected by a professional franchise, we develop an empirical model quantifying the impact of increased satisfaction on a patron's future willingness to pay, controlling for customer attribute and seat location characteristics, to understand the linkage between a customer satisfaction metric and financial metrics.

4 - Pricing Services Subject to Congestion: Charge Per-use Fees or Sell Subscriptions?

Pnina Feldman, The Wharton School, 3730 Walnut St., JMHH Suite 500, Philadelphia, PA, 19104, United States of America, pninaf@wharton.upenn.edu, Gerard Cachon

Using a queueing framework, we find that a firm may prefer subscription pricing over per-use pricing even if consumers dislike congestion. Furthermore, subscription pricing may be preferable in situations that would a priori suggest a preference for per-use pricing: when the industry has a high standard for congestion; or when customers' waiting costs are high (so that congestion is costly) or when capacity is expensive (so that it is costly to build sufficient capacity to reduce congestion).

■ TA17

M - Room 8226

SPC Methods for Autocorrelated Processes

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Marcus Perry, Florida International University, West Flagler Street EC 3172, Miami, FL, United States of America, perrym@fiu.edu

1 - Identifying the Time of Linear Change in the Mean of ARMA(p,q) Processes

Marcus Perry, Florida International University, West Flagler Street EC 3172, Miami, FL, United States of America, perrym@fiu.edu

In this talk, a maximum likelihood estimator for the time of linear change in the mean of an ARMA(p,q) processes is presented. We outline the development of the estimator under the general ARMA framework, and provide illustrative examples to demonstrate the application of the proposed estimator. We also present results of a Monte Carlo simulation study used to evaluate the expected performance of the estimator following EWMAST control chart signals.

2 - Model-based Multivariate Monitoring Charts for Autocorrelated Processes

Xuan Huang, University of Massachusetts Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01002, United States of America, xuan@som.umass.edu, Soren Bisgaard

Autocorrelation may seriously impact the performance of conventional control charts. For univariate process, it has been proposed to use a special cause control chart on the residuals after fitting a time series model. We generalize this idea to multivariate scenario. We produce plot on fitted values to provide a guidance of process adjustments and propose applying the Hotelling T2 to the residuals after fitting a multivariate time series model. The Average Run Length performance is reported.

3 - A Control Chart for Detecting and Estimating Step Changes in the Mean of Autocorrelated Processes

Douglas Timmer, The University of Texas-Pan American, 1201 W. University Drive, Edinburg, TX, United States of America, timmer@utpa.edu

A new control chart will be developed to monitor a stationary autocorrelated process for a step change in the mean utilizing the likelihood ratio approach. In addition to have excellent detection capabilities, the proposed control chart provides estimates for the change point and new value of the process mean. Monte Carlo simulation is used to evaluate the average run length performance of the proposed control chart applied to stationary first-order pure and mixed ARMA models.

■ TA18

M - Room 8228

Service Supply Chains

Sponsor: Service Science
Sponsored Session

Chair: Ralph Badinelli, Professor, Virginia Tech, Department of BIT (0235), Virginia Tech, Blacksburg, VA, 24061, United States of America, ralphb@vt.edu

1 - A Distributed Methodology for Resource Allocation in the Healthcare Industry

Shao-Jen Weng, PhD Candidate, Arizona State University, 720 S. Roosevelt St., Apt.8, Tempe, AZ, 85281, United States of America, sjweng64@gmail.com, Teresa Wu, Gerald Mackulak, William Verdini

It is widely believed that the inefficiency of healthcare institutions contributes to high healthcare expenditures. This study proposes a bi-level distributed framework to improve resource allocation and thereby improve hospital operation efficiency. The proposed framework integrates Data Envelopment Analysis (DEA), and a Genetic Algorithm (GA) to determine efficient staffing of hospitals based on a budget allocation from headquarters.

2 - Contracting and Outsourcing in Collaborative Services

Guillaume Roels, Assistant Professor, UCLA, UCLA Anderson School of Management, 110 Westwood Plaza Gold Hall Suite B511, Los Angeles, CA, 90095, United States of America, guillaume.roels@anderson.ucla.edu, Uday Karmarkar

In this talk, we evaluate the performance of various types of contract (fixed fee, time and materials, performance incentives) for collaborative services. We adopt a game-theoretic approach to model the joint interaction between a buyer and a vendor and services. Our model generates insights into how ex-ante specification, increased visibility on effort, and task allocation can be optimized to increase value in collaborative services.

3 - Resource Allocation for Service Supply Chains

Ralph Badinelli, Professor, Virginia Tech, Department of BIT (0235), Virginia Tech, Blacksburg, VA, 24061, United States of America, ralphb@vt.edu, Sheneeta White

In this paper we develop a productivity-based resource allocation model with various forms of technology functions. We evaluate the risks that are inherent in resource plans due to inaccuracy in the specification or estimation of technology functions. Adaptive planning approaches are suggested and evaluated.

■ TA19

M - Lincoln 4

A Variety of Decision Analysis Research

Sponsor: Decision Analysis
Sponsored Session

Chair: Ronald Howard, Stanford University, 646 Tennyson Ave., Palo Alto, CA, 94301, rhoward@stanford.edu

1 - From Value Rhetoric to Valuation

Somik Raha, Doctoral Candidate, Stanford University, The Stanford Decisions and Ethics Center, Terman Engineering Center #418, Stanford, CA, 94305, United States of America, somik.raha@gmail.com

Value rhetoric is the language decision makers use to justify or explain preferences. The speaker studied the Stanford Police Department and mined their value rhetoric using ethnographic analysis. In the next step, decision diagrams were constructed to identify the attributes of value the police department cared about. The primary objective of this research is to help the police department (and organizations that care about more than profit) think about how they should allocate their resources.

2 - Power Utility Function for Entrepreneurs

Manar El-Chammas, Stanford University, PO Box 19278, Stanford, CA, 94309, United States of America, manar@stanford.edu, Ibrahim Almojel, Jim Matheson

We discuss the power utility function in the context of entrepreneurial decision making. In this context we have prospects with large returns and very small probabilities, and the currency used tends to be equity instead of money. The power utility naturally lends itself to both. We define the certain equivalent multiplier (CEM) as the certain return equivalent to the deal. We solve for the value of information and control in terms of the CEM, and we give approximations based on few moments.

3 - Applying Risk and Decision Analysis to Nuclear Nonproliferation Strategy

David Caswell, Stanford University, 2247 Oak Hills Dr, Pittsburg, CA, 94565, United States of America, dcaswell@stanford.edu, Elisabeth Paté-Cornell

We discuss ongoing research on applying risk and decision analysis techniques for assessing strategic options to prevent the proliferation of nuclear weapons. We examine a multi-tier model for addressing the problem which enables a probabilistic modeling of a country's nuclear weapons program along with a meta-model for assessing policy impact.

4 - Value Discovery: Dynamic Decision Analysis

Ibrahim Almojel, Stanford University, PO Box 15348, Stanford, CA, 94309, United States of America, mojel@stanford.edu, Manar El-Chammas

We study situations in which decision makers have a flow of deals which come over time. The decision maker can only accept a limited number of deals and has to immediately decide whether to accept or reject each one. An example is a VC evaluating business proposals. We solve this problem following the setup of the dynamic stochastic knapsack problem. In this context we find the dynamic value of information and that of control and discuss the value of the option of reversing a decision.

5 - The Value of Perfect Hedging

Thomas Seyller, Consultant, Strategic Decisions Group, 745 Emerson Street, Palo Alto, CA, 94301-2411, United States of America, tseyller@sdg.com

I will define the value of perfect hedging, which captures the decision-maker's willingness to pay for the hedges that best complement his portfolio. The analysis provides three benefits. First, it shows the decision-maker how much of his resources he should devote to searching for hedges. It also helps identify the uncertainties on which it is most valuable to hedge. Finally, it gives an upper bound on his personal indifferent buying price for any uncertain deal he might consider acquiring.

■ TA20

M - Lincoln 3

Probability and Utility Elicitation

Sponsor: Decision Analysis
Sponsored Session

Chair: Ali Abbas, Assistant Professor, University of Illinois Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61820, United States of America, aliabbas@uiuc.edu

1 - Assessing Joint Distributions with Isoprobability Contours

Ali Abbas, Assistant Professor, University of Illinois Urbana-Champaign, 104 S. Mathews Ave, Urbana, IL, 61820, United States of America, aliabbas@uiuc.edu, David Budescu, Yuhong Gu

We present a method to elicit joint probability distributions using isoprobability contours: the set of points with equal cumulative probability. This approach dispenses with the need to assess conditional probabilities, correlation coefficients or concordance probabilities, and reduces the joint probability assessment into a one-dimensional assessment. We present the results of an experiment to elicit the contours using pairwise choices; comment on consistency, and show how to infer dependence.

2 - Risk Tolerance as Maximum Acceptable Loss: Theory and Experimental Evidence from Business Executives

Philippe Delquié, INSEAD, Boulevard de Constance, Fontainebleau, France, philippe.delquie@insead.edu

Could it be helpful to think of your risk tolerance as a maximum probable loss you are willing to face, no matter how large the upside? This may be natural to decision makers in some contexts. Exponential utility permits such an interpretation, but we should be mindful of possible pitfalls. The possibility and merits of this approach to measuring risk taking propensity will be discussed. Experimental evidence from private equity and banking executives will be presented to illustrate the issues.

3 - Reconciling Support Theory and the Book-making Principle

Enrico Diecidue, INSEAD, Blv de Constance, Fontainebleau, 77305, France, enrico.diecidue@insead.edu, Dolchai La-ornual

Support theory postulates that probability judgments for uncertain events depend on the description of events. We show that the theory violates basic consistency requirements for decision under uncertainty. We illustrate how support theory's incoherence stems from its assumption of non-extensionality rather than subadditivity. We propose a relaxation of the book-making principle, a famous consistency argument, and bridge the descriptively appealing support theory with normative criteria.

4 - The Impact of Delay on Risk Preferences

Ayse Onculer, ESSEC, Ave. Bernard Hirsch, Cergy, FR, 95021, France, onculer@essec.fr, Enrico Diecidue, Mohammed Abdellaoui

This study is an elicitation of the probability weighting function over time. By adding a temporal component to probability transformation, we can capture the impact of delay on risk preferences. Our experimental results imply that such a model has a better predictive power than existing models of risky intertemporal choice.

5 - Probability and Time Trade-Off with Multiple Outcomes

Alessandra Cillo, ACillo@iese.edu, Manel Baucells

Previous work has introduced a preference model for simple lotteries in which both time and risk dimensions were fully integrated through the probability and time trade-off. In this paper we propose an extension of this work to multiple outcome lotteries with delay. Predictions in terms of risk attitude are also analyzed in the paper.

■ TA21

M - Lincoln 2

Panel Discussion: Health 2.0 - A Different Type of Health Care Reform

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Gerald Kane, Assistant Professor, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, 02467, United States of America, gerald.kane@bc.edu

1 - Health 2.0 - A Different Type of Health Care Reform

Moderator: Rob Fichman, Boston College, Carroll School of Management 410A Fulton Hall, 140 Commonwealth Avenue, Chestnut Hill, MA, 02467-3808, United States of America, fichman@bc.edu

Will lead a discussion on the issues raised by panelists.

2 - Health 2.0 - A Different Type of Healthcare Reform

Gerald Kane, Assistant Professor, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, 02467, United States of America, gerald.kane@bc.edu, Rob Fichman

Health 2.0 describes a growing people-powered movement that has the potential to provoke very rapid change in the US healthcare industry. It empowers individual patients and caregivers to exert control over how healthcare happens. It employs a robust new technological foundation that allows people to connect, collaborate, and coordinate in new ways. Involving presentations from industry and academia, this panel explores how Health 2.0 could fundamentally change healthcare delivery in the US.

3 - Sermo: An Online Community Exclusively for Physicians

Gina Ashe, SERMO, gashe@sermo.com

Sermo is the fastest-growing community created by physicians, for physicians. Over 60,00 member physicians aggregate observations from their daily practice and then - rapidly and in large numbers - challenge or corroborate each others opinions, accelerating the emergence of trends and new insights on medications, devices and treatments. They can then apply the collective knowledge to achieve better outcomes for their patients.

4 - American Well: Bringing Patients and Providers Together Online

Yael Glassman, American Well, Yael.Glassman@AmericanWell.com

American Well is a new healthcare marketplace where consumers and physicians can come together online, to acquire and provide convenient and immediate healthcare services. Using the latest technologies in Web communications and digital telephony, the Company extends traditional healthcare services to the home setting. American Well is committed to supporting health plans in meeting consumer and employer demand for affordable, efficient, and immediate access to quality care.

5 - Inspire: Bringing Patients Together

Amir Lewkowicz, Vice President, Business Development Inspire, amir@inspire.com

Inspire connects patients, families, friends, caregivers and health professionals for health and wellness support. Inspire works with trusted health partners to build safe and secure health and wellness groups. Inspire builds and manages online communities in which thousands of patients, family members and caregivers support and communicate with one another in safe, secure, privacy- protected environments.

■ TA22

M - Lincoln 1

Scheduling I

Contributed Session

Chair: Camilo Mancilla, PhD Student, Lehigh University, 200 West Packer Av, Bethlehem, PA, 18015, United States of America, cam306@lehigh.edu

1 - Scheduling of a Linguistic Project

Joanna Marszewska, Dr., Jagiellonian University, Department of Japanology and Sinology, Al. Mickiewicza 9/11, Krakow, 31120, Poland, rokimi@op.pl, Tadeusz Sawik

A linguistic study sometimes requires a sequence of visits by researcher to different countries with different sojourn times. Scheduling the visits leads to a traveling salesperson problem with additional time and budget constraints. The application is illustrated with a study of Ryukyuan dialect of Japanese, where the Ryukyuans migration to Asia, Australia, South America and Hawaii is considered.

2 - Approximation Algorithms for Multi-agent Scheduling to Minimize Total Completion Time

Byung-Cheon Choi, New York University, 44W. 4th St. Rm 8-177 KMC, New York, 10012-1106, United States of America, byungcheon.choi@gmail.com, Kangbok Lee, Joseph Leung, Mike Pinedo

We consider a multi-agent scheduling problem to minimize the total completion time corresponding to each agent on single machine. We provide a fully polynomial time approximation scheme (FPTAS) for two agent scheduling problem, which is known to be NP-hard. An FPTAS for generating an ϵ-efficient set is presented for the case with fixed number of agents. Finally, for the case with arbitrary number of agents, we provide an approximation algorithm to guarantee the worst-case ratio.

3 - Match-up Scheduling with Manufacturing Cost Considerations

Selim Akturk, Professor, Bilkent University, Department of Industrial Engineering, Ankara, 06800, Turkey, akturk@bilkent.edu.tr, Alper Atamturk, Sinan Gurel

Many scheduling problems in practice involve rescheduling of disrupted schedules. We show that in contrast to fixed processing times, if we have the flexibility to control the processing times of the jobs, we can generate alternative reactive schedules considering the manufacturing cost implications in response to disruptions. We employ the recent advances in conic mixed-integer programming to model this time/cost tradeoff problem effectively.

4- Minimizing Cross-trained Staffing Levels in Parallel Systems with Heterogeneous Learning/Forgetting

Sungsu Kim, Pennsylvania State University, Industrial and Manufacturing Engineering, University Park PA 16802, United States of America, sungsukim2@hotmail.com, David A. Nembhard

This study investigates the effects of several exogenous and controllable factors on optimal staffing levels in parallel DRC systems in the presence of heterogeneous individual learning and forgetting throughout the fixed planning horizon. The factors we examine include worker selection policy, task heterogeneity, individual cross-training level, period length, and production requirements. We explore two cases of parallel systems of the same number of workers and tasks and more tasks.

5 - Stochastic Sequencing & Scheduling of Operating Rooms

Camilo Mancilla, PhD Student, Lehigh University, 200 West Packer Av, Bethlehem, PA, 18015, United States of America, cam306@lehigh.edu, Robert Storer

We study sequencing and scheduling problems for a single OR when surgery times are random variables. We first present a network flow based algorithm that solves the scheduling problem for a given sequence of surgeries with multiple scenarios. Next we address the sequencing problem using different heuristic methods.

■ TA23

M - Lincoln 5

Asymptotic Limit Theorems for Stochastic Networks

Sponsor: Applied Probability

Sponsored Session

Chair: Kavita Ramanan, Associate Professor, Carnegie Mellon University, Department of Mathematical Sciences, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, kramanan@math.cmu.edu

1 - Control under Model Uncertainty in the Halfin-Whitt Regime

Rami Atar, Assoc. Professor, Technion, Department of Electrical Engineering, Haifa, 32000, Israel, atar@ee.technion.ac.il, Adam Shwartz

I will present diffusion limit theorems for many-server queueing models under three forms of uncertainty: Models where parameters are random; models where information on service time distribution is given only through samples from the distribution; and models where service rates are completely unknown.

2 - Fluid Limits of Many-Servers Queues with Reneging

Weining Kang, Visiting Assistant Professor, Carnegie Mellon University, Department of Mathematical Sciences, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, weikang@andrew.cmu.edu, Kavita Ramanan

Motivated from call centers, we consider a GI/GI/N queue system with many servers. In this system, a customer in the queue will leave and give up service if his/her patience time exceeds a random time, which has a general distribution. We derive a fluid limit of the system when N, the number of servers, goes to infinity and show that the fluid limit is the unique solution to a set of dynamic equations. In describing the dynamics of the system certain measure valued processes are used.

3 - Limit Theorems for a Shortest Remaining Processing Time Queue

Amber Puha, Department of Mathematics, Cal State San Marcos, San Marcos, CA, 92096, United States of America, apuha@csusm.edu, Christian Gromoll

Consider a GI/GI/1 queue operating under shortest remaining processing time with preemption. To describe the evolution of this system, we use a measure valued process that keeps track of the residual service times of all jobs in the system at any given time. We propose measure valued fluid and diffusion models for this systems. Under mild assumptions, we present limit theorems justifying the fluid and diffusion models as approximations for the SRPT queue.

4 - Importance Sampling for Jackson Networks

Hui Wang, Associate Professor, Brown University, 182 George Street, Providence, RI, United States of America, huiwang@dam.brown.edu, Paul Dupuis

We construct simple and efficient state-dependent importance sampling for simulating buffer overflows in Jackson networks. The scheme is universal in that the sampling distributions do not depend on the particular event of interest. We also identify the minimizing trajectory for the calculus of variation problem that is associated with the sample-path large deviation rate function.

■ TA24

M - Lincoln 6

Retail Optimization in Merchandising and Marketing

Sponsor: Computing Society

Sponsored Session

Chair: Lisa Miller, Target Corp., 33 South Sixth Street, CC-2220, Minneapolis, MN, 55402, United States of America, LisaA.Miller@target.com

1 - Markdown Optimization Analytics for Retail

Tugrul Sanli, Manager, SAS Institute Inc., SAS Campus Drive, Cary, 27513, United States of America, Tugrul.Sanli@sas.com

Clearance markdowns help retailers to adapt to inventory overstocking, make way for new merchandise, and increase customer traffic. Taking markdowns too often, at the wrong time, on the wrong items or at the wrong location can be costly. SAS Markdown Optimization enables retailers to develop and implement optimal pricing strategies. Our presentation will focus on the modeling and formulation of the business problem and solution methodologies used.

2 - Marketing Budget Allocation

Randy Erdahl, Erik Miller

Today's retail marketers must allocate their advertising spend across customer segments, marketing channels, and time periods to optimize short & long term financial metrics. This solution leverages historical customer behavior with simulation & optimization techniques to create an effective marketing budget allocation tool. With a catalog retailer example, the allocation tool will recommend the allocation strategy to meet current & future year goals.

3 - Practical Methods of Leveraging Data to Increase Revenue

Bob Marklein, Manager, Procter & Gamble, 2 P&G Plaza, Cincinnati, OH, 45202, United States of America, marklein.ra@pg.com

The volume of data available to retailers about their customers continues to grow, yet the capacity of resources to optimize value from this sea of data tends to remain flat. I will talk about practical ways of leveraging data to help make investment choices to increase category, department, and total store sales while avoiding "analysis paralysis".

4 - Space Optimization at Target

Lisa Miller, Target Corp., 33 South Sixth Street, CC-2220, Minneapolis, MN, 55402, United States of America, LisaA.Miller@target.com

With over 1,500 stores of varying shapes and sizes in diverse markets, Target faces a constant challenge to put the right products in the right stores in the right quantities. Additionally, the placement of items within the stores must be done in a way that is easy for guests to shop. In this talk, I will discuss current efforts to use optimization to determine how to place products on shelves while considering product restrictions, presentation strategies, and inventory goals.

■ TA25

M - Lincoln 6A

Computational Issues in Large-scale Models of Conflict

Sponsor: Computing Society
Sponsored Session

Chair: Matthew Carlyle, Associate Professor, Naval Postgraduate School, 1411 Cunningham Rd, Glasgow 111, Monterey, CA, 93943, United States of America, mcarlyle@nps.edu

1 - Defense Against K-best Interdiction Attacks

Cole Smith, Associate Professor, ISE, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, j.cole.smith@gmail.com, Kevin Wood

While traditional defender-attacker models protect against a worst-case interdiction action, there has been very little consideration regarding defense against a profile of actions that an attacker might make. This talk regards exact multi-level optimization algorithms to quantify trade-offs in defense against a worst-case attack, versus defense against a set of k most-effective interdiction actions, where each of the k actions is assumed to be equally likely.

2 - Interdicting Smuggled Nuclear Material

David Morton, Professor, The University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, morton@mail.utexas.edu, Nedialko Dimitrov, Michael Nehme, Kevin Wood

We describe a class of stochastic network interdiction models for interdicting smuggled nuclear material. We consider multiple models of how the smuggler chooses his path, and discuss associated computational challenges.

3 - Optimizing Positions of Port Defense Radar Picket Ships- A Defender-attacker Model

Gerald Brown, Distinguished Professor, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93943, United States of America, GBrown@nps.edu, Matthew Carlyle, Kevin Wood, Jeff Kline, Abdul Ghaffar

The US Coast Guard is purchasing hundreds of small patrol boats for port defense, including protecting US Navy ships making port calls worldwide. We show how to cooperatively position a set of such patrol pickets to minimize the probability a set of speedboat attackers will avoid detection by maneuvering to evade us, given they can observe our picket positions and know our radar capablities. We show several port examples and the surprising insights offered.

■ TA26

M - Lincoln 5A

Open Source Software for Optimization and Automatic Graph Drawing

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Michael Juenger, University of Cologne, Computer Science Department, Pohligstr. 1, Koeln, D, 50969, Germany, mjuenger@informatik.uni-koeln.de

Co-Chair: Carsten Gutwenger, Dortmund University of Technology, Otto-Hahn-Str. 14, Dortmund, - 44227, Germany, carsten.gutwenger@cs.uni-dortmund.de

1 - OGDF- The Open Graph Drawing Framework

Carsten Gutwenger, Dortmund University of Technology, Otto-Hahn-Str. 14, Dortmund, - 44227, Germany, carsten.gutwenger@cs.uni-dortmund.de

Graph drawing has now grown for several decades and a huge amount of algorithms has been proposed. Many of these algorithms build upon complex data structures and further algorithms, thus making new implementations from scratch cumbersome and time-consuming. Moreover, the lack of comprehensive libraries with publicly available source-code restricted the understanding of implementations considerably. This motivated the development of OGDF, an open source C++ library for drawing graphs.

2 - Simple and Fast Implementation of Exact Optimization Algorithms with SCIL

Frank Baumann, University of Cologne, Pohligstr. 1, Cologne, D-50969, Germany, baumann@informatik.uni-koeln.de

The SCIL software package facilitates and accelerates the implementation of exact algorithms for hard optimization problems. Based on the Branch and Cut system ABACUS, it allows the specification of both linear and symbolic constraints, thereby combining the advantages of Integer Linear Programming and Constraint Programming. SCIL has been used successfully to solve problems in areas such as curve reconstruction, protein docking and range assignment in ad-hoc wireless networks, among others.

3 - Combean/Grooml- A Simple Modelling Language for the Java Platform

Thomas Schickinger, Combean project, Nehringstr. 3a, Berlin, 14059, Germany, thomasschickinger@web.de

Then Open Source project Combean is aimed at integrating OR with the Java platform and at combining mathematical programming with the wealth of tools and technologies in the Java world. In this talk we report on the modelling language Grooml for (integer) linear programming. Grooml is part of Combean and has been created based on Groovy, a dynamic scripting language for the JVM. Through Combean, Grooml has access to all COIN-OSI-compatible solvers and a couple of others.

■ TA28

M - Washington 1

Online Decision Making

Cluster: Online Decision Making
Invited Session

Chair: Tanya Levin, Assistant Professor, Queen's School of Business, 143 Union Str., Kingston, ON, K7L 3N6, Canada, TLevin@business.queensu.ca

1 - Linear Programming with Online Learning

Tanya Levin, Assistant Professor, Queen's School of Business, 143 Union Str., Kingston, ON, K7L 3N6, Canada, TLevin@business.queensu.ca, Yuri Levin, Jeff McGill, Mikhail Nediak

We propose online decision strategies for time-dependent sequences of linear programs which use no distributional and minimal geometric assumptions about the data. These strategies are obtained through Vovk's aggregating algorithm which combines recommendations from a given strategy pool. We establish an average performance bound for the resulting solution sequence.

2 - Finite Time Bounds for Stochastic Approximation Algorithms

Assaf Zeevi, Professor, Columbia Business School, New York, NY, 10027, United States of America, assaf@gsb.columbia.edu, Deniz Cicek, Mark Broadie

We consider the Kiefer-Wolfowitz stochastic approximation algorithm for sequentially estimating the point of maximum of an unknown function from noisy observations. We develop a new and simple proof that leads to general bounds on the mean squared error of the algorithm, and show that some assumptions adopted to date are superfluous. The analysis leads to "speedup" heuristics as well, improving the transient behavior of such algorithms.

3 - A Stochastic Approximation Method for the Single-leg RM Problem with Discrete Demand Distributions

Sumit Kunnumkal, Assistant Professor, Indian School of Business, AC 4, Level 1, 4116, Indian School of Business, Hyderabad, AP, 500032, India, sumit_kunnumkal@isb.edu, Huseyin Topaloglu

We consider the problem of optimally allocating seats on a single flight leg to the demands from multiple fare classes that arrive sequentially. We develop a new stochastic approximation method to compute the optimal protection levels under the assumption that the demand distributions are not known and we only have access to samples from the demand distributions. Computational experiments indicate that our method can provide significant advantages over existing methods.

■ TA29

M - Washington 2

Tutorial: Closed-loop Supply Chain Management

Cluster: Tutorials
Invited Session

Chair: Gilvan "Gil" Souza, Associate Professor, University of Maryland, Smith School of Business, College Park, MD, 20742, United States of America, gsouza@rhsmith.umd.edu

1 - Closed-loop Supply Chain Management
Gilvan "Gil" Souza, Associate Professor, University of Maryland, Smith School of Business, College Park, MD, 20742, United States of America, gsouza@rhsmith.umd.edu

Closed-loop supply chains have flows of products (post-purchase) back to manufacturers, for example, consumer returns, and leasing. I define basic terms: differences with respect to forward chains, sources of returns, disposition options, strategic, tactical, and operational issues, and regulatory issues. I provide an overview of remanufacturing practices in select industries, and review the academic literature on closed-loop supply chains, focusing on business and management aspects.

■ TA30

M - Washington 4

Raytheon Missile Defense Applications

Sponsor: Military Applications
Sponsored Session

Chair: George Mayernik, Raytheon Company, 235 Presidential Way, MS 26/2207c, Woburn, MA, 01801-1060, United States of America, George_E_Mayernik@raytheon.com

1 - Multi-sensor Data Fusion for Missile Defense
Dimitri Papageorgiou, Systems Engineer, Raytheon, 235 Presidential Way, Woburn, MA, 01801, United States of America, Dimitri_J_Papageorgiou@raytheon.com

The primary goal of multi-sensor data fusion in missile defense is to leverage the information collected by a suite of sensors to create a more complete integrated picture of objects of interest. When heterogeneous sensors with varying resolution observe different features for different subsets of the truth, this task becomes all the more challenging. We present fusion techniques to handle these issues and the consequences they have on algorithms required to solve these fusion problems.

2 - Aerial Sensor Flight Formation for Ground Target Tracking
Michael Hirsch, Principal Engineer, Raytheon, PO Box 12248, M/S 61, St. Petersburg, FL, 33733, United States of America, Michael_J_Hirsch@raytheon.com, Chris Eck, Hector Ortiz-Pena

Fusion from disparate sources, in general, produces a more complete representation than any one sensor could provide. However, some sensor geometries might provide a 'better' fused representation than others. We consider the following: Given a set of aerial sensors, each tracking the same moving ground target and sharing the kinematic information they sense, determine the flight pattern for the aerial sensors such that the resulting fused track of the ground target has minimal location error.

3 - Operations Research of Enemy Ballistic Missile Offensive Action and Adequate Defense to Counter It
Billy Bradley, Senior Systems Engineer, Raytheon Integrated Defense Systems, 235 Presidential Way, Woburn, MA, 01801, United States of America, Billy_W_Bradley@raytheon.com

The problem presented here involves one of tactical ballistic missile defense from the offensive and defensive sides. The effective number of ballistic missiles that have to be fired to hit a particular target will be investigated as well as determining the number of interceptors to adequately defend the target. Unclassified data is used and is presented along with the location of the data as well as if the data is conjectural. High explosives are used, not nuclear weapons.

4 - Improved Sensor Netting Using Radar Target Object Map
George Mayernik, Raytheon Company, 235 Presidential Way, MS 26/2207c, Woburn, MA, 01801-1060, United States of America, George_E_Mayernik@raytheon.com

Radar netting techniques developed and evaluated using Radar Target Object Map (RTOM) applied with the Tactical Component Network are described. The RTOM is presented with an illustration of the approach. Applications of RTOM are described and illustrated using track data fusion of X-Band Radars. It is shown that the use of RTOM provides a key ingredient to allow sensors to work as a unit in a coordinated manner with direct communications between them and with the fire units under C2BMC control.

■ TA31

M - Washington 5

OR, The Science of, Homeland Security

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Russell Wooten, Program Manager, Emerging Initiatives, US Department of Homeland Security, 46842 Graham Cove Square, Potomac Falls, VA, 20165-7578, United States of America, russell.wooten@dhs.gov

Co-Chair: Michael Kuhl, Associate Professor, Rochester Institute of Technology, Industrial & Systems Engineering Department, 81 Lomb Memorial Drive, Rochester, NY, 14623, United States of America, mekeie@rit.edu

1 - Optimal Aviation Security Screening Strategies with Dynamic Passenger Risk Updates
Sheldon Jacobson, Professor, University of Illinois, 201 N. Goodwin Avenue (MC258), urbana, IL, 61821, United States of America, shj@uiuc.edu, Adrian Lee, Alexander Nikoleav

Multistage Sequential Passenger Screening Problem is formulated for aviation security systems, with passenger risks initialized upon arrival and updated as passengers pass through multiple screening stages. Optimal screening policies are obtained using sequential assignment theory. Monte Carlo simulation-based heuristics are developed and compared with other algorithms for a two-stage MSPSP.

2 - Selectee Lane Queueing Design for Passenger Checkpoint Screening
Rajan Batta, Professor, Department of Industrial & Systems Engineering, University at Buffalo (SUNY), 420 Bell Hall, Buffalo, NY, 14260, United States of America, batta@eng.buffalo.edu, Xiaofeng Nie, Colin Drury, Li Lin

We propose a selectee lane queueing design model to study how to efficiently utilize the selectee lane. We consider how to assign passengers from different risk classes to the selectee lane based on how many passengers are already in the selectee lane. The objective is to maximize the checkpoint screening system's probability of true alarm. A rule-based heuristics is proposed and some computational experiments are performed.

3 - Cost versus Robustness in Layered Infrastructure Networks
Kevin Kennedy, Captain, Air Force, 5880 Gross Drive, Dayton, OH, 45431, United States of America, kevin.kennedy@afit.edu, Dick Deckro, James Moore

This presentation outlines a model for layered infrastructure networks that considers the following factors: cost versus risk in design; and system construction and operations costs versus potential "robust" systems costs in the face of disruption, either nature or man-made. This is a parameterized model (using epsilon-constraint multiobjective programming) which considers various budget levels.

■ TA32

M - Washington 6

Daniel H. Wagner Prize Competition Awards

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for the 2008 and these seven will be presented in three sessions on Monday and the winning entry announed on Tuesday morning.

■ TA33

M - Johnson

OR Applications in Healthcare Systems

Sponsor: Health Applications Section
Sponsored Session

Chair: Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu

1 - Total Body Irradiation Treatment Planning Using IMRT Optimization
Dionne Aleman, Assistant professor, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, aleman@mie.utoronto.ca, Michael Sharpe

Before bone marrow transplants, patients are treated with total body irradiation (TBI). Designing TBI treatments poses unique challenges that are not present in other forms of site-specific radiation therapy. In particular, the large distance from isocenter results in high uncertainty in the radiation dosage. We use intensity modulated radiation therapy (IMRT) with non-coplanar beam orientation optimization to deliver TBI treatments that place patients closer to isocenter, increasing accuracy.

2 - Staffing under Seasonal Variation in Demand for Neonatal Intensive Care

Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu, Sandra Sullivan, Murray Côté

Staffing for neonatal intensive care unit (NICU) is an ongoing challenge for NICU managers due to limited resources. Seasonal demand for NICU has not been fully explored in scheduling its staff. We present some of our new findings in NICU staffing problem. Our staffing models take into account seasonal demand and staff preferences on scheduling. Results show that our models can not only reduce the burden of staffing scheduling, but also improve efficiency in staff utilization.

3 - Integer Programming Strategies for Large-scale Cancer Instances

Kyungduck Cha, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, chacha2000@isye.gatech.edu, Eva Lee

In this talk, we will describe integer programming models and computational strategies including adaptive column generation for some large-scale intractable MIP instances arising from cancer treatment planning.

4 - Robust Models for Range Estimate from Noisy Biosensors

Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu, Richard Van Duyne, Olga Lyandres, Matthew Glucksberg, Joseph Walsh

Development of reliable bio-sensors hinges on the accuracy of their calibration and preredictions. For example, when comparing predictions for a set of glucose measurements based on surface-enhanced Raman spectra least-square and partial-least-square models have been used. We develop new robsut models for estimating glucose concentrations from sensor measurements with two important features: namely, generating an estimate range, and incorporating data uncertainty.

■ TA34

M - Jefferson

Joint Session HAS/Minority Issues: Mathematical and Statistical Models for Mental Health

Sponsor: Health Applications Section, Minority Issues
Sponsored Session

Chair: Julie Simmons Ivy, North Carolina State University, ISE Department, Campus Box 7906, Raleigh, NC, 27695, United States of America, jsivy@ncsu.edu

1 - Inference for Clinical Decision Making Policies

Susan Murphy, Professor of Statistics, University of Michigan, 439 West Hall, 1085 S. Univ., Department of Statistics, Ann Arbor, MI, 48109-1107, United States of America, samurphy@umich.edu, Bibhas Chakraborty, Lacey Gunter

Policies estimated from randomized clinical trials can vary greatly across training data sets and to reduce implementation costs should only include important patient variables. Thus it is crucial to provide measures of confidence concerning whether a particular patient variable is necessary. We discuss a method for providing a measure of confidence and illustrate the method with STAR*D clinical trial data.

2 - A Micro-simulation Model of U.S. Mental Health and Juvenile Justice System

Michael Foster, Professor of Maternal and Child Health of Health Policy and Administration of Biostatistics (adjunct), University of North Carolina at Chapel Hill, Rosenau Hall, Campus Box# 7445, School of Public Health,UNC-CH, Chapel Hill, NC, 27599-7445, United States of America, emfoster@unc.edu, Miao (Joyce) Jiang, Nilay Argon

Juvenile crimes have serious consequences to the individuals, families, and society as a whole. Much of the juvenile crime is drug-related and the need for drug treatment is high in juvenile justice system. This paper applies simulation tools to model the passage of young people through juvenile justice system, mental health system, and the community, and evaluates various impact for different policy scenarios of shifting resources between mental health treatment and juvenile detention.

3 - A Control Engineering Approach for the Design and Analysis of Adaptive Behavioral Interventions

Daniel E. Rivera, Associate Professor, Arizona State University, Mail Stop 876006, Department of Chemical Engineering, Tempe, AZ, 85287-6006, United States of America, daniel.rivera@asu.edu, Linda M. Collins

The talk will discuss how control engineering can be applied to optimize adaptive interventions for prevention and treatment of chronic, relapsing behavioral disorders such as substance abuse, mental illness, and obesity. Adaptive interventions are feedback systems that individualize therapy using decision rules that assign dosages and forms of treatment over time. A hypothetical example based on a real-life intervention designed to reduce conduct disorder in at-risk children will be presented.

■ TA35

M - Jackson

Internationalizing Experiences in Teaching and Learning

Sponsor: INFORM-ED
Sponsored Session

Chair: Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu

1 - A Global Supply Chain Study: A Collaborative Course Project by International Teammates

Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu, John Jackman, Cheng-Kang Chen

A global supply chain project is presented. The goal is to improve students' abilities regarding global enterprise perspectives, team functions, and leadership through collaboratively solving an ill-structured nonlinear mixed-integer programming problem. The communication and collaboration are mostly conducted through an interactive Internet platform called Problem Solving Internet Portal (PSLP).

2 - Experiences Teaching Spreadsheet Modeling & Optimization in Different Cultures

Jonathan P. Caulkins, Professor, Carnegie Mellon Heinz School, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, caulkins@andrew.cmu.edu

Is managerial spreadsheet modeling & optimization a universal skill - akin to algebra or calculus - or something best taught in a "culturally contextualized" manner and, if the latter, how so? I will reflect on but not answer this question based on experiences teaching on four continents. Audience input welcome!

3 - Lessons Learned while Organizing International Teaching Effectiveness Colloquia

James Cochran, Louisiana Tech University, PO Box 10318, College of Business, Ruston, LA, 71272, United States of America, jcochran@cab.latech.edu

Over the past 3 years INFORMS, IFORS, and EURO have worked with the Association of Latin-Iberoamerican Operational Research Societies, Operations Research Society of South Africa, and Operations Research Practice for Africa to organize joint Teaching Effectiveness Colloquia. These colloquia feature workshops on innovative O.R. education given by members of each organization. I will discuss differences, similarities, issues, etc. in O.R. education across cultures that participants have observed.

■ TA37

M - T. Marshall Ballroom West

Tutorial: City Logistics: Advanced Urban Frieght Transportation Systems

Cluster: Tutorials
Invited Session

Chair: Teodor Gabriel Crainic, Professor, Department Management & Technology, ESG, UQAM, C.P. 8888, succ. Centre-ville, Montreal, QC, H3C 3P8, Canada, theo@crt.umontreal.ca

1 - City Logistics: Advanced Urban Frieght Transportation Systems

Teodor Gabriel Crainic, Professor, Department Management & Technology, ESG, UQAM, C.P. 8888, Succ. Centre-ville, Montreal, QC, H3C 3P8, Canada, theo@crt.umontreal.ca

City Logistics aims to reduce the nuisances associated to freight transportation in urban areas while supporting their economic and social development. The main idea is to view individual stakeholders and decisions as components of an integrated logistics system to be optimized, through coordination and consolidation of decisions, loads, and movements. The tutorial presents an overview of City Logistics concepts, planning issues, and models, and identifies research avenues and challenges.

■ TA38

M - Tyler

Algorithms and Computing for Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman, OK, 73019, United States of America, yguan@ou.edu

1 - Branch-and-cut for the Robust Single-machine Scheduling
Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu, Christy Zhao, Ming Zhao

We present a family of facet-defining inequalities for the robust single-machine scheduling polyhedron, in which the processing times of the jobs are uncertain. We give computational results that demonstrate the efficiency of the inequalities when used as cuts in a branch-and-cut algorithm.

2 - Warm Starting for Mixed Integer Linear Programs
Menal Guzelsoy, Lehigh University, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, megb@lehigh.edu, Ted Ralphs

Warm starting is a technique used to start the solution procedure of a modified mixed integer linear program (MILP) from an advanced state using data generated from execution of a previous solution procedure. In this talk, we discuss warm starting procedures that can be used with branch-and-cut algorithms for MILPs and analyze techniques for obtaining effective starting points.

3 - A Study of Stochastic Dynamic Knapsack Polytope
Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman, OK, 73019, United States of America, yguan@ou.edu, Zhili Zhou, Bo Zeng

In this talk, we focus on the study of a general stochastic dynamic knapsack polytope. We first show that pairing and mixing schemes can obtain strong valid inequalities and under certain conditions, these inequalities can describe the convex hull of the polytope. Then, we provide a study on lifting schemes for this polytope. Especially, we explore sequence independent and sequence dominant lifting properties for this polytope. Computational experiments show the effectiveness of our approach.

4 - Lifted Valid Inequalities for Stochastic Dynamic Knapsack (SDKP) Sets
Bo Zeng, Postdoctoral Research Associate, Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, 47906, United States of America, bzeng@purdue.edu, Yongpei Guan

We first derive conditions under which lifting is (complete) sequence independent, build strong superadditive approximating lifting functions and describe special cases where lifted inequalities are facet-defining. We then propose a partial sequence independent lifting approach, i.e. sequential lifting from path to path and sequence independent lifting inside paths. We finally compare these two approaches and derive cutting planes from SDKP for stochastic lot-sizing problems.

■ TA39

M - Truman

Network Design

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Nikhil Bansal, IBM Research, PO Box 218, Yorktown, NY, United States of America, nikhil@us.ibm.com

1 - Degree Bounded Network Design in Directed Graphs
Viswanath Nagarajan, viswa@cmu.edu, Nikhil Bansal, Rohit Khandekar

An arborescence in a directed graph with a specified root is a minimal subgraph that contains a path from the root to each vertex. In the minimum degree arborescence problem, given a rooted directed graph, the goal is to find an arborescence that minimizes its maximum out-degree. This problem is NP-hard even in the undirected case. We give an algorithm for this problem that obtains an arborescence having degree at most 2 more than the optimal. This can be extended to more general connectivity.

2 - Group-strategyproof Mechanisms for Network Design Games
Jochen Konemann, Kunlun Tan Department of Combinatorics and Optimization University of Waterloo, Waterloo, ON, Canada, jochen@math.uwaterloo.ca

In this talk we first define a class of cost-sharing games arising from network design optimization problems. We then show how group-strategyproof (i.e., collusion resistant) mechanisms for such games can be derived from existing primal-dual algorithms for the underlying optimization problems in an automatic way.

3 - Heuristics for Fiber Installation in Optical Network Optimization
Spyridon Antonakopoulos, Columbia University, 608 W 114 St, Apt 2A, New York, NY, 10025, United States of America, spyros@cs.columbia.edu

Suppose we are given a fiber-optic network topology and a set of traffic demands, some of which may require protection against equipment failures. Our goal is to route all demands while minimizing the cost of optical components needed. In this work, we define edge cost using sub-additive functions and reason why they closely model the optical component cost. Then, we present effective shortest-path based heuristics to route demands, where the choice of edge weights drives the optimization.

4 - Additive Approximations for Bounded Degree Survivable Network Design
Mohit Singh, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15232, United States of America, mohits@andrew.cmu.edu, Lap Lau

We study the minimum cost survivable network design problem with degree constraints on vertices. We design approximation algorithms that minimize the total cost and the degree violation simultaneously. We present a polynomial time algorithm which returns a solution with cost at most twice the optimal cost and where the degree bounds are violated by a small additive constant depending on the connectivity requirement.

■ TA40

M - Taylor

Joint Session Optimization/Stochastic Programming /CS: Decomposition and Sampling Schemes for Stochastic Optimization and Game-theoretic Problems

Sponsor: Optimization/ Stochastic Programming, Computing Society
Sponsored Session

Chair: Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu

1 - Convergence of SAA Approaches for Stochastic MPCC with Expectation Constraints
John Birge, Chicago GSB, 5807 South Woodlawn Avenue Chicago, IL, United States of America, jbirge@chicagogsb.edu, Mihai Anitescu

We present a framework to ensure convergence of sample average approximation approaches for stochastic optimization problems whose constraints include expectation operators. We discuss the applicability of our results to problems with complementarity constraints. We present an example from auction energy markets to which our framework is applicable.

2 - Dynamic Competition in Electricity Markets
Talat Genc, Asst. Professor, University of Guelph, Department of Economics, Guelph, On, Canada, tgenc@uoguelph.ca

We study dynamic competition between hydro and thermal generators under demand uncertainty. Two versions of the model are analyzed: an infinite-horizon game with fixed capacity and a finite-horizon in which thermal generator can invest in capacity. We find that duopoly is nearly efficient, and duopoly prices are too smooth. We also find that investment is higher under closed-loop information than under S-adapted open-loop information.

3 - A Benders-SQP Framework for Non-linear Programming under Uncertainty
Ankur Kulkarni, PhD Student, University of Illinois at Urbana-Champaign, Urbana, United States of America, akulkar3@uiuc.edu, Uday Shanbhag

We address two-period stoch. NLP and use seq quadratic programming on such problems. The resulting QP approx. are stoch. QPs with random recourse. Existence questions are studied under such a recourse framework. The stoch. QPs are solved using two variants of Benders decomposition: (1) inexact-cut L-shaped method, (2) QP extension of a trust-region method of Linderoth and Wright. Multipliers are obtained by solving a low-dimensional QP. The algo. is tested on a set of stoch. NLP test problems.

4 - A Complementarity Framework for Forward Contracting under Uncertainty
Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Gerd Infanger, Peter W. Glynn

We consider an instance of a stochastic multi-leader multi-follower equilibrium problem. By conjecturing a relationship between forward and spot decisions, we may use complementarity theory to provide an existence result. We present a scalable algorithm for solving the resulting stochastic complementarity problem by using matrix-splitting techniques. Tests show that the effort grows linearly with the number of scenarios. The model is applied to a two-settlement 6-node electricity market.

■ TA41

M - Taft

Innovation and Technology Commercialization

Cluster: New Product Development
Invited Session

Chair: Vish Krishnan, Professor of Innovation, Technology & Operations, University of California at San Diego, Rady School of Management, Otterson Hall, Room 3S144 9500 Gilman Dr, La Jolla, CA, 92093-0553, United States of America, vkrishnan@ucsd.edu

1 - Collaboration and the Distribution of Creative Outcomes

Lee Fleming, Harvard Business School, Morgan 485, Boston, MA, 02163, United States of America, lfleming@hbs.edu

How does collaboration influence creativity and in particular, the invention of breakthroughs? Recent research has attempted to resolve this question by considering the variance of creative outcomes, yet this research has overlooked a simple examination of the overall distribution of outcomes. We demonstrate opposite effects of collaboration on each tail of the distribution: collaboration reduces the probability of poor outcomes without reducing the probability of extremely successful outcomes.

2 - R&D Intensity and the NPD Portfolio

Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu, Raul Chao

A key metric for the assessment of innovative activity and organic growth is R&D intensity (the percentage of revenue that is reinvested in R&D). This research examines the link between R&D intensity, resource allocation, and the NPD portfolio. We find that lower R&D productivity, uncertainty, and cost of sales drive higher R&D intensity. Such metrics can help managers understand whether they are under or over investing in R&D given their particular industry and NPD portfolio characteristics.

3 - Optimal Incentives for Pro-Social Innovation

Yi Xu, Assistant Professor, Robert H. Smith School of Business, University of Maryland, College Park, MD, United States of America, yxu@miami.edu, Christian Terwiesch

The adoption of a pro-social innovation or new product (e.g., fuel efficient automobile) has a positive impact on social welfare. However, both firms and consumers may not fully take this positive social impact into account in their decision making. In this paper, we study how a social planner could play an active role in promoting and stimulating such pro-social innovations through various incentive mechanisms.

4 - Global Product Line Design

Ram Bala, Indian School of Business, Gachibowli, Hyderabad, AP, India, ram_bala@isb.edu, Vish Krishnan, Wenge Zhu

We seek to understand how the practice of globally distributed product development interacts with a firm's product line design problem. While the addition of new locations offers the firm the potential of lower wages, it also introduces coordination costs. We consider the case of a firm resorting to distributed development with or without development capacity constraints. We find that "capacitated distribution" in the presence of coordination costs can make product lines conditionally optimal.

5 - Turf Wars: Brand Extensions in Markets with Preference Based Segmentation

Yogesh Joshi, Assistant Professor, University of Maryland, 3301 Van Munching Hall, College Park, MD, 20742, United States of America, yjoshi@rhsmith.umd.edu, David Reibstein, John Zhang

Firms often need to decide how narrow or broad the scope of their brand should be. Some firms choose a narrow scope and are careful to not stake a claim in the competitor's turf, whereas other firms offer a broad scope and introduce innovations that encroach on the competitor's turf. We investigate the conditions under which these strategies are optimal, when firms face distinct market segments and are able to distinguish between own and rivals' customers.

■ TA42

M - McKinley

Joint Session CS/HAS: Models and Algorithms for Computational Biology

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)
Sponsored Session

Chair: Wei Xie, Operations Research Consultant, American Airlines OR&DS Group, 4255 Amon Carter Blvd, MD 4453, PO Box 619616, Fort Worth, TX, 76155, United States of America, Wei.Xie@aa.com

1 - Identification of Optimal Measurement Sets for Complete Metabolic Flux Elucidation

YoungJung Chang, Postdoctoral Scholar, The Pennsylvania State University, 147B Fenske Laboratory, University Park, PA, 16802, United States of America, yjchang@psu.edu, Costas Maranas, Patrick Suthers

Metabolic flux analysis (MFA) estimates intracellular fluxes from isotopic measurements. In this talk, we present OptMeas optimization formulation that identifies the measurement sets that lead to unique flux elucidation while minimizing overall measurement cost. OptMeas utilizes incidence structure analysis, and considers both stationary and isotopically nonstationary MFA experimental conditions. OptMeas also accounts for partial isotopic measurements such as mass distributions.

2 - Statistics and Algorithms for Prediction of Protein Side-chain Conformations

Roland Dunbrack, Member, Fox Chase Cancer Center, 333 Cottman Avenue, Philadelphia, PA, 19111, United States of America, roland.dunbrack@fccc.edu, Maxim Shapovalov, Georgy Krivov

A new version of the backbone-dependent rotamer library for protein side chains has been developed using kernel density estimates and kernel regression to produce smoothly varying rotamer probabilities and mean dihedral angles and variances. This library has been incorporated into SCWRL4 for side-chain conformation prediction. SCWRL4 has several algorithmic improvements, including graph tree decomposition to solve the combinatorial problem of rotamer choice given an input backbone structure.

3 - Relative Expression Analysis for Cancer Diagnosis and Perturbed Network Identification

Nathan Price, Assistant Professor, University of Illinois, 600 S. Mathews Ave., 119 RAL, Box C-3, MC-712, Urbana, IL, 61801, United States of America, ndprice@uiuc.edu

Using bioinformatic analysis of transcriptomic data, we identified a highly-accurate classifier to differentiate gastrointestinal stromal tumor and leiomyosarcoma, two cancers that appear similar, but require very different treatments. We have also developed a novel method, called pathway eXpression Rank AnalYsis (p-XRAY) for utilizing multiple relative expression reversals between genes within defined gene sets that are informative for identifying perturbed networks and disease diagnosis.

4 - Functional Modules in Protein- Protein Interaction Networks Via Prize-collecting Steiner Trees

Gunnar W. Klau, CWI, Kruislaan 413, Amsterdam, 1098, Netherlands, gunnar@math.fu-berlin.de

An important topic in systems biology is the identification of functional modules in PPI networks by means of detecting jointly differentially expressed network regions. Here we present an exact integer linear programming solution for this problem, which is based on its connection to the well-known prize-collecting Steiner tree problem from Operations Research.

5 - Protein Structure Alignment via Contact Map Overlap Maximization

Wei Xie, Operations Research Consultant, American Airlines OR&DS Group, 4255 Amon Carter Blvd, MD 4453, PO Box 619616, Fort Worth, TX, 76155, United States of America, Wei.Xie@aa.com, Nick Sahinidis

Protein structure alignment is an important technique to study protein structures and functions, and contact map overlap maximization provides an accurate and reliable way to align protein structures. In this talk, we present a global optimization algorithm that incorporates branch-and-bound, domain reduction, and local search to solve this challenging biological problem.

■ TA43

M - Balcony D

OR and Strategy II

Cluster: OR and Strategy
Invited Session

Chair: Peter Bell, Professor, Management Science and Information Systems, Richard Ivey School of Business, University of Western Ontario, London, ON, N6A 3K7, Canada, PBell@ivey.uwo.ca

1 - Building a Business Based on an OR Technology

Irv Lustig, ILOG Direct Channel Director, ILOG, 25 Sylvan Way, Short Hills, NJ, 07078, United States of America, irv@ilog.com

Twenty years ago, CPLEX went from being a linear programming solver developed by Bob Bixby to the core technology behind a small business. That small business did 5.7 million dollars of sales in Fiscal Year 1997, and was sold for over 30 million dollars at the time. Now, it is the key driver behind over 40 million dollars of annual optimization license revenue for ILOG. This presentation will discuss how a business was built around an LP solver, and the challenges to make that business grow.

2 - Alternative Energy Strategy

Ray Strong, IBM, strong@almaden.ibm.com, Ruoyi Zhou, Larry Proctor

We report on a systematic exploration of trends in R&D investment in alternative electrical energy sources via information mining of patent activity. We compare coal, wind, thermal, hydro, nuclear, and solar. Patent trends suggest the wisdom of planning for significant improvements in the economic efficiency of photovoltaic electricity generation. We discuss why there might be less acceleration in patent activity for other alternative energy sources.

3 - Strategic Forecasting: An Application of Collaborative Modeling and Simulation

Brian Lewis, VP, Professional Services, Vanguard Software, 1100 Crescent Green, Cary, NC, 27518, United States of America, brian.lewis@vanguardsw.com

Strategic forecasting is a complex endeavor involving knowledge-exchange capabilities and OR methodologies. Collaborative Modeling and Simulation frees decision-makers from having to rely on the analysis of a single planner by directly involving key individuals in the modeling process itself. Presented case studies: Forecasting Manufacturing Costs to Improve Product Design; Product Portfolio Simulations for Market Forecasting; and Industry-wide Supply Chain Models for Capacity Planning.

■ TA44

M - Balcony C

Supply Disruptions and Risks

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Ehsan Elahi, Assistant Professor, University of Massachusetts - Boston, 100 Morrissey Blvd, Boston, 02125, United States of America, ehsan.elahi@umb.edu

1 - Subsidizing Risky Suppliers: A Comparison of Supply Chain Structures

Adam Wadecki, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, awadecki@umich.edu, Volodymyr Babich

Supplier financial distress affects supply risks faced by manufacturers. To alleviate such risks, manufacturers may provide suppliers with financial subsidies. We examine the optimal subsidy decisions and supply chain profits when manufacturers deal with dedicated and shared suppliers. We also examine the affects of competition among manufacturers.

2 - The Effects of Social Relationship on Supply Chain Networks Vulnerability and Risk Management

Jose Cruz, Assistant Professor, University of Connecticut, School of Business, 2100 Hillside Road Unit 1041, Storrs, CT, 06269-1041, United States of America, Jose.Cruz@business.uconn.edu

We analyze the effects of levels of social relationship on a supply chain networks. We propose a performance measure for the evaluation of supply chain vulnerability. The model investigate the interplay of the heterogeneous decision-makers in the supply chain and compute the equilibrium pattern of product transactions, prices, and levels of social relationship. The results show that high levels of relationship lead to lower overall cost, lower price and higher product transaction.

3 - Bargaining Power and Supply Base Diversification

Zhixi Wan, PhD Candidate, Stephen M. Ross School of Business, University of Michigan, 701 Tappan Street, Ann Arbor, MI, 48109, United States of America, wanzhixi@umich.edu, Damian Beil

A buyer must select a set of suppliers to maintain as a supply base. Contracts are auctioned periodically and the buyer seeks to minimize long-term expected costs. Suppliers in the same "region" have correlated costs, and the buyer can mitigate the influence of correlated costs by choosing suppliers from different regions. We characterize the buyer's optimal supply base diversification strategy and show how it depends upon her bargaining power.

4 - Optimal Incentive Contract under the Risk of Disruptions

Ehsan Elahi, Assistant Professor, University of Massachusetts - Boston, 100 Morrissey Blvd, Boston, 02125, United States of America, ehsan.elahi@umb.edu

In this research, we consider a single buyer who has the option to procure a seasonal product from one or two suppliers. The suppliers may fail to deliver the orders due to a disruption in their operations. The suppliers can increase their reliability by making costly efforts. Both the buyer and the supplier are assumed to be risk averse in the sense that they maximize the probability of meeting a target-profit. We show the optimal form of incentive contracts which maximizes the buyer's profit.

■ TA45

M - Balcony B

Global Supply Chain Design with Integrated Operational Risk Management Strategies

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Yimin Wang, Assistant Professor, Arizona State University, W.P. Carey School of Business, Department of Supply Chain Management, Tempe, AZ, 85287, United States of America, Yimin_Wang@asu.edu

1 - Sourcing Decisions in the Presence of Yield and Demand Uncertainties

Jian Li, Assistant Professor, Department of Management & Marketing, Northeastern Illinois University, 5500 N. St. Louis Ave, Chicago, IL, 60625, United States of America, jli@neiu.edu, Panos Kouvelis

In this paper, we look at the sourcing decisions at one facility facing yield and demand uncertainties over a finite discrete-time horizon from the perspective of an inventory manager. We propose and model two systems: Ante-Delivery Ensuring system (ADES) and Post-Delivery Ensuring system (PDES). For each developed model, we characterize theoretically the optimal decisions, and derive sensitivity results on how these decisions are affected by one another and the yield and demand uncertainties.

2 - A Multi-source Inventory System with Order Tracking and Expediting

Jeannette Song, Professor, Duke University, Fuqua School of Business, 1 Towerview Dr., Durham, NC, 27708, United States of America, jssong@duke.edu, Kamran Moinzadeh, Yongpin Zhou, Paul Zipkin

We consider an inventory system with multiple supply sources and expediting options. The replenishment leadtimes from each supply source are stochastic, representing congestion and disruption. We develop performance evaluation tools for a family of reasonable ordering and expediting policies that take into account real-time supply information.

3 - IPOs, Financial Hedging and Product Market Competition

Jiri Chod, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, United States of America, chodj@bc.edu, Evgeny Lyandres

Because public firms tend to be less risk averse than private firms, they tend to compete more aggressively in uncertain product markets, which in turn improves their competitive position vis-a-vis private firms. Because this benefit of being public increases with the competition intensity, our model predicts a higher proportion of public firms in more competitive markets.

4 - Multi-Market Pricing and Supply Strategy: Market Dependence and Competition

Yimin Wang, Assistant Professor, Arizona State University, W.P. Carey School of Business, Department of Supply Chain Management, Tempe, AZ, 85287, United States of America, Yimin_Wang@asu.edu

Offshoring production to lower cost countries has often been suggested to lower the domestic market price. We prove that this observation may not hold when firms sell in both domestic and foreign markets, even if the firm is not resource constrained. We fully characterize the firm's optimal multi-market supply strategy and investigate how market structure and competition influence the firm's procurement and selling decisions. In doing so, we obtain a number of managerial and policy implications.

■ TA46

M - Balcony A

Supply Chain Scheduling

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Zhi-Long Chen, University of Maryland, Robert H. Smith School of Business, College Park, MD, United States of America, ZChen@rhsmith.umd.edu

1 - Coordination in a Two-stage Production System: Complexity, Conflict and Cooperation
Manoj Vanajakumari, Prairie View A & M University, Prairie View, TX, United States of America, manojuv@gmail.com, Chelliah Sriskandarajah, Edouard Wagneur

We study conflict and cooperation issues in a two-stage production system. The first stage is to minimize the sum of the completion times of jobs, and the second stage is to minimize the number of late jobs. If required, jobs are re-sequenced to enhance the performance at a cost. We show that the coordination problem is strongly NP-Hard. Computational studies reveal the benefits of coordination, positive surplus with coordination, and significant conflict at the stages without coordination.

2 - On the Vessel Scheduling Problem with Multi-loading Capacities
Lei Lei, Rutgers University, Rutgers Business School, Newark & New Brunswick, NJ, United States of America, llei@business.rutgers.edu, Endre Boros, Selim Bora

We consider the scheduling problem of vessels with multi-loading capacities. Such a scheduling problem becomes very complicated when the fleet is heterogeneous and the shipping network is large. We present two special cases where polynomial-time solutions exist and propose a heuristic with error bound analysis for a more general case.

3 - Centralization vs. Competition in Subcontracting Operations
George Vairaktarakis, Case Western Reserve University, Weatherhead School of Managament, Department of Operations, Cleveland, OH, 44106, United States of America, gxv5@case.edu, Tolga Aydinliyim

A group of manufacturers subcontract part of their workload to a third-party, each with the objective of completing his total workload the soonest possible. We develop centralized solutions and compare them to Nash Equilibria and FCFS practices. Also, we propose incentive schemes to promote cooperation.

4 - Integrated Production and Distribution Scheduling with Committed Delivery Dates
Zhi-Long Chen, University of Maryland, Robert H. Smith School of Business, College Park, MD, United States of America, ZChen@rhsmith.umd.edu, Weiya Zhong

We consider an integrated production-distribution scheduling problem faced by a make-to-order manufacturer with a commit-to-delivery business mode. The shipping cost of an order decreases linearly with the delivery time used. The problem is to minimize the total shipping cost subject to the committed delivery dates constraints. The problem is strongly NP-hard. We propose a polynomial-time heuristic algorithm and show that its worst-case performance ratio is bound by 2 and this bound is tight.

■ TA47

M - Hoover

Radiation Therapy Treatment Planning I

Sponsor: Health Applications Section
Sponsored Session

Chair: Edwin Romeijn, Professor, University of Florida, ISE Department, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611-6595, United States of America, romeijn@ise.ufl.edu

1 - Taking Advantage of Problem Structure in Optimization of Radiation Therapy
Anders Forsgren, Royal Institute of Technology (KTH), Department of Mathematics, Stockholm, SE-100 44, Sweden, andersf@kth.se, Fredrik Carlsson

The optimization problem in IMRT may be formulated in several ways. One approach is to solve a fluence map optimization problem and then convert the solution to machine parameters of the treatment unit. Alternatively, one may solve an optimization problem in the machine parameters, either directly, by a column generation approach or by combining these two approaches. We discuss how one may take advantage of problem structure in the above approaches.

2 - Image-guided IMRT Planning for Radiation Therapy
Ronald L. Rardin, White Distinguished Professor, University of Arkansas, Industrial Engineering, Bell 4169, Fayetteville, AR, 72762, United States of America, rrardin@uark.edu, Seda Gumrukcu, Mark Langer MD

Intensity Modulated Radiation Therapy (IMRT) treatments involve daily fractions rather than one single session. Plans should be updated and modified after each fraction due to the tumor position and the shape changes, and recent developments in such "Image Guided Radiation Therapy (IGRT)" technology are showing promise. In this paper we discuss optimization models that update the plan and find the best IMRT design for both fraction and overall treatment.

3 - Controling the Dose with Convex gEUD-type Constraints in Radiotherapy Optimization Framework
Yuriy Zinchenko, AdvOL, CAS, McMaster University, 1280 Main str W, ITB 221, Hamilton, ON, L5A3Y4, Canada, zinchen@mcmaster.ca

We investigate the possibility of including the dose prescription, specified by the Dose Volume Histogram (DVH), within the convex optimization framework for inverse radiotherapy treatment planning. Specifically, we study the quality of approximating a given DVH with a superset of generalized Equivalent Uniform Dose (gEUD)-based constraints, the so-called Generalized Moment Constraints (GMC's). As a bi-product, we establish an analytic relationship between a DVH and a sequence of gEUD values.

4 - A Dynamic Approach to the Dose Optimization in Radiotherapy
Minsun Kim, Student, University of Washington, 1959 N.E. Pacific, Seattle, WA, United States of America, mk688@u.washington.edu, Archis Ghate, Mark Phillips

We propose a novel treatment planning strategy that dynamically includes patients' radiobiological responses. The dose delivery is thus optimized not only spatially as in IMRT but also temporally. Preliminary results for simplified scenarios will be presented.

■ TA48

M - Coolidge

Product Development and Technologies

Sponsor: Technology Management
Sponsored Session

Chair: Juliana Hsuan, Associate Professor, PhD, Copenhagen Business School, Solbjerg Plads 3, DK-2000 Frederiksberg, Coppenhagen, Denmark, jh.om@cbs.dk

1 - Product Architecture Modularity Measurement with Stochastic Modeling
Juliana Hsuan, Associate Professor, PhD, Copenhagen Business School, Solbjerg Plads 3, DK-2000 Frederiksberg, Coppenhagen, Denmark, jh.om@cbs.dk, Eric Bentzen

Due to the combinatorial properties of modularity, customer demand for customization is assumed to be stochastic (as opposed to deterministic). Competitive properties of product architecture modularity include the degree of novelty, interface standardization, substitutability, and degree of coupling. We explore the stochastic properties of these elements in modularity.

2 - Product Development Teaching in North America: A Status Report
Sebastian Fixson, Babson College, Tomasso Hall 226, Babson Park, MA, 02457, United States of America, sfixson@babson.edu

Over the past 15 years many universities have introduced multi-disciplinary courses in product development (PD). In this presentation, we report on the results of a survey of these courses across business, engineering, and design schools.† We discuss course features such as disciplinary course set-up, student and faculty involvement, course size, course age and evolution, and industry and practitioner participation. We identify successful course designs, practices, and techniques.

3 - Technological Coevolution: Critical Dynamics in Industry Transformation
Jeroen Struben, MIT, E53-364A, 50 Memorial Drive, Cambridge, 02142, United States of America, jjrs@mit.edu

This paper addresses a neglected question within the phenomenon of technological discontinuities: how do promising technologies succeed or fail? I examine the role of technology coevolution through a dynamic simulation model with firm capabilities, resource allocation, and market factors. Counterintuitive results include technologies' breakthrough being enabled by competition. Findings highlight the importance of consideration of environmental interactions for understanding technological change.

4 - Cross-discipline and Cross-cultural Challenges in Customer-driven Vehicle Development

R. Jean Ruth, General Motors R&D, MC 480-106-256, 30500 Mound Road, Warren, MI, 48090-9055, United States of America, rjean.ruth@gm.com

We focus here on the interplay of design, market research, and engineering in new vehicle development and the additional challenges of understanding consumers in global product development across cultures, languages, countries, infrastructures, and continents: differences in customer preference and needs, in information sources and methods, in mature markets (with a large base of customers familiar with the products) and in fast-growing developing markets of potential customers.

■ TA49

M - Harding

Advances in Simulation Output Analysis

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Roy Creasey, Assistant Professor, Longwood University, 201 High Street, Farmville, VA, 23909, United States of America, creaseyrr@longwood.edu

Co-Chair: Preston White, University of Virginia: Department of Systems and Information, Charlottesville, VA, United States of America, kpw8h@virginia.edu

1 - Automating the Analysis of Simulation Output Data

Katy Hoad, Research Fellow, ORMS Group, Warwick Business School, The University of Warwick, Coventry, CV4 7AL, United Kingdom, Kathryn.Hoad@wbs.ac.uk, Stewart Robinson

Current simulation software gives little or no guidance in making decisions regarding warm-up, run-length and number of replications. A three year project sponsored by the EPSRC and SIMUL8 has investigated the development of a methodology for automatically advising a simulation user on these three key decisions. This paper will present an overview of the work undertaken to create an automated procedure for carrying out simulation output analysis.

2 - A Dynamic Crashing Method for Project Management Using Simulation-based Optimization

Michael Kuhl, Associate Professor, Rochester Institute of Technology, Industrial & Systems Engineering Department, 81 Lomb Memorial Drive, Rochester, NY, 14623, United States of America, mekeie@rit.edu, Radhamés Tolentino-Peña

A dynamic simulation-based crashing method is introduced to evaluate project networks and determine the optimum crashing configuration that minimizes the average project cost due to lateness penalties and crashing costs. The dynamic approach determines a crashing strategy at the beginning of the project and also during the life of the project so changes to the crashing strategy may be identified and implemented. The output includes the distribution of the project completion time and total cost.

3 - Use of Customer Desired Maximum Probability for Bayesian Limit Models

Roy Creasey, Assistant Professor, Longwood University, 201 High Street, Farmville, VA, 23909, United States of America, creaseyrr@longwood.edu, Linda Wright, K Preston White, Cheryl Davis

Limit standards are probabilistic interval requirements for proportions. The focus in simulation literature is on determining the confidence interval, which is inappropriate for limit standards. Bayesian methods provide approaches that can be utilized for limit standard models. Instead of the typical methods used to establish the prior distribution, we consider a methodology developed in reliability analysis for defining a priori the maximum desired a posteriori probability of a proportion.

■ TA50

M - Wilson C

Large-Scale Stochastic Optimization I

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Guzin Bayraksan, University of Arizona, 1127 E James E. Rogers Way, Engineering Building #20, Tucson, AZ, 85721, United States of America, guzinb@sie.arizona.edu

1 - Risk and Expectation-based Models and Algorithms for Insuring Critical Paths

Siqian Shen, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, sshen@ufl.edu, Cole Smith, Shabbir Ahmed

We consider a class of two-stage stochastic optimization problems arising in the protection of vital arcs in a critical path network, where one must trade off costs in insuring arcs with expected penalties from late completion times. We analyze different risk-level cases, provide various formulations, and employ RLT to remodel the problem to be amenable to solution via Benders decomposition. We employ SAA for scenario generation and demonstrate the computational efficacy of our approach.

2 - Progressive Hedging Innovations for Stochastic Mixed-integer Programming

David Woodruff, Prof, UC Davis, Graduate School of Management, One Shields Avenue, Davis, CA, 95616, United States of America, dlWoodruff@ucdavis.edu, Jean-Paul Watson

Progressive hedging (PH) is a scenario-based decomposition technique well-suited to solving stochastic mixed-integer programs. A variety of issues arise when implementing PH in practice. We investigate these issues in the context of a large-scale, real-world stochastic mixed-integer problems. We introduce a mathematically-based heuristic for setting the algorithm parameter, methods for detecting convergence, and novel techniques for convergence acceleration.

3 - A Stochastic Programming Approach to Multiple Resource Constrained Job Scheduling under Uncertainty

Brian Keller, University of Arizona, 1127 E James E. Rogers Way, Engineering Building #20, Tucson, AZ, 85721, United States of America, kellerbd@email.arizona.edu, Guzin Bayraksan

We formulate a two-stage stochastic integer program to determine an optimal schedule for jobs requiring multiple classes of constrained resources under uncertain processing times, due dates, resource demand, and resource availability. Potential applications of this model include team scheduling problems that arise in industries such as engineering consulting. We develop a solution procedure based on decomposition and add several algorithmic enhancements to improve efficiency.

■ TA51

M - Wilson B

Emerging Topics in IS

Sponsor: Information Systems
Sponsored Session

Chair: Fidan Boylu, Assistant Professor, University of Connecticut, University of Connecticut, School of Business,One University Place, Stamford, CT, 06901, United States of America, Fidan.Boylu@business.uconn.edu

1 - Quantum Global Optimization

Liu Yipeng, PhD Candidate, University of Florida, 387 Maguire VLG # 5, Gainesville, FL, 32603, United States of America, ypliu@ufl.edu, Gary Koehler

We study the problem of finding a global optimal solution to discrete optimization problems using quantum computing methods. We improve over a successful method, BBW, by converting it from a static method to a dynamic one. To make this practical, we modify the BBW algorithm to achieve a dramatic speed-up. Experimental results show the value of this dynamic version.

2 - A Survey of Quantum Games

Julie Zhang, PhD Student, University of Florida, PO Box 117169, Gainesville, FL, 32611-715, United States of America, juheng@gmail.com, Hong Guo, Gary Koehler

This paper presents an overview and survey of a new type of game theoretic setting based on ideas emanating from quantum computing. (We provide a brief overview of quantum computing in the Appendix. Initial results suggest this view brings more flexibility and possibilities into decisions involving game theoretic considerations. Applications cover a broad spectrum of classical games as well as games in economics, finance and other areas.

3 - Information Quality and Customer Acquisition: A Risk Management Approach for Private Label Cards

Pantea Alirezazadeh, PhD Student, University of Connecticut, 205C, crawford, Storrs, CT, 06269, United States of America, Pantea.Alirezazadeh@business.uconn.edu, Fidan Boylu, Ram Gopal, Paulo Goes

In this paper we analyze risks from information deficiencies in credit application and ensuing financial implications. We first employ the use of record matching software and design optimal configuration to minimize financial costs. Next we explore the option of procuring additional information to improve accuracy of record matches. We develop models to decide conditions under which it is optimal to exercise the option of information procurement.

■ TA52

M - Wilson A

Evacuation Planning

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Elise Miller-Hooks, Associate Professor, University of Maryland, Department of Civil & Environmental Engin., 1173 Glenn Martin Hall, College Park, MD, 20742, United States of America, elisemh@umd.edu

1 - Multi-modal, Behavior-robust, Adaptive Evacuation Management

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng. and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Mark Hickman, Pitu Mirchandani

During emergencies requiring evacuation, traveler behavior may deviate significantly from model-predicted outputs. This applies in a multi-modal context, affecting both automobile route choice and the mobility needs of "carless" populations. Such uncertainty on traveler behavior underscores the need for behavior-robust, adaptive transportation management strategies during an evacuation. The implications for both evacuees and emergency operations and logistics managers are discussed.

2 - Hurricane Evacuation: Origin, Route and Destination

Vinayak Dixit, University of Central Florida, 12039 Red Ibis Lane, Apt. 1056, Orlando, Fl, 32817, United States of America, vvdixit@yahoo.com, Essam Radwan

Evacuation operations can be divided into three main levels: at the origin, routes and destination. At the Origin the demand dictates when to schedule evacuation orders, it also dictates the capacity required on different routes. On the routes it is crucial to determine locations for access to the contraflow lanes. This research also proposes a "Network Breathing Strategy" to improve operations at destinations. These breakthroughs will provide a framework for a real time Decision Support System.

3 - Modeling City Evacuations with Advance Warning

Stella So, Graduate Student, Univ. of California, Berkeley, 416D McLaughlin Hall, MC1720, University of California, Berkeley, CA, 94720, United States of America, stellaso@berkeley.edu, Carlos Daganzo

Current city evacuation plans are highly centralized and require complex coordination of multiple government agencies for implementation. In research, conventional models used today to strategize for an evacuation are often heavily dependent on behavioral assumptions, generating non-robust solutions. We propose an innovative approach to modeling a city evacuation process that can produce robust solutions. These solutions have the potential to lend insight for the development of simple, decentralized strategies for evacuation.

4 - OR Challenges in the Evacuation of the Carless

Mark Hickman, University of Arizona, Civil Engineering, PO Box 210072, Tucson, AZ, 85721-0072, United States of America, mhickman@email.arizona.edu

We consider the evacuation needs of persons without access to personal vehicles during an emergency. Specifically, we consider the use of buses or vans to evacuate these persons. To support decision-making, we introduce various vehicle routing strategies, depending on the scale and scope of the evacuation. We illustrate these strategies with some examples, but emphasize that more practical challenges remain.

■ TA53

M - Nathan Hale- Wardman Tower

Optimization Approaches in Financial Applications

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Nikita Boyko, PhD Student, University of Florida, Department of Industrial and Systems Engineering, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, nikita@ufl.edu

1 - Pricing American Options By Numerical Replication: Quadratic Programming Approach

Timofey Turko, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32608, United States of America, jk13@ufl.edu, Valeriy Ryabchenko, Stan Uryasev

Quadratic programming approach is considered for pricing American options in an incomplete market. The algorithm replicates an option by a portfolio consisting of the underlying security and a risk-free bond. To make the model robust we incorporate a set of American option specific monotonicity constraints that are theoretically justified for general price dynamics processes. We populate the model with historical sample paths of the underlying security or with Monte Carlo simulated paths.

2 - Pricing CDO Tranches: Optimization Approach

Alex Veremyev, PhD Student, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States of America, averemyev@ufl.edu, Stan Uryasev, Oleksandr Nakonechnyi

This research presents a framework for pricing Collateralized Debt Obligation tranches. It applies maximum entropy principle and its appropriate modifications for estimating default distribution implied by the market prices (spreads) of CDO tranches.

3 - Pricing American Options and Finding Optimal Exercise Boundary via Linear Programming

Nikita Boyko, PhD Student, University of Florida, Department of Industrial and Systems Engineering, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, nikita@ufl.edu, Stan Uryasev, Panos Pardalos

We suggest an optimization based approach to find both the price of an American option contract and its optimal exercise boundary. The trading universe is modeled on a discrete grid where each node is connected to a time point and a price of underlying security. Such a representation allows us reducing the problem to the computationally efficient linear program. We performed a series of numerical experiments to compare with existing methods.

4 - Information Asymmetry in Direction and Volatility: Price Process and Transaction Level Analysis

Joon-Hui Yoon, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611-6595, United States of America, jhfoever@gmail.com, Farid AitSahlia

Asymmetric information in equity and option markets is one reason why the Black-Scholes assumption of redundant options is violated. We develop a Nash-equilibrium strategy to be adopted by a market maker to successfully set bid-ask spreads of equity and option prices in order to make the informed trader refrain from taking advantage of private information and encourage the uninformed liquidity trader to trade.

5 - Minimax Portfolio Optimization for Risk Management

David Rogers, Associate Professor, University of Cincinnati, Quantitative Analysis & Operations Manag, College of Business, 531 Lindner Hall, Cincinnati, OH, 45221-0130, United States of America, David.Rogers@UC.edu, George Polak, Dennis Sweeney

Worst-case risk is considered by maximizing return subject to a risk threshold. Postoptimality/parametric analysis reveal insights for financial firms and Lagrangian relaxation quantifies Knightian uncertainty with alternative probabilities (surrogate prior). Minimax models maximize expected return for the surrogate prior providing insight regarding investors' risk. LP for firms to assist investors to hedge against losses by buying insurance is proposed. A 79-stock/10-period example is examined.

■ TA54

M - Congressional - Wardman Tower

Protecting Critical Assets and Infrastructure

Cluster: Risk Security
Invited Session

Chair: Robert Liebe, Innovative Decisions, Inc., 6 Abraham Ct, Stafford, VA, 22554, United States of America, rmliebe@innovativedecisions.com

1 - Interdependence of Critical Infrastructure Operations: Fire Response and Water Distribution

Elizabeth Bristow, Assistant Professor, U.S. Military Academy, Department Civil & Mechanical Engineering, Bldg. 752, West Point, NY, 10996, United States of America, elizabeth.bristow@usma.edu, Kelly Brumbelow

Effective fire response is crucial to cities' security, but this critical infrastructure is itself dependent on a robust water distribution system, which may depend on other critical infrastructures. Consequences of interdependence of critical infrastructures on each system's operation are not well known. This work presents a model which simulates the operation of interdependent infrastructures to predict the consequences of multi-infrastructure failures and to design mitigation strategies.

2 - Integrated Chemical, Biological, Radiological, and Nuclear Risk Assessment (iCBRNra) Methodology

Barry Ezell, IDI, barry.ezell@innovativedecisions.com, Steve Bennett

The Department of Homeland Security (DHS) developed the the Integrated Chemical, Biological, Radiological, and Nuclear Risk Assessment (iCBRNra) to fulfill the objectives of HSPD-18 Medical Countermeasures Against Weapons of Mass Destruction. iCBRNra is an extension of the Bioterrorism Risk Assessment (BTRA 2006) developed by DHS in 2005. In this presentation we introduce the iCBRNra methodology and discuss the strengths and limitations.

3 - Installation Access Control Analysis

J. Gregory Heck, Operation Research Analyst, Center for Army Analysis, US Army, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States of America, john.heck2@us.army.mil

The Office of the Provost Marshal General is required to ensure all Army installations have proper security regarding Anti-Terrorism/Force Protection. This requirement includes access control of installations. Requirements and standards must be reviewed to support reprogramming of future funding. The Center for Army Analysis assisted in identifying efficiencies, increasing effectiveness and reducing requirements for installation security.

■ TA55

M - Embassy- Wardman Tower

Queues in Random Environment

Sponsor: Telecommunications
Sponsored Session

Chair: Melike Baykal-Gursoy, Associate Professor, I&SE Department Rutgers, 96 Frelinghuysen Rd., Piscataway, NJ, 08854-8018, United States of America, gursoy@rci.rutgers.edu

1 - Brownian Queue with Markov Modulated Buffer Size

Bernardo D'Auria, Visiting Professor, Universidad Carlos III de Madrid, Avda. de la Universidad, 30, Leganes, MD, 28911, Spain, bernardo.dauria@uc3m.es, Offer Kella

We address the analysis of a finite-buffer Brownian queue when the buffer size is modulated by an independent continuous-time and finite-state Markov process. For this queue we look at in detail the case of a two-state system deriving the stationary distribution of the buffer content and successively we extend the results to more general queues.

2 - An Infinite-server Queue in a Semi-Markov Environment

Brian Fralix, EURANDOM, Den Dolech 2, Eindhoven, NB, Netherlands, fralix@eurandom.tue.nl, Ivo Adan

We consider an infinite-server queue, where customers with general service times arrive in a Poisson fashion, with an arrival and a service rate depending on a semi-Markovian environment. Our contributions include (1) providing a procedure to compute all moments of the queue length for Erlang or hyper-exponential service times, and (2) a continuity result that gives rigorous approximations of all moments of the queue-length for general service times.

3 - Decomposition Results for Queues in Random Environment

Melike Baykal-Gursoy, Associate Professor, I&SE Department Rutgers, 96 Frelinghuysen Rd., Piscataway, NJ, 08854-8018, United States of America, gursoy@rci.rutgers.edu, Zhe Duan

We study the infinite server Markovian queue with two-state Markov modulated arrival and service processes and the M/M/1/1 retrial queue. We show that the Fuhrman and Cooper type decomposition holds for the stationary occupancy distributions in both queues. We derive the explicit form of the occupancy distributions.

■ TA56

O - Blue Room

Sloan / Freight SIG 1

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Karen Smilowitz, Associate Professor, Northwestern University, 2145 Sheridan Road, TECH M233, Evanston, IL, 60201, United States of America, ksmilowitz@northwestern.edu

1 - A Novel Hybrid Vehicle Routing Approach for PCB Assembly on a Collect-and-place Machine

Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, Anupam Seth, Placid Ferreira

Effective production planning on the collect-and-place assembly machine defies standard OR approaches, resulting in unexploited automation flexibility. We model the problem as a generalized vehicle routing problem and present a constructive heuristic with a worst-case bound. An improvement integer programming based heuristic is also designed.

2 - Multiple Scenario Approach for the Dynamic Pickup and Delivery Problem with Time Windows

Maciek Nowak, Assistant Professor, Loyola University, 1 E. Pearson Ave., Chicago, IL, 60611, United States of America, mnowak4@luc.edu, Barrett Thomas

We solve the Dynamic PDP with Time Windows through a multiple scenario approach that generates numerous routing schemes at each time period. A consensus scheme is selected by a principal function that calls a deterministic PDPTW algorithm for route generation. The route generation algorithms used include both a cutting edge exact solution method and a simple local search heuristic. A comparison of these methods allows for an exploration of the value of an exact algorithm in route generation.

3 - Execution Cost Approximation for LTL Load Plans

Yang Zhang, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, United States of America, yzhang@isye.gatech.edu, Alan Erera, Martin Savelsbergh

We consider the problem of determining an approximation of the true execution cost of a load plan for an LTL carrier. We first determine freight consolidations in time and matching of trailers using an integer programming model. Next, we construct driver tours or use purchased transportation to cover all dispatches while minimizing total cost. Column generation approaches are developed for this problem.

4 - Dynamic Intermodal Operations

Karen Smilowitz, Associate Professor, Northwestern University, 2145 Sheridan Road, TECH M233, Evanston, IL, 60201, United States of America, ksmilowitz@northwestern.edu, Alan Erera, Guangming Zhang

This paper investigates models for planning urban freight drayage operations, and focuses specifically on challenges arising from the informational and operational dynamics inherent in these systems.

■ TA57

O - Blue Room Prefunction

Joint Session AAS/QSR: Service Quality Improvements in Aviation Applications

Sponsor: Aviation Applications, Quality, Statistics and Reliability
Sponsored Session

Chair: Rajesh Ganesan, Asst. Professor, George Mason University, 4400 Univ. Dr. MS 4A6, Fairfax, VA, 22030, United States of America, rganesan@gmu.edu

1 - Airline Passenger Trip Reliability for U.S. Domestic Routes

Lance Sherry, Associate Professor, George Mason University, 4400 University Drive MS4A6, Fairfax, VA, 22030, United States of America, lsherry@gmu.edu

Previous research has identified the discrepancy between flight performanceand passenger trip performance, and has developed algorithms for theestimation of passenger trip performance from publicly available data. This paper describes an analysis of passenger trip delays for 5224 routesbetween 309 air ports in the U.S. air transportation system for 2007. Analysis of passenger trip delays for routes and airports, and theimplications of these results are also discussed.

2 - Airport Taxi-out Time Prediction Using Approximate Dynamic

Poornima Balakrishna, George Mason Univ, 4400 Univ. Dr MS 4A6, Fairfax, VA, 22030, United States of America, pbalakri@gmu.edu, Rajesh Ganesan

The talk presents case studies of taxi-out time prediction at Detroit, Washington Reagan, and Tampa International airports using approximate dynamic programming (ADP). The talk focuses on the quality improvement in airport surface management systems by better departure planning that can be achieved through accurate taxi-out time predications. The talk also points out the advantages of ADP over traditional regression and queueing models.

3 - Environmental Constraints in Metroplex Design

Kostas Stefanidis, Senior Analyst, Metron Aviation, 131 Elden Street, Herndon, VA, 20170, United States of America, Stefanidis@metronaviation.com, Terry Thompson, Taryn Lewis

In Metroplexes highly interdependent complex interactions exists between the arrival and departure flows of airports in close proximity. Changes to arrival and departure operations require rigorous studies of the environmental effects on the region surrounding the airport. This paper explores the environmental (noise and emission) constraints on developing the best possible Metroplex designs.

■ TA58

O - Capital

Joint Session AAS/ RM: Airline Passenger Choice Models

Sponsor: Aviation Applications, Revenue Management & Pricing
Sponsored Session

Chair: Gregory Coldren, Coldren Choice Consulting Ltd., 106 Frederick Ave., Frederick, MD, 21701, United States of America, gregorycoldren@yahoo.com

1 - Airline Customers' Searching and Purchasing Behavior

Misuk Lee, PhD Student, Georgia Institute of Technology, School of Industrial and Systems Engr., Atlanta, GA, 30332, United States of America, mlee@gatech.edu, Laurie Garrow, David Post

Markov models are use to analyze how individuals search for information about air ticket attributes and prices using data from a website that employs a unique strategy for selling tickets at low prices to travelers with a high degree of travel flexibility. Results show search intensity is highly dependent on the relative discount level and there is a high degree of correlation observed across screens, that is customers are seen to fixate on specific attributes of the search process.

2 - Modeling the Choice of an Itinerary and Fare Product Using Booking and Seat Availability Data

Emmanuel Carrier, Massachusetts Institute of Technology, 77 Massachusetts Ave, 35-217, Cambridge, MA, 02139, United States of America, ecarrier@mit.edu

In this paper, we develop a methodology to analyze the choice of an airline itinerary and fare product based on booking data. To incorporate the impact of airline pricing and RM and reconstruct the traveler's choice set, booking data is combined with fare rules and seat availability data. In addition, characteristics of the traveler and the trip are retrieved and used to estimate a latent class choice model providing an alternative to the traditional segmentation based on trip purpose.

3 - Price Volatility in Airline Markets

Benny Mantin, Assistant Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, bmantin@uwaterloo.ca, David Gillen

Revenue management is used by all airlines as well as in car rentals, theatres and hotels. The systems update prices as time progresses to match realized demand to expected demand, termed the booking curve. Purchase behaviour may differ based on how stable and predictable prices are. Airlines may have the incentive to introduce price volatility as a means to affect demand. We examine two volatility measures, and investigate what factors explain more or less volatility.

4 - A Discrete Choice Approach to Measuring Travel Website's Screen Quality and Predicting Market Share

Hai Jiang, Travelocity.com, 3150 Sabre Dr, A2-616, Southlake TX 76092, United States of America, hai.jiang@sabre.com

Presenting desirable flights to customers is essential to an air travel website's success. We use discrete choice models to measure "screen quality", ie, the overall desirability of flights displayed on a screen. We first generate a screen quality metric called "selection probability" by comparing the host website to a reference website. We then introduce website-specific constants to capture unobserved effects. Experiments show that our approach generates accurate predictions.

■ TA59

O - Embassy Room

Dynamic Pricing, Discount Management in Service Industry

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

1 - On the Strategic Effects of Requiring Minimum Purchases to Trigger Commissions

Guillermo Gallego, Professor and Chairman, Columbia University, 326 Mudd Bldg, New York, NY, 10026, United States of America, ggallego@ieor.columbia.edu, Masoud Talebian

Consider a game between two suppliers with fixed capacity and a broker facing consumer demand. With fixed commission margins, providers have incentives to impose minimum purchase quantities. If providers also compete with commission margins the NE results in lower profits for the smaller provider and larger profits for the broker.

2 - Pricing and Discounting Against Real-world Competition

Dave Decker, Revenue Manager, Extra Space Storage (NYSE:EXR), Salt Lake City, UT, 84121, United States of America, DDecker@extraspace.com

In competitive markets, there are no ideal market conditions. When building models to optimize/forecast demand by pricing/discounting there are many moving parts that, by necessity to achieve a working model, generally assumed out of the equation. We have found several interesting variables and tests that have shown us accurate and achievable discounting/pricing modes. We will be discussing findings in promotion sensitivity, competitive data gathering, and customer segmentation opportunities.

3 - A Model of Dynamic Pricing with Strategic Customers and an Information Provider

Song (Alex) Yang, PhD Student, The University of Chicago Graduate School of Business, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States of America, syang1@chicagogsb.edu, John Birge

Dynamic pricing problems with strategic customer behavior have drawn increasing attentions from academia, among which many focus on equilibrium results in the dynamic game between the seller and customers with symmetric information. However, in reality, asymmetric information is a more valid assumption. In this talk, we propose a dynamic pricing problem assuming customers have limited information from an information provider. Both theoretical and numerical results will be shown.

4 - Revenue Management with Little Price Elasticity, Competition, and Unknow Demand

Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

We present revenue management experiences in selected industries. In these industries, we can neither estimate the demand curve nor use price as a direct leverage to create demand. The desired revenue management model should be a combination of an adaptive pricing and discounting management policy; the mechanism to avoid a price war; and the way to collect the competitor's information. We present our solutions to these problems.

■ TA60

O - Hampton Room

Locomotive Optimization: The State of the Art

Sponsor: Railway Applications
Sponsored Session

Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Locomotive Planning and Real-time Assignment Models at CSX Transportation

Ravindra Ahuja, President, Innovative Scheduling, Inc., GTEC, 2153 SE Hawthorne Road,, Suite, Gainesville, FL, 32611, United States of America, ahuja@ufl.edu

We have been partnering with CSX Transportation to develop several locomotive-related models. These models include: Locomotive Planning Optimizer (which determines an optimal locomotive plan), Locomotive Simulation Optimizer (which simulates the locomotive movement across the railroad network), and Real-Time Locomotive Shop Router (which sends locomotives to shops for quarterly maintenances). This presentation will give an overview of these models and their computational results.

2 - Motivations, Uses, and Benefits of Locomotive Models at CSX Transportation

Andy John, AVP - Locomotive Planning & Utilization, CSX Transportation, 3019 Warrington Street, Jacksonville, FL, 32254, United States of America, Andy_John@csx.com, Kamalesh Somani

CSX Transportation is partnering with Innovative Scheduling to develop and implement several locomotive models and implementing them. In this presentation, we will describe the motivation for developing these models, how we developed them, how we are using them, and what are the benefits derived from the use of these models. We will also share with the audience the lessons learnt in this process.

3 - Locomotive Optimization for Norfolk Southern Using Approximate Dynamic Programming

Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu, Belgacem Bouzaiene-Ayari

We describe a locomotive optimization model which allows Norfolk Southern to perform a wide range of strategic planning exercises. The system uses approximate dynamic programming, which allows us to capture operations at a very high level of detail. It combines the power and flexibility of Cplex to make good decisions at a point in time, while using ADP to optimize over time. The model closely matches actual operations, and can be used for strategic, tactical and real-time planning.

4 - Locomotive Fleet Planning System at Norfolk Southern

Clark Cheng, Sr. Manager Operations Research, Norfolk Southern Railway, 1200 Peachtree St. NE, MS 12-117, Atlanta, GA, 30309, United States of America, clark.cheng@nscorp.com, Ricardo Fiorillo, Junxia Chang, Sourav Das, Belgacem Bouzaiene-Ayari, Warren Powell

In order to meet the forecasted demand, Norfolk Southern needs to identify the optimal locomotive fleet size. On one hand, locomotive shortage can result in train delays and lost business. On the other hand, locomotives are very expensive assets. NS and Princeton University jointly developed a locomotive fleet sizing model. The model has been integrated into the existing NS planning framework and provides an effective tool to identify locomotive requirements for various service levels.

■ TA61

O - Calvert Room

Sensor Location Modeling for ITS Applications

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu

1 - Quantifying Marginal Values of Historical and Real-time Traffic Information

Tao Xing, University of Utah, Civil Engineering Department, Salt Lake City, UT, 84112, United States of America, tao.xing@utah.edu, Xuesong Zhou

A challenging question in traveler information services is how to quantify the value of information from different data sources such as fixed detectors, AVI readers and mobile GPS probes. Focusing on transportation sensor network design problems, this talk presents an information-theoretic model to systematically capture the marginal values of historical data and real-time traffic measurements in different applications such as travel time estimation and incident detection.

2 - Optimal Placement of Fixed-location Sensors for Traffic Reconstruction

Ryan Herring, ryanherring@gmail.com, Xuegang (Jeff) Ban, Alexandre Bayen, JD Margulici

In this paper, we examine optimal strategies for placing fixed-location sensors in order to estimate the current state of traffic. We present several possible objectives and prove that the problem can be solved via a simple dynamic programming algorithm for those objectives. We also examine the scenario where only some of the vehicles in the system are sensed by the sensors being placed. We establish a relationship between the penetration rate and the information quality obtained.

3 - An Integer Programming Model for Sensor Location Optimization on Freeway Corridors

Henry Liu, University of Minnesota, 500 Pillsbury Dr., Minneapolis, MN, 55455, United States of America, henryliu@umn.edu, Adam Danczyk

We present an integer programming formulation and its solution algorithm for optimally locating aggregated-point sensors on freeway corridors for performance monitoring purposes, given budgetary constraints. The solution to the integer programming model is mathematically equivalent to solve a cost-constrained shortest path problem. This model can serve as a planning tool for sensor installments on corridors with or without existing sensor configurations.

4 - A Dynamic Programming Model for Optimal Sensor Placement for Providing Travel Times

Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu, Alexandre Bayen, Ryan Herring, JD Margulici

We present a dynamic programming model to determine the optimal sensor locations for providing freeway travel times. The model is tested using both microsimulation data and GPS-equipped cellular phone data for real-world transportation corridors.

■ TA62

O - Governor's Boardroom

Joint Session RM/INFORM-ED: Teaching Revenue Management (based on ITE special issue)

Sponsor: Revenue Management & Pricing (Sponsored/Invited), INFORM-ED
Sponsored Session

Chair: Ioana Popescu, Chaired Professor of Revenue Management, INSEAD, Blvd de Constance, Fontainebleau, 77305, France, ioana.popescu@insead.edu

1 - A MDP Based Optimal Price Markdown Tool

Martin Puterman, Professor, Sauder School of Business UBC, 2053 Main Mall #470, Vancouver, BC, V6T 1Z2, Canada, Martin.Puterman@sauder.ubc.ca

While driving to our monthly poker game, my buddy, Frank, (owner of Current Fashions) noted, "Last year was awful, we marked down prices too late and our competitors really socked it to us!" Frank's situation is not unique; retailers globally face this challenge. To help Frank, I developed an interactive Excel tool for use in teaching both MDPs and revenue management. Using it the student can investigate sensitivity of the optimal markdown strategy to inputs and compare it to other strategies.

2 - Wait-or-buy Game

Anton Ovchinnnikov, Darden School of Business, 100 Darden Blvd, Charlottesville, VA, 22903, United States of America, aovchinnikov@darden.virginia.edu

The wait-or-buy game introduces strategic consumer behavior in the dynamic pricing and revenue management context. It puts students into a role of consumers who decide whether to wait for a possible discount or to buy early at full price but guarantee the product. We discuss the game design from student's and instructor's perspectives and comment on its use in business school curriculum. We then present our experiences with the game and provide the analysis of the typical players' strategies.

3 - Teaching Unconstraining of Demand Data

Mark Ferguson, Associate Professor, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, Mark.Ferguson@mgt.gatech.edu, Carrie Queenan

Accurate unconstraining of demand data is essential to the success of a revenue management system. We demonstrate the dangers of ignoring unconstraining and present a simple unconstraining method that can be easily used as a classroom exercise.

4 - Revenue Management Implementation Challenges: Case of Swagatam Hotel in Kolkata, India

Goutam Dutta, Professor, IIM Ahmedabad, W-3, IIM Campus, Vastrapur, Ahmedabad, GU, 380015, India, goutam@iimahd.ernet.in, Shilpy Singh, Aditya Challa

Any organization that wants to implement a RM system must have 2-3 years data. In case data is not available, RM cannot be implemented. This is the basic message that is discussed in this case. Students learn how to use concepts of booking curve. For a two session course, we demonstrate formulation of Hotel RM as Stochastic Linear Programming Problem.

■ TA63

O - Congressional B

Transportation and Climate Change

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, nagurney@gbfin.umass.edu

1 - A Bilevel Programming Approach to Sustainable Urban Transportation

S. Ilker Birbil, Professor, Faculty of Engineering and Natural Sciences, Sabanci University, Istanbul, Turkey, sibirbil@sabanciuniv.edu, Ahmet Esat Hizir, Orhan Feyzioglu

Urban transportation produces an enormous loss of time, unhealthy environments for inhabitants and contributes substantially to climate change. To demonstrate a possible application of mathematical programming within sustainable transportation, we present several bilevel optimization models that aim at reduction of the gas emissions through toll pricing and capacity enhancement. We conduct a thorough computational study with the proposed models on a testing network and interpret the results.

2 - Managing Transportation Infrastructure Transition in a Dynamic Commodity Flow Model

Kieran Donaghy, Professor, Cornell University, Department of City & Regional Planning, Cornell University, Ithaca, NY, 14853, United States of America, kpd23@cornell.edu

The U.S. DOT projects exponential growth in freight shipments resulting from globalization. It also identifies a need to replace aging transportation infrastructure and expand capacity for goods movement, while reducing environmental impacts of transport-related activities. This paper introduces a network model for determining the timing and location of investments in infrastructure systems to manage the impacts of evolving goods movement and promote sustainable regional economic development.

3 - Environmental Impact Assessment of Transportation Networks with Degradable Links

Qiang Qiang, Doctoral Student, University of Massachusetts Amherst, Isenberg School of Management, Amherst, 01003, United States of America, qqiang@som.umass.edu, Anna Nagurney

We propose environmental impact assessment indices to evaluate the environmental effects of link capacity degradation in transportation networks. The indices are applicable in the case of either U-O or S-O behavior. We also construct environmental link importance indicators that allow for the ranking of links in transportation networks in terms of their environmental importance, should they be removed/destroyed. Numerical examples illustrate the proposed quantitative environmental indicators.

4 - Environmental and Cost Synergy in Supply Chain Network Integration

Trisha Woolley, Doctoral Student, UMass Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01003, United States of America, twoolley@som.umass.edu, Anna Nagurney

We quantify, from a supply chain network perspective, the environmental effects resulting when integration occurs. We develop a multicriteria decision-making supply chain network framework that captures the economic activities of manufacturing, storage, and distribution pre and post the integration. The models yield the system optima associated with the minimization of the total costs and the total emissions under firm-specific weights. Numerical examples are also presented.

■ TA64

O - Congressional A

Pricing and Network Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Javier Faulin, Public University of Navarre, Campus Arrosadia s/n, Los Magnolios Building, 1st floor, Pamplona, 31006, Spain, javier.faulin@unavarra.es

1 - Value of Traveler Information for Adaptive Routing in Stochastic Time-dependent Networks

Song Gao, Assistant Professor, University of Massachusetts Amherst, 214C Marston Hall, 130 Natural Resources Road, Amherst, MA, 01002, United States of America, songgao@ecs.umass.edu, He Huang

Real-time information plays an important role in travelers' routing choices in an uncertain network by enabling online adaptation to revealed traffic conditions. The quality of the information affects its effectiveness. In this work, we introduce information time lag, and simulate the situation that VMS is employed. We design an exact algorithm for the optimal routing policy problem with respect to each of them. We conduct computational tests to analyze the value of traveler information.

2 - Auction Mechanisms for Pricing Transportation Networks

Lauren Gardner, Graduate Student, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, lmgardner@mail.utexas.edu, Avinash Unnikrishnan, Travis Waller

The involvement of private investors in roadway development has increased significantly in recent years with the growing popularity of Build-Operate-Transfer (BOT) projects. In cases where multiple private investors compete to manage a set of public roads, auctions may serve as an efficient method to determine ownership of each road. This work will examine characteristics of the auctioning process such that network system performance is optimized.

3 - Public-private Partnerships for Transportation Infrastructure Development

Javier Faulin, Public University of Navarre, Campus Arrosadia s/n, Los Magnolios Building, 1st floor, Pamplona, 31006, Spain, javier.faulin@unavarra.es, Scott Grasman, Angel Juan, Fernando Lera

PPPs allow for greater private sector participation in the delivery of transportation projects and tap private sector technical, management and financial expertise in order to improve performance related to cost and schedule certainty, innovative technology applications, specialized expertise or access to private capital. This presentation provides an understanding of the applicable policies used to meet the goals of both the public and private sectors in advancing transportation projects.

■ TA65

M - Virginia A

Joint Session Workforce/APS: Control of Queueing Systems with Flexible Servers

Cluster: Workforce Flexibility/Management, Applied Probability
Invited Session

Chair: Nilay Argon, Assistant Professor, University of North Carolina, Department of Statistics and Operations Res., Smith Building CB#3260, Chapel Hill, NC, 27599, United States of America, nilay@unc.edu

1 - Load Balancing in Parallel Systems with Highly Variable Service Times

Mark Lewis, Associate Professor, School of Operations Research and Information Engineering, Cornell University, 226 Rhode Hall, Ithaca, NY, 14850, United States of America, mark.lewis@cornell.edu, David Kaufman, Luz Caudillo-Fuentes

We consider two parallel queues with customers that arrive to each according to Poisson processes. After each arrival or service, a decision-maker can decide to re-balance the system by moving customers between queues. The issue is that the service times are highly variable or follow a heavy-tailed distribution. Heuristics based on a Markov decision process formulation are developed.

2 - A c\mu Rule for Parallel Servers with Nested Preferences

Michael Veatch, Gordon College, 255 Grapevine Rd, Wenham, MA, 01984, United States of America, mike.veatch@gordon.edu

We establish a c\mu-rule for systems with parallel servers, memoryless service times, linear holding costs and certain c\mu orderings. Multiple job classes arrive and wait in separate queues. Heterogeneous servers each can serve a subset of the classes at different rates. Stochastic coupling sample path arguments are used.

3 - Dynamic Control of a Flexible Server in an Assembly System with Setups

Nilay Argon, Assistant Professor, University of North Carolina, Department of Statistics and Operations Res., Smith Building CB#3260, Chapel Hill, NC, 27599, United States of America, nilay@unc.edu, Yi-Chun Tsai

We study an assembly system with a single flexible server, multiple feeder stations, and an instantaneous assembly operation. Our objective is to minimize the long-run average holding and setup costs by dynamically controlling the server. We provide partial characterizations of the optimal policy and numerical results on the performance of heuristic policies that we developed.

4 - Flexible Servers in Tandem Lines with Setups

Eser Kirkizlar, Assistant Professor, SUNY-Binghamton, School of Management (AA 272), PO Box 6000, Binghamton, NY, 13902, United States of America, eser@binghamton.edu, Sigrun Andradottir, Hayriye Ayhan

We study the dynamic assignment of flexible servers to stations in the presence of setup costs that are incurred when servers move between stations. The goal is to maximize the long-run average profit in a tandem system with two stations, infinite supply of jobs in front of the first station, infinite storage space after the second station, and a finite buffer between the stations. We investigate how the optimal server assignment policy depends on the magnitude of the setup costs.

■ TA66

O - Cabinet Room

Spreadsheet Risks, Errors & Compliance I

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com

1 - Impact of Errors in Operational Spreadsheets

Stephen Powell, Tuck School of Business, Dartmouth College, Hanover, NH, United States of America, Stephen.G.Powell@tuck.dartmouth.edu, Kenneth Baker

We estimated the quantitative impacts of errors in 25 operational spreadsheets from five different organizations. Within these 25 spreadsheets we identified 381 potential errors, of which 117 (31%) were confirmed as errors by the developers of the spreadsheet. Among these confirmed errors, 47 (40%) had no quantitative impact on the results. Among the remaining 70 confirmed errors, the largest error was $100 million; however, 9 of the 25 spreadsheets tested had no errors at all.

2 - Error-resistant Spreadsheet Design

David Cawlfield, Principal Engineering, Olin Corporation, 1186 Lower River Rd, Charleston, TN, 37310-0248, United States of America, DWCawlfield@olin.com

Spreadsheet application development can benefit from the principle of reusable components, just as object-oriented programming has done in the development of procedural languages. The author has pioneered the development and use of re-useable spreadsheet modules in technical and business applications at Olin Corporation. Methods used to separate input from analysis will be discussed which use little or no VBA code. Examples will demonstrate how these features greatly enhance re-useability.

3 - Overcoming Spreadsheet Risk in Supply Chain Modeling

Larry J. LeBlanc, Professor, Owen Graduate School of Management, Vanderbilt University, 401 21st Avenue South, Nashville, Tn, 37203, United States of America, Larry.LeBlanc@Owen.Vanderbilt.edu, Michael Galbreth

Spreadsheet optimization modeling plays an important role in the management of today's sophisticated supply chains. However, it is inherent that spreadsheet risk occurs, defined as the chance of adverse operational or financial consequences due to errors in a spreadsheet. These risks arise because the intrinsic complexity of optimization models is beyond the expertise of many non-technical managers. We show how to manage the substantial risks associated with the use of spreadsheets for optimization.

4 - Verifying Spreadsheets by Rewriting into Analytica

Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com, Surya Swamy

As researchers develop more thorough auditing methods for spreadsheets, they find correspondingly higher error rates. What fraction of errors remain undetected? We find that rewriting spreadsheets into Analytica reveals many otherwise undetected errors. This approach gives rigorous verification of spreadsheets for high-stakes applications.

■ TA67

O - Forum Room

Facility Location Models I

Sponsor: Location Analysis
Sponsored Session

Chair: Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu

1 - Effective Allocation of Proposals to Reviewers; a Branch-and-price Approach

Ozgur Ozpeynirci, Asst. Professor, Dr., Izmir University of Economics, Sakarya Cad. No:156, Balcova, Izmir, 35330, Turkey, ozgur.ozpeynirci@ieu.edu.tr, A. Yavuz Oruç, Nüket Yetip

One of the key problems for funding agencies is to determine the proposals that are worth funding. In a recent evaluation approach, ordinal ranking of the proposals is used with a set covering IP model. In this study, we develop two new mathematical models and propose a branch and price algorithm for this problem. We conduct a computational experiment to compare the performance of three models on a set of randomly generated instances.

2 - Models for Reallocation of Hospital Capacity and Ambulances for Efficient Disaster Mitigation

Jomon Aliyas Paul, Assistant Professor, Kennesaw State University, Coles College of Business, 1000 Chastain Road, Kennesaw, GA, 30144, United States of America, jpaul17@kennesaw.edu, Arun Jotshi, Kedar Sambhoos

Optimal allocation of hospital capacities and ambulances has profound impact on disaster mitigation and hence a problem of considerable importance. Congestion on roads is a function of disaster type and is a major deterrent for ambulance routing. We model congestion using stochastic simulation, which along with casualty clusters are used to reallocate hospital capacities via an optimization model. This is used for ambulance scheduling and routing. Results are demonstrated via case-studies.

3 - Reducing Workload Differences for Ambulances with Alpha Reliable Coverage

Hari Rajagopalan, Assistant Professor, Francis Marion University, School of Business, PO Box 10, Florence, SC, 29501, United States of America, hrajagop@fmarion.edu, Frances Vergara, Cem Saydam

Emergency administrators face task of locating a limited number of ambulances to yield the best service to a population. To maintain coverage when demand fluctuates, EMS operators are practicing dynamic redeployment strategies by relocating the fleet during the day. The more busy an ambulance is the greater the chance of crew fatigue and increasing attrition. We formulate a probabilistic model to minimize the workload differences within the fleet while maintaining coverage requirements.

■ TA68

O - Senate Room

Probability Models for Marketing Applications

Sponsor: Marketing Science
Sponsored Session

Chair: Michael Braun, Assistant Professor of Markting, MIT Sloan School of Management, 1 Amherst St., E40-169, Cambridge, MA, 02142, United States of America, braunm@mit.edu

1 - Online User Ratings: When and How Consumers Post and the Effect it Has on Sales

Wendy Moe, Associate Professor of Marketing, University of Maryland, 3469 Van Munching Hall, College Park, MD, 20742, United States of America, wmoe@rhsmith.umd.edu

Online user ratings and reviews is the number one e-commerce functionality desired by consumers (Forrester 2008). Therefore, it is not surprising that marketers are investing in this technology or that researchers are studying the effects of ratings on sales. While existing research has shown a relationship between ratings and sales, several issues remain unaddressed. The objective of this paper is to model both product sales and posted ratings as two separate but related processes.

2 - A Multiple Services Lifetime Value Model

Howard Dover, Salisbury University, 1101 Camden Ave, Salisbury, MD, 21801, United States of America, hfdover@salisbury.edu, Ram Rao, B.P.S. Murthi

We address the challenge of computing lifetime value in the presence of multiple interdependent streams of profit. We propose a multi-state, semi-Markovian model to capture the dependency between contractual product spells. The advantages of this model specification versus other methods, like correlated models, are explored using data from an online content provider. The MSCLV model allows firms with more than one contractual relationship to predict the customer lifetime value.

3 - A Multivariate Diffusion Model for Social Groups

Blake McShane, Doctoral Student, University of Pennsylvania, Wharton School, 3730 Walnut St., Philadelphia, PA, 19104, United States of America, mcshaneb@wharton.upenn.edu, Jonah Berger, Eric Bradlow

How does the type of people who own a particular product influence others' likelihood of purchase? How do these effects vary across products? We have acquired data on over 26m cars sold in the US over the past ten years. We model the relevant (potentially latent) social groups as well as whether the adoption of a given model by one social group can be explained by previous adoption by another. We also incorporate spatial effects in our model to address the local effects of social contagion.

4 - Scalable Latent Space Models for Social Networking Data Using Dirichlet Processes

Michael Braun, Assistant Professor of Markting, MIT Sloan School of Management, 1 Amherst St., E40-169, Cambridge, MA, 02142, United States of America, braunm@mit.edu, Andre Bonfrer

Two of the challenges in working with dyadic social networking data are dealing with scalability (a dataset of N customers involves evaluating N-choose-2 likelihoods) and unobserved heterogeneity. We address both issues by "locating"

each person on a latent social space, and modeling the distribution of locations as a mixture of Dirichlet processes. We demonstrate the efficiency and utility of this model using call record data from more than 10,000 mobile phone users.

Tuesday, 11:00am - 12:30pm

■ TB01

M - Marriott Ballroom 3

Online Word of Mouth

Sponsor: eBusiness
Sponsored Session

Chair: Xinxin Li, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, xli@business.uconn.edu

1 - The Effect of Online Reviews on Consumer Search and Purchase Behavior
Dina Mayzlin, Yale University, dina.mayzlin@yale.edu, Wendy Moe

While previous literature has analyzed the impact of reviews on sales, little is known about the effect of reviews on search. Here we analyze how an online retailer's introduction of a review tool affects the search as well as purchase behavior of its customers. We also show that a product's reviews have positive externalities on the page views and sales of similar products.

2 - Needs-centric Searching and Recommendations Based on Customer Reviews
Thomas Lee, Assistant Professor, Wharton School, University of Pennsylvania, 573 JMHH, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, thomas.lee@wharton.upenn.edu

In this paper, we integrate traditional information retrieval relevance ranking with database aggregation to model the knowledge within online product reviews and product descriptions. Customers search the knowledgebase of reviews by querying on specific needs or interests. The result is a customized ranking of products, a recommendation list, that is based upon and explained by the text of reviews written by prior users expressing similar needs or interests.

3 - Price Effects in Online Product Reviews: An Analytical Model and Empirical Analysis
Xinxin Li, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, xli@business.uconn.edu, Lorin Hitt

Consumer reviews may reflect not only perceived quality but also the difference between price and quality (perceived value). In markets where product prices change frequently, these price-influenced reviews may be biased as a signal of product quality when referred by consumers without possessing knowledge of historical prices. In this paper, we examine the price effects in consumer reviews for different formats of review systems using actual market prices and online consumer ratings data.

■ TB02

M - Marriott Ballroom 2

Doing Good with OR: Energy/ Environment

Cluster: Doing Good with Good OR
Invited Session

Chairs: James Sweeney and John Weyant, Department of Management Science and Engineering, Stanford University

1- Doing Good with OR: Energy/ Environment
Moderators: James Sweeney and John Weyant, Department of Management Science and Engineering, Stanford University. Panelists: Brian McLean, Howard K. Gruenspecht, Jae Edmonds, Richard Richels

This special series on "Doing Good with Good OR" is aimed at demonstrating how operations research can (and does) provide important insights that can be used to inform and shape public policy. We focus on three daunting societal challenges: energy and the environment; public health; and air congestion. Each focus area will feature a plenary presentation by a leader in the field, followed by a panel discussion involving key stakeholders from government and industry together with academic experts. This session is the panel discussion on energy and the environment.

■ TB03

M - Marriott Ballroom 1

Dantzig Memorial II

Cluster: Dantzig Memorial
Invited Session

Chair: Saul Gass, Professor Emeritus, University of Maryland, 8809 Maxwell Drive, Potomac, MD, 20854, United States of America, sgass@rhsmith.umd.edu

1 - George Dantzig at RAND, Berkeley, and Stanford
Richard Cottle, Department of Management Science and Engineering, Stanford University, Stanford, CA, 94305-4026, United States of America, rwc@stanford.edu

This talk will touch on highlights of the last 53 years of George Dantzig's professional life: his eight years as a research mathematician at the RAND Corporation, his six years at the University of California, Berkeley, his thirty years on active duty at Stanford University, and his nine productive years in retirement. The accent here will be on the continuity and scope of Dantzig's major research initiatives.

2 - Projection, Lifting and the Two Representations of Polyhedra
Egon Balas, Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, eb17@andrew.cmu.edu

This talk will convey some thoughts about the relationship between projection on the one hand and various lifting techniques on the other, prompted by leafing through George Dantzig's last book.

3 - George B. Dantzig's Influence on My Research
Arthur Veinott, Jr., Professor, Department of Management Science and Engineering, Stanford Universitry, Stanford, CA, 94305, United States of America, veinott@stanford.edu

This talk will discuss George B. Dantzig's influence on several areas of my research. The areas include Leontief substitution systems, least d-majorized network flows, dynamic programming and supply chains. I will illustrate how my work benefited from his genius, generosity and warmth as a friend and colleague at Stanford for 40 years.

■ TB04

M - Delaware B

The Airline Industry: Convergence, Consolidation, Competition

Cluster: Public Policy: Operations Research in the Public Sector: Change We Can Believe In!
Invited Session

Chair: Peter Belobaba, MIT International Center for Air Transportation, 77 Mass. Ave., Cambridge, MA, 02139, belobaba@mit.edu

1 - Cost and Productivity Convergence Among US Airlines
Peter Belobaba, MIT International Center for Air Transportation, 77 Mass. Ave., Cambridge, MA, 02139, belobaba@mit.edu

Our analysis of US airline data indicates significant cost convergence between the Network Legacy Carriers (NLCs) and Low Cost Carriers (LCCs), in terms of labor unit costs in particular. While NLCs have improved cost efficiency through labor cost reductions and longer stage length flying, LCC labor unit costs continue to increase as these airlines mature.

2 - A Competitive Analysis of an Industry in Transition
Patrick Murphy, Gerchick-Murphy Associates, 1134 29th Street N.W, Washington, DC, 20007, pmurphy@gerchickmurphy.com

We have updated our work documenting the state of domestic airline competition in the U.S. We have found that the industry changed dramatically beginning in 2000. Low Cost Carriers have emerged as the drivers of growth and pricing. Network carriers have lost their previous ability to segment high-end demand and are focusing on international markets. These trends are continuing.

3 - Airline Mergers and Air Transportation System Congestion
Michael Ball, University of Maryland, Robert H. Smith School of Business, College Park, MD, 20742, United States of America, MBall@rhsmith.umd.edu

We consider the impact of consolidation within the US airline industry on air transportation system congestion. Specifically, we argue that 1) market forces are pushing US carriers toward national footprints and that 2) mergers will tend to reduce redundant services in certain market and thus tend to reduce congestion.

4 - Are US Airlines Being Relegated to a Supporting Role in the Global Market?

Bill Swelbar, MIT International Center for Air Transportation, 77 Mass. Ave., Cambridge, MA, 02139, swelbar@mit.edu

As US network carriers shift some of their focus away from the US domestic market and increase capacity to international markets, we assess their competitive position vis-à-vis non-US competition. Can US flag carriers be competitive internationally without a meaningful US domestic presence? Can the US carriers afford the necessary investments in their product to be competitive?

■ TB05

M - Virginia B

Some Applications of Nonlinear Optimization

Sponsor: Optimization/ Nonlinear Optimization
Sponsored Session

Chair: Genetha Gray, Sandia National Labs, PO Box 969, MS 9159, Livermore, CA, 94550, United States of America, gagray@sandia.gov

1 - Derivative-free Optimization for Hydrological Applications

Genetha Gray, Sandia National Labs, PO Box 969, MS 9159, Livermore, CA, 94550, United States of America, gagray@sandia.gov

Tackling water resources management problems routinely requires the pairing of subsurface simulators and optimization algorithms. Unfortunately, the problem formulations introduce a number of obstacles to obtaining reasonable solutions. To overcome these, suitable derivative-free optimization methods can be combined to take advantage of the beneficial elements of multiple methods. We will demonstrate a hybrid approach on a set of groundwater test problems.

2 - Using Surrogates for Expensive Black-box Type Optimization Problems

Thomas Hemker, Technische Universität Darmstadt, Hochschulstr. 10, Darmstadt, HE, Germany, hemker@sim.tu-darmstadt.de

Optimization problems with underlying expensive black-box evaluations are arising in various applications, e.g. when results from computational expensive simulations, or even laboratory experiments are needed to evaluate the objective function and the constraints. We will discuss how surrogates can be used for the arising problems, even when beside of the resulting noisy function output and the absense of gradients furthermore integer-valued variables are included beside of continuous ones.

3 - A Model for Heart Rate Regulation during Postural Change

April Alston, PhD Student, North Carolina State University, Campus Box 8205, Raleigh, NC, 27695-8205, United States of America, avalston@unity.ncsu.edu

Orthostatic stress tests, such as postural change from sit-to-stand, are common noninvasive procedures used to study short-term regulation of the cardio-respiratory system. In this talk, we present a mathematical model with 17 parameters that can predict the dynamics of heart rate regulation in response to orthostatic stress. To estimate the 17 unknown parameters, an inverse least squares problem was formulated and solved using the Nelder-Mead nonlinear optimization technique.

■ TB06

M - Virginia C

Buyer-Determined Procurement Auctions: Theory and Experiments

Cluster: Auctions
Invited Session

Chair: Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu

1 - Procurement Auctions with an Incumbent and Partially Qualified Entrant

Zhixi Wan, PhD Candidate, Stephen M. Ross School of Business, University of Michigan, 701 Tappan Street, Ann Arbor, MI, 48109, United States of America, wanzhixi@umich.edu, Damian Beil, Elena Katok

A buyer wishes to pit an incumbent supplier against a possibly unqualified entrant in an open-descending auction. We find that the incumbent strategically drops out early to forestall a bidding war, depending on his cost, degree of risk aversion, and the entrant's qualification probability. We show it is optimal for the buyer to prevent this by attempting to qualify the entrant before the auction only when the qualification cost is small and the entrant's qualification probability is moderate.

2 - The Effect of Variance Reduction and Risk Aversion on Bidding in Auctions

Elena Katok, Associate Professor, Penn State University, 465 Business Building, University Park, PA, 16802, United States of America, ekatok@psu.edu, Tim Salmon

Bidding above th risk-neutral Nash equilibrium has long been attributed to risk aversion. We present two experiments. One showing that consistent with risk aversion, variance reduction increases certainty equivalence of lotteries. The other showing overbidding in sealed-bid first price auctions is not affected by variance reduction.

3 - Repeat Procurement Auctions with Bidder Defection

Christopher Held, PhD Student, Georgia Institute of Technology, College of Management, 800 West Peachtree St NW, Atlanta, GA, 30332, United States of America, Christopher.Held@mgt.gatech.edu, Atalay Atasu, Mark Ferguson

We explore the impact of entrant bidder defection on the outcome of repeat procurement auctions. We develop a model that includes bidding pool defection and analyze the characteristics of policies that perform well in the presence of defection. We simulate traditional policies and compare their performance in the presence of bidding pool defection to a policy developed specifically for defection. We show that when defection is present, existing policies perform poorly.

■ TB07

M - Maryland A

Stochastic Inventory Systems I

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Saif Benjaafar, Professor, University of Minnesota, Industrial & Systems Engineering Divisio, Minneapolis, MN, 55455, United States of America, saif@umn.edu

1 - Strategic Safety Stocks in Supply Chains with Evolving Forecasts

Stephen Graves, Professor, Sloan School of Management, Massachusetts Institute of Technology, 77 Mass Ave, E53-347, Cambridge, MA, 02139, United States of America, sgraves@mit.edu, Tor Schoenmeyr

We examine safety stock placement in a supply chain with an evolving forecast of demand. We show that safety stock placement for such systems is equivalent to the corresponding well-studied problem for supply chains with stationary demand and base stock policies. We can thus use existing algorithms to find the optimal safety stocks. We use a case study with real data to demonstrate the significant benefits from the inclusion of the forecast process when determining the optimal safety stocks.

2 - Efficient Optimization of Assemble-to-order Systems with Period Order Batching

Ton de Kok, TU Eindhoven, PO Box 513, Paviljoen E4, Eindhoven, 5600 MB, Netherlands, A.G.d.Kok@tm.tue.nl

In this presentation we consider an Assemble-To-Order (ATO) system under periodic review base stock policies. Review periods for different components may differ due to setup costs. We assume a so-called ideal product structure, implying that long lead time components are more common than short lead time components. We derive an expression for the long-run average costs consisting of holding and penalty costs and derive optimality equations through marginal analysis.

3 - A Customer-item Decomposition Approach to Stochastic Inventory Systems with Correlation

Saif Benjaafar, Professor, University of Minnesota, Industrial & Systems Engineering Divisio, Minneapolis, MN, 55455, United States of America, saif@umn.edu, Yimin Yu

We consider a general class of periodic review stochastic inventory problems with demand and leadtime correlation. We use a customer-item decomposition approach to characterize the structure of the optimal policy and construct efficient solution algorithms. We show how the analysis can be extended to systems with multiple stages, advance demand information, and batch ordering, among others.

4 - Lost Sales and Emergency Orders under Stuttering Poisson Demand

Jie Chen, PhD Student, School of Operations Research and Information Engineering,, Rhodes 257, Cornell University, ithaca, United States of America, jc562@cornell.edu, John Muckstadt, Peter Jackson

We investigate the (S-1,S) inventory policy under stuttering Poisson demand when the excess demand is lost or is routed to an emergency order fulfillment system. We show a correction to results presented in Feeney and Sherbrooke's paper in 1966. We show that the distribution of ordered unit delivery times becomes more concentrated as the variance-to-mean ratio of demand increases and we derive approximations for the mean and variance of the number of units in emergency resupply.

■ TB08

M - Maryland B

Portfolio and Risk Management Methods in an Operations Context

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Amit Bhandari, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States of America, amit.bhandari@gmail.com

1 - Profitability, Inventory Volatility, and Capital Structure
John Birge, Chicago GSB, 5807 South Woodlawn Avenue Chicago, IL, United States of America, jbirge@chicagogsb.edu

Traditional theories of capital structure imply a consistent relationship between firm profitability and firm leverage. Empirical data, however, suggest that the relationship is not monotonic. In the cross-section of firms, we describe how non-profitable firms become significantly more leveraged as losses decrease; profitable firms become significantly less leveraged as profits increase until a point where the most profitable firms have again significantly greater leverage as profits increase.

2 - Optimal Crop Planting Schedules and Financial Hedging Strategies
Farid AitSahlia, University of Florida, Weil Hall 303, Gainesville, FL, United States of America, farid@ise.ufl.edu, Chung-Jui Wang, Victor Cabrera, Clyde Fraisse, Stan Uryasev

We investigate the impact of ENSO-based climate forecasts on optimal planting schedules and financial yield-hedging strategies in a CVaR framework. In our context, insurance and futures contracts are available to hedge against yield and price risks, respectively. In a study based on actual data, we derive efficient frontiers for each of the three ENSO phases (Neutral, La Niña, El Niño) and highlight the contrast between their related hedging strategies.

3 - Explicit Optimal Base-Stock Levels with Stochastic Demand and Purchasing Cost
Victor Martinez de Albeniz, Assistant Professor, IESE Business School, Av. Pearson 21, Barcelona, 08034, Spain, valbeniz@iese.edu, Peter Berling

Managing inventory when buying from organized spot markets is a problem faced by many firms. We consider a model where the purchase price is assumed to follow (i) a geometric Brownian motion or (ii) a mean-reverting process. Using the single-unit decomposition approach, we present a simple procedure to compute in closed-form the optimal base-stock levels, which depend on the current price, its expected evolution and its volatility.

4 - Forward and Spot Prices under Cournot Competition and Stochastic Demand
Dana Popescu, Department of Information, Operations and Management Science, Leonard Stern School of Business, New York University, New York, NY, United States of America, dpopescu@stern.nyu.edu, Sridhar Seshadri

We establish the existence of a forward market under Cournot competition and stochastic demand. We compute equilibrium forward and spot prices. We show that the size of the forward market significantly depends on the uncertainty in demand. Our results explain the occasional disappearance of spot market for highly volatile goods.

■ TB09

M - Maryland C

Quality, Statistics and Reliability in Nano-Manufacturing: Research Advances, Perspectives and Issues

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu

1 - Design and Process Control Issues in Nanomanufacturing
Babatunde Ogunnaike, University of Delaware, ogunnaike@udel.edu

This presentation will raise awareness of some key process issues involved in answering the following primary question: in manufacturing products designed for specific end-use applications (e.g. polymer nano-composites); or in the production of self-assembled nanomaterials with desirable structural characteristics (particle size, shape, density, and spatial self-organization); what strategy is required for achieving effective design and control of product properties and for assuring acceptable end-use product performance?

2 - Nanomanufacturing Research at Oklahoma State University
Ranga Komanduri, Regent's Professor and A.H. Nelson, Jr., Chair, Oklahoma State University, School of Mechanical and Aerospace Eng., Stillwater, OK, 74078, United States of America, ranga.komanduri@okstate.edu

A brief overview of the previous NSF workshops on nanomanufacturing, followed by the speakers experiencces in the synthesis of aligned and patterned carbon nanotubes will be presented.

3 - Mechatronics and Metrology for Nanomanufacturing
Jingyan Dong, Assistant Professor, Industrial and Systems Engineering, North Carolina State University, 414-C Daniels Hall, Campus Box 7906, Raleigh, NC, 27695, United States of America, jdong@ncsu.edu, Placid Ferreira

Progresses in nanotechnologies impose critical requirements of high accurate, high repeatable nanomanfacturing systems. As novel process designs involve large-scale integrations of nano, micro and macro structures, the ability to position, manipulate and sense across multidimensional scales becomes extremely important. Technologies including nanopositioning, control, sensing and calibration are key factors to bridging the gap between emerging nanotechnologies and their manufacturing potential.

4 - Mechatronics and Metrology to Improve Quality and Reliability in Nanomanufacturing
Jingyan Dong, Assistant Professor, Industrial and Systems Engineering, North Carolina State University, 414-C Daniels Hall, Campus Box 7906, Raleigh, NC, 27695, United States of America, jdong@ncsu.edu, Placid Ferreira

Progresses in nanoscale sciences and technologies impose critical requirements of high accurate and high repeatable nanomanfacturing systems. As novel product and process designs involve the large-scale integration of nano, micro and macro structures, the ability to position, manipulate and sense across multiple dimensional scales becomes extremely important. Technologies including nano positioning, advanced control, sensing and calibration are key factors to bridging the gap between emerging nano technologies and their manufacturing potential.

■ TB10

M - Room 8206

Current Practices and Optimization Research for Integrating Electricity Markets: Energy and Transmission Issues II

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Marcelino Madrigal, Senior Energy Specialist, The World Bank, 1818 H St NW, Washington, DC, 20433, United States of America, marcelino_madrigal@yahoo.ca

1 - Recent Advancements in the Use of MIP in ISOs
Richard O'Neill, Federal Energy Regulatory Commission, 888 First St NE, Washington, DC, 20426, United States of America, Richard.ONeill@ferc.gov

Unit commitment is a core function of all electricity systems. The associated economic dispatch is a critical element of organized electricity markets. A bid-based-security-constrained-economic-dispatch including unit commitment is an optimization problem with an additional condition that some of the variables must take binary values, a mixed-integer program (MIP). This integer requirement presents issues of computational difficulty, economic interpretation and pricing. The MIP has been long been recognized as a powerful modeling paradigm for electricity markets, but historically hard to solve. Over the last decade, in addition to increased performance for computer hardware, the performance of solution algorithms has improved dramatically. Explicit unit commitment through a full MIP is now being used in some ISOs real-time day-ahead markets and other forward markets. It is being tested or scheduled for introduction in other ISOs. We present the early benefits of obtaining better solutions, how to improve bid functions, for example, for combined cycle plants and forbidden zones. We also present new market designs such as those that allow transmission switching and the implications for energy and reserve pricing.

2 - Experiences with Market Clearing Optimization for Competitive Electrictiy Markets
David Sun, AREVA T&D, 10865 Willows Rd, Redmond, WA, 98052, United States of America, david.sun@areva-td.com

Mathematical optimization provides a formal framework that enables systematic and transparent decision process which is essential for successful operation of competitive electricity markets. Practical experiences with the development and operation of optimization-based market clearing applications, as typical business process activitity time-lines and data flows, and in terms of mathematical formulation, solution performance, and software products.

3 - Cross-border Energy and Transmission Dispatch in Central America Electricity Market

Ricardo Rios, AREVA T&D, United States of America, ricardo.rios-zalapa@areva-td.com

An hourly day-ahead energy and transmission dispatch is currently in operation for the international electricity trade in the six Central American Markets, the optimization mechanism allows market participants to submit energy only bids and offers as well as requests for point to point transmission services. The mechanisms will be compared to models used in the USA.

4 - Border Flow Rights and Contracts for Differences of Differences: Transmission Property Rights

Ross Baldick, Professor, The University of Texas at Austin, 1 University Station, C0803, Austin, TX, 78712, United States of America, Ross.Baldick@engr.utexas.edu

A property rights model for electric transmission is proposed. The rights, called "border flow rights," support financial hedging of transmission risk and merchant transmission expansion through associated financial rights, "contracts for differences of differences." These financial rights allow for forward trading of both energy and transmission by a unified exchange. We consider incentive properties of such a right in the absence of lumpiness, economies of scale, and market power.

■ TB11

M - Room 8209

Climate Change II: Energy Models - Applications and Future Decision-making Needs

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Erin Baker, University of Massachusetts, Amherst, 220 ELab, Amherst, MA, United States of America, edbaker@ecs.umass.edu

1 - Integrated Assessment Models: Aligning the Research for the Decision-maker's Needs

Robert Vallario, Program Manager, Climate Change Integrated Assessment Research Program, U.S. Department of Energy, Office of Science, 1000 Independence Ave., S.W., Washington, DC, 20832, United States of America, bob.vallario@science.doe.gov

Integrated Assessment Models (IAMs) have long been the front line, science-based tools for exploring the interactions and combined influences of human and natural systems in decades-to-century climate change. They are strongly rooted in energy models. With greater national interest in understanding the potential consequences of climate change, and with other decision-maker's needs in mind, DOE's Integrated Assessment Research Program is realigning its research portfolio.

2 - DOE and Congressional Perspectives on Energy Models and Decision-making

Uday Varadarajan, AAAS Science & Technology Policy Fellow, Department of Energy / House Appropriations Committee Staff, Room 2362-B, Rayburn House Office Building, Washington, DC, 20515, United States of America, Uday.Varadarajan@gmail.com

The current role of energy models in corporate decision-making at DOE is reviewed, and some personal lessons learned during the development of the FY 2009 DOE budget are discussed. These are compared and contrasted with the needs of the Congressional appropriations process, and some recommendations are made regarding effective utilization of models in the two different decision-making environments.

3 - Cost Effectiveness of Proposed U.S. Climate Change Legislation

Allen Fawcett, Senior Economist, U.S. EPA, 1200 Pennsylvania Ave. NW, Mail Code 6207J, Washington, DC, 20460, United States of America, fawcett.allen@epa.gov

The US EPA has analyzed several of the leading climate change proposals in the 110th U.S. Congress, including the Lieberman-McCain, "Climate Stewardship and Innovation Act"; the Bingaman-Specter, "Low Carbon Economy Act"; and the "Lieberman-Warner Climate Security Act." The analyses use two CGE models (ADAGE and IGEM), and focus various economic and emissions impacts. This paper draws out some of the key insights from the individual analyses, and important comparisons of the three bills.

■ TB12

M - Room 8212

Data Mining for Class Imbalance Problems

Sponsor: Data Mining
Sponsored Session

Chair: Seoung Bum Kim, Assistant Professor, University of Texas at Arlington, 500 W. First Street, Arlington, TX, 76019, United States of America, sbkim@uta.edu

1 - A One-class Classification Approach for Multivariate Statistical Process Control

Thuntee Sukchotrat, PhD Candidate, University of Texas at Arlington, The University of Texas at Arlington, PO Box 19017, Arlington, TX, 76019, United States of America, tsukchotrat@uta.edu, Seoung Bum Kim

The problems of one-class classification (OCC) have received attentions from various fields. We propose a OCC approach to improve phase I and phase II analysis in multivariate statistical process control (SPC). We introduced the chart statistic that represents the degree of being an outlier from the OCC result. The control limit is established using the user-specified level of significance on a quantile basis. This is an attempt to bring the advantages of OCC techniques to solve SPC problems.

2 - Classification Methods for Highly Imbalanced Class Sizes in Warranty Data

Eunshin Byon, Texas A&M University, United States of America, esbyun@tamu.edu, Yu Ding, Abhishek Shrivatsava

This talk will analyze a set of warranty data encountered in quality control practice. The main challenge for data-mining operations is the small number of faulty units in a lot, implying a highly skewed distribution of the response variable. We propose a statistical procedure to handle this class-imbalance data-mining problem and apply it to a real dataset from a cell phone manufacturer. Our method performs significantly better than some well known off-the-shelf data-mining methods.

3 - Novelty Detection Based on Distance and Topological Relation

Sungzoon Cho, Professor, Seoul National University, Seoul, Korea, Republic of, zoon@snu.ac.kr, Pilsung Kang

A distance-based novelty detector classifies a new data pattern as novel if its distance to normal patterns is larger than a threshold. It is intuitive, is easy to understand and implement, and fits naturally with incremental leaning. Yet, its performance is limited since it relies on distance only. In this talk, we propose a new distance measure that takes topological relation into consideration. A preliminary experiment is promising.

■ TB13

M - Room 8216

Joint Session DM/QSR/CS: Data Driven Methods of Risk Prediction and Mitigation

Sponsor: Data Mining, Quality, Statistics and Reliability, and Computing Society
Sponsored Session

Chair: Artur Dubrawski, Auton Lab, Carnegie Mellon University, 5000 Forbes Avenue, NSH 3121, Pittsburgh, PA, 15213, United States of America, awd@cs.cmu.edu

1 - Predictive Analytics for a Safer Food Supply

Lynda Kelley, Senior Advisor for Food Defense, Office of Food Defense and Emergency Response, FSIS, USDA, Russell Research Center, 950 College Station Road, Athens, GA, 30604, United States of America, Lynda.Kelley@fsis.usda.gov, Artur Dubrawski, Lujie Chen, Paula J. Fedorka-Cray, Adrienne Dunham, Mark Huckabee, Beth McGlinchey

Science based risk analysis improves the USDA Food Safety Inspection Service's ability to combat threats to public health from food-borne illness by allowing the Agency to focus resources on hazards that pose the greatest risk. Innovative algorithms enable detection and containment of threat by analysis of multiple streams of microbiological and sub-typing data, as well as data representing other risk factors such as inspection noncompliance, establishment sizes, and types of produced food.

2 - Radiation Measurement and Contextual Data Fusion for Nuclear Analysis

Simon Labov, Lawrence Livermore National Laboratory, PO Box 808, L-181, Livermore, CA, 94550, United States of America, slabov@llnl.gov, Saswati Ray, Doug Speck, Karl Nelson, Michael Pivovaroff, Artur Dubrawski, Kelley Herndon Ford

One of the most critical challenges in national security is the detection of a nuclear or radiological weapon in the midst of common radioactive materials. We are developing a unique approach that combines inputs from multiple radiation

sensors with contextual information (e.g., location, manifest information, etc.). We use physics-based techniques to reduce the measurements and contextual information into a series of feature vectors, and machine learning algorithms to classify the incident.

3 - Anomalous Group Detection

Kaustav Das, Carnegie Mellon University, 5000 Forbes Av, Pittsburgh, PA, 15213, United States of America, kaustav@cs.cmu.edu, Jeff Schneider, Daniel Neill

We propose a new method for detecting groups of anomalies. Our approach is a generalization of the spatial scan statistic. We extend this framework to non-spatial data sets with discrete valued attributes by modeling the relationship between the attributes using a Bayesian Network. We show that this algorithm is able to accurately detect anomalous groups in real-world hospital, container shipping and network connections data.

4 - Predictive Analytics in Support of Operational Risk Management

Artur Dubrawski, Auton Lab, Carnegie Mellon University, 5000 Forbes Avenue, NSH 3121, Pittsburgh, PA, 15213, United States of America, awd@cs.cmu.edu, Laurel Moyer, Bradley Mowry, Sharon Hamilton, Joe Smith, Timothy Stewart, Michael Baysek, John Ostlund, Michael Knight, Norman Sondheimer, Kirsten Palmer

The key objective of operational risk management is to maintain required levels of availability of systems. Predictive analytics can help achieving that by enabling early detection and identification of emerging as well as previously known patterns in operations data, which may lead to unplanned downtimes or expediting. We illustrate the utility of selected data driven predictive analytics methods with real world examples taken from the area of maintenance and logistics of a fleet of aircraft.

■ TB14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - AIMMS (Paragon) - Enhancing Your Modeling Experience by Using AIMMS

Peter Nieuwesteeg, Senior AIMMS specialist, AIMMS (Paragon Decision Technology), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, Peter.Nieuwesteeg@aimms.com, Ming Fang

The construction of an optimization model is an enjoyable activity; unless the created model produces incorrect results or is too slow. At that time the debugging and analysis start, including the frustration of not having the right tools. Sound familiar? In this demo we show the tools in AIMMS that will help you to complete your model without all the frustration. We start by creating a basic model to give you an overview of the AIMMS capabilities. Followed by a demonstration of some of the diagnostic tools in AIMMS such as the profiler, the debugger and the math program inspector. Join us to learn how to enhance you modeling experience with new and advanced techniques.

2 - Ziena Optimization, Inc. - KNITRO® 5.2 in Action: Practical Examples, New Matlab® Interface

Jorge Nocedal, Ziena Optimization, Inc., 1801 No. Maple Ave., Evanston, IL, 60201, nocedal@ziena.com

The power of KNITRO is demonstrated on various challenging applications arising in financial engineering, power networks and computational economics. The new MATLABÆ interface to KNITRO will be demonstrated.

■ TB15

M - Room 8219

Research in Services

Sponsor: Service Science
Sponsored Session

Chair: Bill Stumbo, Member Research Staff, Xerox Corporation, 800 Phillips Road, MS 128-30E, Webster, NY, 14450, United States of America, William.Stumbo@xerox.com

1 - Time Series Search and Retrieval for Printer Diagnosis and Repair

John Handley, Member of Research Staff, Xerox Corporation, 800 Phillips Road, MS 128 27E, Webster, NY, 14580, United States of America, john.handley@xerox.com, Sankar Virdhagriswaran

Many printers are connected to the Internet and send time-dependent data comprising sensor values and usage statistics to a data warehouse. When diagnosing faults within a machine, service engineers find it valuable to plot a time series of a particular variable and search a database for machines with similar behavior. We present a system for search and retrieval that uses global similarity based on dynamic time warping and local similarity based on a modified Smith-Waterman metric.

2 - Competitive Pricing in Service Systems Market

Wooseong Kang, Assistant Professor, North Carolina State University, College of Management, CB# 7229, Raleigh, NC, 27695, United States of America, wkang@ncsu.edu

The purpose of this study is to examine how firms in a service systems market can maximize profits by coordinating their decisions on multiple service offerings. The service offerings are typically a combination of physical products, professional service components, and after-sale maintenance/upgrade services. We provide a framework and an analytic model to investigate both initial installation and on-going maintenance pricing decisions in a competitive environment.

3 - Quality-adjusted Price Comparison Across Internet Retailers

Sangkil Moon, Assistant Professor, North Carolina State University, College of Management, Raleigh, NC, 27695-7229, United States of America, smoon2@ncsu.edu, Wagner Kamakura

We use a stochastic frontier model to compare retailers in their ability to offer the best deals to consumers considering product assortment quality. Empirically, we compare the price efficiencies of three major online travel agents and demonstrate that interactions between the agent's information presentation mode and the consumer's search strategy have a strong impact on the relative price efficiency.

4 - Efficient Flow-Shop Scheduling for Large Print Shops with Heavy-Tail Job Size Distributions

Rong Zhou, Member Research Staff, Palo Alto Research Center, 3333 Coyote Hill Road, Palo Alto, CA, 94304, United States of America, Rong.Zhou@parc.com, Sudhendu Rail

In this talk, we focus on the flexible flow-shop scheduling problem that arises in large print shops. Special attention is given to heavy-tail job size distributions and sequence-dependent setup costs that can be found in many print-shop environments. We describe a number of computationally efficient approaches to improving the productivity of large print shops while keeping the number of late jobs low.

■ TB16

M - Room 8222

Information Sharing in Services

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu

Co-Chair: Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

1 - Impact of Delaying Waiting Time Announcements

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Achal Bassamboo

In recent times, most service system provide some form of delay related information to the customers. Further, this information may be revealed to the customers at various epochs. In this paper, we model a service system where the system manager announces the congestion in the system to the customers at various points in the time including but not necessarily at the arrival epoch.

2 - Call Centers with Delay Announcement

Zeynep Aksin, Koc University, Rumeli Feneri Yolu, Sariyer, Istanbul, 34450, Turkey, zaksin@ku.edu.tr, Oualid Jouini, Fikri Karaesmen, Yves Dallery

We consider call center models with impatient customers and study how informing customers about their anticipated delays affects performance. We propose and analyze different types of delay announcements. We then present some comparisons using call center data.

3 - Purchase of Information in a System with Parallel Queues

Ricky Roet-Green, Tel Aviv University, Israel, 1855 Saint Francis st., Apt.1113, Reston, VA, 20190, United States of America, rgricky@gmail.com, Refael Hassin

Consider a customer who randomly selects one of two servers and inspects its queue length. The customer can now choose between two options: join this queue, or buy information about the length of the other queue and then join the shorter line. The model has a unique symmetric Nash equilibrium strategy, and it is characterized by cascades. These cascades reflect a behavior in which the actions of other customers serve as signals for the present customer.

■ TB17

M - Room 8226

Prognostics and Maintenance Management I

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Nagi Gabraeel, Assistant Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, nagi@isye.gatech.edu

1 - On Optimality and Equivalency of Test Plans

Elsayed Elsayed, Professor, Department of Industrial Engineering, Rutgers University, 96 Frelinghuysen Road, New Brunswick, NJ, 08854, United States of America, elsayed@rci.rutgers.edu, Yada Zhu, Michael Koskulics, Chen Li

The accuracy of reliability predictions depends on the design of optimum test plans. Since there is a wide range of reliability testing plans with different types of stresses and stress application methods it becomes important to explore the optimality of test plans as well as their equivalency. This paper addresses both optimality and equivalency of test plans under different conditions.

2 - Handling Risks of Failures for a Production Line

Lin Li, Post-doctoral Research Fellow, S.M. Wu Manufacturing Research Center, University of Michigan, Mechanical Engin, 2250 G.G. Brown Bldg, 2350 Hayward St., Ann Arbor, MI, 48109, United States of America, lilz@umich.edu, Saumil Ambani, Jun Ni

In the present scenario of cost cutting and efficient operations,the tradeoff between risks and maximizing profits is often not well addressed. A production line exhibits several modes of failures, which cause a risk to the operations. Companies may wish to avoid, reduce or transfer risks to stay within this risk capacity. In this paper, various approaches of handling risks of failures are analyzed while trying to maximize profit under the constraints of risk capacity and maintenance resources.

3 - Joint Condition Based Maintenance and Spare Part Inventory Control for a Single Manufacturing System

Haitao Liao, Assistant Professor, Department of Nuclear Engineering/Department of Industrial and Information Engineering, University of Tennessee, 211 Pasqua Engineering Building, Knoxville, TN, 37996, United States of America, hliao4@utk.edu, Mitchell Rausch

The problem of integrating condition based maintenance and spare parts inventory control for a single manufacturing system is studied. Based on the underlying degradation process, a preliminary stockout probability optimization model is formulated to initialize the number of spare parts. Condition based maintenance and spare parts management are then tied together into an overall production decision model to generate an optimal static preventive maintenance policy.

4 - Rognostics-based Identification of the Top-k Units in a Fleet

Nagi Gabraeel, Assistant Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, nagi@isye.gatech.edu

This talk presents a novel approach that identifies the top-k (the k most reliable) units in a fleet using sensor-based prognostic information. The proposed Prognostics-Based Ranking Algorithm (PBR-Algorithm) combines prognostics-based stochastic degradation models with state-of-the-art computer science based database ranking algorithms.

■ TB18

M - Room 8228

Risk Management in Services

Sponsor: Service Science
Sponsored Session

Chair: Ruoyi Zhou, IBM Research, 650 Harry Road, San Jose, 95120, United States of America, ruoyi@us.ibm.com

1 - Contingency Estimation from Risk Factor Analysis

Ray Strong, IBM, strong@almaden.ibm.com, Tuija Luoma, Sekou Remy, Ruoyi Zhou, Jaakko Paasi

A standard pricing process for a service offering includes an estimation of cost of delivery and contingency costs, together with an analysis of market constraints on price and business model constraints on profit margin. The basic relationship is price = cost + contingency + profit. We describe an adaptive approach to contingency estimation based on the evaluation of an open-ended, hierarchical organization of risk factors.

2 - Service Operations Classification for Risk Management

Jonathan Hosking, IBM Research Division, IBM T.J. Watson Research Center, PO Box 218, Yorktown Heights, NY, 10598, United States of America, hosking@watson.ibm.com, Farhad Shafti, Tim Bedford, Nicoleta Serban, Haipeng Shen, Lesley Walls, Lea Deleris

We describe a study in the classification of services to gain insights into operational risk management. For each of 36 service operations scores were assessed for 6 service dimensions and 8 risk factors. Statistical clustering methods were applied, and dimension reduction was used to refine the clustering. The results indicate connections between the service operations, service dimensions, and risk factors. Initial findings and a plan for follow-up work will be discussed.

■ TB19

M - Lincoln 4

Intelligent DA for National Decisions

Sponsor: Decision Analysis
Sponsored Session

Chair: Don Buckshaw, Innovative Decisions, Inc., 1945 Old Gallows Road, Suite 215, Vienna, VA, 22182-3931, United States of America, dbuckshaw@innovativedecisions.com

1 - Multiple-objective Decision Model for Choosing Strategic Partners

Don Buckshaw, Department of Defense, United States of America, dbuckshaw@hotmail.com

Selecting a strategic partner can be a complicated process. There can be significant benefits to finding a long-term, capable partner, but there can be devastating results if the partnership leads to disclosure of sensitive information. The problem is to identify the best partner that maximizes benefit while minimizing the effects of misplaced trust. We developed a rigorous and repeatable process for evaluating partners using multiple-objective decision analysis and value-focused thinking.

2 - Benefits and Challenges of Using a Swing Weight Matrix for Data Center Location Selection

Elizabeth Viggiano, US Dept of Defense, 6743 Old Waterloo Rd, 202, Elkridge, MD, 21075, United States of America, elizabethviggiano@gmail.com, Adam Clark

Selecting a data center location is a complex process with motivation for and against use of a swing weight matrix to elicit value measure weights. The many competing objectives are more manageable in a matrix format than pair-wise comparisons. However, countless location alternatives necessitate the use of strong screening criteria, which are less explicit in the matrix. This effort supported multiple data center location selections for an element of the US Department of Defense.

3 - Determining the Best Strategy for Mission Growth in Remote Locations

Andrea Muchinsky, andrea.muchinsky@gmail.com

We used value focused thinking and multiple objective decision analysis to help an element of the U.S. Department of Defense decide on the best strategy for growing missions at locations far removed from headquarters operation. This analyses demonstrated the benefit of increasing mission capability along with the costs of new facilities and decentralized leadership.

4 - Using Multiple Objective Decision Analysis for Cyber Risk Management

Don Buckshaw, Innovative Decisions, Inc., 1945 Old Gallows Road, Suite 215, Vienna, VA, 22182-3931, United States of America, dbuckshaw@innovativedecisions.com

Risk Management is complicated when the threat includes an intelligent adversary. Cyber risk management is further complicated by the need to trade off the security enhancing features of network defenses and corresponding loses of capabilities that may accompany them. This presentation examines the use of multiple objective decision analysis to measure both the attractiveness of attacks to adversaries and the trade-offs required for striking the proper balance between security and functionality.

■ TB20

M - Lincoln 3

Elicitation and Communication of Subjective Probabilities

Sponsor: Decision Analysis
Sponsored Session

Chair: David Budescu, Professor of Psychology, University off Illinois, 603 E. Daniel street, Champaign, IL, 61820, United States of America, dbudescu@uiuc.edu

1 - Fixed Pie or Fixed Variable?

David Budescu, Professor of Psychology, University off Illinois, 603 E. Daniel street, Champaign, IL, 61820, United States of America, dbudescu@uiuc.edu, Ali Abbas, Hsiu Ting Yu, Ryan Haggerty

When encoding subjective probabilities of continuous variables judges can specify (a) cumulative probabilities for a set of values, or (b) values that correspond to particular cumulative probabilities. We report results of an experiment comparing these approaches. Judges estimated probability distributions using both methods. A variety of results favor the fixed value method: The judgments are more consistent, valid, accurate and faster. Most judges prefer this method.

2 - Combining Imprecise or Conflicting Probability Judgments: A Choice-Based Study

Aurelien Baillon, Erasmus University Rotterdam, PO Box 1738, Rotterdam, ZH, 3000DR, Netherlands, baillon@few.eur.nl, Laure Cabantous

We study the impact on decisions of imprecise or conflicting probabilistic forecasts by experts. We define preference-based conditions over revealed beliefs (the precise probability leading to the same choice as an imprecise or a conflicting assessment) to characterize the decision maker's attitude towards imprecision and conflict. We present an experimental study that shows that the type of uncertainty (conflict/imprecision), and the probability level, significantly influence revealed beliefs.

3 - Eliciting Cost-constrained Risk, Probability, or Frequency Distributions

Dan Goldstein, Assistant Professor, London Business School, Regents Park, Sussex Place, London, NW, NW14SA, United Kingdom, dgoldstein@london.edu

Risk preferences are often elicited using pairs of two-outcome gambles. Real-world risks can come in sets much larger than pairs, and have far more than two outcomes. How to elicit preferences when choosing among vast spaces of multiple, multiple-outcome gambles? The distribution builder is a graphical tool for easily selecting one distribution from a very large space. Unlike traditional techniques, the tool enforces cost-constraints, allowing for the measurement of risk-return tradeoffs.

4 - Predicting Binary Choices from Probability Phrase Meanings

Thomas Wallsten, twallsten@psyc.umd.edu, Yoonhee Jang

One way to validate scaled probability phrase meanings is to use them within a model to predict independently observed binary choices. We scaled participant's individually-selected probability phrases and developed a model that predicts choice probabilities by using the scaled meanings as proxies for confidence distributions associated with sampling from memory. Predictions were sustained for 34 of 41 participants. The results have both theoretical and applied implications.

■ TB21

M - Lincoln 2

Operations/IS Issues in Ambulance to Emergency Room Handovers

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Vera Tilson, Assistant Professor, Simon School of Business, University of Rochester, Rochester, NY, 14627, United States of America, Vera.Tilson@simon.rochester.edu

1 - Evaluation of Ambulance Transfers into UCCs to Improve Ambulance Availability & Reduce Offload Delay

Ali Vahit Esensoy, University of Toronto, ali.esensoy@utoronto.ca, Michael Carter

Through the UCC initiative, selected patients with low risk of inpatient admission traveling via ambulance will be transported to a UCC instead of being sent to an ED. This study uses a probabilistic linkage between EMS and ambulatory care databases to propose changes to the patient mix, operating hours and catchment areas of these facilities given operational and medical constraints.

2 - A Service-oriented Architecture for Emergency Healthcare Process Integration

Vasso Koufi, Research Assistant, University of Piraeus, 80, Karaoli & Dimitriou St., Piraeus, GR, 18534, Greece, vassok@unipi.gr, Flora Malamateniou, George Vassilacopoulos, Mikaela Poulymenopoulou

This presentation concerns a prototype system that aims at integrating the processes carried out by both the ambulance service and the emergency department of a hospital to deal with emergency medical cases. The prototype system has been developed on the grounds of a service-oriented architecture and involves the Athens Ambulance Service (AAS).

3 - Coordination of Ambulance to Emergency Room Transitions

Vera Tilson, Assistant Professor, Simon School of Business, University of Rochester, Rochester, NY, 14627, United States of America, Vera.Tilson@simon.rochester.edu, David Tilson

In the management and operations literature, examining coordination across a network of codependent tasks has been consistently recognized as an important way to study communication in the management and operations literature. We build upon coordination theory and process analysis to conceptualize the patterns of dependencies and present and potential means for coordination in ambulance to emergency rooms hand-overs.

4 - A Statistical Analysis of Ambulance Travel Times

Dawit Zerom, Associate Professor, California State University, Fullerton, Mihaylo College of Business, PO Box 6848, Fullerton, CA, 92834, United States of America, dzerom@Exchange.Fullerton.edu, Susan Budge, Armann Ingolfsson

An important component of virtually any model of emergency service operations (an analytic model or optimization model) is the travel time of vehicles, especially of those en route to a call. In this paper, we present a semi-parametric statistical model for estimating travel times for emergency services using unique data from ambulance operations of the city of Calgary, Canada.

■ TB22

M - Lincoln 1

Queueing Games: Pricing and Scheduling for Strategic Customers

Sponsor: Applied Probability
Sponsored Session

Chair: Adam Wierman, Assistant Professor, California Institute of Technology, 1200 E. California Blvd, Pasadena, CA, 91125, United States of America, adamw@caltech.edu

1 - Equilibrium Queue Joining and Service Rate Policies for Services with a Credence Good Character

Laurens Debo, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, laurdebo@andrew.cmu.edu

Services with a credence character are services for which the customers cannot verify how much time is required to address their needs. The equilibrium joining strategy for such services may exhibit a `Follow-The-Crowd' characteristic. The joining probability at the empty queue may be higher than the joining probability at the idling service provider and also higher than the joining probability at the non-empty queue. The service provider strategically slows down when the queue depletes.

2 - Quality vs. Speed: The Waiting/ Service Time Conundrum

Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu, Krishnan Anand, Mehmet Pac

We model a service system where the expected service quality changes with service speed. Increasing the service rate reduces the waiting costs, but also reduces the expected service quality, so slow service might provide better service. An arriving customer decides whether to join a service based on its value, speed of service and his expected waiting costs. We find firms might charge higher or lower price for better service based on rate of value degradation.

3 - Optimal Multipath Rate Allocation for Real-Time Streaming Applications

Cathy Xia, IBM, cathyx@us.ibm.com, Alix Chow, Hao Yang

Multipath content delivery has become one promising approach for improving the quality of real-time streaming. One fundamental design issue is how to split the stream across different paths so as to meet the stringent end-to-end delay and loss requirements. Through modeling and asymptotic analysis, we have derived a closed-form optimal solution to the load splitting problem, and designed an online scheme for adapting the splitting decisions to the network dynamics.

4 - The Effect of Local Scheduling in a Load Balancing Game

Adam Wierman, Assistant Professor, California Institute of Technology, 1200 E. California Blvd, Pasadena, CA, 91125, United States of America, adamw@caltech.edu, Ho-Lin Chen, Jason Marden

Load balancing is a common distributed architecture. In this paper, we show that the degree of inefficiency in load balancing designs is highly dependent on the scheduling discipline used locally at each of the servers. Traditionally, the local scheduler performs Processor Sharing and the degree of inefficiency is bounded by the number of servers. However, if the local scheduler does Shortest Remaining Processing Time the degree of inefficiency can be independent of the number of servers.

■ TB23

M - Lincoln 5

Non-Euclidean State Spaces and Techniques

Sponsor: Applied Probability
Sponsored Session

Chair: Christian Gromoll, Department of Mathematics, University of Virginia, Charlottesville, VA, 22903, United States of America, gromoll@virginia.edu

1 - Second-order Approximations for Many-server Queues

Kavita Ramanan, Associate Professor, Carnegie Mellon University, Department of Mathematical Sciences, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, kramanan@math.cmu.edu, Haya Kaspi, Weining Kang

Many-server queues arise as models of computer data systems and call centers. A Markovian description of the system leads naturally to a state involving a measure-valued process. Using martingale techniques, we obtain functional central limit type approximations for the state. As a corollary, we obtain a simple dynamical description of the total number in system.

2 - Large Deviations for Point Processes Based on Stationary Sequences with Heavy Tails

Henrik Hult, Associate Professor, KTH, Department of Mathematics, Stockholm, 10044, Sweden, hult@kth.se, Gennady Samorodnitksy

A stationary sequence of random variables with regularly varying tails is considered. The goal of this talk is to give a detailed description of the occurrence of large values of the sequence, which may arrive in clusters. To do this a point process based on appropriately scaled points of the stationary sequence is constructed. A limiting measure, on the space of point measures on cylinders, describes the joint limiting behavior of all the large values of the sequence.

3 - Dynamics of New Product Introduction in Closed Rental Systems

Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu, Sunil Kumar, Achal Bassamboo

We consider a rental system, like Netflix, where a fixed number of users rent one product at a time from a collection of re-usable products. We study transient behavior in this system following the introduction of a new product. Analyzing the usage process for this product, we show that an increase in the variability can allow the firm to set lower capacity levels to meet a desired QoS. We also show that the firm is better off not imposing any deadlines for the return of the product.

4 - Heavy Traffic Approximations of Limited Processor Sharing Queues

Jiheng Zhang, Georgia Institute of Technology, 765 ferst dr, Atlanta, GA, 30332, United States of America, jrz@gatech.edu, Bert Zwart

Motivated by application in computer systems, we study a modification of the processor sharing queue where only a limited number of jobs can share the server at a time; excess jobs wait in a FIFO buffer. We model the system using measure valued processes and establish a heavy traffic limit, which is tractable. By validating the interchange of steady state and heavy traffic limits, we obtain approximations of various steady state quantities such as queue length and response time.

■ TB24

M - Lincoln 6

CS (Computing Society) Leading Edge Tutorial

Sponsor: Computing Society
Sponsored Session

Chair: Robert Dell, Professor, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93940, United States of America, Dell@nps.edu

1 - Approximate Dynamic Programming

Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

We show how approximate dynamic programming can be used to combine the power of math programming with the flexibility of simulation to provide practical solutions to complex problems. This tutorial will introduce ADP using a variety of applications, and describe the different algorithmic strategies available when approximating the impact of a decision now on the future. These ideas will be illustrated using industrial applications in transportation, energy and finance.

■ TB25

M - Lincoln 6A

Integer Programming and Applications

Sponsor: Computing Society: Metaheuristics
Sponsored Session

Chair: Haibo Wang, Assistant Professor, TAMIU, 5201 University Blvd, Laredo, TX, 78041, United States of America, hwang@tamiu.edu

1 - A Unified View of Parallel Machine Scheduling with Interdependent Processing Rates

Bahram Alidaee, Professor, The University of Mississippi, School of Business Administration, University, MS, 38677, United States of America, balidaee@bus.olemiss.edu, Haibo Wang, R. Bryan Kethley, Frank Landram

During the last several decades, variety of realistic scheduling models have been proposed in the literature. Many of these models are closely related. The purpose of this study is to present a unified view of these models using two related approaches. Several new complexity results also will be presented.

2 - A Heuristic for an Integrated Inventory and Delivery Planning Problem in a Retailer's Supply Chain

Jiayi Chen, Graduate Student, The Chinese Univ. of Hong Kong, Dept of Syst Engg & Engg Mgmt, The Chinese Univ. of Hong Kong, Shatin, NT, Hong Kong - China, jychen@se.cuhk.edu.hk, C.H. Cheng

An integrated inventory and delivery problem in a retailers supply chain involves the delivery of multi-products to satisfy retailers demands for a planning horizon. An MIP model is formulated and an optimization-based solution will be developed. Computational experiments will also be presented.

3 - A Network Approach to Mining Market Basket Data

Yaquan Xu, Assistant Professor, Virginia State University, 12400 liverpool lane, #104, chester, va, 23836, United States of America, yxu@vsu.edu

Market basket analysis has been an important part of decision support process in retail market for many years. In this paper, we construct the market graph and study the evolution of the structural properties of the market graph over the transactions and draw conclusions regarding the dynamics of the market basket development based on the interpretation of the obtained results.

■ TB26

M - Lincoln 5A

Open Source Software for Nonlinear Optimization

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Carl Laird, Assistant Professor, Chemical Engineering Department Texas A&M University, 3122 TAMU, College Station, TX, 77843, United States of America, carl.laird@tamu.edu

1 - A Python Environment for Nonlinear Programming

Dominique Orban, Professor, Ecole Polytechnique de Montréal, Math & Industrial Eng Department, 2900 Boulevard Edouard Montpetit, Montréal, H3T 1J4, Canada, dominique.orban@polymtl.ca, Michael Friedlander

NLPy is an environment that eases development of numerical methods for linear and nonlinear programming. The far reaches of object-oriented programming and the power of the Python language promote reusability, readability and rapid development without sacrificing numerical efficiency. NLPy provides the building blocks on which optimization methods are built. We illustrate the implementation of some well-known and novel algorithms routinely used in optimization and their performance.

2 - Optimica- An Extension of Modelica Supporting Dynamic Optimization

Johan Akesson, PhD, Lund University, Box 118, Lund, 22100, Sweden, johan.akesson@control.lth.se

An extension of Modelica (a modeling language for dynamic systems), entitled Optimica is presented. Optimica supports formulation of dynamic optimization problems based on Modelica models. A prototype compiler which supports a subset of Modelica and a first draft version of Optimica is under development. The compiler also supports code generation to AMPL, including automatic transcription of continuous time derivatives. The resulting algebraic problem is solved by AMPL/IPOPT.

3 - Open Source Software for Interfacing and Support of Large-scale Embedded Nonlinear Optimization

Roscoe Bartlett, Senior Member of the Technical Staff, Sandia National Laboritories, PO Box 5800, Albuquerque, NM, 87185-1318, United States of America, rabartl@sandia.gov

It is difficult for embedded nonlinear optimization to impact important application areas. I will discuss the Thyra effort in Trilinos to develop the software infrastructure for interfacing embedded nonlinear optimization solvers while keeping well integrated with production simulation codes. I will present the concepts behind "abstract numerical algorithms" that underlie Thyra and describe a case study involving the semi-production code Charon and the optimization solver MOOCHO.

4 - DrAMPL: A Meta-solver for Optimization

Robert Fourer, Northwestern University, Department of Industrial Engineering and Mgt. Science, Evanston, IL, United States of America, 4er@iems.northwestern.edu, Dominique Orban

Building upon the AMPL-solver interface library, DrAmpl is a meta-solver for analyzing optimization problems prior to solution. Its functions include bounding expressions in the decision variables; symbolically proving or numerically disproving convexity of expressions; and using a relational database to suggest appropriate solvers by matching problem characteristics to solvers available on the NEOS Server. We describe the design of DrAmpl, needs that it meets, and perspectives that it offers.

■ TB28

M - Washington 1

Data-Driven Revenue Management

Cluster: Online Decision Making
Invited Session

Chair: Sumit Kunnumkal, Assistant Professor, Indian School of Business, AC 4, Level 1, 4116, Indian School of Business, Hyderabad, AP, 500032, India, sumit_kunnumkal@isb.edu

1 - Dynamic Pricing in the Presence of Demand Shocks: Hedging Point Policies

Omar Besbes, Assistant Professor, The Wharton School, University of Pennsylvania, 3730 Walnut Street, 545 JMHH, Philadelphia, PA, 19104, United States of America, obesbes@wharton.upenn.edu, Assaf Zeevi

We study a dynamic pricing problem in the presence of changes in the demand environment. In particular, we analyze the trade-off between future (uncertain) sales and instantaneous sales. The latter is seen to be an interplay between resource constraints and uncertainty with regard to the future demand model.

2 - A Network Prescott Model of Capacity Pricing

Garrett van Ryzin, Professor, Columbia University, 412 Uris Hall, NY, NY, 10027, United States of America, gjv1@columbia.edu, Dan Mallet

We consider a network version of the Prescott model of capacity pricing, in which firms commit to capacity and price under a zero-profit equilibrium condition. While stylized, the model has interesting implications for cost sharing and price dispersion in airline networks.

3 - Irrevocable Multi-armed Bandit Policies

Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu, Ritesh Madan

We consider the multi-armed bandit problem with multiple simultaneous plays. Motivated by applications to dynamic assortment management, we develop a new 'irrevocable' heuristic for this problem. In particular, we do not allow recourse to arms that were pulled at some point in the past but then discarded. Surprisingly, we demonstrate via a computational study and a uniform performance loss bound that the cost of irrevocability is very limited for a broad useful class of bandits.

4 - A Practical Method for Overbooking and Fare-class Allocation with Censored Demand Data

Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu, Yingjie Lan, Michael Ball

Extending our work on competitive analysis of online algorithms in revenue management, we show how fare-class allocation decisions can be combined with overbooking when an airline has good no-show information but has censored demand data.

■ TB29

M - Washington 2

Panel Discussion: The Academic Job Search

Cluster: Job Placement Service
Invited Session

Chair: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu

1 - Academic Job Search

Moderator: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu, Panelists: Dessislava Pachamanova, Ana Muriel, Gilvan "Gil" Souza, Andrew Loerch

The panel will lead an informal discussion concerning the academic interview process, the appropriate steps to take during the job search, and the challenges that may be faced along the way. Time will be provided for questions and answers.

■ TB30

M - Washington 4

OR Applications in the United States Marine Corps

Sponsor: Military Applications
Sponsored Session

Chair: Joseph Mlakar, Operations Research Analyst, United States Marine Corps, 3300 Russell Road, Quantico, VA, 22554, United States of America, joseph.mlakar@usmc.mil

1 - Sensible Validation for IW Simulations

Michael Bailey, USMC, 3300 Russell Road, Quantico, VA, United States of America, michael.bailey@usmc.mil

The USMC has led an effort to tailor the concept of simulation validation to analytical applications used to explore irregular warfare issues. This effort has produced a set of guidelines that require actions from model developers and from analysts. We provide a vernacular and a structured framework for exposing the adequacy of a simulation to support a typical irregular warfare analysis task, and give guidance concerning the assessment of positive and negative validation results.

2 - Analytical Support to Marine Aviation Logistics

Tom Tsoutis, USMC, 3300 Russell Road, Quantico, VA, anastasios.tsoutis@usmc.mil

The Marine Aviation Logistics Support Program (MALSP) II is the next generation of logistics support concept with the aim of producing improved performance while reducing the deployment footprint. We use modeling to analyze different configurations in order to determine the best way to set up aviation logistics support. The scope of our analysis includes developing a method to use historical data and expected operational utilization to predict demand profiles.

3 - Using Value-focused Thinking in the JCIDS Process

Matt Aylward, USMC, 3300 Russell Road, Quantico, VA, United States of America, matthew.aylward@usmc.mil

We built an Excel tool for Borda voting as part of a Capabilities-Based Assessment effort, simplifying the task of determining the group's judgment on the correct rank-order while preserving preferences of team members. With four rounds of voting, analysts were able to display the Tasks, Conditions and Standards in rank order, a fully-populated Swing Weight Matrix, the global and local weights - in short, a completely specified quantitative value model. Necessary prep work is also covered.

4 - Determining the Most Influential Factors to the Severity of Casualties in Iraq

Douglas Hoffman, USMC, 3300 Russell Road, Quantico, VA, United States of America, douglas.hoffman@usmc.mil

Our objective in this research is to analyze data contained in Personnel Casualty Reports (PCRs) and Significant Event reports in order to determine the most influential factors to the severity of casualties in Iraq. We describe the process of transforming data contained in PCR files into a structure that is suitable for analysis and our procedure to link each PCR to the event that caused the casualty. We present some of the initial findings resulting from this ongoing research.

■ TB31

M - Washington 5

General Electric: Financial Analytics and OR Applications

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Andrew Barnes, Researcher, Quantitative Methods, General Electric Global Research, 1 Research Circle, K1 4A58, Niskayuna, NY, 12309, United States of America, barnesa@research.ge.com

1 - Options Framework for Strategic Investments with Knightian Uncertainty

Bex Thomas, Operations Researcher, GE Global Research, 1 Research Circle, Niskayuna, NY, 12309, bex.thomas@ge.com

Strategic investments are difficult to analyze based on standard approaches such as Discounted Cash Flow (DCF) and Net Present Value (NPV). However, such strategic investments determine the firm's competitive success in a dynamic competitive market place. Usually such strategic options are high value, high risk technological investments. We will discuss a real options based framework to quantify the value of strategic options and investing under risk. We will extend the real options framework to incorporate the distinction between risk and uncertainty as shown by Frank Knight. The effect of Knightian uncertainty is shown to be very different from that of traditional uncertainty in the form of risk. We will apply this concept for strategic investment in a photovoltaic technology.

2 - Two-dimensional Percentile-based Price Optimization

Huaiyu Ma, Statistician, GE Global Research, 1 Research Circle, Niskayuna, NY, 12309, United States of America, mah@research.ge.com, Deniz Senturk, Kareem Aggour

In order to effectively understand a market, target and actual prices need to be considered simultaneously. We developed a Model-Based Clustering technique to identify market-defined segments in this two dimensional space. Optimal target prices are then determined by a percentile-based pricing policy. The new method takes into account the interaction between target and actual prices and thus gives more realistic and actionable suggestions than other techniques.

3 - Efficient Portfolio Risk Modeling under Uncertainty

Andrew Barnes, Researcher, Quantitative Methods, General Electric Global Research, 1 Research Circle, K1 4A58, Niskayuna, NY, 12309, United States of America, barnesa@research.ge.com

We examine portfolio risk models in the face of uncertainty. Many high level portfolio management decisions can only be made in the face of large uncertainties. In this context, it is not helpful to build overly complex risk models, where a lot of the complexity is lost in the overall noise. We present a simple, efficient analytical framework for portfolio risk analysis and show that this framework enables sensitivity analysis as well as insight into the main drivers of portfolio risk problems.

4 - A Robust Non-parametric Approach to Valuing Fixed-income Portfolios Based on Sum-of-squares Program

Adrian Becker, MIT, Boston, MA, United States of America, adrianbb@mit.edu

We formulate robust counterparts to the fixed-income portfolio valuation problems as sum-of-squares programs. This allows us to value baskets of fixed-income securities without making specific assumptions as to the dynamics of joint default or joint loss-given-default. We then compare our method to the current state of the art in importance sampling based approaches and analyze the impact of using such a robust optimization technique for the valuation and rating of securitization tranches.

■ TB32

M - Washington 6

Sloan Travel and Tourism Industry Center: Travel and Tourism for Economic Development

Cluster: Sloan Foundation
Invited Session

Chair: Sam Cole, Professor, SUNY Buffalo, Hayes Hall, Main St Campus, Buffalo, NY, 14214, United States of America, samcole@buffalo.edu

Co-Chair: Richard Harrill, Director, Sloan Travel and Tourism Center, Univ. South Carolina, Columbia, SC, 29208, United States of America, RHARRILL@mailbox.sc.edu

1 - The Future Chinese Outbound Tourism Market

Richard Harrill, Director, Sloan Travel and Tourism Center, Univ. South Carolina, Columbia, SC, 29208, United States of America, RHARRILL@mailbox.sc.edu

The Alfred P. Sloan Travel & Tourism Industry Center at the University of South Carolina, in partnership with the Travel Industry Association (TIA) and the U.S. Department of Commerce, Office of Travel & Tourism Industries (OTTI), launched a major research project addressing the anticipated future increase in Chinese travelers visiting the United States. This presentation provides an overview of the project's results.

2 - Global Tourism on the Edge of Chaos?

Sam Cole, Professor, SUNY Buffalo, Hayes Hall, Main St Campus, Buffalo, NY, 14214, United States of America, samcole@buffalo.edu

This paper explores suggestions in the literature that the tourism industry is "chaotic" by transforming a previously developed model of the resort life cycle to a discrete logistic equation. The results suggest that globalized industries, such as tourism, may exhibit quite different dynamics from those captured by traditional growth models or localized supply-demand models. The implication of such findings and directions for further research are indicated.

3 - Agent-based Spatial Modeling for Tourism Development

Li Yin, Professor, SUNY Buffalo, Hayes Hall, Main St Campus, Buffalo, NY, 14214, United States of America, liyin@buffalo.edu

This industry study uses an agent-based model to explore how homeowners' investment and reinvestment decisions are influenced by the level of investment and amenities available in their neighborhoods in a case study area of town of Breckenridge, Colorado. This paper found that individual level of appreciation of amenities and continuing investment in a neighborhood attracted investment and reinvestment, and created pressure for high density resort housing development at the aggregate level.

4 - African American Tourism and Inner City Economic Development

Henry Louis Taylor Jr, Professor/Director, Center for Urban Studies, SUNY Buffalo, Main St Campus, Buffalo, NY, 14214, United States of America, htaylor@buffalo.edu

African Americans spend 30 billion on tourism annually. Yet, the travel and tourism industry largely ignores this market, as do many urban centers, attempting to revive their sluggish economies. A potentially significant link exists between African American tourism and inner city economic development. Developing black heritage tourism sites in inner city communities and connecting them to other regional tourist attractions, would spur inner city economic development.

■ TB33

M - Johnson

Innovation in Healthcare Logistics

Sponsor: Health Applications Section
Sponsored Session

Chair: Ronald L. Rardin, White Distinguished Professor, University of Arkansas, Industrial Engineering, Bell 4169, Fayetteville, AR, 72762, United States of America, rrardin@uark.edu

1 - Unit Dose Packaging Systems Analysis

Russell Meller, University of Arkansas, 4207 Bell Engineering, Department of Industrial Engineering, Fayetteville, AR, 72701, United States of America, rmeller@uark.edu, Scott Mason, Jen Pazour, Sarah Root, Yasin Unlu

Medications are typically distributed by manufacturers in bulk, but to increase patient safety, they are often administered to patients in unit doses with electronic verification. A systems analysis is needed to determine the best manner for the implied repackaging and labeling of the medications. An optimization approach will be presented that considers the quantifiable factors directly and the non-quantifiable factors via an efficient frontier and break-even analysis.

2 - Cost and Quality of Healthcare Supply Chains

Edward Pohl, Assoc Professor, University of Arkansas, 4207 Bell Engineering Ctr, Fayetteville, AR, United States of America, epoh@uark.edu, Heather Nachtmann, Brian Smith

The cost and quality of healthcare is a much debated issue. Early studies have shown the healthcare supply chain to be inefficient and expensive when compared to supply chains in other sectors. Our study seeks to identify opportunities for cost and quality improvement in the healthcare supply chain.

3 - Equipment and Material Process Streams in Receiving to Patient Healthcare Supply Chains

Ronald L. Rardin, White Distinguished Professor, University of Arkansas, Industrial Engineering, Bell 4169, Fayetteville, AR, 72762, United States of America, rrardin@uark.edu, Angelica Burbano, Behlul Saka, Nebil Buyurgan, Josh Eno, Craig Thompson

Equipment process streams in hospitals involve what types of portable equipment to track and levels of aggregation, whereas materials process streams involve integration of receiving, replenishment, utilization and billing of the

med/surg supplies and implantables. Business processes and the technology options are explored for both streams. Findings from literature, site visits and expert consultations are presented along with preliminary design support models.

■ TB34

M - Jefferson

OR in Cancer Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Steven Shechter, Assistant Professor, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, steven.shechter@sauder.ubc.ca

1 - Reducing Wait Times & Improving Resource Utilization at the BC Cancer Agency's Ambulatory Care Unit

Pablo Santibanez, Operations Research Scientist, British Columbia Cancer Agency, 600 West 10th Avenue, Vancouver, BC, V5Z 4E6, Canada, psantibanez@bccancer.bc.ca, Vincent Chow, John French, Martin Puterman, Scott Tyldesley

We report results of a study of the British Columbia Cancer Agency's Ambulatory Care Unit. We developed a simulation model of the process and showed that improved patient scheduling and operational changes would reduce patient wait times and use resources more efficiently. Short-term recommendations are currently being implemented and long-term recommendations will drive a major physical renovation.

2 - Radiation Therapy Treatment Scheduling

Antoine Saure, PhD Student, Sauder School of Business, University of British Columbia, 402 - 930 Seymour St., Vancouver, BC, V6B1B4, Canada, antoine.saure@sauder.ubc.ca, Martin Puterman, John French, Mike Darud

Motivated by the adverse effect of delays on patients' health such as physical distress and deterioration of quality of life, and the inefficiencies in the use of expensive resources, we develop a model for scheduling multi-priority patients into Radiation Therapy treatment units. The main purpose of this model is to allocate available capacity to incoming demand, while achieving wait time targets and increasing treatment units utilization.

3 - Optimizing Colorectal Cancer Screening Policy

Fatih Safa Erenay, University of Wisconsin-Madison, Madison, WI, United States of America, erenay@wisc.edu, Ritesh Banerjee, Oguzhan Alagoz

Colorectal cancer (CRC) is the third leading cause of cancer death in women, and the second leading cause of cancer death in men. CRC screenings are proven to be effective to detect and eliminate the precursor of CRC so that cancer can be prevented before it develops. We develop a finite-horizon POMDP model that can be used to obtain a patient-specific optimal lifetime screening policy. We consider two criteria: total expected quality adjusted lifetime of the patient and total cost of treatment.

4 - Mixed-Integer Programming Techniques for Decomposing IMRT Fluence Maps Using Rectangular Apertures

Zeki Caner Taskin, PhD Candidate, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, taskin@ufl.edu, J. Cole Smith, Edwin Romeijn

We consider a matrix decomposition problem arising in IMRT, in which a matrix of intensity values is to be delivered to a patient from a given angle, under the condition that the IMRT device can only deliver radiation in rectangular shapes. We study the problem of minimizing the number of rectangles necessary to decompose such a matrix. We propose an integer programming-based methodology for providing bounds on the optimal solution, and demonstrate the efficacy of our approach on clinical data.

■ TB35

M - Jackson

On-line Education in OR/MS

Sponsor: INFORM-ED
Sponsored Session

Chair: Christina Scherrer, Assistant Professor, Southern Polytechnic State University, Department of Industrial Engineering Tec, 1100 S. Marietta Parkway, Marietta, GA, 30060, United States of America, cscherre@spsu.edu

1 - Perceptions of On-line Education

Christina Scherrer, Assistant Professor, Southern Polytechnic State University, Department of Industrial Engineering Tec, 1100 S. Marietta Parkway, Marietta, GA, 30060, United States of America, cscherre@spsu.edu, Renee Butler, Shekinah Burns

Our university currently offers some masters degrees completely on-line and additional graduate and undergraduate courses in both on-line and hybrid formats. Using results from a comprehensive survey, we characterize the types of students on-line education is most suited for and which delivery methods work best for various student groups. In addition, we study differences in perceptions of on-line education that exist between students who have and have not actually taken an on-line course.

2 - Design of Online Course Interface for Student Usability and Satisfaction

Renee Butler, Assistant Professor, Southern Polytechnic Stat Univ, Division of Engineering, 1100 South Marietta Pkwy, Marietta, GA, 30060, United States of America, rbutler@spsu.edu, Christina Scherrer

In recent years, online education has increased dramatically, however there has not been much study of the usability and satisfaction of the online student interface. We study current online course interfaces from several disciplines to generate sample interfaces that are tested for usability and satisfaction. The goal of this presentation is to present several steps instructors/designers can implement to increase the satisfaction of students with the technology used in online courses.

3 - Quality Testing for Online Programs

Jaby Mohammed, Assistant Professor, Morehead State University, 215 A, Lloyd Cassity Building, Morehead State University, Morehead, KY, 40351, United States of America, j.mohammed@moreheadstate.edu

Online program enrollments have been growing substantially faster than overall higher education enrollments. Academic leaders do expect that these enrollments would continue their exponential growth. The biggest concern in an online program is how efficiently and effectively the online programs are run. There is need to evaluate how the online programs are delivered. Quality evaluation is an approach to ensure the online courses are met the standards.

■ TB37

M - T. Marshall Ballroom West

Tutorial: Statistical Challenges in eCommerce: Modeling Dynamic and Networked Data

Cluster: Tutorials
Invited Session

Chair: Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu

1 - Statistical Challenges in eCommerce: Modeling Dynamic and Networked Data

Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu, Inbal Yahav, Shu Zhang, Mayukh Dass, Galit Shmueli

Research in electronic commerce is growing due to the availability of rich data originating from different behavioral social or economic processes and resulting in new dependencies that are not supported by classical statistics. In this tutorial, we discuss three key aspects of eCommerce data: dynamics, competition, and user networks. Each aspect raises new challenges for data modeling, and we present three case studies that showcase the various challenges and discuss some solutions.

■ TB38

M - Tyler

Integer Programming Theory and Applications

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Miguel Constantino, Faculdade Ciências Universidade de Lisboa, DEIO, Ed C6, Campo Grande, Lisbon, 1749-016, Portugal, miguel.constantino@fc.ul.pt

1 - A Dual Ascent Procedure for the Design of Virtual Private Networks

Ishwar Murthy, Professor, Indian Institute of Management Bangalore, 103 NF, IIM Bangalore, Bannerghatta Rd, Bangalore, 560076, India, ishwar@iimb.ernet.in, Sri Narasimhan

In this paper we present a new formulation and solution procedure for designing virtual private networks for corporate networks. We study the following problem: Given the locations of the corporate offices we would like to design a virtual private network that best connects the various corporate locations. We formulate an integer programming problem and develop a dual ascent procedure for solving large-scale problems approximately. Computational results are provided.

2 - Linear Description of Mixing Sets with Two Non Divisible Coefficients

Miguel Constantino, Faculdade Ciências Universidade de Lisboa, DEIO, Ed C6, Campo Grande, Lisbon, 1749-016, Portugal, miguel.constantino@fc.ul.pt, Agostinho Agra

We consider a mixed-integer set X, defined by linear constraints in which the coefficients of the integer variables are a or b (integer non divisible). We decompose X into a small number of subsets whose convex hull description is trivial. The convex hull of the union of those polyhedra have an higher-dimensional representation as a linear program. By projection onto the space of original variables we characterize all the facet-defining inequalities of P in the space of the original variables.

3 - Network Design under Worst Interdiction Scenario

Churlzu Lim, UNC Charlotte, 9201 University City Blvd, Charlotte, NC, United States of America, clim2@uncc.edu, Cole Smith

Consider a network design problem in which an intelligent enemy optimally destroys arcs to minimize the weighted sum of flows. We first present the enemy's strategy that finds an optimal interdiction by solving a series of integer bilinear programs. Noting that considering a finite solution space is sufficient in the enemy's problem, we employ a cutting plane algorithm to identify an optimal network design. Computational results for solving randomly generated test instances will be reported.

■ TB39

M - Truman

Semidefinite Programming and Applications

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Satyen Kale, Postdoctoral Researcher, Microsoft, 1 Microsoft Way, Redmond, WA, 98121, United States of America, sakale@microsoft.com

1 - Sparse Approximate Solutions to Semidefinite Programs

Elad Hazan, IBM Almaden, 650 Harry Road, San Jose, CA, 95120, United States of America, ehazan@cs.princeton.edu

We propose an algorithm for approximately maximizing a concave function over the bounded semi-definite cone, which produces sparse solutions. Sparsity for SDP corresponds to low rank matrices, and is a important property for both computational as well as learning theoretic reasons. As an application, building on Aaronson's recent work, we derive a linear time algorithm for Quantum State Tomography.

2 - Improved Approximation Bound for Quadratic Optimization Problems with Orthogonality Constraints

Anthony So, Assistant Professor, The Chinese University of Hong Kong, Department of Sys. Eng. & Eng. Mgmt., Shatin, NT, Hong Kong - China, manchoso@se.cuhk.edu.hk

In this talk we consider approximation algorithms for quadratic optimization problems that contain orthogonality constraints. In a recent work, Nemirovski (2007) gave an $O((m+n)^{1/3})$ approximation algorithm for these problems. Using tools from functional analysis, we improve the ratio to $O(\ln\max{m,n})$. Our techniques can also be used to improve a result of Ben-Tal and Nemirovski (2007) on certain chance constrained LMI systems.

3 - Finding Low-rank Matrices via Nuclear Norm Minimization

Maryam Fazel, Assistant Professor, University of Washington, Box 352500, Electrical Engineering Dept, Univ. of Washington, Seattle, WA, 98195, United States of America, mfazel@u.washington.edu

In many applications, notions of order or dimension of a model can be expressed as the rank of an appropriate matrix. Matrix rank minimization is NP-hard. We discuss a convex relaxation, minimizing the nuclear norm of the matrix, and give results on recovering the lowest rank matrix when the constraints are linear equalities and satisfy a certain isometry condition. The recovery is also robust to noise in the constraints. This talk is based on joint work with Ben Recht and Pablo Parrilo.

4 - Quadratic Forms on Graphs

Konstantin Makarychev, Research Staff Member, IBM Research, PO Box 218, Yorktown, NY, 10598, United States of America, konstantin.makarychev@gmail.com, Assaf Naor, Yury Makarychev, Noga Alon

We introduce a new graph parameter, called the Grothendieck constant of a graph. This parameter is a generalization of the classical Grothendieck constant; and it is equal to an integrality gap of a certain SDP problem, which has various algorithmic applications. Our results improve a recent result of Kashin and Szarek on Gram matrices of uniformly bounded functions, and settle a problem of Megretski and of Charikar and Wirth.

■ TB40

M - Taylor

Joint Session: Optimization/Stochastic Programming/CS: Sampling Schemes and Stopping Rules in Stochastic Optimization

Sponsor: Optimization/ Stochastic Programming, Computing Society
Sponsored Session

Chair: Johannes Royset, Assistant Professor, Naval Postgraduate School, 1411 Cunningham Rd, Monterey, CA, 93943, United States of America, joroyset@nps.edu

1 - Monte Carlo Methods in Stochastic Optimization Problems with Stochastic Dominance Constraints

Jian Hu, Northwestern University, Department of IEMS, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, jianhu@northwestern.edu, Sanjay Mehrotra, Tito Homem-de-Mello

We discuss stochastic optimization problems where the constraints are modeled using the concept of stochastic dominance. This is an area that has received increasing attention in the literature recently. We study the application of sampling methods to solving such problems when the number of scenarios is too large or even infinite. Theoretical results and algorithms are presented, as well as some numerical experiments illustrating the ideas.

2 - On Adaptive Trust-region Methods for Nonlinear Stochastic Programming

Fabian Bastin, Assistant Professor, Université de Montreal, Department of Computing Science and Oper. Res., CP 6128, Succ Centre-Ville, Montreal, QC, H3C 3J7, Canada, bastin@iro.umontreal.ca

Sample average approximations are a popular approach to deal with complex optimization problems involving expectations. The accuracy is however related to the sample size, so that the numerical cost can be prohibitive. We examine numerical and theoretical improvments of a previoulsy proposed adaptive strategy, varying the number of draws from iteration to iteration, in the light of recent developments in the trust-region and stochastic programming litterature.

3 - A Combined Sampling-and-bounding Approximation Method

Guzin Bayraksan, University of Arizona, 1127 E James E. Rogers Way, Engineering Building #20, Tucson, AZ, 85721, United States of America, guzinb@sie.arizona.edu, Peguy Pierre-Louis, David Morton

A classic approximation scheme for stochastic programs calculates refined deterministic upper and lower bounds on the objective function value via Jensen's and Edmundson-Madansky (EM) inequalities. In this talk, we present a method that replaces the computationally burdensome EM bound with sampling. We provide stopping rules that ensure the quality of the obtained solutions. We employ a control variate for variance reduction and present computational results.

4 - Asymptotic Analysis of Sample Allocation in Stochastic Optimization

Johannes Royset, Assistant Professor, Naval Postgraduate School, 1411 Cunningham Rd, Monterey, CA, 93943, United States of America, joroyset@nps.edu, Roberto Szechtman

Sample average approximations use sampling and deterministic optimization algorithms to generate solutions of stochastic optimization problems. We analyze efficient sample allocation strategies given a limited computing budget. The strategy balances errors due to sampling, inexact solution of approximate problems, and convergence to local instead of global minima.

■ TB41

M - Taft

Product and Organizational Architectures

Cluster: New Product Development
Invited Session

Chair: Manuel Sosa, Associate Professor of Technology and Operations Management, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, manuel.sosa@insead.edu

1 - The Impact of Misalignment of Organization Structure and Product Architecture on Quality

Bilal Gokpinar, Assistant Professor, University College London, Management Science and Innovation, London, WC1E 6BT, United Kingdom, bilal@iems.northwestern.edu, Seyed Iravani, Wallace Hopp

A key challenge for organizations that design complex products is matching the organization to the product being developed. Using network analysis, we

characterize mismatches between the product architecture and organization structure by defining a new metric, called "coordination deficit", and show that it is positively associated with quality problems observed when the product gets to the market.

2 - The Mirroring Hypothesis: Theory and Evidence

Carliss Baldwin, Professor, Harvard Business School, Baker Library 355, Boston, MA, United States of America, cbaldwin@hbs.edu, Lyra Colfer, Alan MacCormack, John Rusnak

The "mirroring hypothesis" claims that the structure of a product development organization mirrors the architecture of the product it develops. This paper reviews the theory and empirical evidence with respect to the hypothesis. While there is much evidence in support of mirroring, there are also clear exceptions. In particular, the ability to understand and interact with the design itself appears to be a substitute for organizational structure.

3 - Software Architecture, Quality and Innovation

Manuel Sosa, Associate Professor of Technology and Operations Management, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, manuel.sosa@insead.edu, Jurgen Mihm, Tyson Browning

We study how software architecture relates to quality and innovation. By examining several java-based applications developed by the Apache open-source foundation, we analyze empirically the relationship between software architecture characteristics and the capability of the organization to uncover and fix bugs as well as to implement intended product changes.

■ TB42

M - McKinley

Joint Session CS/HAS: Optimization Techniques in Computational Biology and Systems Biology

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)

Sponsored Session

Chair: Art Chaovaitwongse, Assistant Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, 08854, United States of America, wchaoval@rci.rutgers.edu

Co-Chair: Petros Xanthopoulos, University of Florida, 303 Weil Hall, PO Box 11659, Gainesville, FL, United States of America, petrosx@ufl.edu

1 - Models of Clustering of High-dimensional Microarray

Neng Fan, University of Florida, 303 Weil Hall, PO Box 116595, University of Florida, Gainesville, FL, 32611, United States of America, andynfan@ufl.edu, Panos Pardalos

Clustering, biclustering models have been studied a lot, but for high-dimensional clustering, only several algorithms have been given. In this paper, we are trying to give several models to describe the mathematical backgrounds of high-dimensional clustering, which will be the foundations of designing efficient algorithms.

2 - Greedy Randomized Algorithm for Large-scale Set Covering Problem for Sibling Reconstruction

Chun-An Chou, Rutgers University, 96 Frelinghuysen Rd., Piscataway, NJ, 08854, United States of America, joechou@rci.rutgers.edu, Art Chaovaitwongse, Tanya Berger-Wolf, Bhaskar DasGupta, Mary Ashley, Saad Sheikh, Isabel Caballero

We present a complex set covering model for reconstructing sibling relationships from genetic markers. We propose a greedy randomized algorithm to generate probable sibling sets, similar to column generation framework. The algorithm uses a greedy function to maximize the group coverage and randomly prioritize individuals to be included in a sibset. The results of this study may lead to a greater understanding of fundamental biological processes like mating systems and adaptive trait evolution.

3 - Generalized A-Optimality and Hybrid Designs for Two-Color Microarrays

Theodore Allen, Associate Professor, Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, allen.515@osu.edu, Nilgun Ferhatosmanoglu

Several researchers have proposed optimal experimental plans based on A-optimality to pair samples for testing using two-color microarrays. We show that if model misspecification or bias is considered in the formulation, the so-called "reference" designs that practitioners prefer perform better compared with A-optimal "loop" designs. Next, we propose an integer programming formulation based on what we call "generalized A-optimality" and display optimal solutions which we call hybrid designs.

4 - A Classification Technique in Computational Biology

Altannar Chinchuluun, Industrial and Systems Engineering Department, University of Florida, Weil Hall 303, Gainesville, FL, 32611, United States of America, altannar@ufl.edu, Mario Guarracino, Panos Pardalos

The problem of classifying data in spaces with thousands of dimensions have recently been addressed in the literature for its importance in biomedical and computational biology applications. An example of such applications is the analysis of gene expression data. We present a supervised learning technique based on incremental generalized eigenvalue classifier to obtain higher classification accuracy with a small training set.

5 - Identifying Critical Nodes in Protein-Protein Interaction Networks

Vladimir Boginski, University of Florida REEF, 1350 N Poquito Road, Shalimar, FL, 32579, United States of America, boginski@reef.ufl.edu, Clayton Commander

We consider the problem of identifying the critical nodes of a network and its potential applications to protein-protein interaction networks. The study presents an innovative approach of applying the recently introduced combinatorial optimization technique to detecting target proteins in protein-protein interaction networks, which has important applications in biology, biomedicine and drug design.

■ TB43

M - Balcony D

Supporting Strategic Development - Contibutions from OR

Cluster: OR and Strategy

Invited Session

Chair: Frances O'Brien, Associate Professor, Warwick Business School, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL, United Kingdom, f.a.o-brien@warwick.ac.uk

1 - Trends and Fashions in Strategy Support Tools

Robert Dyson, Professor, Warwick Business School, University of Warick, Coventry, CV4 7AL, United Kingdom, robert.dyson@wbs.ac.uk

The paper identifies fashionable strategic management tools that have appeared in the academic literature over the past 50 years. The popularity of each tool through time was measured by analysing the content of relevant academic and professional journals. The tools are also related to the support they provide for particular strategic activities. The aim was to demonstrate patterns and infer causes through time.

2 - Supporting Strategy: An Empirical Study of UK Practitioners

Frances O'Brien, Associate Professor, Warwick Business School, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL, United Kingdom, f.a.o-brien@warwick.ac.uk

This paper reports the latest findings of a program of research into the current practice of supporting strategy development within the UK. The paper presents an analysis of interviews conducted with UK OR practitioners regarding how they support strategy development within their organisations. The analysis identifies the activities within a strategy process that are supported and the tools used to support these activities. The paper concludes with a conceptual framework highlighting the possible roles that OR can provide in supporting strategy development within organisations.

3 - Exploring the Model Uses within Group Problem Structuring and Negotiation

Orestis Afordakos, Warwick Business School, Gibett Hill Road, Coventry, United Kingdom, Orestis.Afordakos05@phd.wbs.ac.uk, Frances O'Brien, Alberto Franco

The purpose of this presentation is to report on research about the effects that facilitation-driven model uses have when strategic decision making groups engage in conflict management and influence behaviors. The presentation shall begin by framing the research questions. It will then explicate the methodological approach and the application of interaction analysis. In the last part we shall provide preliminary results of groups working on real life strategic problems (non-experimental).

4 - Exploring the Role of Cognitive Style on the Efficacy of Causal Mapping to Structuring Problems

Luiz Felipe Nasser-Carvalho, Postgraduate Researcher, Warwick University, Warwick University, Teaching Centre M0.06, Coventry, CV4 7AL, United Kingdom, lfnasser@googlemail.com, Alberto Franco

The importance of engaging in problem structuring to reach clear, well articulated problem definitions (PD) has been long recognized. Causal mapping (CM) has been one of the most used approaches to support problem structuring efforts. The study explores the role of Need for Cognition and Need for Closure as moderators of the efficacy of CM to improve PD quality. A mixed-methods approach is used to identify if (path analysis) and how (process tracing) predictors and outcomes relate to each other.

■ TB44

M - Balcony C

RFID in Operations Management

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Gary Gaukler, Texas A&M University, TAMU 3131, College Station, TX, United States of America, gaukler@tamu.edu

1 - Expediting with Expiry under RFID

Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, David Simchi-Levi, Chiwon Kim

Expediting of outstanding orders is facilitated by RFID deployments. We show how to improve inventory control under expediting. We also assume that goods have an expiry date.

2 - RFID with Shelf-space Dependent Demand

Jiang Zhang, Assistant Professor, Adelphi University, School of Business, Adelphi University, Garden City, NY, 11530, United States of America, zhang@adelphi.edu, Joseph Szmerekovsky, Vera Tilson

We consider the case of RFID adoption and management when demand is shelf-space dependent. We compare the performance of RFID enabled and non-RFID enabled suppliers. We determine optimal policies for both the management and adoption of RFID technology.

3 - Parsimony vs RFID

Metin Cakanyildirim, University of Texas at Dallas, School of Management SM 30, Richardson, TX, United States of America, metin@utdallas.edu, Alain Bensoussan, Suresh Sethi, Celine Ho

One of the potential benefits of RFID tags is reducing inventory costs by using information-rich models. The benefit is the difference between the costs of an information-rich model and the cost of a parsimonious model. We illustrate numerical/approximation techniques to compute the costs.

4 - Product Contamination and Traceability in the Food Supply Chain

Gary Gaukler, Texas A&M University, TAMU 3131, College Station, TX, United States of America, gaukler@tamu.edu, Vijaya Chebolu-Subramanian

In this talk, we study the disruption to part or whole of a food supply chain due to product contamination of any type. We consider a real world situation where a contaminated food product (meat, produce, etc.) has entered the supply chain. We frame this problem as a multi-stage supply chain network and evaluate the impact of real-time product traceability on several performance metrics.

■ TB45

M - Balcony B

Topics on Operational Flexibility

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Mark Van Oyen, Assoc. Professor, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, 48105, United States of America, vanoyen@umich.edu

Co-Chair: Eylem Tekin, Assistant Professor, Texas A&M University, Industrial and Systems Engineering, College Station, TX, 77843, United States of America, eylem@tamu.edu

1 - Price and Quantity Competition between Outlets and Retail Stores

Xuying Zhao, Assistant Professor, University of Notre Dame, 361 Mendoza College of Business, Notre Dame, IN, 46556, United States of America, xzhao1@nd.edu, Jennifer Ryan, Daewon Sun

We study a dual channel supply chain in which a manufacturer sells a single product to end-users through both a traditional retail channel and a manufacturer-owned outlet store. Each channel faces a newsvendor problem, with price and order quantity as decision variables. A unique equilibrium is provided for the system. We propose a modified revenue sharing contract to enable supply chain coordination. We use numerical tests to answer when the manufacturer should delay sales at the outlet store.

2 - Exact and Heuristic Procedures for Capacity Expansion Problems with Congestion

Sukron Kim, PhD Student, Purdue University, School of Industrial Engineerin, West Lafayette, IN, 47907, United States of America, sukgon@gmail.com, Reha Uzsoy

We consider optimal capacity expansion and contraction schedule decisions over time for production resources subject to congestion. We use concave clearing functions that capture the relationship between throughput and WIP. We propose a column generation procedure that uses a previously developed algorithm for the single workcenter problem. Computational experiments on randomly generated test problems show that the procedure consistently produces near-optimal solutions in modest CPU times.

3 - Stochastic Networks with Breakdowns: Effective Control of Flexible Servers

Soroush Saghafian, PhD Student, University of Michigan, Industrial & Operations Engineering, Ann Arbor, MI, 48109, soroush@umich.edu, Bora Kolfal, Mark Van Oyen

The optimal control (scheduling) of flexible servers subject to breakdown in a parallel queueing network is a theoretically interesting and practical problem which we model as a MDP. We present structural properties for interesting special cases in pursuit of principles for effective management of problems within this broad class.

4 - Joint Production and Economic Retention Quantity Decisions in Capacitated Production Systems

Abhilasha Katariya, PhD Student, Texas A&M University, Industrial and System Engineering, TAMU 3131, College Station, TX, 77843, United States of America, abhilashapk@neo.tamu.edu, Eylem Tekin

We consider production/inventory management decisions of a firm that sells its product in two market segments during a finite horizon. The objective is to maximize the total expected net revenue by determining the optimal production quantity in each period, and the optimal inventory amount to carry to the next period after the sales in primary and secondary markets. We characterize the structure of the optimal policy and establish lower and upper bounds on the optimal policy parameters.

■ TB46

M - Balcony A

Optimization of Inventory in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Frank Ciarallo, Associate Professor, Wright State University, 3640 Col. Glenn Hwy, Dayton, OH, 45435, United States of America, frank.ciarallo@wright.edu

1 - Technology Enabled Hybrid Inventory Control Policies in Hospitals

Claudia Rosales, PhD Candidate, University of Cincinnati, 523 Linder Hall, College of Business Administration, Cincinnati, OH, 45221, United States of America, rosalecr@email.uc.edu, Uday Rao, Mike Magazine

New technology has emerged to improve availability and control of medical supplies in hospitals. Pyxis SupplyStations, which allow continuous inventory tracking, have enabled new inventory practices such as a hybrid inventory policy. This policy combines the option to perform periodic replenishments with the flexibility of additional replenishments any time stockouts are imminent. In single- and multiple-item systems, we study the impact of the new hybrid inventory policy.

2 - Inventory Policies, Costs and Risks in Master Production Scheduling with Explicit Demand Uncertainty

Keli Feng, Assistant Professor, South Carolina State University, 300 college street, NE, Orangeburg, SC, 29118, United States of America, kfeng1@scsu.edu, Uday Rao

For a single-item MPS with capacity limits and dynamic uncertain demand (mean, forecast error), we consider planning using an order quantity vector or order-up-to levels. Performance measures include service levels, cost (mean, standard deviation, c.v.), expected upside risk, "cost-at-risk", and probability of exceeding a target cost. Using simulation-based optimization, we computationally explore the impact of parameters such as shortage penalty, demand c.v., capacity utilization.

3 - Enterprise Inventory Optimization- The Devil is in the Details

Valerie Tardif, Vice President, Algorithms, SmartOps Corporation, Suite 400, 12 Federal Street, Pittsburgh, PA, 15212, United States of America, VTardif@smartops.com, Sridhar Tayur, Lei Wang

Delivering value through inventory optimization requires three elements: a comprehensive model of the supply chain, an algorithm that optimize tradeoffs between cost and service, and end-to-end integration with execution systems. We share solution approaches, and a few lessons learned along the way, that have contributed to our success at implementing enterprise inventory optimization and bringing value across industries.

4 - Supply Performance in Contemporary Multi-echelon Inventory Systems with Multiple Sources of Demand

Suman Niranjan, Visiting Assistant Professor, State University of New York - Binghamton, 4400 Vestal Parkway East, Binghamton, NY, 13902, United States of America, sniranja@binghamton.edu, Frank Ciarallo

Two capacitated multi-echelon assembly systems: i) a network of manufacturers with demand for sub-assembly and final product and ii) manufacturers-warehouse-DC-retail outlets, are used in a simulation based inventory optimization approach to determine the optimal base stock levels at each stage. The gradient estimation technique of perturbation analysis is used to derive sample path estimators. We propose a heuristic approach which provides a near optimal base-stock level.

■ TB47

M - Hoover

Radiation Therapy Treatment Planning II

Sponsor: Health Applications Section
Sponsored Session

Chair: Edwin Romeijn, Professor, University of Florida, ISE Department, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611-6595, United States of America, romeijn@ise.ufl.edu

1 - Volumetric Modulated Arc Therapy Planning

Halil Ozan Gozbasi, Georgia Institute of Technology, 4573 River Parkway, Apt K, Atlanta, GA, 30339, United States of America, ozan@gatech.edu, Tim Fox, Martin Savelsbergh, Eduard Schreibmann, Shabbir Ahmed, Ian Crocker

VMAT is a new technology in radiation therapy which delivers dose in a single 360 degree rotation of the gantry by simultaneously controlling leaf positions and dose rate. Treatment times are significantly smaller than with current IMRT technology, resulting in increased patient comfort, and treatment of more patients. We present an optimization algorithm to construct a VMAT plan and evaluate its results on a real patient case through a comparison with results from existing IMRT technology.

2 - Off-line Adaptive Radiation Therapy

Marina Epelman, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48109, United States of America, mepelman@umich.edu, Mustafa Sir, Stephen Pollock

Optimization-based planning of radiation treatments often produces sharp dose gradients between tumors and healthy tissue. Due to random shifts during treatment, significant differences between the "optimized" plan and the actual dose can occur. Radiation is delivered in small daily fractions, and we exploit the dynamic nature of treatment and information gathering by adapting the plan to fraction-to-fraction variations measured during a patient's treatment course using Bayesian updating.

3 - A Robust Approach to Intensity Modulated Proton (not Photon) Therapy under Range Uncertainty

Timothy Chan, McKinsey and Company, 30 E Huron St. Apt 4609, Chicago, IL, United States of America, tcychan@alum.mit.edu, Thomas Bortfeld, John Tsitsiklis

Unlike traditional photon-based radiation therapy treatments, proton-based treatments are witness to significant uncertainty in the location of maximum dose deposition by the beamlets of radiation. In this talk, we present a robust formulation to optimize intensity-modulated proton therapy treatments. We demonstrate that optimal robust solutions use specific physical characteristics of the proton beam to create dose distributions that are far less sensistive to the underlying uncertainty.

4 - Trade-off Between Treatment Plan Quality and Beam-on-time in IMRT Using Direct Aperture Optimization

Ehsan Salari, University of Florida, 999 SW 16th Avenue Apt 64, Gainesville, FL, 32601, United States of America, esalari@ufl.edu, Edwin Romeijn

Direct aperture optimization of IMRT treatment plans allows for a much more accurate modeling of treatment delivery aspects than traditional beamlet-based treatment plan optimization. We extend a column generation approach for direct aperture optimization to include total beam-on time as one of the treatment plan evaluation criteria and use this model to determine the Pareto efficient frontier of treatment plan quality and beam-on time for clinical patient cases.

■ TB48

M - Coolidge

KLIC: Team and Organizational Learning and Knowledge Management

Sponsor: Technology Management
Sponsored Session

Chair: Nile Hatch, Marriott School - BYU, 619 TNRB, Provo, UT, 84602, United States of America, nile@byu.edu

1 - Learning to Operate: Management of Knowledge Creation and Transfer in Orthopedic Surgeries

Nile Hatch, Marriott School - BYU, 619 TNRB, Provo, UT, 84602, United States of America, nile@byu.edu, David Moore

The economics of hospital health care reward efficiency and quality. Using a sample of almost 15,000 orthopedic surgeries, we study the learning processes of surgeons, surgical teams, and hospitals. While experience matters, so does management of learning. We find that some hospital management practices promote learning and efficiency while others impede learning.

2 - Learning in Professional Services

Ram Ganeshan, Assoc. Professor, College of William and Mary, Mason School of Business, Williamsburg, va, 23185, United States of America, ram.ganeshan@mason.wm.edu, Tonya Boone, Robert L. Hicks

This talk focuses on the dynamics of learning in professional services. Using learning curve theory, and supported by project-level data from an architecture-engineering firm, we report on how professional firms learn; how different units within the firm transfer and leverage knowledge for project effectiveness; and if and how it leverages knowledge from sub-contracted projects.

3 - How do Organizations Really Learn from Their Experience? A Construal Based View

Chris Bingham, University of Maryland, 4519 Van Munching Hall, College Park, MD, 20742, United States of America, cbingham@rhsmith.umd.edu

While research suggests that firms learn from their experience, little is known about how such learning occurs. Using data on the country entries of new venture firms we explore this gap. Specifically, we bring to light the importance of two forms of cognitive construal, both of which influence whether and how learning takes place over time. Overall, our findings have implications for the underexplored interplay between cognition and behavior that lies at the heart of experiential learning.

4 - Novelty and Appropriability: The Role of Entrepeneurial Knowledge

Tony Briggs, Doctoral Candidate, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, tbriggs@bu.edu

Why do entrepreneurs share information when others can steal their ideas? I present an ex ante information sharing framework in which novel information is abundant but of predominantly poor quality. Evidence of "entrepreneurial knowledge" about novel complementary asset combinations is illustrated by a historical example and by primary data from repeat entrepreneurs. Implications for strategy, knowledge management, and entrepreneurship are discussed.

■ TB49

M - Harding

Simulation Optimization: Theory and Applications

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Jeff Hong, Assistant Professor, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, China, hongl@ust.hk

1 - Design of Experiments for Simulation Optimization

Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

In this paper, we will discuss efficient design of experiments for simulation optimization. We have proposed a DOE-based simulation optimization framework that has nice convergence property. Based on the framework, we will discuss different designs that are suitable for simulation optimization.

2 - Revisit of Stochastic Mesh Method for Pricing American Options

Guangwu Liu, Department of Industrial Engineering and Logistics Management, The Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, China, liugw@ust.hk, Jeff Hong

We revisit stochastic mesh method for pricing American options, from a conditioning point of view, instead of the importance sampling viewpoint in Broadie and Glasserman (1997). Based on this new viewpoint, we derive new weights which exploit not only the backward but also the forward information. These weights may be fast to implement for some models where the existing weights may not be able to handle because of the huge computational effort required, e.g., the variance-gamma model.

3 - Comparing Two Systems: Beyond Common Random Numbers

Shane G. Henderson, Associate Professor, Cornell University, 230 Rhodes Hall, Ithaca, NY, 14853, United States of America, sgh9@cornell.edu, Samuel M. T. Ehrlichman

Suppose one is comparing 2 closely related stochastic systems via simulation. Common-random numbers (CRN) involves using the same streams of uniform random variables on both systems to sharpen the comparison. One can view CRN as a special choice of copula that gives the joint distribution on the inputs to both systems. We discuss the possibility of using more general copulae, including simple examples that show why this can outperform CRN.

4 - Sequential Convex Approximations of Chance Constrained Programs

Jeff Hong, Assistant Professor, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, China, hongl@ust.hk, Yi Yang

Chance constrained programs are difficult to solve due to the nonconvexity of the chance function. n this talk, we proposed to approximate the problem by a sequence of convex programs. We show that the sequence leads to a local optimal solution to the original problem, and the solution is provable better than the solution found by the CVaR approximation. We solve the sequence of convex programs using the Monte Carlo method.

■ TB50

M - Wilson C

Large-scale Stochastic Optimization II

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)

Sponsored Session

Chair: Guanghui Lan, Georgia Tech, School of ISyE, Atlanta, GA, United States of America, glan@isye.gatech.edu

1 - Validation Analysis of Robust Stochastic Approximation

Guanghui Lan, Georgia Tech, School of ISyE, Atlanta, GA, United States of America, glan@isye.gatech.edu, Alex Shapiro, Arkadi Nemirovski

The main goal of this paper is to develop accuracy estimates for stochastic programming problems by employing robust stochastic approximation (SA) type algorithms. We show that while running a Robust SA procedure one can compute, with a small additional effort, lower and upper statistical bounds for the optimal objective value. We demonstrate that the quality of these bounds are comparable with those of sampling average method (SAA) for certain class of stochastic programs.

2 - Subsampling Algorithms for Semidefinite Programming

Alexandre D'aspremont, Asst. Professor, Princeton University, Olden St, Princeton, NJ, 08544, United States of America, aspremon@princeton.edu

We derive two stochastic gradient algorithms for semidefinite optimization using randomization techniques. One is based on the robust stochastic approximation method and uses random sparsifications of the current iterate to both accelerate eigenvalue computations and reduce memory requirements. The other relies on gradient sampling techniques to reduce the per iteration cost of smooth semidefinite optimization methods.

3 - Convex Stochastic Minimization and Saddle Point Problems via Stochastic Mirror-Prox Algorithm

Arkadi Nemirovski, School of Industrial and Systems Engineering Georgia Institute of Technology, Atlanta, GA, nemirovs@isye.gatech.edu, Anatoli Juditsky, Claire Tauvel

We present a novel Stochastic Mirror-Prox (SMP) algorithm for Convex Stochastic Nash Equilibrium problems (e.g., problems of convex minimization and of solving convex-concave games). Assuming the associated monotone operator possessing both smooth and nonsmooth components, we show that SMP exhibits optimal rates of convergence achievable under this hypothesis. We discuss applications of SMP to Stochastic Composite minimization, Semidefinite feasibility and Eigenvalue minimization.

■ TB51

M - Wilson B

Socioeconomic Aspects of Information Security

Sponsor: Information Systems

Sponsored Session

Chair: Dmitry Zhdanov, University of Connecticut, 2100 Hillside Rd, Unit 1041, OPIM Department School of Business, Storrs, CT, 06066, United States of America, Dmitry.Zhdanov@business.uconn.edu

1 - Balancing Information Access and Risk with Capacitated IT Service

Eric Johnson, Professor, Dartmouth College, Center for Digital Strategies, Tuck School of Business, Hanover, NH, 03755, United States of America, M.Eric.Johnson@tuck.dartmouth.edu, Xia. Zhao

Controls for information access, while needed to maintain the security, inevitably constrain the firm's ability to respond quickly to changing needs. We introduce an escalation component to the access control process and study design and control decisions for an IT service department focused on both security risks and delay costs.

2 - Manipulating Privacy Valuations: Coherent Arbitrariness, Endowment Effects, and Willingness to Pay

Alessandro Acquisti, Carnegie Mellon University, acquisti@andrew.cmu.edu, Leslie John, George Loewenstein

We study the impact of coherent arbitrariness and endowment effects on individuals' willingness to pay for privacy and willingness to accept money to reveal personal information. In four experiments, subjects had to choose between different types of trackable gift cards. We manipulated the initial endowment of the subjects as well as the framing and order of the offers they received. Our results suggest that privacy valuations are not stable and can be easily manipulated.

3 - Design of Security-constrained Workflows

Dmitry Zhdanov, University of Connecticut, 2100 Hillside Rd, Unit 1041, OPIM Department School of Business, Storrs, CT, 06066, United States of America, Dmitry.Zhdanov@business.uconn.edu, Xue Bai, Ram Gopal, Manuel Nunez

We describe a workflow optimization problem where information security serves as a set of constraints. Any digital transformation that involves confidential data sequences are applicable to our model because it carries vulnerability. Examples are B2B or B2C EDI, online-banking, electronic payment systems, email exchange, where the userID, password, and other personal information should not appear available to the same information processor.

■ TB52

M - Wilson A

Panel Discussion: Disaster Preparedness and Response and Inter-Organizational Collaboration

Cluster: Humanitarian Logistics and Disaster Preparedness

Invited Session

Chair: Pinar Keskinocak, Associate Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, pinar@isye.gatech.edu

1 - Disaster Preparedness and Response and Inter-Organizational Collaboration

Moderator: Elizabeth Critchley, Red Cross, CritchleyE@usa.redcross.org, Panelists: Louiqa Rashid, Rosemary Parnell, Eric Smith

The panelists will discuss the challenges and opportunities in disaster preparedness and response, and the role of intra- and inter-enterprise collaboration and coordination.

2 - Disaster Preparedness & Response at American Red Cross

Rosemary Parnell, Red Cross, ParnellR@usa.redcross.org, Elizabeth Critchley

The disaster response of the American Red Cross includes shelter, food, health services and to assist people affected by disaster to to resume their normal daily activities independently. Logistics within the American Red Cross is responsible for all activities related to the procurements of goods and services, acquisition and release of facilities, availability of supplies and equipment, warehousing, transportation, and maintenance of the national fleet of disaster vehicles.

3 - Disaster Logistics and DHS/FEMA Logistics Management Directorate (LMD)

Eric Smith, Assistant Administrator for the Logistics Management Directorate, FEMA, DHS/Federal Emergency Management Agency, Washington, DC, 20472, United States of America, eric.smith@dhs.gov

LMD is responsible for policy, guidance, standards, execution and governance of logistics support, services, and operations. FEMA transformed its logistics management and created a responsive and robust logistics capability by rightsizing inventory, enhancing its relationships with federal partners as the integrator for coordinating national logistics response operations, and establishing an effective pre-positioning plan. The preparations for recent disasters validated the new strategies.

4 - Effective Deployment of Scalable Information Technology Solutions for Humanitarian Relief Services

Louiqa Rashid, University of Maryland, VMH, College Park, United States of America, louiqa@umiacs.umd.edu

Recent disasters have identified the shortcomings of ICT solutions. I will discuss the effective deployment of solutions that address the following challenges of disaster data management (disDM): Diversity of the partner or client organizations; Heterogeneity and the need for interoperability to facilitate information sharing; Data Quality requirements to ensure overall high quality of service; Support for evolving semantic dataspaces to model past disasters and to provide a flexible platform and evolving solutions.

■ TB53

M - Nathan Hale- Wardman Tower

Optimization under Risk

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Michael Zabarankin, Assistant Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, Michael.Zabarankin@stevens.edu

1 - Risk Averse Portfolio Optimization Via Stochastic Dominance with Respect to a Floating Benchmark

Darinka Dentcheva, Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, darinka.dentcheva@stevens.edu, Andrzej Ruszczynski

We consider optimal portfolio selection approach which requires the portfolio returns to dominate a random benchmark. Allowing for unattainable benchmarks, we introduce a shift in the benchmark return, which is penalized in the objective function. This results in a floating benchmark, which can be viewed as a continuum of conditional value at risk constraints with aspiration levels. A new cutting plane method for the resulting problem is proposed. Numerical illustration is provided.

2 - Risk Optimization with p-Order Conic Constraints

Pavlo Krokhmal, University of Iowa, krokhmal@engineering.uiowa.edu

A class of risk-reward optimization models that reduce to mathematical programming problems with p-order conic constraints is considered. Properties and solution algorithms are discussed, and an illustrative case study of portfolio optimization with p-cone constraints is presented.

3 - Most Informative Component Analysis in Application to a Stock Market

Anton Molyboha, Stevens Institute of Technology, Castle Point on Hudson, Math department, Hoboken, NJ, 07030, United States of America, amolyboh@stevens.edu

A novel model of a stock market has been developed, which provides a global view at investors preferences. A maximum entropy technique for fitting the model to the data has been elaborated. In the framework of the model, the Most Informative Component Analysis (MICA) has been applied to characterize the state of the market. The MICA is based on the notion of mutual information and identifies the most informative factors for describing stochastic system states and comparing states one to another.

■ TB54

M - Congressional - Wardman Tower

Cost and Performance Analysis in OR

Contributed Session

Chair: Zehra Bilginturk Yalcin, University of Texas, Austin, 1 University Station C2200, Austin, TX, 78712, United States of America, zbilginturk@gmail.com

1 - A Hidden Markov Model Forecasting Satellite Life-cycle Stage Risk

Leif Anderson, Blackhawk Management Corporation, 2115 Runnels Street, 4210, Houston, 77003, United States of America, leif.anderson@boeing.com, Liang-Chieh Cheng

This paper introduces a Hidden Markov Model incorporating operational cost, insurance coverage, and reliability data to model four stages characterizing a satellite system life-cycle. The model addresses market complexity by integrating the cost and insurance coverage proportions at each stage. We use a priori knowledge of the satellite system, gathered from published reliability data, as it progresses to the fully operational, in-orbit stage.

2 - Minimum Life Cycle Cost or Maximum Life Cycle Value, a Performance Comparison

Ali Rezvani, Graduate Assistant, Rutgers State University, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States of America, rezvani@rutgers.edu, Farnaz Farzan, Mohsen Jafari

We investigate the effect of change in the ownership structure of an infrastructure asset on its maintenance repair and rehabilitation strategies. This effect is studied by cost/benefits analysis of optimum maintenance strategies resulted from models having "Cost-center" and "Profit-center" looks toward the infrastructure asset. In this investigation, different levels of demand-elasticity are considered to find the point that one approach out performs the other.

3 - Quantifying Diminishing Reliability Returns from Electric Utility Vegetation Management Spending

Wiko Kabiling, Analytic Consultant, Davies Consulting, 6935 Wisconsin Ave, Suite 600, Chevy Chase, MD, 20815, United States of America, wkabiling@daviescon.com, Patrick Delaney

Trees coming into contact with electric power lines are a major contributor to customer interruptions. This paper presents a framework for correlating tree trimming budget levels with the impact on system reliability. The approach is composed of three core parts - the evaluation of circuit-by-circuit cost-effectiveness based on reliability and cost curves, annual prioritization of circuits subject to a budget constraint, and what-if analysis by varying budget levels and trim cycle constraints.

4 - First Wafer Delay Effect Problem in Semiconductor Manufacturing

Zehra Bilginturk Yalcin, University of Texas, Austin, 1 University Station C2200, Austin, TX, 78712, United States of America, zbilginturk@gmail.com

We use semiconductors nearly in all of the areas that need minor technologies. The process of manufacturing semiconductor devices is very complex, customized and costly and many of the semiconductor facilities, called 'fabs' in semiconductor terminology, are far from theoretical limits. Hence there is a great potential of improving the production times. In this paper, we examine the first wafer's production delay problem and test some solution approaches to optimize the total completion time.

5 - Decision Making Methodology for the Cost-effectiveness Study of Asthma Treatments

Luis Hernàndez, Research Assistant, Universidad de Los Andes, Carrera 1E No 19A-40 Office ML752, Bogota, Colombia, gabr-her@uniandes.edu.co, Mario Castillo H., Elizabeth Garcia

This work develops a decision analysis methodology to identify and select the most cost-effective health technology in a health care system. This methodology is supported in a discrete event simulation model that estimates the impact and long term effects of different health technologies in the health and costs of the health system population, using clinical trials and prevalence studies information and was applied in a real case for asthmatic children in Colombia.

■ TB55

M - Embassy- Wardman Tower

Stochastic Models in Telecommunications

Sponsor: Telecommunications
Sponsored Session

Chair: John F. Shortle, George Mason University, 4400 University Dr., MS 4A6, Fairfax, VA, 22030, United States of America, jshortle@gmu.edu

1 - Transient Analysis of the TCP Window Size Process

Johan Leeuwaarden, Technical University of Eindhoven, Netherlands, j.s.h.v.leeuwaarden@TUE.nl

The window size in TCP (Transmission Control Protocol) can be modeled as a Markov process that increases linearly in time and experiences downward jumps at Poisson times. We present a transient analysis of this process, including explicit results for transient moments and hitting times. This is joint work with A.H. Lopker.

2 - Stochastic Models for Wireless Networks with Opportunistic Spectrum Sharing

Shensheng Tang, Research Associate, ECE Department, George Mason University, 4400 University Drive, Fairfax, VA, 22030, United States of America, stang1@gmu.edu, Brian L. Mark

An opportunistic spectrum sharing system carries two types of calls. Primary calls occupy channels irrespective of the presence of secondary calls. When a secondary call occupying a channel detects the arrival of a primary call, it moves to an idle channel or is placed in a queue where it waits for a channel to become available or until a maximum waiting time elapses. We study the performance of such a system using Markovian models and matrix-analytic methods.

3 - Characterization of Internet Application Traffic and Network Capacity Sizing Implications

Amie Elcan, Qwest Communications, 1801 California Street, Suite 2620, Denver, CO, 80202, United States of America, Amie.Elcan@qwest.com

Internet carrier traffic volumes have been increasing exponentially due to the availability of large digital media files from commercial web sites and from private sources through peer to peer file sharing clients. Other bandwidth intensive applications such as VoIP, short form video and online TV have gained popularity. Internet application usage trends will be presented as well as methods for sizing network link capacity to respond to traffic loads made possible by faster service speeds.

4 - Modeling the Performance of the Low Latency Queueing Router Discipline

Martin Fischer, Senior Fellow, Noblis, 3150 Fairview Park Drive South, Falls Church, VA, 22042, United States of America, mfischer@noblis.org, John Shortle, Denise Masi

Low Latency Queueing (LLQ) is an Internet Protocol (IP) router discipline that is being used to ensure that performance-sensitive high priority traffic receives a high level of performance, while allowing less performance-sensitive traffic to receive some portion of the bandwidth. We present a discussion of our experiences in modeling the performance of this system. The discussion involves the roles analytics, simulation, and the use of approximations have had in this development.

■ TB56

O - Blue Room

Information and Freight Trucking Operations

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Bruce Wang, Assistant Professor, Texas A&M University, 1415 Engineering Dr., Room 2205, College Station, WI, United States of America, bwang@civil.tamu.edu

1 - Real-time Monitoring and Visualization of Truck GPS and Engine Data in the Toronto Area

Matthew Roorda, Assistant Professor, University of Toronto, 35 St. George Street, Toronto, M5S 1A4, Canada, roordam@ecf.utoronto.ca

A "pseudo real-time" truck monitoring system is described, which is under development in Toronto, Canada. The system makes use of route trackers, currently installed in over 10,000 trucks, that download data wirelessly to roadside receivers at freeway interchanges throughout Toronto. A variety of location, speed, and engine data are collected and visualized in a university based laboratory. The project reflects a significant private sector / government / academia partnership.

2 - Analysis of LTL Routes in Congested Urban Areas

Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

Data from the daily activity of less than truckload (LTL) delivery tours is used to identify route patterns, estimate travel distances, and analyze the impact of congestion. Route characteristics, data collection challenges, and the potential of GPS based collection methods are also discussed.

3 - Utilizing Anonymous Vehicle Location Data to Derive Freight Origin-destination Information

Crystal Jones, Transportation Specialist, US DOT Federal Highway Administration, 1200 New Jersey Ave, Washington, DC, 20590, United States of America, Crystal.Jones@dot.gov, Jeffrey Short

This presentation details a public-private partnership that centers on collecting anonymous vehicle location data, processing and managing the data, and using it to support freight transportation planning. The presentation includes examples of how the resultant data can be used to derive trip length estimation on a facility, zone to zone travel times for a region, and tables that estimate external-external and external-internal trips for a state.

■ TB57

O - Blue Room Prefunction

Performance Issues

Sponsor: Aviation Applications
Sponsored Session

Chair: Dipasis Bhadra, Principal, MITRE/CAASD, 7515 Colshire Avenue, McLean, VA, 22102, United States of America, dbhadra@mitre.org

1 - Can Airport Congestion Be Anticipated?

Tony Diana, Manager, Information Systems, FAA, 800 Independence Avenue, Washington, DC, 20591, United States of America, tony.diana@faa.gov

Airport congestion occurs when an airport fails to bring under control its mutually interdependent operational subsystems. The study reveals that the odds of congestion in 2007 at the three largest New York airports increased with taxi times and total capacity utilized. Therefore any initiative designed to reduce congestion needs to focus on landside operations, which may further decrease capacity at arrival and departure.

2 - A Preliminary Comparison of European & U.S. Performance

Dave Knorr, FAA Liasion at DFS, FAA, 800 Independence Avenue, Washington, DC, 200008, United States of America, Dave.Knorr@faa.gov, Marc Rose

Anecdotal comparisons have been made comparing United States with Europe ATM. Many believe the European system applies more stringent ground delays to flights to control for demand exceeding capacity. Taxi times are believed to be longer in the U.S. To date a systematic approach to comparing performance trends by phase of flight has not been performed. Detailed flight data in both Europe and the US to compare real performance is used. A normalizing technique the "DLTA Method" is used.

3 - Structure of US Air Travel Demand

Dipasis Bhadra, Principal, MITRE/CAASD, 7515 Colshire Avenue, McLean, VA, 22102, United States of America, dbhadra@mitre.org

Has the relationship that drive demand between origin and destination cities in the US scheduled commercial air travel changed since 9/11 and other exogenous shocks? In this presentation, I use a time series model to discern systematic and non-systematic factors underlying the structural relationships integrating demand for air travel to fare, economic and demographic factors.

4 - Delay Propagation

Akira Kondo, Senior OR Analyst, FAA, 800 Independence Agenue, Washington, DC, 20591, United States of America, akira.kondo@faa.gov

A process of delay propagation is tracked by sequencing airlines city pair flights time-wise, using tail numbers. A definition is established when a propagated delay materializes. Measures and statistics are computed such as leap counts and multipliers for the propagated delays. Further, shapes of the distributions of the propagated delays are examined to group them into three types and to describe changing development of the types during the course of the day.

5 - City Pair Block Time Analysis

Esther Hernandez, Analyst, FAA, 800 Independence Avenue SW, Rm 939, Washington, DC, 20591, United States of America, Esther.Hernandez@faa.gov, Tony Diana

The study investigates whether block and buffer times for selected city pairs have been increasing from 2000 to 2007 and how changes may have impacted delays and congestion.

■ TB58

O - Capital

Joint Session AAS/RM: Airline Pricing

Sponsor: Aviation Applications, Revenue Management & Pricing
Sponsored Session

Chair: Anne Mercier, Senior Scientist, ExPretio Technologies, 200 Laurier Ouest, Suite 400, Montréal, QC, H2T 2N8, Canada, anne.mercier@expretio.com

1 - Competitive Pricing Practices in the US Airline Industry

Laurie Garrow, Assistant Professor, Georgia Institute of Technology, School of Civil and Environmental Engine, 790 Atlantic Dr, Atlanta, GA, 30332-0355, United States of America, laurie.garrow@ce.gatech.edu, Shawn Pope

This study analyzes competitive pricing practices using on-line data collected for 100 US markets for 1 month of departures and 4 week booking horizon. Impacts of multiple market factors on the average lowest nonstop price and price dispersion are examined. Average price and price dispersion are associated with several factors, including time until departure, presence of a low cost carrier, and amount of market concentration. Different pricing practices among carriers are also observed.

2 - Inter-temporal Price Dispersion in Airline Markets: an Empirical Analysis

Benny Mantin, Assistant Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, bmantin@uwaterloo.ca, Bon Koo

We empirically investigate inter-temporal price dispersion in the airline industry on 1000 US domestic routes. By measuring price dispersion about the average observed airfares for same periods, we examine the factors that affect dispersion, such as competitive, route, and carrier specific variables.

3 - Optimal Search Behavior of Strategic Customers under Deadlines

Marco Castillo, Assistant Professor, Georgia Institute of Technology, 685 Cherry Street, N.W., Atlanta, GA, 30332-0345, United States of America, marco.castillo@pubpolicy.gatech.edu, Laurie Garrow, Misuk Lee

We investigate optimal search and purchase behavior of a buyer under a deadline. We show strategic customer have consequences on the optimal pricing of monopolists that are themselves strategic and time-consistent. While mark-down pricing is always optimal for a large class of models of heterogeneous preferences commonly used in the discrete choice literature, we find that mark-up pricing might be optimal when buyers are time-inconsistent.

4 - Towards a New Approach to Seat Inventory Control at Air Canada

Anne Mercier, Senior Scientist, ExPretio Technologies, 200 Laurier Ouest, suite 400, Montréal, QC, H2T 2N8, Canada, anne.mercier@expretio.com, Jean-François Pagé, Jean-Philippe Côté, Louis-Philippe Bigras

The proposed integrated approach incorporates a segmentation procedure, a discrete choice model that computes choice probabilities for each alternative of the passengers' choice set, and an optimization tool for the airline's seat allocation maximizing revenue in accordance with the airline's business strategies.

■ TB59

O - Embassy Room

Robust Pricing and Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Zhi-Long Chen, University of Maryland, Robert H. Smith School of Business, College Park, MD, United States of America, ZChen@rhsmith.umd.edu

1 - Robust Airline Fare-class Allocation Competitition

Huina Gao, University of Maryland, Robert H. Smith School of Business, College Park, MD, 20742, United States of America, hgao@rhsmith.umd.edu, Itir Karaesmen, Michael Ball

We study the fare-class allocation problem for competing airlines. Neither airline has perfect probabilistic characterization of demand; only range of demand in each fare class is known. Each airline is interested in deriving policies with worst-case guarantees. We provide a game-theoretic analysis of the problem assuming nested booking limits are used by each airline. We provide sufficient conditions for unique Nash equilibrium to exist. Properties of the optimal policies are also discussed.

2 - A Riskless-price Heuristic for the Newsvendor

Guillaume Roels, UCLA, Anderson School of Management, Los Angeles, CA, 90095, United States of America, groels@anderson.ucla.edu

We revisit the problem of the newsvendor with pricing. Using worst-case bounds over all demand probability distributions, we demonstrate that it is relatively robust to price at the riskless price, both for the additive and the multiplicative demand models. We then show that the loss of optimality is generally within a few percents from the optimal profit. Our analysis generates new insights into the role of pricing as a hedge against demand uncertainty and its relation to safety stocks.

3 - Pricing Via Robust Optimization

Aurelie Thiele, P.C. Rossin Asst Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@lehigh.edu

We present a robust optimization approach to the problem of pricing a capacitated product over a finite time horizon in the presence of demand uncertainty. We introduce a budget of resource consumption by the uncertainty, establish the existence of a reference price for the product and show that this new parameter plays a crucial role in understanding the impact of uncertainty on the optimal prices.

4 - Robust Markdown Pricing with Two Products

Ming Chen, University of Maryland, Robert H. Smith School of Business, College Park, MD, 20742, United States of America, chenming@rhsmith.umd.edu, Zhi-Long Chen

We consider a markdown pricing problem with two dependent products. The demand for one product is a function of the prices of both products, and only a limited information about this function is known. We propose a solution approach for maximizing the revenue under the worst-case demand scenario.

■ TB60

O - Hampton Room

Revenue & Yield Management

Contributed Session

Chair: Craig Sorochuk, Richard Ivey School of Business, University of Western Ontario, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, csorochuk@ivey.ca

1 - Air Cargo Capacity Allocation Model

Li Luo, Professor, Sichuan University, Business School Sichuan University, Chengdu, 610064, China, luolicc@163.com, Zhan Pang

This paper proposes a stochastic dynamic programming model for air cargo capacity allocation problem between the contract and free-sale customers. We divide decisions into two groups, consisting of the first acceptance of the orders of free-sale customers and the second choice of the flight for all the orders of the contract customers. We use the approximate dynamic programming (ADP) approach to solve the multi-dimension dynamic programming model.

2 - Robust Order Admission Control Considering Capacity Utilization Requirement in B2B MTO Environments

Andy Wu, Graduate Institute of BA, National Taiwan University, No.1, Sec. 4, Roosevelt Road, Taipei, Taiwan - ROC, d92741003@ntu.edu.tw, David Chiang

A robust order admission control is developed to alleviate the target conflict for B2B MTO businesses. The problem is modeled by a multistage integer stochastic program with a chance constraint on the capacity utilization. Taking the penalty function as the salvage value for remaining capacity, the resulting optimal admission issue can be transformed into a Markovian decision problem. A robust order admission policy, a type of reward threshold policy, is proposed.

3 - Revenue Management for Freight Rail Transportation

Luce Brotcorne, Professor, University of Valenciennes, Le Mont Houy, Valenciennes, 59313, France, luce.brotcorne@univ-valenciennes.fr, Ioana Codrutsa Bilegan, Dominique Feillet, Yezekael Hayel

We consider a freight rail transportation problem where a carrier strives to maximize revenue by managing efficiently punctual demands and estimations of future demands for container transportation. We propose a revenue management approach based on solving a mathematical program with respect to a space-time modelling of the transportation network.

4 - Revenue Management with Stochastic Yields

Weifen Zhuang, PhD Candidate, Nanyang Business School, Nanyang Technological University, Singapore, S639798, Singapore, U050023@ntu.edu.sg, Michael Z.F. Li

Traditional revenue management only takes account of the certain direct revenue from selling the product. However in many businesses such as casinos, hotels, cruise liners, there is a significant source of stochastic yields associated with selling that product. In this paper, we develop a mathematic model to study the revenue management problem with stochastic yields to maximize the total expected utility through customized pricing and characterize the structural properties of the optimal price.

5 - Extensions to the Newsvendor Problem with Pricing

Craig Sorochuk, Richard Ivey School of Business, University of Western Ontario, 1151 Richmond Street North, London, ON, N6A 3K7, Canada, csorochuk@ivey.ca, John Wilson

We present models used to address the newsvendor problem when in addition to inventory, price is a decision variable. We begin with specific results for the single price-inventory problem and then expand the model for multiple price-inventory levels. Both discrete and continuous cases are discussed.

■ TB61

O - Calvert Room

Modeling and Control of Recurrent and Nonrecurrent Congestion

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Melike Baykal-Gursoy, Associate Professor, I&SE Department Rutgers, 96 Frelinghuysen Rd., Piscataway, NJ, 08854-8018, United States of America, gursoy@rci.rutgers.edu

1 - Multi-objective Routing in Congested Transportation Networks
James MacGregor Smith, Professor, Univ. of Massachusettes-Amherst, Department Mech. and Ind. Engineering, 160 Governor's Dr., Amherst, MA, 01003, United States of America, jmsmith@ecs.umass.edu, Alexander Stepanov

We present an approach for designing optimal routing policies for emergency evacuation planning. The approach finds a solution which minimizes clearance time, total travelled distance and congestion along egress routes and also accounts for potential road link failures due to incidents. The core of the approach is an integer program (IP) model, which uses a state-dependent service rate queueing model to evaluate the time delays on road links. Numerous computational experiments are provided.

2 - Time Dependent Vehicle Routing Subject to Perturbations
Tom Van Woensel, Eindhoven University of Technology, Den Dolech 2, Eindhoven, 5612 AZ, Netherlands, t.v.woensel@tue.nl, Ola Gabali, Ton de Kok

Vehicle routing problems are extensively studied due to the realistic value such problems have with regards to distribution logistics. This paper extends the existing models by incorporating random disruptions, which depict situations where there are delays at the customers. We find robust solutions that have a good ability to absorb these disruptions.

3 - Vehicle Routing with Stochastic Time-dependent Travel Times
Christophe Lecluyse, University of Antwerp, Prinsstraat 13, Antwerp, 00, Belgium, christophe.lecluyse@ua.ac.be, Tom Van Woensel, Herbert Peremans

In a real-life environment the travel times on an individual link are stochastic in nature. Due to weather conditions, car accidents, congestion, time and spatial fluctuations of traffic flows can be observed. Minimizing the expected travel time does not account for this. Consequently, the road traffic conditions and its variability can not be ignored in order to carry out a good quality route optimization, represented here as the 95th - percentile of the travel time distribution (lognormal).

4 - Modeling Nonrecurrent Congestion
Melike Baykal-Gursoy, Associate Professor, I&SE Department Rutgers, 96 Frelinghuysen Rd., Piscataway, NJ, 08854-8018, United States of America, gursoy@rci.rutgers.edu, Zhe Duan, Kaan Ozbay

Multi-server queue with service interruptions is introduced to model the traffic flow subject to incidents. Under incidents, either all lanes or part of a lane is closed. We analyze this system and present a scheme to obtain the stationary number of vehicles. Large capacity links can be approximated as infinite server queues. The effect of recurrent congestion due to excess demand is also incorporated into the flow model. We present simulation results showing the validity of queueing models.

■ TB62

O - Governor's Boardroom

Revenue Management with Model Uncertainty and Model Approximations

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Miguel Lobo, INSEAD, 1 Ayer Rajah Avenue, Singapore, 138676, Singapore, Miguel.LOBO@insead.edu

1 - A Revenue Management Application of Nonlinear Approximate Dynamic Programming
Canan Uckun, University of Chicago, 5807 South Woodlawn Ave., Chicago, IL, 60422, United States of America, cuckun@chicagogsb.edu, Dan Adelman

For a revenue management problem, we explore a strong functional form to approximate the optimal dynamic programming value function. Whereas most of the ADP literature employs weighted combinations of non-parametric basis functions, our basis functions are nonlinearly parameterized. We provide a solution methodology to solve the resulting non-linear program.

2 - Feedback Pricing Policies
Costis Maglaras, Columbia University, New York, NY, 10027, cm479@columbia.edu, Omar Besbes

We study a revenue maximization problem for a seller that is subject to a set of financial and sales milestone constraints. The goal is to choose a pricing policy that satisfies these constraints over time in a revenue maximizing manner, and the focus is in settings with limited or no market information. The motivating application is pricing of large scale real estate projects.

3 - Optimal Sequential Decision Making Relative to a Benchmark
Assaf Zeevi, Professor, Columbia Business School, New York, NY, 10027, United States of America, assaf@gsb.columbia.edu

We consider a simple class of problems involving online decision making with a goal of outperforming a given and known benchmark. Casting this as a "one armed" bandit problem, we develop strategies whose performance over any time horizon is as good as that of an oracle up to a finite fixed loss.

4 - Revenue Management for Negotiated Prices
Miguel Lobo, INSEAD, 1 Ayer Rajah Avenue, Singapore, 138676, Singapore, Miguel.LOBO@insead.edu

We consider the problem of determining the optimal policy for offering an individual discount to a buyer. Buyers have random delays to purchase and to find alternative sellers. We discuss issues of identifiability and robustness when the model parameters are estimated from historical data.

■ TB63

O - Congressional B

Innovations in Traffic Routing Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Satish Ukkusuri, Rensselaer Polytechnic Institute, 4032 JEC, Troy, NY, United States of America, satish.ukkusuri@gmail.com

1 - Policy-based Routing in a Stochastic Networks with Incident Risks
Yupo Chan, University of Arkansas at Little Rock, 2801 South University, Little Rock, AR, United States of America, yxchan@ualr.edu, Adeyemi Fowe

We present a routing algorithm that takes adaptive routing decision at each node en-route. It considers stochasticity, incident delay, and travel-time forecasting in a non-FIFO network. The routing decision is based on two criteria: the optimal next-hop node, and the optimal wait-time. Under these circumstances, a traveler can violate the First-In-First-Out (FIFO) property, by arriving earlier than another who started before s/he did.

2 - Online Routing in Vehicular Ad Hoc Network
Lili Du, Rensselaer Polytechnic Institute, Troy, NY, dul@rpi.edu, Satish Ukkusuri

Online routing is critical in decentralized Advanced Traveler Information Systems (ATIS) based on Vehicular Ad Hoc Networks (VANET. VANET provides information of different qualities in various traffic conditions. This research studies online routing under Closed-loop Adaptive Routing (CAR) rule in VANET incorporating the variation of information reliability and time delay.

3 - Optimal Routing Policy for Taxi Queuing
Shih-Fen Cheng, Assistant Professor, Singapore Management University, 80 Stamford Road, Singapore, 178902, Singapore, sfcheng@smu.edu.sg, Jason Woodard, Darshan Santani

We study the queuing behavior of taxis at a major international airport. Using operational data from a large taxi fleet, we estimate the optimal routing policy for drivers arriving at the airport, i.e., when to join the queue and wait for another passenger vs. leave empty. We then compare the optimal routing policy to observed driver behaviors, and explore mechanisms for improving efficiency through pricing incentives and targeted distribution of demand information.

4 - The Contingent Routing Problem: Exact Algorithms and Heuristics
Stephen Boyles, Graduate Research Assistant, University of Texas at Austin, 1 University Station, C1761, ECJ 6.202, Austin, TX, 78712, United States of America, sboyles@mail.utexas.edu, N. Nezamuddin, Travis Waller

Practical use of online routing algorithms often requires a limitation on the number of alternatives presented to a user. Several approaches are given for the problems of deciding where re-routing information should be given, and which routes are recommended, given a constraint on the total number of options which can be provided.

■ TB64

O - Congressional A

Network Infrastructure Management and Resource Allocation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu

1 - Utilizing GIS to Implement a Traffic Signal Inventory Program

Lisa Sherman, Camp Dresser & McKee Inc., 56 Exchange Terrace, Providence, RI, 02703, United States of America, shermanld@cdm.com, Adam Healey

Traffic signal inventory has traditionally revolved around identifying faulty equipment and nonconformance with the Manual on Uniform Traffic Control Devices (MUTCD). This paper illustrates how a traffic signal inventory program can be performed using ArcGIS© software, enabling municipalities to better identify and plan for maintenance needs and future signal equipment changes. Performing a signal inventory also can help prepare for conformance to evolving Americans with Disabilities Act (ADA) and MUTCD requirements, for which new proposed traffic signal requirements, such as the use of countdown pedestrian signal heads with a 10-year compliance phase-in period, are expected. Using the Signal Inventory Project in Taunton, Massachusetts, as a case study, the paper elaborates on why a traffic signal inventory was helpful, why ArcGIS© was leveraged to aid in the inventory data gathering, how the inventory was performed, the reports generated by the inventory, and lessons learned in using ArcGIS©. Having used GIS at the starting point for project planning and execution, this application led to cost and time savings for Taunton, by creating an effective, efficient data collection and reporting process.

2 - Pavement Management Decision Making through Dynamic Traffic Assignment and Dynamic Programming

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Jorge Villalobos

We present a dynamic programming based decision approach in conjunction with the dynamic traffic assignment to highlight the need for the pavement management system to consider the traffic flow re-distribution due to major highway project in order to improve the prediction of future ESAL load, serviceability of highway pavements, and better resource allocation.

■ TB65

M - Virginia A

Joint Session Scheduling in Service/RAS: Scheduling in Railroads

Cluster: Scheduling in the Service Industry, Railway Applications
Invited Session

Chair: Anant Balakrishnan, Professor, University of Texas at Austin, 1 University Station B6500, Austin, TX, 78712, United States of America, anantb@mail.utexas.edu

1 - Optimal Routing of Locomotives to Shops for Quarterly Maintenances

Ravindra Ahuja, President, Innovative Scheduling, Inc., GTEC, 2153 SE Hawthorne Road,, Suite, Gainesville, FL, 32611, United States of America, ahuja@ufl.edu, Zeynep Sargut, Artyom Nahapetyan

The locomotive fleet for a large freight railroad contains thousands of locomotives which must be sent to shops for quarterly maintenances. Sending locomotives to shops just-in-time, neither early nor late, and in a manner so that each shop receives the same number of locomotives every day which is equal to its shop capacity, is a very complex optimization problem. We will describe an MIP-based methodology to solve this problem and present computational results from a real-life application.

2 - Passenger Coach Utilization on Indian Railway: Leveraging Standardized Train Composition & Scheduling

G. Raghuram, Indian Railways Chair Professor, Public Systems Group, Indian Institute of Management, Ahmedabad, GJ, 380015, India, graghu@iimahd.ernet.in, Piyush Verma, Narayan Rangaraj

Indian Railways run 8702 passenger services daily, amounting to 8.4 billion coach km for 2006-07. The utilization of coaches for these services varies from 250-1000 km per day, averaging 500 km. We present a systematic approach to improve utilization of coaches, using category wise standardization of trains and exploiting scheduling flexibility. We also explore the implications on service levels due to maintenance and late running, and costs due to coach requirements and lost revenues.

3 - Scheduling Track Maintenance at CSX Transportation

Kamalesh Somani, Manager Operations Research, CSX Transportation, 3019 Warrington Street, Jacksonville, FL, 32254, United States of America, Kamalesh_Somani@CSX.com, Fan Peng, Seungmo Kang, Yanfeng Ouyang, Xiaopeng Li

CSX performs around 200-300 scheduled track maintenance projects per year throughout its network. A maintenance project takes anywhere between one to twenty weeks. Different types of work are performed by different type of maintenance teams. We propose network flow models and solution algorithms to find a feasible and implementable schedule so as to minimize the total travel costs of all teams.

4 - Planning Supply of Ballast for Maintenance in the Railroad

Shankara Kuppa, Systems Engineer, Union Pacific Railroad, 1400 Douglas Street MC 580, Omaha, NE, 68179, United States of America, skuppa@up.com, Michelle Clark, John Fuller

Ballast, typically crushed stone, forms the track-bed on which the rails and ties are laid. There are multiple supply pits for ballast, each with different qualities of the product. Demand emerges at multiple locations with varying needs for quality of the ballast and different priorities. We present a problem that finds an efficient allocation of pits to demand locations while minimizing the total cost of sourcing and transporting ballast while satisfying the underlying constraints.

■ TB66

O - Cabinet Room

Spreadsheet Risks, Errors & Compliance II

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: William Eisenhauer, AVP - Lead Senior Management Metrics Analyst, Wells Fargo Home Equity Group, Ike.d.eisenhauer@wellsfargo.com

1 - Controls for Sarbanes-Oxley Compliance for Spreadsheets: What Still Needs to Be Done?

Linda Leon, Associate Professor, Loyola Marymount, University, One LMU Drive, Los Angeles, CA, 90045, lleon@lmu.edu, Dolphy Abraham

We present an analysis of the literature on error prevention and detection in spreadsheets as it relates to compliance with Sarbanes-Oxley (SOX) regulations. Post-SOX the literature has shifted to the need for a variety of controls. Since end-user developed spreadsheets are relied on throughout an organization, formal techniques to control for quality are required. We discuss organizational controls and end-user roles, including formal software development techniques, needed to comply with SOX.

■ TB67

O - Forum Room

Facility Location Models II

Sponsor: Location Analysis
Sponsored Session

Chair: Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu

1 - Cluster Based Optimization for Multi-level Transit Hub Locations

Jie Yu, Postdoctoral Researcher, University of Maryland, Department of Civil Engineering, College Park, MD, 20742, United States of America, yujie@umd.edu, Yue Liu, Gang-Len Chang

This study proposes a cluster based optimal location model for urban multi-level transit hubs. To solve the proposed mixed integer model in a cost-effective way, a new integer non-linear programming reformulation was designed to efficiently reduce the number of variables and the bilinear constraints in the INLP were then re-modeled by linear functions to make the problem easily handled by existing MIP solvers. The model was successfully applied in Suzhou Industrial Park, China.

2 - Distribution Center Location for Green Supply Chain

Feng Li, IBM China Research Laboratory, Beijing, 100193, China, lfeng@cn.ibm.com, John Peter Fasano, Tie Liu, Hao Zhang, Rongzeng Cao, Wei Ding

Carbon emission is key factor for Green Supply Chain (GSC). In order to illustrate its impact on GSC's distribution center location, several mathematical models are proposed to describe the location problem and transportation mode option of GSC. IBM Watson Implosion Technology tool is used to describe them and solve them. Based on these models, we analyze the relationships among carbon emission, transportation cost, distribution center location and transportation mode options.

■ TB68

O - Senate Room

Modeling Channel and Product Decisions

Sponsor: Marketing Science
Sponsored Session

Chair: Nanda Kumar, Associate Professor of Marketing, The Univ. of Texas at Dallas, School of Management, SM 32, 800 West Campbell Rd, Richardson, TX, 75080, United States of America, nkumar@utdallas.edu

1 - Optimal Product Design in a Competitive Market

Ching-Shin Shiau, PhD Student, Carnegie Mellon University, 5000 Forbes Avenue, Scaife Hall 402 Mechanical Engineering, Pittsburgh, PA, 15217, United States of America, cshiau@cmu.edu, Jeremy Michalek

We propose an optimization approach for differentiated new product design, examining market responses of 1) competitor prices, 2) competitor designs, and 3) retail margins. We utilize first-order conditions to efficiently identify Nash and Stackelberg solutions. We find that optimal product design is decoupled from competition and channel structures when consumer preferences are homogeneous (logit), but heterogeneity (mixed logit) couples design and market decisions.

2 - Role of Sampling in Physician Learning and Price Discrimination

Pradeep Bhardwaj, UNC, Chapel Hill, Kenan-Flagler Business School, McColl Building, Chapel Hill, NC, 27599, United States of America, Pradeep_Bhardwaj@unc.edu, Yuxin Chen, Ram Bala

While pharmaceutical companies spend significant money on samples, little is known about their effect on physicians and patients. Physicians use detailing information to match the drug with patients, but use sampling in a dual role: by providing a subsidy to uninsured patients and also enabling learning about the patient population. We find that the optimal number of samples has an inverse-U relationship with the number of patients insured and the proportion of patients for whom the drug works.

3 - Capacity-expandable Product Design for a Competitive Downstream Market

Yue Jin, Researcher, Member of Technical Staff, Alcatel-Lucent Bell Labs, Ireland, Blanchardstown Industrial Park, Blanchardstown, Dublin, IR, 15, Ireland, yuejin@alcatel-lucent.com, Qiong Wang, Ulas Ozen

We consider a two-tier market where an upstream monopoly sells a capacity-expandable product through a two-part tariff. Buyers are competitive downstream firms whose demands are uncertain. The manufacturer chooses between a software-enabled design (SED) with high upfront cost, low incremental cost, and a strict capacity limit, and a hardware-enabled design with the opposite cost structure and no capacity limit. We demonstrate that SED can improve vendor's expected profit with a reduced risk.

4 - Optimal Price and Product Quality Decisions in a Distribution Channel

Xiaowei Xu, Assistant Professor, Rutgers University, 180 University Avenue, ACK208, Newark, NJ, 07102, United States of America, xiaoweix@andromeda.rutgers.edu

We study a joint pricing and product quality decision problem in a distribution channel, in which a manufacturer sells a product through a retailer. The manufacturer jointly determines the wholesale price and quality of the product and the retailer determines the retail price. We find that the curvature of the marginal revenue function determines the comparative statics in the distribution channel.

Interactive Session

■ Tuesday, 12:30pm -1:30pm

Exhibit Hall

Chair: Pablo Durango-Cohen, Associate Professor, Northwestern University, 2145 Sheridan Road, Evanston, IL, United States of America, pdc@northwestern.edu

1 - A Supply Chain Dashboard Pilot - The Oracle Automed Dashboard

Maria Kollberg Thomassen, SINTEF Technology and Society, S.P Andersens v 5, Trondheim, Norway, maria.kollberg@sintef.no

A computer based application has been developed to improve the control of material flows and to support automatic replenishment in a pharmaceuticals supply chain from a producer, via a wholesaler and to a pharmacy network. It is based on a set of performance indicators and a control model that is shared between the involved companies. The tool permits companies to have quick access to updated information about critical processes of the entire supply chain.

2 - Hierarchical Systems of Mathematical Physics with Cross Connections

Vladimir Tsurkov, Prof., Computing Center of RAS, 40 Vavilov Str.,, Moscow, 119333, Russia, tsur@ccas.ru

In the book V.I. Tsurkov "Hierarchical Optimization and Mathematical Physics", Kluwer 2000, the block separable optimal controls problems with partial differential equations are introduced. Here the method of iterative aggregation is generalized to the case when there are cross connections between subsystems. We prove local monotonicity of the algorithm with respect to cost function and convergence. The calculation tests demonstrate the effectiveness of this approach.

3 - On Characterizing the Minimum of a Function of Two Discrete Variables

Sara Nourazari, M.Sc Student, Department of Electrical Engineering, University of Oklahoma, 865 Asp Avenue, Rm 117, (DySSC Center), Norman, OK, 73019, United States of America, sara.n@ou.edu, Hillel Kumin

Sufficient conditions are developed for any local minimum of a function of two discrete variables to be a global minimum. An example is given that shows that a function of two discrete variables need not be integer convex for this condition to hold. This result is important because many optimization problems in integer programming do not have integer convex functions, but still may satisfy this condition.

4 - Simulation Optimization for an Emergency Department Healthcare Unit in Kuwait

Talal Alkhamis, Kuwait University, Box 5969 Safat Kuwait, Kuwait, Kuwait, talalohoud@gmail.com

We present a methodology that uses system simulation, combined with optimization to determine the optimal number of doctors, nurses and lab technicians to maximize patient throughput and to reduce patient time in the system subject to budget restrictions. The major objective of this project is to evaluate the impact of various staffing level on service efficiency.

5 - Sustainability Design and Analysis of Light Emitted Diode (LED) Lighting Systems

Hsueh-Ming Wang, Assistant Professor, University of Alaska Anchorage, ESPM Dept 3211 Providence Dr., Anchorage, AK, 99508, United States of America, afhsw1@uaa.alaska.edu

The low temperature environment in Alaska causes a low failure rate and better performance of LED street lights and becomes a competitive advantage for implementation of this system. This research will develop an economical model to determine the optimized timing for replacement of the Alaskan street lights based on the forecasting of technological changing of white light LED.

6 - Comparison of Constant- and Step-stress Accelerated Degradation Test Plans

Heonsang Lim, PhD Candidate, KAIST 373-1 Kusong-dong, Yusong-ku, Daejeon, 305-701, Korea, Republic of, inlife@kaist.ac.kr, Bong-Jin Yum

Accelerated degradation tests (ADTs) are widely used to assess the lifetime of highly reliable products. In this article, optimal ADT plans when there exists a constraint on the chamber capacity are developed under the assumptions of constant-stress loading and destructive testing. Then, the plans are compared with ADT plans under step-stress loading and destructive testing in terms of the asymptotic efficiency in estimating the q-th quantile of the lifetime distribution.

7 - Scheduling Jobs with Equal Processing Times Subject to Machine Eligibility Constraints

Kangbok Lee, Stern School of Business, New York University, 44 West 4th Street,, New York, NY, 10012, United States of America, klee3@stern.nyu.edu, Joseph Leung, Mike Pinedo

We consider the problem of scheduling a set of n jobs with equal processing times on m parallel machines so as to minimize the makespan subject to eligibility constraints. We consider the most general case of eligibility constraints as well as the special cases of nested and inclusive eligible sets. Both online and offline scheduling models are considered. Our emphasis will be to develop polynomial-time algorithms, optimal algorithms as well as approximation algorithms with good bounds.

8 - The Airport Environmental Charge Schemes: A Global Policy Review

Cherie Lu, Assistant Professor, Chang Jung Christian University, 69-2 Humei Street, Tainan, 70063, Taiwan - ROC, cherie@mail.cjcu.edu.tw

This paper first reviews the noise and engine emission related charges at airports worldwide. A systematic generic approach to setting up environmental charge mechanisms and charge levels is then proposed, with the consideration of socio-environmental costs, the cost of mitigation measures, airport user charges and related parties involved. The impacts of the charges on airline business models, passenger demand and airlines operating costs are investigated.

9 - Sensitivity Analysis of MSAE Regression Problem: Post-optimality Analysis of LHS Coefficients

John F Wellington, Professor, Indiana U. - Purdue U. Fort Wayne, Doermer School of Business, 2101 E. Coliseum Blvd., Fort Wayne, IN, 46805, United States of America, wellingj@ipfw.edu

The technique for assessing sensitivity of the solution to a widely encountered optimization problem in data analysis is presented. It is a post-optimality analysis of the solution to minimum sum of absolute errors (MSAE) regression optimization problem. It is sensitivity analysis of left-hand side (LHS) coefficients of the LP formulation.

10 - Strategic Use of Advertising: A Simulation Model

Malcolm Brady, Lecturer, Dublin City University, Dublin 9, Dublin, 9, Ireland, malcolm.brady@dcu.ie

This paper examines the behaviour of two firms competing in a duopoly where advertising shifts the demand function to the right. The paper reports on a simulation model developed by the author based on the Cournot analytical model. The results show that there exist threshold levels of advertising effectiveness at which duopoly behaviour bifurcates, that perfectly cooperative advertising can lead to competitive disadvantage, and that perfectly predatory advertising can lead to losses.

11 - Potential Impacts of Plug-in Hybrid Electric Vehicles on Locational Marginal Prices and Regional Air Pollution

Lizhi Wang, Iowa State University, 3016 Black Engineering, Iowa State University, Ames, IA, 50011, United States of America, lzwang@iastate.edu

Temporal and spatial differences of electricity prices provide unique opportunity for plug-in hybrid electric vehicle drivers to take advantage of. We study how strategic recharging could impact locational marginal prices and regional air pollution under decentralized and centralized decision making mechanisms.

12 - An Ant Colony System (ACS) for Vehicle Routing Problem with Simultaneous Delivery and Pickup

Yuvraj Gajpal, Post Doctoral Fellow, Interuniversity Research Center on Enterprise Network, Logistics and Transportation (CIRRELT), Montreal, C.P. 6128, succursale Centre-ville, Montreal, Qu, H3C3J7, Canada, gajpaly@crt.umontreal.ca, Prakash Abad

In this paper we use an ant colony system (ACS) algorithm to solve the vehicle routing problem with simultaneous delivery and pickup (VRPSDP). The proposed ACS algorithm uses a construction rule as well as two multi-route local search schemes. An extensive numerical experiment is performed on benchmark problem instances available in literature. It is found that ACS gives good results compared to the existing algorithms.

13 - Designing Next-generation Emergency Medical Service Systems

Laura McLay, Virginia Commonwealth University, PO Box 843083, 1001 W. Main Street, Richmond, VA, 23284, United States of America, lamclay@vcu.edu, Alisha Purohit

Understanding how to simultaneously use multiple types of emergency medical service resources to improve patient survival rates is a challenging problem. We analyzed real data to understand the key features of emergency medical service systems that affect system performance. The results are used as input for a discrete optimization model that sheds light on how to optimally locate multiple types of medical units to respond to multiple patient priorities.

14 - Design of Interplanetary Supply Chain Networks

Yosef Tirat-Gefen, Lead Scientist, Castel Research Inc., 610 North Main Street #288, Blacksburg, VA, 22031, United States of America, yosefgavriel@computer.org

This paper discusses the design of the trajectories of a set of space stations and other spacecraft to support interplanetary missions. We consider a scenario where transport vehicles will carry critical supplies. The problem is modeled as a periodic transportation network optimization problem constrained by time windows and time and cost budgets. Mathematical programming and heuristic techniques optimize the vehicle trajectories.

15 - Modeling Dependent Demand Arrivals in an Open-Access System

Husniyah Abdus-Salaam, Graduate Student, NC A&T SU, 1810 Abberton Way, Apt 2E, High Point, NC, 27260, United States of America, husniyah@gmail.com, Lauren Davis

This poster will present a preliminary model of the effects revenue management has on an open-access scheduling system. The model will assist dental care providers in determining whether to accept batch appointments, where patient demand is dependent on one another.

16 - Diverge Bottlenecks, Optimization Formulations, and Optimal Highway Ramp Metering

Mark McDonald, Assistant Professor, Vanderbilt University, 2112 Fairfax Ave 210, Nashville, TN, 37212, United States of America, markphilipmcdonald@gmail.com, Howard D. McInvale

In recent years, optimization and control methodologies have been applied in ramp metering. However, these methodologies have not accounted for the flow physics of diverge bottlenecks, whose capacity is dependent on queue discipline. Failure to account for these impacts can result in optimal control strategies with actually increase delay. This paper investigates the impacts of diverge bottlenecks on optimal ramp metering controls and how optimal metering strategies can be adapted.

17 - Solving Dynamic Integer Programs Using Wavelets

Kaveh Farokhi-Sadabadi, Faculty Research Assistant, University of Maryland, 1173 Glenn L. Martin Hall, University of Maryland, College Park, MD, 20742, United States of America, kfarokhi@umd.edu

In this study, a method for modeling Dynamic Programs as a continuous program using Wavelets is presented. Wavelets are considered as powerful function approximators. The resulting non-linear problem in time-domain can be solved using a collocation method which is equivalent to solving a static quadratic program.

18 - The New Proposal of the Bidder's Supporting Tool

Tomasz Blaszczyk, Karol Adamiecki University of Economics, Bogucicka 14, Katowice, 40-226, Poland, blaszczyk@ae.katowice.pl

The trade-off between several conflict goals is a typical Multi-Criterial Decision Making (MC DM) problem. It appears in the majority of real-life DM situations, including the bid's preparation. The author proposes the synthesis of following well known methodologies: the Target Costing and Goal Programming. Its application is especially dedicated for particular decision makers who participate in the competitive bidding process.

19 - Tree-Line Analysis of Populations of Tree Structured Objects

Burcu Aydin, UNC-Chapel Hill, 800Pritchard Ave Ext H2, Chapel Hill, 27526, United States of America, aydin@email.unc.edu, Gabor Pataki, Steve Marron, Haonan Wang, Elizabeth Bullitt

The active field of Functional Data Analysis has been recently extended to Object Oriented Data Analysis.A challenging extension of this set of ideas is to tree-structured objects.This problem is addressed by the notion of tree-line.The resulting optimization problem is completely solved with a linear time algorithm developed,the solution is used in the analysis of a serious data set,where data points are trees of blood vessels in one person's brain.

20 - Model and Algorithm for Solving Real Time Dial-A-Ride Problem

Taehyeong Kim, University of Maryland, Department of Civil & Environmental Eng., 1173 Glenn L. Martin Hall, College Park, MD, 20740, United States of America, tommykim@umd.edu, Ali Haghani

In this paper we study a real-time dial-a-ride problem where requests for service arrive in real-time and the travel times on the network links are time-dependent. We formulate a mathematical model for real-time DARP. A heuristic methodology is proposed to solve this problem within a reasonable time to enhance its practical applicability. Also, we develop a simulation framework based on real-world data. Through this simulation we can evaluate the performance of the developed model and algorithm.

21 - Stability Analysis of Exchange Networks

Ankur Mani, MIT, 143 Albany St #013, Cambridge, MA, 02139, United States of America, amani@mit.edu, Alex Pentland

We analyze exchange networks and the bargaining power of individuals arising from the distribution of valued items and the network topology. We analyze: (a) the bargaining equilibrium in networked exchange, and (b) the stability of the network itself given each person does not observe the network beyond its immediate neighbors and myopically tries to maximize its payoff. The work also ties the literature on exchange networks to work on network formation and cooperative games.

22 - Role of Incentives and Coordination Mechanisms in Stability and Equilibrium of Cooperative Networks

Omkar Palsule-Desai, Doctoral Student, Indian Institute of Managemenr Ahmedabad, Dorm 06 Room 07, IIMA Campus, Vastrapur, Ahmedabad, 380015, India, omkardpd@iimahd.ernet.in, Devanath Tirupati, Pankaj Chandra

We develop and analyze a game theoretic model to understand the player dynamics in a cooperative network and examine the impact of alternative price and profit-sharing driven mechanisms on stability and equilibrium of the network. The objective is to examine the role of coordination mechanisms on sustainability of the network.

23 - Technology Readiness and Economic Growth: A Rough Sets Based Decision Rule Approach

Gladys Simpson, Graduate Teaching/Research Assistant, Florida International University, 721 SW 114TH CT, MIAMI, FL, 33174, United States of America, gladys.simpson@fiu.edu

An exploration of the relationship of country level information and communication technology access and readiness with economic growth through the development of a classification model using a decision rule approach based on rough sets theory. Data from the World Bank development indicators database is used for developing the model for the period 2002-2006.

24 - Evolving Destabilization-Tolerant Key Player Configurations in Social Networks

Ritvik Sahajpal, UMD, 3410 Apt 24, Tulane Drive, Hyattsville, MD, 20783, United States of America, ritvik@umd.edu, Jennifer Golbeck

The Key Player Problem/Positive seeks an optimal subset of k key players in a network such that the key player for each of k quadrants has the least average distance to all other players in that quadrant. We use a genetic algorithm to evolve key-player subsets that are tolerant of destabilization via removal of r selected key players, without compromising much on the pre-disruption connectivity. We present results for two social network datasets and for different values of $r < k$.

25 - Vehicle Routing for Bidding Routes

Pavan Mhasavekar, Student, lamar University, 1140 Georgia St. Apt#112, Beaumont, 77705, United States of America, pavanmasvekar@gmail.com

We formulate a multi- objective vehicle routing problem with objectives of miles and days. We use heuristic to solve the VRP to illustrate the tradeoff. This tradeoff can assist users in building formulation to construct routes for bidding to carriers. Ideally carriers want routes that full utilize duty periods.

26 - Capital Renewal as a Real Option

Matthew Reindorp, University of Maryland, Robert H. Smith School of Business, Van Munching Hall, College Park, MD, 20742, United States of America, reindorp@umd.edu

Capital renewal decisions must balance uncertainty about future profitability against uncertainty about future renewal costs. Treating renewal investments as real options, we derive the unique, closed form optimal solution to the infinite horizon version of this problem. Additionally, we calculate the total present value of an institution's capital renewal options.

27 - Unification of Maintenance Modeling and Optimization

Xiaoyue Jiang, Louisiana State University, 3128 Patrick Taylor Hall, Baton Rouge, LA, 70803, United States of America, jiang@lsu.edu, Hongye Wang

A unification methodology for maintenance modeling and optimization, which incorporates a modeling framework and an optimization procedure, is developed based on the theory of optimal stopping and supporting techniques. It enables better organization of 250+ models, comparison of 40+ policies and verification of policy optimality. Several most representative models are presented for illustration.

28 - An Economic-Statistical Model for Decision Making About Production after Receiving the Out of Contro

Adel Alaeddini, PhD Student, Industrial and Manufacturing Department, Wayne State University, Detroit, MI, 48202, United States of America, adel.alaeddini@gmail.com, Kai Yang

This paper presents a simple but effective method to make an appropriate decision about the production rate after receiving an out of control signal from the chart with respect to statistical and economical characteristics of the process. For this purpose control chart design approaches, change point models, production planning concepts, and optimization methods are set together to build up a decision making advisor for practitioners which is effective for various production systems.

29 - Risk-based Rehabilitation Decisions for Network of Pavement Facilities

S. Reza Seyedshohadaie, Research Assistant, Texas A&M University, Department of Industrial and Systems Eng, College Station, TX, 77843-3131, United States of America, sreza@tamu.edu, Ivan Damnjanovic, Sergiy Butenko

A method of constructing risk-based rehabilitation policies for a network of pavement facilities that ensure a specific quality level is introduced. Conditional Value at Risk (CVaR) is used as a measure of risk to represent risk averseness of the decision maker.

30 - Dynamics of Disaster Relief Resource Allocation, Evacuation Patterns and Victims: A Qualitative Look

Alexandra Medina-Borja, Assistant Professor, University of Puerto Rico at Mayaguez, II-205 Industrial Engineering Building, UPRM, Mayaguez, PR, 00682, United States of America, amedina@uprm.edu, Yesenia Cruz

We develop a system dynamics model of the evacuation patterns of Katrina's victims vis-à-vis relief system capacity and the interplay of victims' reactions. Exogenous factors such as category level; staff training level, victim's culture, race, social stratum, education, home ownership status, etc. are contemplated in the evaluation of patterns and behaviors. A user interface for decision-makers to interact with the simulation by building evacuation scenarios with community data is shown.

31 - Coordinating the Supply Chain System of the Colombian Energy Industry

Diana Ramirez, Universidad del Norte, Carrera 53 No.80-71 Apt.1101, Barranquilla, Colombia, dgramirez@uninorte.edu.co, Ruben Yie, Carlos Paternina-Arboleda

We approach an electric energy supply network problem, involving generators, marketers and non-regulated users under deterministic demand. To approach this problem, a model was proposed where a first level optimization is done among generators, following a cooperative game among marketers, where Shapley value is calculated for each player. After analyzing the numerical results of a Colombian Industry case, it shows how coordination economically benefits the entire supply chain.

32 - A Real Option on Revenue Optimization Problem in a Competitive Markets

Xun Li, Assistant Professor, Department of Applied Mathematics, Hong Kong Polytechnic University, Kowloon, Hong Kong, Hong Kong - China, malixun@inet.polyu.edu.hk, Shijie Deng, Youyi Feng

Using a real-option approach, we derive optimal selling strategies to maximize revenue from selling perishable underlying, including both products and services, in advance. We take the competition-varying effects into account in this study, and consider the market demand affected by the fluctuation of underlying price in a competitive market.

33 - Leading Supply Chain Management Software Packages

Zhong-Xian Wang, PhD, Montclair State University, 1 Normal Ave., Montclair, NJ, 07043, United States of America, wangj@mail.montclair.edu, Ruben Xing, Yanling Sun, Kimberly Hollister

SCM Systems are relied on to manage warehouses, transportation, trade logistics and various other issues concerning the coordinated movement of products and services from suppliers to customers. Although in today's fast paced business environment, numerous supply chain solution tools are readily available to pretty much all companies, choosing the right SCM software is not an easy task.

34 - Optimal Capacity Planning for Home and Community Based Services

Feng Lin, Biomedical Engineering, Purdue University, 2419-2C Neil Armstrong Drive, West Lafayette, IN, 47906, United States of America, fenglin@gmail.com, Huiping Xu, Mark Lawley, Nan Kong, Laura Sands, Joseph Thomas III

As Medicaid long-term care expenditure is escalating, planning for a more cost-effective care delivery system is essential. There exist two types of long-term care services. Besides institutional care, Home and Community based Services (HCBS) shifts the care provision to recipients' homes. Our work applied optimal control to determine the capacity of a HCBS program so as the overall Medicaid expenditures, including expenditures of long-term care services and hospitalizations, are minimized.

35 - Inventory Management in Closed-loop Supply Chains under Non-stationary Demand

Ibrahim Dogan, Wayne State University, 4815 Fourth St., Detroit, MI, 48202, United States of America, dogan@wayne.edu, Ratna Babu Chinnam

This study aims to analyze remanufacturer's inventory control policy under non-stationary demand. The objective is to decide on virgin product replenishment quantities under used product returns. The exact solution to this inventory control problem in our setting is complex and time demanding. We offer and analyze a number of different sub-optimal policies.

36 - Maximizing Strategic Value of Product Platforms: From Operational Platform to Strategic Platform

Changmuk Kang, Seoul National University, 599 Kwanakro, Kwanakgu, Seoul, Korea, Republic of, muk83@snu.ac.kr, Yoo S. Hong

Whereas previous studies emphasized on only operational benefits of a product platform, which is saving the cost of customization, this paper presents another strategic benefit of a platform, which is disseminating strategically intended merits to diversified products. This paper presents a framework for developing a platform achieving both strategic and operational benefits by compromising plans for strategic merits and differentiations with a plan for commonizing physical elements.

37 - Efficiency in Public Higher Education Systems: A Statewide Comparison Using Date Envelopment Analysi

Janet Wagner, Dean, Stockton College, PO Box 195, Jimmie Leeds Road, Pomona, NJ, 08240, United States of America, janet.wagner@stockton.edu, Daniel Shimshak

Performance and efficiency in higher education (public and private) has recently received considerable national attention. Kelly and Jones (2007) developed a set of ratio-based measures to look at if and how the performance of public colleges and universities relates to their levels of state funding. Our study builds on this work, exploring the use of DEA methodology to analyze the efficiency of states' higher education systems based on publically available input and output measures.

38 - A DEA Model to Determine The Productivity of the High Education Docents

Gredy Garrido, Professor, Fort Valley State University, 2006 Karl Dr 703, Warner Robins, GA 31088, United States of America, garridog01@fvsu.edu, German Garrido

This study is about the determination of the productivity of the high education docents by applying a "Data Envelopment Analysis" model. The results demonstrate that the applied DEA_UNERMB model determined the levels of relative efficiency of the studied faculty and its potential improvement

39 - Scheduling MRI Patients for a Radiology Department

David Phillips, Assistant Professor, The College of WIlliam & Mary, Math Department, Jones Hall 114, Williamsburg, VA, 23187, United States of America, phillips@math.wm.edu, Grace Phillips, Lawrence Leemis, Cliff Stein, Eyjolfur Asgeirsson, Adam Carpenter

We present a bi-criteria scheduling problem that arises in Seattle Children's Hospital radiology department when they schedule Magnetic Resonance Imaging (MRI) patients. The objectives represent the trade-offs between scheduling enough time for the MRI exam and revenue generated by the exams. Algorithms to solve the problem are tested on collected and simulated patient data.

40 - Design of a Conflict and Error Detection Model

Xin Chen, Purdue University, 315 North Grant Street, West Lafayette, IN, 47906, United States of America, chen144@purdue.edu, Shimon Nof

An agent-based conflict and error detection model (CEDM) is developed to detect conflicts and errors (CEs) in collaboration. Errors are local deviations from specified goals; conflicts among multiple parties are triggered by errors. Detection agents determine best detection policies, monitor CEs, and assess severity through information exchange with support of protocols. A case study with automotive supply networks is applied to validate CEDM for different network topologies.

41 - Dual Behavior of Production Planning Models with Congested Resources

Ali Kefeli, PhD Student '10, Industrial and Systems Engineering Department, NC State University, 303 Daniels Hall, Lampe Dr., Raleigh NC 27695, United States of America, akefeli@ncsu.edu, Michael Kay, Yahya Fathi, Reha Uzsoy

We examine two different production planning models: a conventional LP model and a nonlinear model that captures queueing behavior at resources using clearing functions(CFs). We focus on the dual prices of capacity and demand in a production-inventory system, and discuss their interpretation. We show that CF formulation not only produces positive dual prices when utilization is below 1, it also exhibits more realistic behavior, such as holding finished inventory at utilization levels below 1.

42 - Using Dependency Structure Matrix (DSM) to Evaluate Design—Does Architecture Matter?

Michelle Xiang Liu, Assistant Professor, Marymount University, 2807 North Glebe Road, Arlington, VA, 22207, United States of America, xiangl2001@gmail.com

This study aims at exploring a set of metrics to evaluate design architectures of large software systems. In particular, two techniques are adopted°™DSMs widely applied to manufacturing and engineering industries, and networks-based diagrams derived from social network analysis field°™to analyze and compare the structure of the Eclipse platform. An empirical study on examining design architectures and developer networks of two hundred software projects and their performance was elaborated.

43 - Finding Fraud Waste and Abuse in Health Care

Rasim MUSAL, The George Washington University, Business School, Funger Hall 2201 G St, Washington DC, DC, 20052, United States of America, MMUSAL@GMAIL.COM

A non-trivial amount of the US budget is spent on Medicare and Medicaid. It is estimated that approximately 10% of this amount is lost to fraud waste and abuse. We outline two efforts to detect possible fraud using simple but efficient methodology which includes a probabilistic approach to impractical distance analysis and a clustering application of zip-code areas.

44 - How Non-economic Project Valuation Criteria Impair Corporate Resource Allocation Decisions

Brendan Bridgford, Project Manager, Xilinx, 9814 Fosbak Drive, Vienna, VA, 22182, United States of America, brendan.bridgford@xilinx.com

A key problem in corporate resource allocation decisions is uncertainty in marketing projections. To address this problem many firms seek "different perspectives" on the data by considering criteria like break-even time and ROI that ignore the time value of money. Such criteria introduce subjectivity into the project valuation process and distract from the original problem. Instead, firms should use NPV as the sole valuation metric, freeing managers to focus on strategic factors.

45 - Optimal Dynamic Pricing and Inventory Policies for Fashion Retailers

Samuel Huang, University of Texas at Austin, IROM, 1 University Station B6500, Austin, TX, 78712, United States of America, SamuelHuang@mail.utexas.edu, Genaro Gutierrez, Edward Anderson

We study the problem of dynamic pricing and inventory policies of a fashion retailer who faces the challenge of having short product life cycle but long production lead time. We show how the retailer can make coordinated pricing and inventory decisions when facing uncertain demand. Closed-form solutions are found for special demand distributions and an approximation is provided for the general demand distribution.

46 - Crossdocking Network Design with Load Balancing and Operational Considerations

Nayoung Cho, Purdue University, 315 North Grant Street, GRIS 309, West Lafayette, IN, 46907, United States of America, chon@purdue.edu, Leyla Ozsen

We study a crossdocking network design problem for a two-stage and single product supply chain. Our objective is to determine the optimal location of crossdocking centers and the optimal retailer-crossdocking assignments that minimize the sum of the location, transportation, ordering, and the pipeline inventory costs across whole supply chain given the service rate of each facility and the lead time restrictions. We propose a solution methodology based on Lagrangian Relaxation.

47 - Application of Genetic Algorithms to Three Dimensional Warehouse Retrieval Problems

Patrick Hecht, Clemson University, 110 Freeman Hall, Clemson, SC, 29634, United States of America, phecht@clemson.edu, Mary Beth Kurz

The objective of this project is to solve a three dimensional warehouse storage and retrieval problem with the use of a Genetic Algorithm. The problem will be constrained to identical rack configurations and a limited number of bays per aisle. The coding will be completed in Visual Basic for Applications, and the results will be displayed in an Excel spreadsheet.

48 - An Integer Programming Formulation for an Optimal Student Class Assignment Problem

Anand Seshadri, Booz Allen Hamilton, 8283 Greensboro Dribe, McLean, VA, 22102, United States of America, seshadri_anand@bah.com, John Foreman, Nicholas Nahas, Cenk Tunasar

An integer programming formulation with a simultaneous equation postprocessor has been developed to optimally allocate student schedules in a training program. The objective is to minimize the total number of students for each month. The formulation is flexible and efficient enough to implement in a stand-alone computer using MS Excel in order to comply with client requirements. The postprocessor utilizes the output of the integer program to derive the final assignment of students to classes.

49 - A User Centered Approach to Employee Scheduling

Robert Rose, Optimal Decisions, 4 Kirby Lane, Franklin Park, NJ, 08823, United States of America, robertl.rose@verizon.net

Many employee scheduling problems are very challenging. Not only are they hard combinatorial optimization problems, but they contain multiple objectives, 'soft' objectives, and 'soft' constraints. To successfully deal with such problems the scheduler must be given an integrated system containing an analytical model, interactive graphics, and an expert system. I will discuss these issues and will demonstrate a prototype employee scheduling program.

50 - Mathematical Modeling for Selecting the Suppliers and Optimal Batch Quantity

Morvarid Rahmani,PhD Candidate, UCLA Anderson School of Management, 159 San Tropez Ct,, Laguna Beach CA 92651, United States of America, morvarid.rahmani.2013@anderson.ucla.edu

In this paper a mathematical model by using factors which affect vendor selection decision in outsourcing is presented. In this mathematical model selecting suitable suppliers and determining order quantity are optimized simultaneously based on purchasing, maintaining and ordering costs. Suppliers are differentiate by: price, quality, lead time, production capacity and discounts policies. A nonlinear mathematical model developed. The model was solved by the geometrical method using Delphi.

51 - Information Security Investments in the Healthcare Sector: An Exploratory Study

Ajit Appari,Dartmouth College, 100 Tuck Hall, Hanover NH 03755, United States of America, Ajit.Appari@dartmouth.edu, Denise Anthony, Eric Johnson

In the wake of HIPAA and other state-level privacy regulations, hospitals are investing in information security safeguards in conjunction with IT investments. This study attempts to characterize diffusion of information security investments based on a national survey of IT in US hospitals.

Tuesday, 1:30pm - 3:00pm

■ TC01

M - Marriott Ballroom 3

Portfolio and Risk Mangement

Contributed Session

Chair: Yinyu Ye, Professor of Management Science and Engineering, Stanford University, Terman Engineering Center 316, Stanford, CA, United States of America, yinyu-ye@stanford.edu

1 - A Simple Robust Mean Absolute Deviation Model for Portfolio Optimization

Yongma Moon, Pennsylvania State University, 240 Leonhard Blg, University Park, United States of America, yongma@psu.edu, Tao Yao

We develop a robust model for portfolio optimization. The purpose is to consider parameter uncertainty and to reduce computational complexity. Our empirical study shows that the proposed robust portfolio optimization model generally outperforms a nominal model. However, we also suggest precautions against use of robust optimization under certain circumstances.

2 - Outsample Robust Portfolio Optimization Using the Omega Performance Measure

Chris Parker, London Business School, Regent's Park, London, NW1 4SA, United Kingdom, cparker.phd2007@london.edu

Incorrect assumptions in portfolio optimization have led to suboptimal investments. Abandoning these assumptions results in a multimodal optimization problem which can not be solved with deterministic methods so a simple heuristic optimization technique, Particle Swarm Optimization, is implemented. An empirical study using a broad range of initial investment amounts and transaction cost structures finds that the optimized portfolios outperform the benchmark portfolios in outsample tests.

3 - Portfolio Optimization in Imperfect Markets

Ethem Canakoglu, PhD Candidate, Koç University, Department of Industrial Engineering, Sariyer, Istanbul, Turkey, ecanakoglu@ku.edu.tr, Suleyman Ozekici

We consider a utility based portfolio selection problem where the parameters change according to a partly observable Markovian market. The market consists of riskless and risky assets whose returns depend on the state of the unobserved market. Investment decisions are based on what is observed. We consider two different models that describe the imperfect information flow between the unobserved stochastic market and the observed process one using HMM and other using sufficient statistics.

4 - Data-driven Optimization for Portfolio Selection

Erick Delage, Stanford University, Packard 069, Stanford, CA, United States of America, edelage@stanford.edu, Yinyu Ye

Typical stochastic programming approaches to portfolio optimization rely on the knowledge of the distribution of returns or of its moments. Instead, we propose using historical samples directly to constructs a set which is "known" to contain the true distribution behind the samples. One can then choose an optimal portfolio which guarantees a minimum risk-adjusted performance with respect to the true distribution of returns. The method is evaluated on data extracted from the stock market.

■ TC03

M - Marriott Ballroom 1

Dantzig Memorial III

Cluster: Dantzig Memorial

Invited Session

Chair: Richard Cottle, Department of Management Science and Engineering, Stanford University, Stanford, CA, 94305-4026, United States of America, rwc@stanford.edu

1 - Every Picture Tells a Story

Mukund Thapa, Optical Fusion, Inc, 2060 Old Page Mill Road, Palo Alto, CA, 94304, United States of America, mukund.thapa@sbsinc.net

George Dantzig, the Father of Linear Programming and mathematical genius, had a great sense of humor, dabbled in painting, wrote a science fiction book, designed the house that he and Anne lived in, wrote Compact City (with Saaty), had solutions for ordinary problems, as well as how to create a zero inflation economy. He could enchant, impress and captivate all with his wit, keen sense of humor, wide interests, and patience. This talk will present photos and videos of George, the man.

2 - The History and Significance of Corner Polyhedra

Ralph Gomory, Alfred P. Sloan Foundation and New York University, Alfred P. Sloan Foundation, 630 Fifth Avenue, NYC, NY, 10111, United States of America, gomory@sloan.org

The significance of Corner Polyhedra (CP) arises from the fact that all IP and mixed-IP problems are contained in the intersections of their CP. While these general problems can be extremely complex and unstructured, CP are highly structured and much can be learned about that structure. Thus, CP are a natural pathway for the development of a theory of IP and mixed-IP. They also can contribute to practical computations as an extremely rich source of a great variety of strong cutting planes.

3 - The Khachiyan and Karmarkar Challenges

Margaret Wright, Computer Science Department, Courant Institute of Math Sciences, New York University, NYC, NY, 10012, United States of America, mhw@cs.nyu.edu

The field of linear programming was rocked twice within five years—-in 1979 by the dramatic news of Khachiyan's polynomial-time ellipsoid algorithm, and in 1984 by Karmarkar's announcement of a polynomial-time algorithm that was 50 times faster than the simplex method. This talk will describe what George Dantzig and researchers in his Systems Optimization Laboratory thought and did about these events.

■ TC04

M - Delaware B

Organization Theory

Contributed Session

Chair: Mengxiao Zhu, Northwestern University, 2145 Sheridan Rd C210, Evanston, IL, 60208, United States of America, mzhu@northwestern.edu

1 - A Network Model of Shared Cognition in Teams

Mark Avnet, PhD Candidate in Engineering Systems, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Room 17-110, Boston, MA, 02139, United States of America, avnet@mit.edu, Annalisa Weigel

We propose a quantitative approach for analyzing team-wide shared mental models. Prior work has studied only 2- to 3-person teams or offered top-down qualitative descriptions of team mental models. We extend that work by providing a bottom-up means of measuring shared knowledge across a team. A pair-wise metric of sharedness is used to quantify edge weights in a social network. A relationship is demonstrated between the extent of change in the network over time and the difficulty of the work.

2 - Enacting Strategic Change

Maria Gondo, Student, University of Memphis, Department of Management, Fogelman College of Business & Economics, Memphis, TN, 38152, United States of America, mgondo@memphis.edu, John Amis

Our purpose is to understand the ways in which strategic change initiatives influence, and are influenced by, the daily activities of individuals in an organization. Our findings suggest that when organizational elites elect to initiate a change, the imposition of new structures and systems results in actors engaging in sensemaking that forms the basis of how changes become enacted. We connect this sensemaking to alterations in the interpretive scheme and ultimately the overall archetype.

3 - Realizing Institutional Logics: Power, Values and Interests in the Implementation of Policy

James Vardaman, Doctoral Student, University of Memphis, Fogelman College of Business & Economics, University of Memphis, Memphis, TN, 38152, United States of America, jvardamn@memphis.edu, John Amis

In this paper we examine the role of power, interests, and values in the emphasizing, transformation, and deemphasizing of institutional logics. Our work is located in a longitudinal case study that draws on real-time data to investigate the processes of change in a pluralistic institutional environment. Specifically, we examine disjunctures in the creation and implementation of policy designed to address childhood obesity in public schools.

4 - The Role of Networks in the Emergency Response Organizations

Mengxiao Zhu, Northwestern University, 2145 Sheridan Rd C210, Evanston, IL, 60208, United States of America, mzhu@northwestern.edu, Noshir Contractor

This research focuses on the role of social and trust networks in responding to emergencies. IKNOW (Inquiring Knowledge Networks on the Web) system was used to collect data on information flow and trust relations in an emergency response team. Exponential Random Graph Models (ERGMs) was built to test multi-theoretical multilevel hypotheses about the structure of trust networks and the interaction of trust relations and information exchange relations.

■ TC05

M - Virginia B

Trust-region Algorithms and Geometrical Problems

Sponsor: Optimization/ Nonlinear Optimization
Sponsored Session

Chair: Mihai Anitescu, Argonne National Laboratory, 9700 S Cass Ave, Argonne, IL, 60439, United States of America, anitescu@mcs.anl.gov

1 - Trust-search Methods for Unconstrained Optimization
Philip Gill, University of California, San Diego, CA, United States of America, pgill@ucsd.edu

Recent research on interior methods has re-emphasized the role of sequential unconstrained optimization for the solution of very large nonlinear programming problems. We focus on the numerical linear algebra associated with a class of "trust-search" methods that combine the best features of line-search and trust-region methods for unconstrained optimization.

2 - A Retrospective Trust-region Method for Unconstrained Optimization
Fabian Bastin, Assistant Professor, Université de Montreal, Department of Computing Science and Oper. Res., CP 6128, Succ Centre-Ville, Montreal, QC, H3C 3J7, Canada, bastin@iro.umontreal.ca, Mélodie Mouffe, Dimitri Tomanos, Vincent Malmedy, Philippe L. Toint

We introduce a new trust-region method for unconstrained optimization where the radius update is computed using the model information at the current iterate rather than at the preceding one. The update is then performed according to how well the current model retrospectively predicts the value of the objective function at last iterate. Global convergence to first- and second-order critical points is proved and numerical experiments indicate that the new method is competitive.

3 - Extremal-volume Ellipsoids and Their Applications, Especially in Statistics
Osman Guler, Professor, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, MD, 21250, United States of America, guler@math.umbc.edu

We discuss geometric problems, e.g. extremal-volume ellipsoids and some of their applications, in data mining, control theory, statistics, and functional analysis. We use semi-infinite duality to obtain new results as well improving and unifying some known results. May other geometric problems can be treated with our approach; we will mention several of these. We also consider symmetry properties of our problems, with a view towards their practical and theoretical aspects.

4 - An Active Index Algorithm for the Nearest Point Problem in a Polyhedral Cone
Zhe Liu, PhD Candidate, NC State University, Graduate Program in OR, Box 7913, Raleigh, NC, 27695, United States of America, zliu@ncsu.edu, Yahya Fathi

We consider the nearest point problem from a given point to a given polyhedral cone in the n-dimensional space. This problem can be formulated as a convex quadratic programming problem (CQP) with special structure. We study the structure of this problem and its relationship with the nearest point problem in a pos cone, propose an efficient algorithm for solving this problem, and carry out computational experiments to evaluate its effectiveness.

■ TC06

M - Virginia C

Auctions in the Wild: Field Studies

Cluster: Auctions
Invited Session

Chair: Otto Koppius, Erasmus University Rotterdam, Rotterdam School of Management, PO Box 1738, Rotterdam, ZH, 3000 DR, Netherlands, OKoppius@rsm.nl

1 - The Sales Process and Online Auction Outcomes
Jason Kuruzovich, Assistant Professor of Management Information Systems, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States of America, kuruzj@rpi.edu

Online auctions frequently occur as part of a sales process in which the same item is offered both across multiple auctions and even across multiple channels. In this study, we investigate how aspects related to the sales process influences auctions outcomes. We conduct the study using data from the online auction market for used vehicles.

2 - Beyond Feedback Scores: Measuring Bidder Migration and Its Price Effects
Mingfeng Lin, University of Maryland, mingfeng@rhsmith.umd.edu, Wolfgang Jank

We argue that the movement of bidders "migrating" from one auction to the other creates an important linkage among them. Such activities are not captured by the feedback score measures widely used in online auctions. We propose a series of measures of bidder migration, and then empirically examined their price effects using eBay data. We show that bidder migration carries rich information about bidders and can help predict auction outcomes.

3 - On the Robustness of the Scoring Rule in Multi-attribute Auctions
Otto Koppius, Erasmus University Rotterdam, Rotterdam School of Management, PO Box 1738, Rotterdam, ZH, 3000 DR, Netherlands, OKoppius@rsm.nl

Using multi-attribute reverse auctions in empirical settings requires the elicitation of the buyer's utility function, or scoring rule. As such scoring rules can be elicited in various ways with potentially different resulting scoring rules, this may affect the outcome of the auction. Using a dataset obtained from a reverse auction provider, we test how sensitive the observed outcomes are to changes in the weights of the scoring rule.

■ TC07

M - Maryland A

Stochastic Inventory Systems II

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Saif Benjaafar, Professor, University of Minnesota, Industrial & Systems Engineering Divisio, Minneapolis, MN, 55455, United States of America, saif@umn.edu

1 - A Price-Dependent Demand Substitution Rule with Applications to joint Pricing and Inventory Game
Ye Lu, MIT, 77 Mass. Ave. E40-130, Cambridge, MA, 02139, United States of America, yelu@MIT.EDU, David Simchi-Levi

In a multi-product market, if one product stocks out, consumers may substitute to its competing products. In this paper, we use an axiomatic approach to characterize a price-dependent demand substitution rule, and give a sufficient and necessary condition for demand models where our demand substitution rule applies. We use this demand substitution rule to study joint pricing and inventory game. We also extend the existing work in the literature for pricing game.

2 - Inventory Management with Advance Capacity Information
Marko Jaksic, Faculty of Economics University of Ljubljana, Kardeljeva ploscad 17, Ljubljana, Slovenia, M.Jaksic@tue.nl, Jan Fransoo

We study a periodic-review inventory system under stochastic demand and stochastic limited supply capacity, where the uncertainty of future supply can be lowered through acquiring the advance capacity information (ACI). We analyze the characteristics of the optimal ordering policy and establish a link with advance demand information modeling. We perform a numerical analysis to quantify the value of ACI and obtain useful managerial insights from the study of the specific problem instances.

3 - Multi-Stage Assembly Systems with Multiple Demand Classes and Phase-Type Assembly Times
Saif Benjaafar, Professor, University of Minnesota, Industrial & Systems Engineering Divisio, Minneapolis, MN, 55455, United States of America, saif@umn.edu, Mohsen ElHafsi

We consider a general assembly system with multiple stages, multiple customer classes, compound demand, and production times characterized by a phase-type distribution. We characterize the structure of the optimal policy and evaluate the performance of the optimal policy against the performance of common heuristics.

4 - Inventory Control in the Presence of Correlated Demands in Service Parts Supply Chains
Collin Chan, PhD Student, School of Operations Research and Information Engineering, Cornell University, 287 Rhodes Hall, Cornell University, Ithaca, NY, 14853, United States of America, csc45@cornell.edu, Peter Jackson, John Muckstadt

Correlated demands for service parts arise in equipment overhaul operations such as jet engine repair. Planning stock levels and allocating inventory properly is of paramount importance to the timely and cost effective completion of these overhauls. We present DP formulations of these planning and allocation problems, and apply ADP methods to solve them. Computational results show the advantage of using a dynamic stocking policy as opposed to myopic first-come-first-serve overhaul strategies.

■ TC08

M - Maryland B

Understanding and Influencing Operations for Investment Decisions

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Saravanan Kesavan, University of North Carolina at Chapel Hill, 27516, United States of America, skesavan@unc.edu

1- Incorporating Price and Inventory Shocks in Earnings Forecasting for Retailers

Saravanan Kesavan, University of North Carolina at Chapel Hill, 27516, United States of America, skesavan@unc.edu

Unexpected changes or shocks to inventory and margin serve as noisy signals of future performance for retailers. In this paper, I study if shocks to inventory and margin serve as a leading indicators of changes to future earnings. Also, I analyze the persistence of these shocks under different conditions to determine if it explains these unexpected changes in earnings. Finally, I investigate if equity analysts incorporate these information in their earnings forecasts.

2 - Sales Forecasting with Financial Indicators and Experts' Input

Vishal Gaur, Associate Professor, Cornell University, Sage Hall, The Johnson School, Ithaca, NY, 14853, United States of America, vg77@cornell.edu, Nikolay Osadchiy, Sridhar Seshadri

The volume of retail sales is commonly understood to be correlated with the state of the economy. This information could be employed in aggregate forecasting, inventory decisions, and risk management. We present a model in which total sales is a function of sales forecast, forecast term, and financial market return over the forecast term. We show results using panel data of sales forecast evolution for 214 retailers over 10 years, each year containing many forecasts of varying terms.

3 - Understanding and Influencing Operations as an Investor

Ananth Raman, Professor, Harvard University, araman@hbs.edu, Vishal Gaur, Saravanan Kesavan, Richard Lai

This seminar will describe a new course at Harvard Business School with the above-mentioned title. Most courses in operations management take the operators, perspective. This course explores how investors, with less information and decision rights, can understand and influence operations management. How can for example investors understand and evaluate a firm, inventory management or R&D capabilities?

4 - Supplier Finance –The Case of Nestle Russia

Daniel Corsten, Professor, IE Business School, Maria de Molina 13, Madrid, 28004, Spain, daniel.corsten@ie.edu

Whilst factoring is a very traditional financing instrument, reverse factoring was developed more recently in response to the need for innovative financing instruments, particularly in emerging markets with its opaque credit market conditions. This session will outline Nestle Russia's supplier finance program, discuss teaching applications and ideas for a research agenda.

■ TC09

M - Maryland C

Quality, Statistics and Reliability in Nanomanufacturing: Research/Funding Opportunities

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu

1 - Manufacturing Enterprise Systems at NSF

Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

Manufacturing ahs held constant at 20% of GDP for some time. It is still an integral and important component of our economy. Research in understanding and promoting theis key area is essential to the continued growth of our economy. This presentation will discuss the efforts and funding opportunities at the National Science Foundation in manufacturing systems. Additionally, as part of the presentation an open discussion related to the future of manufacturing will be held.

2 - Nanomanufacturing Opportunities: An Air Force Research Laboratory Perspective

Capt. Joseph McDermott, U.S. Air Force, Joseph.McDermott@wpafb.af.mil, Katie Thorp

After a brief overview of the current nanomaterial focus areas within the Air Force Research Laboratory this talk will highlight opportunities in aerospace for nanotechnology as well as provide examples of the potential of nano-structured materials to meet the necessary challenges. Early successful nanomanufacturing projects to improve scale-up and decrease cost will be briefly discussed.

3 - Panel Discussion: Nanomanufacturing -Funding Opportunities

Moderator: Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu, Panelists: Katie Thorp, Cerry Klein, Capt. Joseph McDermott

The panel will discuss the various nanomanufacturing research opportunities available for Quality, Statistics, and Reliability.

■ TC10

M - Room 8206

Supply Function Models for Electricity Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Andy Philpott, Professor, University of Auckland, Private Bag 92019, Auckland, AK, 1025, New Zealand, a.philpott@auckland.ac.nz

1 - Using a Supply Function Equilibrium to Predict Carbon Emissions

Eddie Anderson, Professor, University of Sydney, Faculty of Economics and Business, Sydney, Australia, E.Anderson@econ.usyd.edu.au

This paper makes use of recent work on the characteristics of supply function equilibrium and effective methods to calculate these, given the generator cost functions. A supply function equilibrium may not fully reflect generator bids in practice, but it does give some guidance on likely behaviors. Using a supply function equilibrium calculation we will look at the way in which carbon emissions change as the carbon price increases in a situation in which gas and coal generators are competing.

2 - Supply-function Equilibria with Mixed and Pure Strategies

Andy Philpott, Professor, University of Auckland, Private Bag 92019, Auckland, AK, 1025, New Zealand, a.philpott@auckland.ac.nz, Eddie Anderson, Par Holmberg

Supply-function equilibria in pure strategies for uniform-price and pay-as-bid auctions have been well studied. We investigate settings in which these might fail to exist, and study the resulting mixed-strategy equilibria, with particular emphasis on situations in which the mixtures are over non-trivial supply functions.

3 - Electricity Auctions: Discriminatory versus Uniform-Price

Talat Genc, Asst. Professor, University of Guelph, Department of Economics, Guelph, On, Canada, tgenc@uoguelph.ca

We formulate a supply function equilibrium model in continuous offer schedules with time varying demand and with single/multiple step marginal cost function to compare two auction institutions in the presence of capacity constraints. We show that payments made to the suppliers in the unique equilibrium of the discriminatory auction can be less than the payments in the uniform-price auction. We also characterize mixed strategy supply function equilibrium under the discriminatory auction.

4 - Stochastic Modeling of Wind Generation for Long-term Planning and Regulatory Studies

William Rosehart, Professor, University of Calgary, 2500 University Drive, N.W., Calgary, AB, T2N1N4, Canada, rosehart@ucalgary.ca, Hamid Zareipour, David Westwick, John MacCormack

This work describes a method to create realistic time series models of wind generation for use in planning studies. Seasonal and diurnal regularities are filtered from the data and a stochastic model of the residual shape information is created that preserves key statistical properties of the observed data. The model can be used to create scenarios of future wind developments that reasonably capture both the deterministic and random characteristics of wind generation that are locally unique.

■ TC11

M - Room 8209

Energy and the Environment

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Ekundayo Shittu, Research Assistant, University of Massachusetts Amherst, Amherst, MA, 01003, United States of America, eashittu@engin.umass.edu

1 - Carbon Abatement Strategies for Electric Utilities

Jayant Kalagnanam, IBM Research, 1101 Kitchawan Rd, Yorktown Hts 10591, United States of America, jayant@us.ibm.com, Stuart Siegel, Dharmashankar Subramanian, Rahul Jain, Anshul Gupta

The abatement of CO2 emissions from fossil fuel burning power plants requires the adoption of new technologies such as alternate energy sources (wind, solar, nuclear), carbon sequestration or carbon emissions reduction credits. The cost and efficacy of all these alternatives is uncertain. Abatement policies would therefore require capacity planning across uncertain alternatives and require stochastic programming. We will present a method with an example.

2 - Does a Regional Greenhouse Gas Policy Make Sense? A Case Study of CO2 Leakage & Emissions Spillover

Yihsu Chen, University of California, Merced, 5200 N. Lake Rd., Merced, CA, United States of America, yihsu.chen@ucmerced.edu, Enzo Sauma

Regional Greenhouse Gas Initiative (RGGI) is a joint effort by 10 U.S. northeast states that will be in effect in 2009 to control CO2 emissions from power sector. We perform a counterfactual analysis on the possible CO2 leakage and NOx and SO2 emissions spillover under 2006 market conditions. The results show that leakage in the expected RGGI allowances prices range could be 80-90%. This is accompanied with 50-60% increases of SO2 and NOx emissions spillover.

3 - Profit-maximizing Investments in Energy Technology under Carbon Tax Uncertainty

Ekundayo Shittu, Research Assistant, University of Massachusetts Amherst, Amherst, MA, 01003, United States of America, eashittu@engin.umass.edu

We explore a firm's profit-maximizing investment in an energy R&D portfolio in response to an uncertain carbon tax. We pay attention to the representation of technical change as it affects the marginal cost of abatement. We find how the firm's investment is influenced by different technologies and uncertainties in the size and timing of a carbon tax. We find that the drivers of the optimal portfolio are the energy sources' elasticity of substitution and the efficacy of R&D into the energy types.

4 - A Structural Analysis of Vehicle Design Responses to Corporate Average Fuel Economy Policy

Ching-Shin Shiau, PhD Student, Carnegie Mellon University, 5000 Forbes Avenue, Scaife Hall 402 Mechanical Engineering, Pittsburgh, PA, 15217, United States of America, cshiau@cmu.edu, Jeremy Michalek

We conduct a structural analysis of automaker vehicle design and pricing responses to CAFE policy in long-run oligopolistic equilibrium. We find that vehicle fuel economy responses follow a distinct pattern where high CAFE standards are ineffective without correspondingly high penalties for violation. Recent consumer and vehicle data suggest that vehicle decisions are more sensitive to gas prices than CAFE, and the new CAFE standards may be irrelevant if gasoline prices continue to rise.

■ TC12

M - Room 8212

Data Mining and Pricing

Sponsor: Data Mining
Sponsored Session

Chair: Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu

Co-Chair: Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu

1 - On the Existence of E-loyalty Networks in eBay Auctions and Their Structure

Inbal Yahav, UMD, 4358 VMH, RH Smith School of Business, College Park, United States of America, iyahav@rhsmith.umd.edu, Wolfgang Jank

We investigate loyalty in online auction bidder-seller networks. Generating loyalty in online auctions is hard because of sellers' limited ability to influence bidder behavior. We study dynamics between sellers and bidders in the form of networks. We investigate the structure of networks, their differences and their impact on the auction outcome. We discuss heterogeneity in bidders' preferences and differences to fixed price purchases.

2 - Analysis of Sales Force Effects and Pricing Decisions

Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu, Wolfgang Jank, Shu Zhang, Wedad Elmaghraby

In this study, we analyze the sales transactions of a perishable-goods distributor. We investigate when sales force accept or reject pricing recommendations from an automated pricing optimization tool and what factors influence the transaction prices. We study the effect of margins previously quoted to the customers, product characteristics, length of the relationship with the customer, and sales force characteristics on the final sales prices.

3 - Estimating Customer Price Elasticity Curves: Methodologies, Challenges and Solutions

Julia Morrison, Marriott International, MD, Julia.E.Morrison@marriott.com

One of the first steps in Pricing Optimization is defining customer segmentation, and estimation of customer elasticity curves by segment. Application of the traditional theory around these methods in practice presents many challenges: statistically significant segments might not make sense from business perspective; price elasticity curves estimated from the data might not be elastic enough. In our presentation we illustrate these challenges, and discuss some of the methods to address them.

■ TC13

M - Room 8216

Horizontal and Vertical Information Selection

Sponsor: Data Mining
Sponsored Session

Chair: Mu Zhu, Associate Professor, University of Waterloo, 200 University Ave W, Waterloo, ON, N2L 3G1, Canada, m3zhu@uwaterloo.ca

1 - Variable Selection for Model-based High-dimensional Clustering

Sijian Wang, University of Michigan, Department of Biostatistics, University of Michigan, Ann Arbor, MI, 48109, United States of America, sijwang@umich.edu, Ji Zhu

Variable selection in high-dimensional clustering analysis is an important yet challenging problem. In this paper, we propose two methods that simultaneously clustering data points and select important variables that contribute to the clustering. Our methods make use of the fact that parameters belonging to one variable should be treated as a natural "group", and tend to remove unimportant variables more effectively and provide better clustering results than the traditional L1-norm approach.

2 - Variable Selection for Multicategory SVM Via Sup-norm Regularization

Hao Zhang, North Carolina State University, Campus Box 8203, North Carolina State University, Raleigh, NC, 27695, United States of America, haohelen.zhang@gmail.com

Multiclass Support Vector Machine (MSVM) is a popular classification method in machine learning and has many successful applications. However, the standard MSVM does not select variables and the solution utilizes all input variables, which can hurt its accuracy and interpretability especially for high dimensional data. We propose a novel type of regularization for MSVM based on the supnorm penalty and its adaptive form, which automates variable selection process and improves the standard MSVM.

3 - Web Mining for Improved Customer Targeting

Prem Melville, Research Scientist, IBM Research, 25 Bank St, #212E, White Plains, NY, 10606, United States of America, pmelvil@us.ibm.com, Saharon Rosset, Richard Lawrence

We consider the problem of predicting the likelihood that a company will purchase a new product from a seller. We extend previous structured firmographic models to include text-based features based on analysis of company websites. Empirical results demonstrate that incorporating such web content can significantly improve customer targeting. Furthermore, we present methods to actively select only the web content that is likely to improve our models, while reducing the costs of acquisition.

4 - LAGO on the Unit Sphere

Mu Zhu, Associate Professor, University of Waterloo, 200 University Ave W, Waterloo, ON, N2L 3G1, Canada, m3zhu@uwaterloo.ca, Alexandra Laflamme-Sanders

LAGO is an efficient kernel algorithm designed specifically for the rare target detection problem but, unlike other kernel algorithms, one cannot easily use LAGO with many domain-specific kernels. We solve this problem by first providing a unified framework for LAGO and clarifying its basic principle, and then applying that principle on the unit sphere instead of in the Euclidean space.

■ TC14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Frontline Systems, Inc. - Risk Analysis and Robust Optimal Solutions: High Productivity Modeling in Excel

Daniel H. Fylstra, Frontline Systems, Inc., PO Box 4288, Incline Village, NV, 89450, dfylstra@frontsys.com

More than ever today, models for risk analysis and optimal resource allocation in the presence of uncertainty can be built more easily, scaled up to large size, and solved more effectively in Microsoft Excel. Robust optimization and stochastic programming models that once required very scarce expertise and long development cycles are extremely easy to create and solve in Excel. Access to disparate data sources, often a headache with other tools, is surprisingly simple in Excel. This session will demonstrate the tools and open your eyes to new possibilities.

2 - SAS - Versatile, Extensible Optimization Modeling with OPTMODEL

Ed Hughes, SAS Institute Inc., SAS Campus Dr., Cary, NC, 27513, ed.hughes@sas.com, Trevor Kearney

We'll demonstrate how OPTMODEL enables you to build and solve linear, mixed-integer, quadratic, and general nonlinear optimization models via its powerful, accessible modeling language. We'll also illustrate how you can extend OPTMODEL to implement specialized solution methods for more challenging optimization problems, integrating with SAS data handling, analytic, and reporting capabilities as needed.

■ TC15

M - Room 8219

Financial Modeling of Complex Service Systems

Sponsor: Service Science
Sponsored Session

Chair: James Rhodes, Senior Software Engineer, IBM, 650 Harry Road, San Jose, CA, 95120, United States of America, jjrhodes@us.ibm.com

1 - Service Analytics Workbench

Shun Jiang, R&D Engineer, IBM CRL, Diamond Building, ZGC Software Park 19, Dong Beiwang road, ShangDi, Beijing, China, jshun@cn.ibm.com, Chunhua Tian, Rongzeng Cao, Wei Ding, Juhnyoung Lee

To provide consistent results, expedite the analysis process, and save efforts in assessing cost and benefit of IT services projects, it is important to leverage the commonality of individual projects. We present a tool, Service Analytics Workbench, which utilizes a questionnaire-based approach to project scoping and capturing the heterogeneity of various projects, and a rule-based approach to generating cost estimations. Additionally it provides other derivative analyses abilities.

2 - Peak and Off-peak Strategies in Constrained Capacity Industries

Steven Shugan, University of Florida Warrington College of Business Admin, 201 Bryan Hall Campus Box 117155, Gainesville, FL, United States of America, Steven.Shugan@cba.ufl.edu, Aydin Alptekinoglu

Pricing theory suggests that during peak periods, service providers should improve profits by strategically raising prices and decreasing quality. However, we show when and why that is not the case.

3 - Services Costing in a Complex Environment: A Hierarchical Dichotomy

Toby Lehman, Research Staff Member, IBM Research, 650 Harry Road, San Jose, CA, 95120, United States of America, toby@almaden.ibm.com, Greg Eyres

Costing requires adopting one of two opposing modeling methodologies: tops-down or bottoms-up. Tops-down provides a quick turn-around for estimates, but bottoms-up provides a more accuracy. The ideal solution is to take the benefits of each method without incurring any of the problems. We present a mechanism that balances the two approaches and derives benefits from both.

■ TC16

M - Room 8222

Operations Research in Media and Entertainment Industry

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Andreea Popescu, Senior Operations Research Scientist, Turner Broadcasting System, INC., 1050 Techwood Dr., Atlanta, GA, 30318, United States of America, Andreea.Popescu@turner.com

1 - Pricing and Timing Impacts on Sales: An Empirical Study on the Entertainment Industry

Naragain Phumchusri, PhD Student, Georgia Institute of Technology, Atlanta, GA, United States of America, gth752r@mail.gatech.edu, Julie Swann

In this study, we use data from an entertainment industry in Georgia to empirically examine Revenue Management practices and their impacts. Particularly, we observe how pricing for each seating zone and the timing affect sales of its zone and other zones in the same show. In addition, we study the impacts of factors such as weekday versus weekend shows and identify opportunities to increase revenue from their different popularities.

2 - NBC-Universal Uses a Novel Qualitative Forecasting Technique to Predict Advertising Demand

Srinivas Bollapragada, Principal Scientist, GE Global Research Center, 1 Research Circle, # K1-4A50A, Niskayuna, NY, 12309, United States of America, bollapragada@research.ge.com, Rajesh Tyagi

We describe a novel demand prediction system that we had developed for NBC Universal (NBCU). The system uses an innovative combination of the Delphi and Grass roots forecasting methods to estimate advertising demand. We embedded our algorithm in a work flow system that seamlessly integrates into NBCU's existing sales systems. Since 2004 over 200 sales and finance personnel at NBCU have been using the system to support sales decisions during the $4.5 billion upfront market.

3 - Managing On-air Ad Inventory in Broadcast Television

Suman Mallik, University of Kansas, 1300 Sunnyside Avenue, Lawrence, KS, United States of America, mallik@uiuc.edu, Srinivas Bollapragada

We present a model for managing on-air ad inventory in broadcast television. The ad inventory in this industry is sold through two distinct processes: the Upfront, which occurs before the broadcast season, and the Scatter, which occurs during the broadcast season. A firm needs to allocate its total ad inventory to these two markets before knowing either the performance of its shows or the Scatter market price. We present a model to optimally solve this problem and derive insights from it.

4 - Scheduling Commercials into Television Breaks

Andreea Popescu, Senior Operations Research Scientist, Turner Broadcasting System, INC., 1050 Techwood Dr., Atlanta, GA, 30318, United States of America, Andreea.Popescu@turner.com

We present a model to schedule commercial ads into television breaks. The complexity of the problem lies in trading off solution quality against computational time. The estimated average calls of the scheduler across all networks per day is 8,000 with peak 28,000; we present modelling techniques that achieve desired solution quality in a resonable time.

■ TC17

M - Room 8226

Prognostics and Maintenance Management II

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Nagi Gabraeel, Assistant Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA 30332, United States of America, nagi@isye.gatech.edu

Co-Chair: Alaa Elwany, PhD Student, Georgia Institute of Technology, 765 Ferst Dr, NW, Atlanta, GA, 30332, United States of America, elwany@gatech.edu

1 - Semiparametric Bayesian Replacement Strategies

Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu, Jason Merrick

We consider repairable systems that are subject to wear. We present a semi-parametric model by specifying a gamma process for cumulative intensity function and by taking into account effect of covariates by a parametric form.

Use of the gamma process prior complicates the Bayesian analysis when the updating is based on failure count data. We develop a Bayesian analysis of the model using MCMC methods, which involves a data augmentation algorithm, and determine replacement strategies.

2 - Some Limit Theorems for a Cumulative Degradation Process

Jeffrey Kharoufeh, Associate Professor, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, jkharouf@pitt.edu

We present transient and asymptotic reliability measures for a cumulative degradation process resulting from Markov-modulated wear and damage-inducing shocks of random magnitude. The asymptotic results lead to computationally-expedient approximations for remaining life distributions suitable for use within a real-time prognostics framework. A few numerical illustrations are provided.

3 - On Replacements of a Vital Component to Extend System Life Using Finite Spares

Gozde Icten, University of Pittsburgh, University of Pittsburgh, Pittsburgh, PA, United States of America, gozdeicten@yahoo.com, Steven Shechter, Lisa Maillart

We examine the problem of scheduling replacements of a vital component using a finite number of identical spare parts in a multi-state, discrete-time Markovian deterioration setting. Whenever the vital component fails, a catastrophic system failure occurs and the problem terminates. So, our objective is to maximize the total expected lifetime of the system. We formulate this problem as a Markov decision process and explore the structural properties of the optimal policy.

4 - Optimality of Control Limit Policies (CLPs) for a Sensor-based Single-unit Replacement Problem

Alaa Elwany, PhD Student, Georgia Institute of Technology, 765 Ferst Dr, NW, Atlanta, GA, 30332, United States of America, elwany@gatech.edu, Nagi Gabraeel, Lisa Maillart

We propose a sensor-based model for the finite horizon single-unit replacement problem. The replacement decision is based upon the component's underlying state of degradation. Information about the degradation state is gathered from real-time sensory signals acquired using condition monitoring techniques. We formulate the model as a Markov Decision Process (MDP) and show that a control limit policy (CLP)is optimal for this model.

■ TC18

M - Room 8228

Service Factory Design and Optimization

Sponsor: Service Science

Sponsored Session

Chair: Abhijit Bose, Member of Research Staff, IBM T. J. Watson Research, 19 Skyline Drive, Hawthorne, NY, 10532, United States of America, bosea@us.ibm.com

1 - The Services Factory: Models and Challenges

Abhijit Bose, Member of Research Staff, IBM T. J. Watson Research, 19 Skyline Drive, Hawthorne, NY, 10532, United States of America, bosea@us.ibm.com

Manufacturing has benefitted tremendously from advancements in automation, standardization, inventory control and supply chains. The services sector has yet to achieve such economies of scale, quality and efficiency. There has been significant interest in understanding how IT, healthcare and other service domains can benefit from initiatives undertaken in manufacturing. This session will identify the issues faced by the services sector today in achieving factory-scale efficiencies.

2 - Tractable Optimization Subject to Service Level Constraints

Assaf Zeevi, Professor, Columbia Business School, New York, NY, 10027, United States of America, assaf@gsb.columbia.edu

We present a simple and tractable approach to optimizing service centers ' capacity planning decisions, subject to service level constraints. A salient feature of the proposed approach is that it allows to deal with uncertainty in the basic model primitives (such as demand volume and other business drivers).

3 - Dynamic Assignment of Cross-trained Agents Providing On-demand Services

Mark Van Oyen, Assoc. Professor, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, 48105, United States of America, vanoyen@umich.edu, Abhijit Bose, Hoda Parvin, Hyun-soo Ahn

We report on a problem of dynamic assignment of cross-trained agents in an environment of on-demand technical support services. The general, high-fidelity model is intractable; however, stylized models, analysis, and heuristics are useful in developing effective policies for managing these systems. In addition to information technology delivery/support systems, this research is relevant to many domains including healthcare.

4 - Call Center: Customer Information Exchange and Knowledge Factory

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu

In any large-scale services operation, potentially valuable information can be captured through interactions with customers. Despite massive investments in CRM systems, the information in these databases is rarely ever utilized to create business value. In this paper, we describe some of the challenges associated with this kind of "information value chain" and describe a successful case study of creating such a value chain for a large multi-site software technical support operation.

■ TC19

M - Lincoln 4

Military Decision Analysis

Sponsor: Decision Analysis

Sponsored Session

Chair: Gregory Parnell, Professor of Systems Engineering, United States Military Academy, Department of Systems Engineering, West Point, NY, 10996, United States of America, gregory.parnell@usma.edu

1 - Weight a Minute: Do the Alternatives have Something to Say?

Matthew F. Dabkowski, Instructor of Systems Engineering, Department of Systems Engineering, 646 Swift Road, Building 752, West Point, NY, 10996, United States of America, Matthew.Dabkowski@usma.edu, Terry Bresnick, Gregory Parnell, Robert Dees

Originally multiple objective decision analysis obtained the measure range using the extreme outcomes of existing alternatives (Alternative-Focused Thinking). Value-Focused Thinking has been used for many studies to identify future desired capabilities. Two potential concerns are less differentiation of alternatives and potentially different ranking of alternatives. This presentation examines these issues.

2 - Weight a Minute: What might the Alternatives Say?

Robert Dees, Instructor and Analyst, US Army, Department of Systems Engineering, 4th Floor, BLDG 752, West Point, NY, 10996, United States of America, robert.dees@usma.edu, Terry Bresnick, Gregory Parnell, Matthew F. Dabkowski

When we practice Value-Focused Thinking, we attempt to answer the question "What do we want?" At some point, we must transition to the questions of "What can we do" and "What should we do?" We start by thinking about our values and finish by deciding between alternatives. In our efforts to make opaque decision situations clear and enhance decision quality, we attempt to illuminate the differences between alternatives. As we move to decide, our alternatives' range of values across multiple objectives may help to illuminate these differences and provide discriminatory power. We present a possible technique for updating of weights in a multi-objective model once we move from "what we want" to "what we should do.

3 - Using VFT and Optimization to Create the Acquisition Portfolio for the Marines

Harry Newton, Innovative Decisions, Inc, PO Box 231660, Centreville, VA, 20120, United States of America, harry.newton@innovativedecisions.com, John Smith, Dennis Buede, Russell Mosier, Fred Daubenspeck, A.J. Maltenfort

The Marine Corps has 35 different optics systems in its inventory and acquisition pipeline. In this study, we develop two models: An Individual Optics (IO) Model based on Value Focused Thinking to evaluate similar optic systems; and, a Family Of Individual Optics (FOIO) Portfolio Model based on optimization that compares potential portfolios of optics for a rifle company and heavy machine gun platoon.

4 - Comparison of Homeland Security Risk Assessment Methodologies

Chris Smith, Instructor, United States Military Academy, 3102 C Paterson Loop, West Point, NY, 10996, United States of America, Christopher.Smith@usma.edu, Gregory Parnell

We summarize the usefulness of several risk assessment/management techniques currently in use to assess threats, vulnerabilities and consequences for homeland security decision making. Using bioterrorism as an illustrative example, we explore commercially available software to compare several techniques. We specifically focus on the feasibility of using this software to perform risk assessment/management. We explore different scale models to assess the benefits of additional fidelity.

■ TC20

M - Lincoln 3

DA Arcade I

Sponsor: Decision Analysis
Sponsored Session

Chair: Chen Wang, University of Wisconsin Madison, 3237 Mechanical Engineering, 1513 University Avenue, Madison, WI, 53706, United States of America, cwang37@wisc.edu

1 - Aiding Washinton Policy Makers with Analytic Tools
Rex Brown, Distinguished Senior Fellow, School of Public Policy, GMU, 2018 Lakebreeze Way, Reston, VA, 20191, United States of America, Rexvbrown@aol.com

A consultant's perspective and lessons learned from helping government executives to make and defend high level environmental, energy and other decisions. Analytic, political, administrative, legal and private considerations.

2 - Preferences for Multiperiod Consumption Streams
Casey Lichtendahl, Assistant Professor, University of Virginia, PO Box 6550, Charlottesville, VA, 22906, United States of America, lichtendahlc@darden.virginia.edu, Samuel Bodily

A decision analysis often requires eliciting the form of a decision-maker's preferences for non-negative attributes such as consumption streams. We propose a set of simple and desirable conditions on multiattribute preferences which together narrow down the search to some attractive forms. These forms offer a rich set of possibilities for expressing degrees of multivariate and componentwise risk aversion while retaining an essential and compelling simplicity.

3 - Optimal Allocation of Defensive Resources in the Face of Intelligence About Atacker Preferences
Chen Wang, University of Wisconsin Madison, 3237 Mechanical Engineering, 1513 University Avenue, Madison, WI, 53706, United States of America, cwang37@wisc.edu, Vicki Bier

We consider a game in which an attacker chooses which target to attack according to a multi-attribute utility function. The defender is uncertain about the attacker's weights on the various attributes. We show how the defender can update her knowledge of the attacker's attribute weights in a Bayesian manner after each observed successful or attempted attack.

4 - Rank-based Sensitivity Analysis of Multiattribute Value Models
Antti Punkka, Researcher, TKK, Otakaari 1 M, Espoo, 02150, Finland, antti.punkka@tkk.fi, Ahti Salo

We extend methods for multi-way sensitivity analysis of multiattribute value models by examining what rankings the alternatives can attain subject to incomplete information about attribute weights and alternatives' scores. These rankings - which complement other sensitivity results such as value intervals and dominance relationships - are computed from an MILP model that allows hundreds of alternatives to be analyzed efficiently. Numerical examples with university rankings are given.

5 - An Interactive Search Method Based on User Preferences
Asim Roy, Department of Information Systems, Arizona State University, PO Box 874606, AZ, 85287-4606, ASIM.ROY@asu.edu, Jyrki Wallenius, Patrick Mackin, James Corner

We present a method to search for objects in a large collection where objects are defined by a large number of discrete attributes. The iterative method presents some objects and allows one to indicate a preference for them by: (1) assigning objects to predefined categories, or (2) by direct preference comparison of objects. From these preference statements, the method approximates the user's value function. It uses this approximate value function to re-rank objects in the collection and retrieve top-ranked ones to present to the user at the next iteration. Test results are reported.

■ TC21

M - Lincoln 2

Healthcare Operations Management

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Jeffrey Herrmann, University of Maryland, Department of Mechanical Engineering, College Park, MD, United States of America, jwh2@umd.edu

1 - Operating Room Scheduling Heuristics to Improve Post-operative Patient Flow
Carter Price, University of Maryland, 446 Ridge Road Apt 5, College Park, MD, 20742, United States of America, price@math.umd.edu, Bruce Golden, Edward Wasil, Timothy Babineau, Michael Harrington, Ramon Konewko

Operating room schedules generally neglect to consider the down-stream effects of the block assignment. Mixed-integer programming and simulation can be used to develop block assignments that better accommodate known sources of variation. Using hospital data, we found that that minor scheduling alterations can significantly reduce the census variability.

2 - Post-operative Destination Capacity Analysis
Jeffrey Herrmann, University of Maryland, Department of Mechanical Engineering, College Park, MD, United States of America, jwh2@umd.edu

Predicting the demand for post-operative beds is an important task for identifying post-operative units that are facing bed shortages based on the current surgery schedule, evaluating how new operating rooms will increase bed demand, and estimating how changes to the block schedule will affect bed demand. Our approach uses empirical length-of-stay distributions plus the current surgery schedule to estimate expected unit census. These forecasts are better than other estimation methods.

3 - Coordination Challenges in Hospital Care
Yan Xiao, University of Maryland Medical School, Baltimore, MD, yxiao@umaryland.edu, Peter Hu, Douglas Martz, Richard Dutton

Some of the challenges facing workers in hospitals may be summarized as those in coordination of knowledge, activities, and intentions. Detailed field studies have demonstrated that a number of artifacts, most physical, are used to articulate activities at different sites. These findings suggest both the variety of information needs for coordination. In this presentation, field study results and prototypes will be used to highlight the potential to support coordination in hospital care.

■ TC22

M - Lincoln 1

Scheduling II

Contributed Session

Chair: Dirk Briskorn, University of Kiel, Olshausenstr. 40, Kiel, Germany, briskorn@bwl.uni-kiel.de

1 - A Branch, Bound, and Remember Algorithm for the 1|r|T Scheduling Problem
Edward Sewell, Professor, Souther Illinois University Edwardsville, Department of Math and Stats, Edwardsville, IL, 62026, United States of America, esewell@siue.edu, Gio Kao, Sheldon Jacobson

We present a branch, bound, and remember algorithm for minimizing the total tardiness on a single machine with release times. It incorporates new memory-based dominance properties, an efficient memory-based method for computing a strong lower bound, and the distributed best first search strategy. It solves the hardest test instances three to four orders of magnitude faster than previous algorithms.

2 - A GA for Multi Objective Scheduling- Application to the Movie Shoot Scheduling Problem
Felix Bomsdorf, University of Cologne, Pohligstr. 1, Cologne, 50969, Germany, bomsdorf@uni-koeln.de, Ulrich Derigs

We present a GA for generating efficient solutions for multi objective (resource constrained) scheduling problems where contrary regular and non regular performance measures have to be respected. To reduce the number of accepted solutions we propose an "adapted Pareto operator" which accepts efficient solutions only if they differ substantially with respect to solution quality and structure. We have applied this procedure to solve the Movie Shoot Scheduling Problem and we report first results.

3 - Analysis of a Backfilling Scheduling Policy
Ingrid Vliegen, Technology Management, Eindhoven University of Technology, Den Dolech 2, Eindhoven, Netherlands, i.m.h.vliegen@tm.tue.nl, Alan Scheller-Wolf, Paul Enders

In many applications different tasks require the service of multiple units of a resource at the same time. Examples include the use of several locomotives for shunting a (heavy) train or using parallel processors in a supercomputing environment. When a variety of tasks exists, each requiring different amounts of the resource, straightforward scheduling algorithms often lead to idling of some of the resource. We analyze a scheduling policy, backfilling, that targets to circumvent this idling.

4 - Bias Adjusted Safety Stock Method for Open System Master Production Scheduling
Hyoung-Gon Lee, Postdoctoral Fellow, MIT, 77 Massachusetts Avenue, 35-135, Cambridge, MA, 02139, United States of America, hg_lee@mit.edu, Edmund W. Schuster, Stuart J. Allen

In this study, we propose a new way to improve master production schedule (MPS) stability under conditions of finite capacity and deliver the tool as open system. The approach has its genesis in a real world, make-to-stock situation that frequently occurs in the food industry and other related types of manufacturing. By eliminating forecast bias and choosing safety stock method, MPS stability could be significantly improved.

5 - Time Buffer Allocation in Machine Scheduling

Dirk Briskorn, University of Kiel, Olshausenstr. 40, Kiel, Germany, briskorn@bwl.uni-kiel.de, Mike Pinedo

A well known approach to protect schedules from uncertainty is to have buffer time between the scheduled finishing time of a job and the scheduled starting time of the next job. In a machine scheduling environment a buffer corresponds to machine idle time. We present a framework to formalize the problem of buffer allocation adding a feature of schedule robustness to an arbitrary scheduling problem. Moreover, we give results related to the computational complexity and outline possible extensions.

■ TC23

M - Lincoln 5

Stochastic Networks

Sponsor: Applied Probability
Sponsored Session

Chair: John Hasenbein, University of Texas, Austin, TX, United States of America, jhas@mail.utexas.edu

1 - Performance Analysis of Queuing Networks via Robust Optimization

Alexander Rikun, MIT - ORC, 72 Brookline St. apt 201, cambridge, ma, 02139, United States of America, alexander.rikun@gmail.com, Dimitris Bertsimas, David Gamarnik

In this paper we propose a new approach for performance analysis of queueing networks based on robust optimization. We apply our approach to tandem single class and multiclass single server queueing networks. In both cases we obtain explicit bounds on performance measures such as sojourn time and busy period.

2 - Continuous Mapping Approach to Many-server Heavy Traffic Limit Theorems

Jim Dai, Georgia Institute of Technology, 765 Ferst Drive NW, Atlanta, GA, United States of America, dai@isye.gatech.edu

We show that the continuous mapping theorem, and sometimes together with a state space collpase result, is sufficient to prove existing many-server heavy traffic limit theorems in the Halfin-Whitt regime. The approach applies to parallel-server systems with exponential or phase type distributions. The customer patience time distribution is assumed to be exponential.

3 - Routing in Systems with Flexible Multi-server Pools

Alexander Stolyar, Bell Labs, Alcatel-Lucent, 600 Mountain Ave, 2C-322, Murray Hill, NJ, 07974, United States of America, stolyar@research.bell-labs.com, Tolga Tezcan

A general model with multiple input flows (classes) and several flexible multi-server pools is considered. We propose a robust, generic algorithm for routing new arrivals, which optimally balances server pools' loads, without the knowledge of the flow input rates and without solving any optimization problem. We study behavior of the algorithm in the fluid limit and Halfin-Whitt (or, QED) asymptotic regimes.

4 - Distributed Resource Allocation for Fork and Join

Cathy Xia, IBM, cathyx@us.ibm.com, Chuck Zhao, Zhen Liu, Don Towsley

Many emerging information processing applications require applying various fork and join type operations to data streams in real-time. Effective in-network processing and resource management in a distributed heterogeneous environment is critical to achieve better scalability and quality of service provision. We present novel distributed resource allocation algorithms that achieve the global optimality in a generic fork and join network setting.

■ TC24

M - Lincoln 6

ICS Winners

Sponsor: Computing Society
Sponsored Session

Chair: James Orlin, Professor, M.I.T., E53-363, Cambridge, MA, 02139, United States of America, jorlin@MIT.EDU

The winners of the 2008 ICS Prize and the 2008 ICS Student Paper Award present their award-winning papers. The 2008 ICS Prize winners are Robert Day and S. Raghavan for their paper: "Fair Payments for Efficient Allocations in Public Sector Combinatorial Auctions," which was published in Management Science in 2007. The Student Paper Award Winner is Guanghui Lan for his paper: "Efficient Methods for Stochastic Composite Optimization."

1 - 2008 ICS Prize Winner: Fair Payments for Efficient Allocations in Public Sector Combinatorial Auctions

S. Raghavan, Associate Professor, University of Maryland, The Robert H. Smith School of Business, College Park, MD, 20740, United States of America, raghavan@umd.edu, Bob Day

We focus on the notion of bidder-pareto-optimal core (BPOC) prices that is viewed as being fair, and has gained prevalence among decision makers in public sector combinatorial auctions. Unfortunately, the computation of BPOC in a practical manner has been a major stumbling block to real-world implementation. Based on a mathematical programming formulation of the problem, we devise a computationally efficient constraint-generation approach to rapidly compute BPOC prices.

2 - Student Paper Award Winner: Efficient Methods for Stochastic Composite Optimization

Guanghui Lan, Georgia Tech, School of ISyE, Atlanta, GA, United States of America, glan@isye.gatech.edu

This paper considers an important class of convex programming problems whose objective functions, given by the summation of a smooth and non-smooth component, are contaminated by stochastic noise. We show that the robust stochastic approximation method exhibits the best-known rate of convergence for solving these problems. The main goal is to present the first theoretically optimal method for solving this class of problems and demonstrate its significant advantages over existing algorithms.

■ TC25

M - Lincoln 6A

Metaheuristics

Sponsor: Computing Society: Metaheuristics
Sponsored Session

Chair: Mary Beth Kurz, Clemson University, 110 Freeman Hall, Clemson, SC, United States of America, mkurz@exchange.clemson.edu

1 - Investigating Random Keys Representation in a Particle Swarm Optimization Metaheuristic

Vinodh Sankaran, Dr.Mary Elizaberth Kurz/Clemson university, Clemson, SC, United States of America, vsankar@clemson.edu

This talk considers how the combinatorial optimization problem of scheduling flexible flow line to minimize makespan can be attacked with particle swarm optimization by representing the combinatorial solution with random keys. Extensive computational experiments are facilitated through the use of high-throughput computing via Clemson's Condor grid.

2 - Scheduling Flexible Flow Lines Using Artificial Immune Algorithms

Thashika Rupasinghe, Clemson University, Department of Industrial Engineering, Clemson, SC, 29634-0920, United States of America, rthashi@clemson.edu, Mary Beth Kurz

Similar to the other biologically-inspired techniques such as genetic algorithms, the field of artificial immune system is an emerging branch of computational intelligence. This study evaluates the effectiveness of immune algorithms compared to genetic algorithms in solving complex scheduling problems.

3 - Approximation Metaheuristics for Assortment Problems with Multiple Quality Levels

Mark McElreath, Research Assistant, Clemson University, 110 Freeman Hall, Clemson University, Clemson, SC, 29634-0920, United States of America, mmcelre@clemson.edu, Maria Mayorga, Mary Beth Kurz

While research on assortment planning has yielded useful analytical results, it has also left open computational questions. In particular, when products are differentiated both horizontally and vertically the optimal solution has only been partially characterized. We investigate three metaheuristics (using a common representation) and evaluate performance over several problem instances.

4 - Intelligent Mechanisms to Escape Local Optima

Michele Samorani, PhD Candidate, Leeds School of Business, Bldg #4, UCB 419, Boulder, CO, 80309-0419, United States of America, Michael.Samorani@Colorado.EDU, Manuel Laguna

Existing mechanisms to escape local optimality, such as randomization, restarting and neighborhood modifications, are not strategically designed to lead the search to promising regions of the solution space. We propose the application of data mining techniques to discover effective escape directions from a training set of problem instances with known optimal solutions. Tests on a set of task allocation problems are conducted to assess the merit of our proposal.

■ TC26

M - Lincoln 5A

Open Source Software for Semidefinite Programming

Sponsor: Computing Society: Open Source Software
(Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Brian Borchers, New Mexico Tech, Department of Mathematics, 801 Leroy Place, Socorro, NM, 87801, United States of America, borchers@nmt.edu

1 - Improvements in SDPT3

Michael J. Todd, Professor, Cornell University, 229 Rhodes Hall, Cornell University, Ithaca, NY, 14853, United States of America, mjt7@cornell.edu, Kim-Chuan Toh, Reha Tutuncu

We will describe recent enhancements incorporated into SDPT3-4.0-beta, a code for solving semidefinite-quadratic- linear programming problems. This version can handle complex data and log barrier terms in the objective function. It deals with unrestricted variables better than earlier versions, and can exploit low-rank constraint matrices. In addition, a homogeneous self-dual variant is provided.

2 - SDPA: Leading-edge Software for SDP

Makoto Yamashita, Tokyo Institute of Technology, 2-12-1-W8-29 Oh-okayama Meguro-ku, Tokyo, 152-8552, Japan, Makoto.Yamashita@is.titech.ac.jp, Kazuhiro Kobayashi, Masakazu Kojima, Maho Nakata, Kazhide Nakata, Katsuki Fujisawa, Mituhiro Fukuda

SDPA (SemiDefinite Programming Algorithm) is an Open Source Software to solve SemiDefinite Programs. SDPA has contributed to various fields, such as control theory and quantum chemistry. Since its first release in 1995, it has been continuously updated. The latest version (SDPA7) attains outstanding speed-up mainly due to the new data structures. SDPA is now distributed under GPL and users also can access SDPA via SDPA Online Solver on the Internet. [http://sdpa.indsys.chuo-u.ac.jp/sdpa/]

3 - CSDP: An Open Source SDP Solver

Brian Borchers, New Mexico Tech, Department of Mathematics, 801 Leroy Place, Socorro, NM, 87801, United States of America, borchers@nmt.edu

CSDP is an SDP solver that has been under development since 1997. The software is now available through the COIN-OR repository of open source software. This talk will discuss recent improvements to the package.

4 - Reimplementing SeDuMi: A Progress Report

Imre Pòlik, Lehigh University, Department of Industrial and Systems Engineering, 200 West Packer Avenue, Bethlehem, PA, 18015-1582, United States of America, imre.polik@gmail.com

SeDuMi is an open source package for optimization over symmetric cones, written originally by Jos Sturm. Int his talk we summarize our efforts to reimplement SeDuMi package using Python. Issues regarding the input format and design layout will be discussed.

■ TC28

M - Washington 1

Optimal Learning

Cluster: Online Decision Making
Invited Session

Chair: Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

1 - Convergence of Sequential Sampling Policies for Bayesian Information Collection Problems

Peter Frazier, Princeton University, Princeton, NJ, 08544, United States of America, pfrazier@princeton.edu, Warren Powell

We consider adaptive sequential sampling policies in a general Bayesian framework. We present new sufficient conditions for convergence, or asymptotic optimality, in this sequential setting, and apply these conditions to show asymptotic optimality of several existing policies for ranking and selection.

2 - Optimal learning for the Newsvendor Problem

Diana Negoescu, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, negoescu@Princeton.EDU, Warren Powell

Some applications of the newsvendor problem involve measurements that are time-consuming or expensive with high levels of uncertainty. We explore the use of the knowledge gradient policy, and compare it to other heuristic policies and an optimal measurement policy that applies only for the small class of newsvendor distributions. We show that the knowledge gradient policy closely matches the optimal while providing a general strategy for a broad range of distributions.

3 - Knowledge Gradient For Bandit Problems

Ilya Ryzhov, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08544, United States of America, iryzhov@Princeton.EDU, Warren Powell

We derive a one-period look-ahead policy for a finite-horizon bandit problem with independent Gaussian rewards. The policy yields a computable algorithm for choosing arms. The resulting "KG formula" strikes a balance between exploration and exploitation, and always benefits from learning. However, information collection in this problem exhibits counter-intuitive properties: the marginal value of measuring one arm does not always diminish with the number of measurements.

■ TC29

M - Washington 2

Tutorial: Exploiting Opportunities at the Interfaces of Operations and Finance

Cluster: Tutorials
Invited Session

Chair: Panos Kouvelis, Professor, Washington University in St.Louis, Olin Business School, St.Louis, MO, 63130, United States of America, kouvelis@wustl.edu

1 - Global Supply Chain Finance: Exploiting Opportunities at the Interfaces of Operations and Finance

Panos Kouvelis, Professor, Washington University in St.Louis, Olin Business School, St.Louis, MO, 63130, United States of America, kouvelis@wustl.edu

We will discuss recent research that advocates a tighter integration of the Operations and Finance functions within and across enterprises for higher value creation and for enterprise risk management purposes.We place emphasis on better understanding of: (a) Interfaces of financing and supply chain decisions;and (b)Integrated risk management of commodity and currency risks through the combined use of operational flexibilities and financial hedges.

■ TC30

M - Washington 4

Optimization in Military Applications: Resource Management and Course of Action

Sponsor: Military Applications
Sponsored Session

Chair: Rakesh Nagi, Professor and Chair, University at Buffalo, Department of Industrial & Sys Eng, 438 Bell Hall, Buffalo, NY, 14260, United States of America, nagi@buffalo.edu

1 - Cooperative ISR Utilizing Airborne Reconnaissance Platforms and Unmanned Aircraft Systems

Chase Murray, PhD Candidate, University at Buffalo, 308A Bell Hall, Department of Industrial and Systems Eng, Buffalo, NY, 14260-1900, United States of America, cmurray3@eng.buffalo.edu, Mark Karwan

A general modeling framework for dynamic re-routing of resources responding to battlespace changes (e.g. appearance of a new threat or loss of a resource) is presented. We demonstrate the model in the context of cooperative intelligence, surveillance, and reconnaissance (ISR) missions involving multiple manned and unmanned aircraft systems. Examples and computational results are discussed.

2 - An Optimization Framework for Resource Management and Course of Action Analysis

Michael Hirsch, Principal Engineer, Raytheon, PO Box 12248, M/S 61, St. Petersburg, FL, 33733, United States of America, Michael_J_Hirsch@raytheon.com, Rakesh Nagi, David Sudit

COA problem domain considered with support of fusion technology. Assume that level 1/2 fusion technology provides a set of suspicious situations currently unfolding and associated objects of interest participating in these situations. Limited resources are available to gather additional information. COA analysis and RM prescribe placement of resources to accomplish desired tasks. Problem formulated from an optimization framework, resulting in an NP-hard problem.

3 - Multi-objective Optimization of a Contingency Logistics Network

Edward Pohl, Associate Professor, University of Arkansas, Department of Industrial Engineering, Bell Engineering Center, Fayetteville, AR, 72701, United States of America, epohl@uark.edu

A contingency logistic network can be responsible for resourcing several missions at the same time with different levels of desirability for mission success. Furthermore, depending on the time and budget available at each node or region in the network, a decision maker has a different level of cost and time tolerance

for the different missions. In this paper, Physical Programming is used in conjunction with a memetic algorithm to optimize the performance of a contingency logistics network.

4 - Mixed Integer Formulation of the Critical Resource Diagramming Method

Adedeji Badiru, Professor and Department Head, Air Force Institute of Technology, AFIT/ENV 2950 Hobson Way, Wright Patterson Air Force Base, Dayton, OH, 45433, United States of America, adedeji.badiru@afit.edu, Ashish Nemani, Ravindra Ahuja

The Critical Resource Diagramming (CRD) was formulated as an extension of PERT/CPM; but with the constraint of scheduling from the resource viewpoint rather than activity viewpoint and the added requirement that a resource unit can appear at multiple locations in the schedule. We present an integer programming formulation for the CRD problem to generate all possible starting times and assign a variable to each of them with the objective of minimizing the project makespan.

■ TC31

M - Washington 5

Mortgage and Housing Price Modeling

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Gigi Yuen-Reed, Consultant, IBM, 14 Third Street SE, Washington, DC, 20003, United States of America, gigi.yuen@us.ibm.com

1 - Models and Methods of the FHA MMI Fund Independent Actuarial Review : Part I

Charles Calhoun, Principal Consultant, Calhoun Consulting LLC, 4837 King Solomon Drive, Annandale, VA, 22003, United States of America, charles_calhoun@cox.net, Tyler Yang, Cary Lin, Ted Chiu

We present an overview of the statistical methods underlying recent FHA MMI Fund actuarial reviews. We will summarize the statistical model specification (discrete-time hazard model for competing risks) and estimation issues arising from the analysis of FHA claim and prepayment rates. We will discuss the key economic predictors of mortgage default and prepayment - house prices, interest rates, and borrower credit scores. A brief overview of empirical estimates will be presented.

2 - Collateral Risk in Residential Mortgage Defaults

Tyler Yang, President, IFE Group, 51 Monroe Street, Suite 801, Rockville, MD, 20850, United States of America, tyler.yang@ifegroup.com, Che-Chun Lin, Man Cho

This paper introduces a systematic framework to model the collateral house values underlying a mortgage portfolio. Future house price dynamic is decomposed into time series volatility of the overall housing market fluctuation and cross sectional deviation of a particular house°¶s growth rate from the overall housing market. Such decomposition allows a mortgage investor or insurer to differentiate and better manage the systematic part from idiosyncratic part of mortgage default risk.

3 - Credit Risk Model and Insurance Pricing for Reverse Mortgages

Gigi Yuen-Reed, Consultant, IBM, 14 Third Street SE, Washington, DC, 20003, United States of America, gigi.yuen@us.ibm.com

Reverse mortgages (RM) provide senior citizens cash payments and/or a credit line secured by their home's equity. While the primary risk of traditional mortgage is default, RM's risks are borrowers' mortality, mobility, and the liquidation value. To provide a more efficient financial pricing structure for RM, we formulated a loan repayment model from historical data and developed a stochastic pricing model to incorporate the impact of house price appreciation and interest rate.

4 - Spillover Effects of Foreclosures on Neighborhood Property Values

Len Lin, Fannie Mae, Washington, DC, United States of America, len_lin@fanniemae.com, Eric Rosenblatt, Vincent Yao

This paper extends previous studies into a formal theoretical model through pricing based on comparables. We theorize that the spillover effect of a foreclosure on neighborhood property values depends on two factors. One is related to housing cycle and the other varies by time of foreclosure and its distance from the subject property. Our empirical findings are consistent with our theory.

■ TC32

M - Washington 6

Sloan: Efficiency Improvement Initiatives in Supply Chain and Health Care

Cluster: Sloan Foundation
Invited Session

Chair: Shital Shah, Assistant Professor, Rush University Medical Center, 1700 W. Van Buren St, 126B, Chicago, IL, 60612, United States of America, Shital_C_Shah@rush.edu

1 - Impact of RFID Technology on the Bullwhip Effect

Pedro Reyes, Assistant Professor, Baylor University, One Bear Place #98006, Waco, TX, 76798, United States of America, Pedro_Reyes@baylor.edu

In this research, we investigate the impact of RFID technology on the bullwhip effect in a decentralized and centralized supply chain. Using the traditional Beer Game, we study the availability of information captured using RFID and effect of order variance amplification and supply chain performance. Our simulation results demonstrate the use of RFID for improving supply chain operation performance may help dampen the bullwhip effect.

2 - Economic Forces Shaping the Aluminum Industry

Frank Scott, Professor, University of Kentucky, Department of Economics, University of Kentucky, Lexington, KY, 40506-0034, United States of America, fscott@email.uky.edu, John Garen, Chris Jepsen

This paper studies horizontal and vertical aspects of the aluminum industry. We pay particular attention to upstream and downstream linkages in the vertical supply chain. We analyze economic forces in the supply chain that influence business location decisions. Of particular interest are the downstream aluminum fabrication industries, and factors such as technological improvements, energy costs, and labor force issues which affect the extent of foreign competition and outsourcing.

3 - How to Use Healthcare Operational Data for Benchmarking and Efficiency Improvement

Samuel Hohmann, Senior Manager, University HealthSystem Consortium, 2001 Spring Road, Suite 700, Oak Brook, IL, 60523, United States of America, hohmann@uhc.edu, Shital Shah

University Healthcare Consortium is a rich source of both administrative and operational data that provide unique insight into the healthcare operations in Academic Medical Centers. The applicability of the healthcare operational data for benchmarking and efficiency improvement is demonstrated on laboratory services using data and other quantative apporaches.

4 - Application of Lean principles to Emergency Department Discharge Process

Shital Shah, Assistant Professor, Rush University Medical Center, 1700 W. Van Buren St, 126B, Chicago, IL, 60612, United States of America, Shital_C_Shah@rush.edu, Dino Rumoro, Julio Silva

Emergency departments (ED) are facing tremendous pressure due to overcrowding resulting in waste generation in form of inefficient resource utilization, long wait times, boarding patients, and lower patient satisfaction. Lean principles such as value stream and process flow mapping and A3 approach not only identify process waste but also aid in streamlining ED operations. Applicability of lean principles in healthcare is demonstrated via the streamlining of ED to home discharge process.

■ TC33

M - Johnson

Operations Research Applications in Long-Term Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Murray Côté, Associate Professor, University of Colorado Denver, Health Care Policy & Research, 13611 E. Colfax Avenue, Suite 100, Aurora, CO, 80045, United States of America, Murray.Cote@UCHSC.edu

1 - Long Term Home and Community Care Planning on Vancouver Island

Martin Puterman, Professor, Sauder School of Business UBC, 2053 Main Mall #470, Vancouver, BC, V6T 1Z2, Canada, Martin.Puterman@sauder.ubc.ca, Matthew Nelson, Mehmet Ayvaci

In response to long waiting times for residential care placements, we collaborated with the Vancouver Island Health Authority (VIHA) to develop an approach for forecasting complex care and assisted living requirements to year 2020. Arrival rates derived from demographic analysis coupled with length of stay estimates derived from censored data models provided inputs into a spreadsheet based planning model. Results of this study impact both resource planning and resource allocation decisions.

2 - Background Check Screening for Long-term Care Workers

Tiffany Radcliff, Assistant Professor, University of Colorado, 13611 E. Colfax Ave, Suite 110, Aurora, CO, 80045, United States of America, tiffany.radcliff@uchsc.edu, David West, Donna Hurd, Alan White

As part of the evaluation of a seven-state pilot demonstration program mandated by Congress, we mapped the processes that are used to conduct criminal history background screenings for long-term care workers. We found variation across states in terms of technology, screening criteria, program structure, and program processes. Several procedures and methods were associated with increased program efficiency. General themes will be discussed.

3 - Classifying Nursing Homes in the Presence of Incomplete and Inconsistent Data

Murray Côté, Associate Professor, University of Colorado Denver, Health Care Policy & Research, 13611 E. Colfax Avenue, Suite 100, Aurora, CO, 80045, United States of America, Murray.Cote@UCHSC.edu, Gino Lim, Allen Holder

It is generally known that the Online Survey Certification and Reporting (OSCAR) database has some important analytic limitations when evaluating nursing home quality giving rise to an interesting and timely identification problem. How can we classify nursing homes in the presence of incomplete (i.e., not all aspects of the OSCAR database are reported) and inconsistent (i.e., nursing homes are not all evaluated identically) data? We will examine a variety of methods and report on their results.

■ TC34

M - Jefferson

OR in Public Health

Sponsor: Health Applications Section

Sponsored Session

Chair: Arielle Lasry, CDC, 1600 Clifton Road, Atlanta, GA, United States of America, alasry@cdc.gov

Co-Chair: Stephanie Sansom, Team Lead, DHAP/CDC, 1600 Clifton Road, MS E-48, Atlanta, GA, 30333, United States of America, sos9@cdc.gov

1 - Revisiting R0: The Basic Reproductive Number for Pandemic Influenza

Richard Larson, MIT, E40-231, Cambridge, MA, 02139, United States of America, rclarson@MIT.EDU

The basic reproductive number R0 is the mean number of new influenza infections created by a newly infected person in a population of all susceptible people. We show that R0 is not a constant of nature as its value is determined largely by behavioral patterns. R0 can be greater than 1.0 and, contrary to popular belief, the probability of an exponentially growing pandemic may be small. Attempts to estimate R0 from data of previous pandemics are fraught with methodological complexities.

2 - A Nonlinear Programming Approach for the Estimation of Large-scale Infectious Disease Models

Carl Laird, Assistant Professor, Chemical Engineering Department Texas A&M University, 3122 TAMU, College Station, TX, 77843, United States of America, carl.laird@tamu.edu, James Young, Derek Cummings

A reliable mechanistic model for infectious disease spread allows public health officials to make more informed decisions, while improving scientific understanding of the factors affecting transmission of the disease. Using the TSIR model as a basis, we develop large-scale nonlinear programming formulations for estimating model parameters using long time-series information on reported cases. These estimates provide insight into the fundamental drivers affecting the spread of infectious disease.

3 - Rationing of HIV Treatment in Resource-constrained Settings under Supply Uncertainty

Sarang Deo, Northwestern University, s-deo@kellogg.northwestern.edu, Charles Corbett

HIV clinics operating in developing countries have to contend with an uncertain supply of drugs. This creates a trade-off between enrolling new patients and providing uninterrupted treatment to those already enrolled. We formalize this trade-off using stochastic dynamic program, derive the optimal policy for the number of new enrollments and compare its performance with that of policies used in practice. We discuss the relevance of our model to the resource allocation decision in non-profits.

4 - Modeling the Spread of Measles and Investigating the Effectiveness of Vaccination Strategies

Pinar Keskinocak, Associate Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, pinar@isye.gatech.edu, Daniel Park, Farminder Anand, Julie Swann, Tuba Yilmaz

We develop an agent-based simulation to model the spread of measles both geographically and over time. We then explore the effectiveness of different vaccination strategies given limited resources.

■ TC35

M - Jackson

Undergraduate Research Showcase

Sponsor: INFORM-ED

Sponsored Session

Chair: Susan Martonosi, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, martonosi@hmc.edu

1 - Scheduling First-Year Seminars

Kevin Hutson, Furman University, Greenville, SC, United States of America, kevin.hutson@furman.edu, Ellen Rogerson

First-year seminars are designed to help incoming students adjust to college-level material and work load. At Furman, this seminar is broken into two courses: FYS and FYW courses (FYW's are writing intensive). Incoming students are required to take one of each of these courses in their first two terms and are scheduled for both before they arrive to campus. Here we discuss algorithms for scheduling students to these courses and compare the algorithms on the basis of different objectives.

2 - Teaching Integer Programming Using an Academic Scheduling Project

Dawn Strickland, Assistant Professor of Mathematics, Winthrop University, 156 Bancroft Hall, Rock Hill, SC, 29733, United States of America, stricklandd@winthrop.edu, Ginny Batson

In this talk we present two aspects of a course project in integer programming. First, a student discusses the motivation and formulation of a program that schedules classes based on instructors' time, day, and course preferences. Then, an instructor discusses methods and benefits of using this type of project to teach optimization techniques.

3 - Analyzing Human Papillomavirus Vaccine Stockpiles

Laura McLay, Virginia Commonwealth University, PO Box 843083, 1001 W. Main Street, Richmond, VA, 23284, United States of America, lamclay@vcu.edu, Jamie Dauberman

The human papillomavirus (HPV) vaccine has the potential to prevent 70% of all cervical cancers. The demand for the HPV vaccine is expected to dramatically rise, which could make our nation vulnerable to HPV vaccine shortages. One major factor in the prevention of HPV vaccine shortages is the creation of vaccine stockpiles by the CDC. We use mathematical models to determine and analyze stockpile levels sufficient to minimize the effects of a production interruption for the HPV vaccine.

4 - Designing an Effective Mass Prophylaxis Response System

Cindie Wu, Undergraduate Student, Cornell University, 286 Rhodes Hall, c/o John Muckstadt, Ithaca, NY, 14853, United States of America, cw282@cornell.edu, Caitlin Hawkins

Prophylaxing a population within 48 hours of infection is key to ensuring survival during an outbreak of smallpox, anthrax, or influenza. To prophylaxis a large population quickly, moving people to a point of dispensing (PoD) and serving them efficiently within a PoD is imperative. We present an analytic and simulation PoD model that will assist public health officials in determining staffing and service levels throughout a prophylaxis campaign for a system of PoDs.

5 - Resource Allocation for Malaria Prevention

Cesar Gutierrez, Georgia Institute of Technology, 1016 Howell Mill Rd Apt 2510, Atlanta, GA, 30318, United States of America, cgutierrez3@mail.gatech.edu, Michele Cataldi, Cesar Gutierrez, Jeff Hull, Phillip Kim, Andrew Park, Julie Swann, Christina Cho

The project's purpose was to develop a process for allocation and deployment of resources used for malaria prevention in Africa. Using Swaziland as a pilot, the team quantified at-risk populations and times for malaria and intervention costs for spraying. They developed recommendations for number and placement of facilities with scheduled deployment for labor, chemicals, and trucks. The team designed an interface to test and visualize the benefits of adapting the methodologies throughout Africa.

■ TC37

M - T. Marshall Ballroom West

INFORMS Communities/Subdivisions Session on INFORMS Web Pages

Cluster: INFORMS Communities/Subdivisions
Invited Session

Chair: Gary Bennett, INFORMS, Director of Marketing, Gary.Bennett@INFORMS.org

Co-Chair: Mary Magrogan, INFORMS, Director of Subdivisions Services, Mary.Magrogan@INFORMS.org

1 - Using INFORMS Content Management System for Your Community Web Site Needs

Shirley Mohr, INFORMS, Web Designer, Internet and New Media, Shirley.Mohr@INFORMS.org

This special training session for INFORMS Communities and Subdivision webmasters introduces INFORMS Content Management System (CMS) as the preferred solution for easily creating and updating web sites without the need for special software or programming knowledge. Any community or Subdivision that wishes to utilize a ready-made INFORMS template and intuitive tools to create and maintain their website should attend. The second part of this session will include training for current users of our CMS in advanced aspects of the system such as password protected areas, polls, and user feedback forms.

■ TC38

M - Tyler

Advances in Theory of Mixed Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Kiavash Kianfar, Assistant Professor, Texas A&M University, 239B Zachry, TAMU 3131, College Station, TX, 77843-3131, United States of America, kianfar@tamu.edu

1 - A Study of Robust Lot-sizing Problem

Zhili Zhou, PhD Student, School of Industrial Engineering University of Oklahoma, 202 W. Boyd St., Room 124, Norman, OK, United States of America, zhilizhou@ou.edu, Yongpei Guan

In this paper, we consider a lot-sizing problem in which severe events may happen such that the normal process will be disrupted. Our objective is to provide a robust schedule such that the total cost is minimized with the consideration of uncertain extreme events. A Minimax formulation is formulated and a corresponding algorithm is developed. Our preliminary study verifies the effectiveness of our approach. The applications of our model include production and inventory planning problems.

2 - The Mixing Set with Cardinality Constraints

Simge Kucukyavuz, Assistant Professor, University of Arizona, Systems and Industrial Engineering, Tucson, AZ, United States of America, simge@sie.arizona.edu

We propose valid inequalities for the mixing set with cardinality (and kanpsack) constraints. This set was recently studied by Luedtke et. al in the context of probabilistic linear programming. We show that our inequalities subsume the inequalities proposed earlier for related polyhedra. We give polynomial-time separation algorithms for our inequalities. Finally, we present a summary of our computational experiments to illustrate the effectiveness of the proposed inequalities.

3 - Approximating the Value Function of a Mixed Integer Linear Program

Menal Guzelsoy, Lehigh University, 200 West Packer Avenue, Bethlehem, PA, 18015, United States of America, megb@lehigh.edu, Ted Ralphs

The value function of a mixed integer linear program (MILP) is a function that returns the optimal solution value as a function of the right-hand-side. In this study, we approximate the value function of a MILP by considering various subadditive approximations to the value functions derived from single row relaxations using results from MILP duality and the technique of maximal subadditive extension.

4 - n-step Mingling Inequalities

Kiavash Kianfar, Assistant Professor, Texas A&M University, 239B Zachry, TAMU 3131, College Station, TX, 77843-3131, United States of America, kianfar@tamu.edu, Alper Atamturk

Mingling and two-step mingling inequalities are inequalities based on mixed integer rounding (MIR) which were recently shown to be valid (and in many cases facet-defining) for mixed-integer knapsack sets with bounded variables. We show that in general mingling and n-step MIR ideas can be utilized together to generate new classes of valid inequalities called n-step mingling inequalities.

■ TC39

M - Truman

Networks, Game Theory, and Computation

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Vincent Conitzer, Assistant Professor, Duke University, LSRC, Box 90129, Durham, NC, 27708, United States of America, conitzer@cs.duke.edu

1 - Overpayment in Set-system Auctions

Edith Elkind, eelkind@gmail.com, Kenneth Steiglitz, Paul Goldberg, Amit Sahai, Leslie Goldberg

In set-system auctions, there is a task than can be completed by several overlapping teams of agents, and the center's goal is to hire one of these teams and pay as little as possible. Examples of this setting include shortest path auctions, minimum spanning tree auctions, and vertex cover auctions. In this talk, we discuss several approaches to reducing the total payment of the center in this setting, and the associated computational challenges.

2 - Action-graph Games

Kevin Leyton-Brown, Assistant Professor, University of British Columbia, 2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada, kevinlb@cs.ubc.ca, Navin Bhat, Albert Xin Jiang

Action-Graph Games (AGGs) are a realistic, fully-expressive game representation that can compactly express utility functions with structure such as context-specific (or strict) independence, anonymity, and additivity. We give dynamic programming algorithms for computing sample Nash and correlated equilibria. Experiments with these algorithms show that the AGG representation enables a dramatic increase in the size of games accessible to computational methods.

3 - Charity Auctions on Social Networks

Mohammad Mahdian, Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, mahdian@alum.mit.edu, Arpita Ghosh

Charitable giving is influenced by many social, psychological, and economic factors. A common way to encourage individuals to donate to offer to match their gift. Conitzer and Sandholm introduced auctions that allow individuals to match each other's contribution. We explore this idea in a social network setting, where agents care about the contribution of their friends. We give mechanisms that raise the largest individually rational amount, and analyze the equilibria of this mechanism.

4 - Computing Pure Nash Equilibria in Action Graph Games

Albert Xin Jiang, University of British Columbia, 316-5500 Arcadia Rd, Richmond, BC, V6X2G9, Canada, jiang@cs.ubc.ca

Action graph games (AGGs) are a compact game-theoretic representation. Finding a pure Nash equilibrium of an AGG is NP-complete, but for certain classes there exist polynomial time algorithms. We give a dynamic-programming approach that constructs equilibria from equilibria of restricted games played on subgraphs of the action graph. If the game is symmetric and the action graph has bounded treewidth and in-degree, we can determine the existence of pure Nash equilibrium in polynomial time.

■ TC40

M - Taylor

IPMs for Linear Programming: Regularization and Constraint Reduction

Sponsor: Optimization/ Linear Programming & Complementarity
Sponsored Session

Chair: Andre Tits, Professor, University of Maryland, Department ECE and ISR, College Park, MD, United States of America, andre@umd.edu

1 - Exact Primal-dual Regularization of Linear Programs

Dominique Orban, Professor, Ecole Polytechnique de Montréal, Math & Industrial Eng Department, 2900 Boulevard Edouard Montpetit, Montréal, H3T 1J4, Canada, dominique.orban@polymtl.ca, Michael Friedlander

We propose a primal-dual algorithm for linear programs (LPs) with explicit primal and dual regularization. The regularizations are "exact" in the sense that a solution of the original LP can be recovered independently of the regularization parameters. This regularization leads to a sequence of symmetric quasi-definite linear systems.

2 - Worst Case Examples for the Central Path: Redundancy and Large Input Length

Tamas Terlaky, Professor, McMaster University, ITB-110, 1280 Main Street West, Hamilton, ON, Canada, terlaky@mcmaster.ca, Eissa Nematollahi, Antoine Deza, Yuriy Zinchenko

In this talk we highlight how redundancy affects the central path of the Klee-Minty cube, i.e., how exponentially many redundant constraints may force the central path to make exponentially many sharp turns. We also discuss some non-redundant examples where the number of sharp turns of the central path is linear in the number of inequalities, while all the constraints are facet defining. These constructions lead to the continuous analogue of the Hirsch conjecture.

3 - Regularization for Constraint Reduction under Degeneracy

Luke Winternitz, University of Maryland, University of Maryland, College Park, MD, 20770, United States of America, lukewinternitz@gmail.com, Andre Tits

"Constraint-reduced" primal-dual interior-point algorithms for linear programming consider only small working subsets of the (dual) constraints in constructing search directions. Such algorithms can yield dramatic speedup on some classes of LPs with large numbers of inequality constraints. In this talk, we discuss a type of degeneracy that arises when applying constraint-reduced methods to even well-posed problems and we investigate a regularization designed to deal with the problem.

■ TC41

M - Taft

Leveraging Methodologies, Resources, and Network Externalities to Achieve NPD Goals

Cluster: New Product Development
Invited Session

Chair: Edward Anderson, Associate Professor, The University of Texas at Austin, McCombs School of Business, 1 University Station, B6500, CBA 5.202, Austin, TX, 78712-0212, United States of America, Edward.Anderson@mccombs.utexas.edu

1 - A Quantitative Framework for Value, Risk and Opportunity Management in Projects

Tyson Browning, Assistant Professor of Enterprise Operations, Texas Christian University, TCU Box 298530, Fort Worth, TX, 76129, United States of America, T.Browning@tcu.edu

We provide an analytical framework for quantifying the value of a project, as well as the risk and opportunity it faces, as functions of its chosen goals, its stakeholders' desired values, its technological capabilities, and the prevailing uncertainties. We show how managers must think beyond a mere quantification of uncertainty to the expected costs and benefits of that uncertaintyói.e., risk and opportunity.

2 - Pushing Performance Frontier through Globalization: Asset Allocation and Operational Efficiencies

Jie Zhang, Boston University, 595 Commonwealth Avenue, Boston, MA, United States of America, jz@bu.edu, Justin Ren, Anil Khurana, Nitin Joglekar

Globalization requires that firms leverage their value network by allocating assets and build efficient operations. We examine how a firm's asset allocation decisions impact its operational efficiency. We build on the Theory of Performance Frontiers (Schmenner and Swink 1998) to distinguish two kinds of efficiencies - technical and allocative. We test empirically whether performance can be improved by balancing these two efficiencies through strategic investments in fixed and relational assets.

3 - An Efficient, Accurate, and Valid FMEA Priority Ranking Methodology

James Bradley, Associate Professor, College of William and Mary, Mason School of Business, PO Box 8795, Williamsburg, VA, 23187-8795, United States of America, james.bradley@mason.wm.edu, Hector Guerrero

One shortcoming of an FMEA priority ranking is that it requires an invalid mathematical operation. Methodologies proposed to resolve this issue, however, are more complex or more opaque to the decision-maker than the standard approach, or they misrepresent the decision-maker's intentions. We propose a ranking methodology that is efficient, reflects decision-makers' preferences accurately, and that is valid according to measurement theory. We validate our approach with an empirical experiment.

4 - Platform Feature Investment in the Presence of Network Externalities

Burcu Tan, PhD Student, University of Texas, 1 University Station, B6500, Austin, TX, 78712, United States of America, burcu.tan@phd.mccombs.utexas.edu, Edward Anderson, Geoffrey Parker

We examine the development of product platforms in markets that exhibit network externalities. We focus on the trade-off firms must make between investing new product development resources to increase a platform's core functionality versus investments designed to change or leverage the platform's network externalities. Abstracting from examples drawn from multiple industries, we use a strategic model to gain intuition about how to make such trade-off decisions.

■ TC42

M - McKinley

Joint Session CS/HAS: Optimization in Computational Biology

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)
Sponsored Session

Chair: Stephen Billups, Associate Professor, University of Colorado Denver, Mathematical and Statistical Sciences, Campus Box 170, PO Box 173364, Denver, CO, 802173364, United States of America, Stephen.Billups@cudenver.edu

1 - Distance-based Supertrees

David Fernàndez-Baca, Professor, Department of Computer Science, Iowa State University, Ames, IA, 50011, United States of America, fernande@cs.iastate.edu, Jianrong Dong, Mukul S. Bansal

A phylogenetic tree represents the evolutionary history of a set of species: leaves correspond to species and internal nodes represent hypothetical ancestors. We study the problem of aggregating a collection of phylogenetic trees for partially overlapping subsets of a set of species into a single supertree that contains all the species. We formulate this question as a median problem by defining various distance measures between trees.

2 - Advances in Time Course Gene Expression Microarray Analysis

Stephen Billups, Associate Professor, University of Colorado Denver, Mathematical and Statistical Sciences, Campus Box 170, PO Box 173364, Denver, CO, 802173364, United States of America, Stephen.Billups@cudenver.edu

Gene expression microarrays measure mRNA expression levels of thousands of genes simultaneously. When collected over a series of time points, one gains a dynamic picture of the inner workings of a cell. This talk will discuss recently development methods for identifying genes that exhibit interesting time dependent variation, and for uncovering meaningful patterns among these "interesting" genes.

3 - Optimally Designed Perturbations for Uncovering Genetic Networks and Inverse Estimation

Cenny Taslim, Graduate Associate, The Ohio State University, 1971 Neil Avenue, 210 Baker Systems, Columbus, OH, 43210, United States of America, taslim.2@osu.edu

The ability to insert specific genes into cells is increasing interest in the planning and analysis of perturbation experiments to predict gene, protein, and metabolite concentrations. Such experiments can show the "mode of action" of a drug by helping to inverse predict what genetic perturbations would be equivalent. We propose innovative experimental design techniques based on integer programming formulations to increase the accuracy of genetic models at minimum cost.

4 - Gap Analysis for Metabolic Models

Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu

Flux Balance Analysis (FBA) is the use of a linear program to model the flow of metabolites through reactions in a cell. Simulations using FBA models can generate hypotheses testable in a lab environment. A common problem when studying bacteria is the development of a defined culture medium that will sustain the organism. We develop a mixed-integer program that aids in the construction of FBA models and indicates possible components of a sustaining culture medium.

■ TC43

M - Balcony D

Facilitated Decision Modelling for Strategic Decision Making

Cluster: OR and Strategy
Invited Session

Chair: Alberto Franco, Associate Professor, Warwick Business School, University of Warwick, Coventry, WM, CV4 7AL, United Kingdom, Alberto.Franco@wbs.ac.uk

1 - Converting Real Time Group Agreements into Successful Implementations

Ashley Carreras, Principal Lecturer, De Montfort University, The Gateway, Leicester, LE19BH, United Kingdom, acarreras@dmu.ac.uk, Parmjit Kaur

We ran an event for a multinational company on the theme of Delivering Breakthrough Technology. A number of outcomes were sought from the event including the selection of four breakthrough technologies in two areas of their core business activity and the development of an improved process for the roll-out of new technology across a range of internationally located production units. This paper explores the factors that became evident in ensuring that the event was viewed as a success post event.

2 - Pointing to Value Priorities in Organizations through Problem Structuring Methods

Leroy White, Reader in Management, University of Bristol, School of Economics, Finance and Managem, 8 Woodland Rd, Bristol, BS8 1TN, United Kingdom, leroy.white@bristol.ac.uk

It is now widely accepted that policy and strategy development requires both an appreciation of values and an ability to involve insights from stakeholders. This paper presents research about values and policy making. Developments in identifying more clearly value priorities of stakeholders will be presented, and alongside problem structuring methods (PSM) they provide the potential for new avenues for PSM research and practice.

3 - A Multimethodology Approach for Planning Development Projects in Vulnerable Communities

Juan Felipe Henao Piza, Doctoral Researcher, Warwick Business School, The University of Warwick, Coventry, CV4 7AL, United Kingdom, Juan.Henao_Piza05@phd.wbs.ac.uk, Ruth Davies, Alberto Franco

In this research a Multimethodology (MM) approach, which combines Multi-Criteria Decision Analysis with Problem Structuring Methods and Sustainable Livelihoods framework, is developed. In here we focus on the benefits of MM and its applicability in developing countries. The MM is validated through a case study in Colombia within the context of a governmental project. The MM proved to be successful in creating business solutions for people living in extremely poor conditions on a garbage dump.

4 - On the Evaluation of Strategic Options

Gilberto Montibeller, Dr, London School of Economics, Houghton Street, London, WC2 2AE, United Kingdom, G.Montibeller@lse.ac.uk

Strategic options have a distinctive nature, when compared with the ones considered in Operations Research. They generate long term consequences that are hard to take into account. They are going to be put in place in an environment bound by uncertainty, where is difficult to define probabilities of events. And their selection needs to be negotiated by the managerial team. In this paper I discuss such challenges and suggest ways of providing decision support in these situations.

■ TC44

M - Balcony C

Supplier Strategies for Supply Chain Risk Management

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Ping Su, Assistant Professor of Operations Management, SUNY at New Paltz, School of Business, 1 Hawk Dr, New Paltz, NY, 12561, United States of America, sup@newpaltz.edu

1 - Supply Base Design: The Number and Capacity of Suppliers

Cuihong Li, University of Connecticut, 2100 Hillside Rd, Storrs, CT, United States of America, Cuihong.Li@business.uconn.edu

Building redundancy in the supply base is important to mitigate supply chain risks. Acquiring more suppliers reduces the procurement cost risk, while investing in more total capacity counters the demand risk. The number and capacity of suppliers also influence supplier competition, driving suppliers' choice of cost-reduction efforts. We analyze the number and capacity of suppliers in supply base design, considering supplier cost uncertainty, supplier competition, and demand uncertainty.

2 - Dual Sourcing in Managing Supply Chain Disruptions

Ping Su, Assistant Professor of Operations Management, SUNY at New Paltz, School of Business, 1 Hawk Dr, New Paltz, NY, 12561, United States of America, sup@newpaltz.edu, Shuguang Liu

This paper focuses on a firm that uses dual sourcing in mitigating supply chain risks. We assume that the firm's demand evolves over time. The firm adjusts its sourcing strategies optimally from two suppliers: one is costly and reliable, and the other is cheap and unreliable. The disruption that could happen to the cheap supplier follows a Poisson process. We develop optimal sourcing policies for the firm and explore the benefits of dual sourcing.

3 - Assesment of Risk of Supplier Disruption

Peter Trkman, University of Ljubljana, Faculty of Economics, Kardeljeva ploscad 17, Ljubljana, Slovenia, peter.trkman@ef.uni-lj.si, Kevin McCormack

The ability to identify which supplier has greater potential of a disruption is a critical first step in managing the frequency and impact of these disruptions. A presented approach enables the classification of suppliers based on a supplier's attributes, performance and supply chain characteristics, modified by factors in the supplier's specific environment. A new portfolio approach for the assessment and classification of suppliers is presented.

4 - Operational Hedging and Diversification under Exogenous Supply Uncertainty

Fabian Sting, WHU - Otto Beisheim School of Management, Fabian.Sting@whu.edu, Arnd Huchzermeier

When facing supply risk caused by exogenous factors such as adverse weather conditions, firms diversify their supply to not "hold all eggs in one basket". Applying basic real options thinking, a firm decides on investment and production levels of substitutable resources. Capturing correlated, continuous, and disruption-type supply uncertainty, we find generic forms of optimal sourcing policies that depend on the resources' joint reliability profile, capacity costs and contribution margins.

■ TC45

M - Balcony B

Cooperation and Competition in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Greys Sosic, Assistant Professor, Univestity of Southern California, Marshall School of Business, Bridge Hall 401, Los Angeles, CA, 90089, United States of America, sosic@marshall.usc.edu

1 - Polymatroid Optimization, Submodularity, and Joint Replenishment Games

Simai He, The Chinese University of Hong Kong, Department of Systems Engineering and En, Hong Kong, HK, China, smhe@se.cuhk.edu.hk, Shuzhong Zhang, Jiawei Zhang

In this paper we show that the optimal value maximizing a separable concave function over a polymatroid is submodular in its parameters. We discuss the application of this result in the joint replenishment games studied by Anily and Haviv (2007) and Zhang (2007).

2 - Capacity Investment and Pricing Strategy under Product Evolution

Xiao Huang, PhD Candidate, University of Southern California, 3670 Trousdale Pkwy, Bridge Hall 401, Los Angeles, CA, 90089, United States of America, xiao.huang.2009@marshall.usc.edu, Greys Sosic

Consider a market with two products, in which the new product is on some attributes inferior to the old one. Our model consists of an entrant who can only provide the new product, and an incumbent who can provide both. A segment of the customers are dedicated to the new product, while the rest can purchase either. We study how the firms strategically determine their capacities and prices under product evolution, and characterize equilibria under different assumptions about the uncertainty.

3 - Inventory Collaborations Among n-Independent Retailers with Asymmetry Demand Information

Hui Zhao, Assistant Professor, Purdue University, 403 W. State Street, West Lafayette, IN, 47906, United States of America, zhaoh@purdue.edu, Xinghao Yan

Most previous literature on inventory sharing has assumed common information. In this paper, we study an inventory sharing game among n retailers who privately hold demand information, non-cooperatively determine their ordering quantities, but cooperatively share inventory with each other. Considering information credibility and potential coalition issues, we develop a coordination mechanism, which, implemented with a truth-inducing scheme, guarantees an all-win situation for all parties.

4 - Currency Supply Chain- Efficacy of the Fed's New Cash-recirculation Policy

Mili Mehrotra, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75080, United States of America, mili.mehrotra@student.utdallas.edu, Vijay Mookerjee, Milind Dawande, Chelliah Sriskandarajah

The overuse of its currency processing operations, characterized by the practice of cross-shipping, by depository institutions (DIs) has motivated the Federal Reserve (Fed) to impose a recirculation fee on cross-shipped cash. The Fed intends to use this fee as a coordinating mechanism for inducing DIs to behave in a manner so that the societal cost of providing currency to the public is minimized. We examine the efficacy of this mechanism and propose a new coordinating mechanism.

■ TC46

M - Balcony A

Capacity Management in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Feryal Erhun, Stanford University, Department of MS&E, Stanford, CA, United States of America, ferhun@stanford.edu

1 - Suppliers Competition in Decentralized Assembly Systems with Price-sensitive and Uncertain Demand

Yunzeng Wang, University of California, Riverside, 900 University Avenue, Riverside, CA, 92521, United States of America, yunzeng.wang@ucr.edu, Li Jiang

In a decentralized assembly channel, firms interact strategically with each other in multiple ways. These include 1) vertical interaction between the assembler and components suppliers, 2) horizontal complementary interaction among suppliers producing complementary components, and 3) horizontal substitutable interaction among suppliers producing substitutable components. We explore how these interactions work together to effect the equilibrium formation of firms' decisions and performances.

2 - Design of Efficient Procurement Contracts under Asymetric Supplier Cost Information

Enis Kayis, PhD Candidate, Stanford University, Management Science and Engineering, Stanford, CA, 94305, United States of America, ekayis@stanford.edu, Erica Plambeck, Feryal Erhun

We search for simple yet effective procurement contracts for a manufacturer to offer a supplier who is privately informed about the production cost. The theory of the optimal incentive contracts under this asymmetric information setting is well-established. However the contracts in the real world frequently take simpler forms than what this theory predicts. In this research, we show the existence of simple contracts that are near-optimal.

3 - Marketing Green Products Subject to Scarce Resources

Jiong Sun, Assistant Professor of Management, Illinois Institute of Technology, 565 W Adams St., Chicago, IL, 60661, United States of America, jsun22@iit.edu, Laurens Debo, Sunder Kekre

This research is motivated by a mass manufacturer introducing "green" vehicles that run on bio-fuel, a fuel with limited supply, along with "brown" vehicles that run on fossil fuel. The scarcity of the complementary product causes the consumers utility to be endogenously determined by the consumers' own vehicle choice. We study the impact of the externalities on the manufacturer's product and pricing strategies, as well as the impact of the green segment size and fluctuating fossil fuel price.

4 - Capacity Reservation Contracts Using Common Agency

Basak Kalkanci, PhD Candidate, Stanford University, Department of MS&E, Stanford, 94305, United States of America, kalkanci@stanford.edu, Feryal Erhun

We examine how suppliers must choose their contracts in an assembly system when the manufacturer has better information on mean demand. We analyze different contracting settings based on the contract type (complex vs. simple) and contract sequence (simultaneous vs. sequential) and characterize the contracting equilibria. We identify the effects of different product and market characteristics on the value of using complex contracts and additional information.

■ TC47

M - Hoover

Joint Session HAS/OPTIM: Preparing for Public Health and Medical Emergencies I

Sponsor: Health Applications Section, Optimization
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - City Readiness and Emergency Response for Biodefense and Infectious Disease Outbreaks

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Chien-Hung Chen, Hannah Smalley

City readiness and emergency response for biodefense and infectious disease outbreaks involves multi-level strategic and operational planning of the public health infrastructure. This talk will focus on protection of regional population through mass dispensing of prophyllaxic medication. In collaboration with CDC, we will discuss our experience in strategic stockpile,locations of dispensing facilities, optimal facility staffing and resource allocation, transportation, and dispensing modalities.

2 - Models and Algorithms to Support a Pandemic Interactive Exercise Tool (PanViz) for State of Indiana

Robert Brigantic, Operations Research Scientist, Pacific Northwest National Laboratory, 902 Battelle Blvd., Richland, WA, 99352, United States of America, robert.brigantic@pnl.gov, George Muller, John Malone

Epidemiologic models and algorithms for pandemic influenza were developed to support pandemic influenza exercises for the Indiana Department of Health in collaboration with the Purdue University Regional Visualization and Analytics Center (PURVAC) and their Pandemic Interactive Exercise Tool (PanViz). PanViz models outputs by city/county/ state include basic demographics, infected number and stage, medical resource requirements and availability, with geospatial and temporal impact over time.

3 - Recommendations for Modeling Crisis Response in Public Health and Medicine

Margaret Brandeau, Professor, Stanford University, MS&E Department, Terman Building, Stanford, CA, 94305, United States of America, brandeau@stanford.edu, Dena Bravata, Nathaniel Hupert, Jon-Erik Holty, Jessica McCoy

The field of emergency response modeling lacks a coherent organization that could facilitate the systematic reporting of model inputs and results, and promote the use of standard methodological approaches. We describe the types of models that have been developed to evaluate crisis threats to public health and potential responses, and present recommendations for conducting and reporting the results of these models in the future.

4 - Can We Detect 'The Coming Plague'?

Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

We analyze metrics that could help us detect natural and human-caused outbreaks of infectious diseases and assess long-term health consequences of disasters. Naturally occurring biological threats already exhibit a pattern of increasing difficulty of detection, more subtle and complex attack pathways, taking advantage of social stigmas attached to some conditions, and exploitation of our own resources against us. Tests of a few proposed metrics lead to some disturbing conclusions.

■ TC48

M - Coolidge

Evaluation and Metrics of Knowledge Systems and Knowledge Management

Sponsor: Technology Management
Sponsored Session

Chair: Elie Geisler, Distinguished Professor, Stuart School of Business—Illinois Institute of Technology, 565 W. Adams Street, Chicago, IL, 60661, United States of America, geisler@mail.stuart.iit.edu

1 - Metrics for Relating the Outputs of a Knowledge Management System to the Host Organization's Critical Success Factors

Albert Rubenstein, President, IASTA Inc., a-rubenstein@northwestern.edu, Herbert Schlikenmaier

The authors and their colleagues performed a Knowledge Capture study for the Aeronautics Research Mission Directorate in NASA. The study yielded over 300 "knowledge nuggets" in the form of "IF x..THEN y" statements about project management and related matters in ongoing and completed projects. The next steps involve constructing "criteria trees", relating the content of such nuggets to several levels of "critical success factors (CSFs) for various functional units and the organization as a whole, in terms of outputs and impacts.

2 - Metrics: Why Then What or What Then Why

Charles Thompson, Professor, IE/MS Department, Northwestern University, Evanston, IL, 60208, United States of America, thompson@iems.northwestern.edu

Metrics can be simple or complex, or somethng in between. It may be useful to distinguish the processes appropriate for the degree to which the problem is unstructured and/or multidisciplinary (what/how hard is it). And it may be useful to distinguish the processes appropriate for the degree to which the solution must increase our/someone's confidence and/or utility (why do we want to know). Matching the degree of uncertainty of the problem and/or of the solution with the variety of available processes might provide a useful checklist (or path through the problem solving maze).

3 - Measuring Firm Innovativeness: Towards a Composite Innovation Index Built on Firm Innovative Posture, Propensity and Performance Attributes

Elias Carayannis, Professor, Department of Information Systems and Technology Management, George Washington University, Washington, DC, 20052, United States of America, caraye@gwu.edu

The ability to innovate is generally accepted as a critical success factor to growth and future performance of firms. Yet, this acceptance obscures a comprehensive perspective on how firms can influence their innovation capacity and resulting performance. This paper proposes a "3P" construct of innovation measurement that simultaneously considers the posture, propensity and performance related to a firm's innovative capabilities. We propose and provide empirical support showing that robust measurement of the performance implications of innovation requires simultaneous consideration of input, throughput and output factors. Single or more limited indicators do not offer the degree of fine-tuning to a firm's innovation system that managers require. Thus, e propose the development, and future research into contingent variations of a Composite Innovation Index. We further demonstrate its use in comparing innovators and allowing managers to design a firm's innovation system.

4 - The Evolution of Knowledge Management from Concepts to Metrics

Elie Geisler, Distinguished Professor, Stuart School of Business—Illinois Institute of Technology, 565 W. Adams Street, Chicago, IL, 60661, United States of America, geisler@stuart.iit.edu

The rapidly growing field of knowledge management has many challenges. Researchers are confronted with the need to define the concept of knowledge, and to offer metrics of its outputs, benefits and value to organizations. This paper traces the evolution of knowledge management through the mapping of its key concepts and its main problems. Knowledge management has developed as a field of study independent of information systems, but it is still facing fundamental challenges such as the definition of its unit of analysis. This paper offers a coherent model of evolution of knowledge management which delineates its stages of development, the problems it faces, and some solutions offered by its researchers.

■ TC49

M - Harding

Agent-based Modeling and Simulation

Contributed Session

Chair: Jianrui Wang, Penn State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, jerrywang@psu.edu

1 - Application of Agent Based Modeling to Restaurant Operations

Rainer Dronzek, Assistant Vice President, TranSystems, 222 S Riverside Plaza, Suite 2320, Chicago, IL, 60606, United States of America, rwdronzek@transystems.com, Mike Cramer, David Brann

Agent based modeling applied to restaurant operations eases the simulation of employee and customer behavior, speeds development time and allows the creation of more complex algorithms than traditional methods. For example, movement is no longer limited to pre-defined paths; attitudes can be more easily quantified; and changing system states drive the development of creative associations and insights. We will demonstrate agent based models and the associated videos of actual operations.

2 - An Approximation of ISI Production Using Agents based Models and Bayesian Networks

Ricardo Bonilla Jiménez, Doctoral student, Universidad de los Andes, Carrera 1 N 18A 10 Bogotà, Bogotà, DC, Colombia, rbonilla@uniandes.edu.co, Cristhian Ruiz Ramos, Roberto Zarama Urdaneta, Diego Andrés Chavarro Bohòrquez

We have developed a methodology that combines Agents Based Models (ABM) and Bayesian Networks to construct models to analyze complex social systems. In this article we apply it to analyze the production of ISI articles. Our assumption is that articles are the result of a pattern in the interactions between authors. In the ABM we use data into an inferential sequences process to construct the interaction function between agents, instead of an a priori definition.

3 - Agent-based Model of the Brazilian Finance System

Denis Borenstein, Associate Professor, Federal University of Rio Grande do Sul, Rua Washington Luis 855, Porto Alegre, RS, 90010-460, Brazil, denisb@ea.ufrgs.br, Rosalvo Streit

An agent-based model is developed and implemented to analyse the regulatory governance of the Brazilian financial sector. The agent-based model is integrated to an econometric model, which is responsible to characterize the macroeconomic environment. The micro environment is modeled by computational agents using the BDI (beliefs-desires-intentions) architecture. The behavior of the agents was modeled using fuzzy logic with rules.

4 - A Semantic Framework for Agent-based Modeling and Simulation

Jianrui Wang, Penn State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, jerrywang@psu.edu, Richard A. Wysk

We develop a semantic framework for agent-based modeling and simulation using pi-calculus. The framework consists of formal models for agent behavior, coordination, and runtime infrastructure. Meta-models of discrete event system, agent-based system, and coordination theory are discussed. A Java implementation is also presented.

■ TC50

M - Wilson C

Decomposition and Nonsmooth Approaches for Conic Optimization

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)

Sponsored Session

Chair: Kartik Sivaramakrishnan, Axioma, Inc., 8800 Roswell Road, Building B, Suite 295, Atlanta, GA, 30350, United States of America, kksivara@ncsu.edu

Co-Chair: Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu

1 - An Interior Point Decomposition Algorithm for Solving Semidefinite Programs via Matrix Completion

Kartik Sivaramakrishnan, Axioma, Inc., 8800 Roswell Road, Building B, Suite 295, Atlanta, GA, 30350, United States of America, kksivara@ncsu.edu, Sanjay Mehrotra

We propose a two stage interior point decomposition algorithm for solving semidefinite relaxations of maxcut, stable set, and box constrained QPs. In the 1st stage, we process the exisiting SDPs into equivalent problems in the block-angular form. In the 2nd stage, we solve the block-angular SDP in a parallel and iterative interior point decomposition framework. We will present our computational experiences with the algorithm on a parallel and distributed cluster of workstations.

2 - Second-order Cone Cutting Surface Method

Mohammad Oskoorouchi, Associate Professor, California State University San Marcos, 333 Twin Oaks Valley Rd., Ssan Marcos, CA, 92096, United States of America, moskooro@csusm.edu, John Mitchell

We present a second-order cone cutting surface method (SOCCSM) for mixed linear-quadratic-semidefinite programming problems with bounded feasible region, and show that it is a fully polynomial algorithm. Using randomly generated problems we show that SOCCSM can efficiently handle problems with large and dense coefficient matrices. By comparing the CPU time between SOCCSM and SDPLR, SDPT3, and SeDuMi we show that SOCCSM outperforms primal-dual interior point methods on dense problems.

3 - How to Solve Optimal Experimental Design Problems?

S. Damla Ahipasaoglu, PhD Student, Cornell University, 222 University Ave. No:5, Ithaca, NY, 14850, United States of America, dse8@cornell.edu, Michael J. Todd

It is known that Frank-Wolfe type algorithms are very useful in finding solutions for the D-optimal design problem of statistics, and its dual, the Minimum Volume Enclosing Ellipsoid problem. We devise similar algorithms for other optimal design problems such as the A-optimal design problem. These algorithms are also locally linearly convergent and have attractive features confirmed by computational results.

4 - A Second-order Method for Stochastic Mathematical Programs with Complementarity Constraints (MPCCs)

Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Walter Murray

We present an algorithm for a class of two-period stochastic MPCCs. Importantly, the algorithm comes with a convergence guarantee of providing a second-order KKT point, through the use of both Newton and negative curvature directions. Scalability is ensured through decomposition schemes for obtaining both the Newton and negative curvature directions. We provide scalability results on a test problem set of two-period stochastic programs with complementarity constraints.

■ TC51

M - Wilson B

Data Mining Methods and Business Applications

Sponsor: Information Systems
Sponsored Session

Chair: Kumar Mehta, George Mason University, 4400 University Drive, MS 5F4, Fairfax, VA, 22030, United States of America, kmehta1@gmu.edu

1 - Clustering Large Data Sets: New Techniques and Insights
Jesse Bockstedt, George Mason University, 4400 University Drive, Fairfax, VA, 22030, United States of America, jesse.bockstedt@gmail.com, Gediminas Adomavicius, Vishnu Parimi

We present new data mining approaches for deriving clustering solutions from data sets that are too large for traditional techniques. Building upon existing clustering algorithms and using sampling and partition-based approaches, we demonstrate that accurate clusters can be determined. The proposed techniques should prove useful for analyzing extremely large data warehouses and large amounts of streaming data, where clustering the entire data set is not possible due to computational limitations.

2 - Predicting Price Movements From News Using Text Classification
Ronny Luss, Princeton University, E-Quad, ORFE, Princeton, NJ, 08544, United States of America, rluss@princeton.edu, Alexandre D'aspremont

We demonstrate how text information from news articles can be used to predict intra-day price movements on equities using support vector machines. This is a classic text classification problem where labels describe price movements following the release of news. Furthermore, we use recent advances in large-scale kernel learning to combine equity returns as predictive features with text in order to increase predictability.

3 - Mining Network Intrusion Models Using Bagging Methods
Mukul Gupta, Assistant Professor, University of Texas at San Antonio, United States of America, Mukul.Gupta@utsa.edu

We use genetic algorithm for learning heterogeneous classification of network intrusions. Exploiting GA’s ability to find multiple intrusion patterns with similar accuracies, modified bagging techniques are used in a layered intrusion detection model, improving the intrusion signaling through provision of type of intrusion. Our approach also significantly increases detection accuracy for all classes of intrusions accompanied with reduced false positives compared to traditional methods.

■ TC52

M - Wilson A

Collaboration, Coordination, and Decentralized Decision Making in Disaster Response

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Jessica Heier, Doctoral Student, Georgia Institute of Technology, 765 Ferst Dr NW, Atlanta, GA, 30332-0205, United States of America, jheier@gatech.edu

1 - Centralized vs. Decentralized Ordering and Inventory Decisions: Designing a Field Experiment in Zambia
Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es

In multi-echelon supply chains for drug distribution, changing the loci of decision making around order management and inventory planning has significant system impact. We share experiences from the design of a randmomized experiment to test some key hypothesis.

2 - The Effect of Unplanned Donations on Humanitarian Logistics Coordination
Lauren Davis, Assistant Professor, North Carolina A&T State University, 1601 East Market Street, Greensboro, NC, 27411, United States of America, lbdavis.ncat@gmail.com, Nolan Applewhaite

The management of unplanned donations, stemming from the public's response to an event, is a challenging process within humanitarian logistics. Through this research, we model the flow of unplanned donations and analyze the impact of these unpredictable donations on the distribution process of a disaster relief coordinating agency.

3 - Heuristics for Disaster Response Supply Chains
Erica Gralla, MIT, 77 Massachusetts Ave, Rm. 37-344a, Cambridge, MA, 02139, United States of America, egralla@mit.edu, Charles Fine

Disaster response logistics is challenging because of the lack of information after a disaster, and the confusion of multiple 'on the ground' decision makers. This paper suggests the notion of heuristics to enable fast decisions with little information, and to introduce structure in the management of supply chains, yet maintain the flexibility of decentralized decision making. Heuristics are identified within current practice, and evaluated for their effect on disaster response logistics.

4 - Optimizing Emergency Systems with Self-routing Users
Jessica Heier, Doctoral Student, Georgia Institute of Technology, 765 Ferst Dr NW, Atlanta, GA, 30332-0205, United States of America, jheier@gatech.edu, Ozlem Ergun, Julie Swann

We study network problems motivated by emergency response scenarios, such as anti-viral distribution during a flu pandemic. In these problems, decentralized users choose among the facilities opened by a centralized planner. We quantify the impact of decentralized decision-making on system performance and present price of anarchy results for several cases. We then extend this framework to the development of facility location models that incorporate decentralized behavior.

■ TC53

M - Nathan Hale- Wardman Tower

Advances in Financial Engineering

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Pavlo Krokhmal, University of Iowa, krokhmal@engineering.uiowa.edu

1 - Equilibrium Pricing in Incomplete Markets
Patrick Cheridito, Professor, Princeton University, dito@Princeton.EDU

Dynamic equilibrium prices are derived for options in incomplete markets for agents with mean-risk preferences. Explicit formulas are given for equilibrium pricing measures in different incomplete discrete-time models, and the corresponding option prices are discussed.

2 - Credit Derivatives and Risk Aversion
Siu-Tang (Tim) Leung, Princeton University, Department of OR&FE, Princeton, NJ, 08544, United States of America, siutang@Princeton.EDU, Ronnie Sircar

The recent turbulence in the credit markets highlights the need for an alternative pricing mechanism. A number of observations suggest that risk aversion may help explain some common market phenomena. We discuss a utility-based valuation model for credit derivatives, and analyze the effects of risk aversion and other factors on the prices.

3 - A Duality Theory for Set-valued Risk Measures and Applications
Andreas Hamel, Princeton University, E-Quad, ORFE, Princeton, NJ, 08544, United States of America, ahamel@princeton.edu

We extend the concept of set-valued coherent risk measures introduced 2004 by Jouini et al. to set-valued monotone and cash-invariant risk measures and establish primal representation results in terms of acceptance sets. For the convex case, we give a complete duality theory. Examples are given among them set-valued counterparts for (negative) expectation, VaRs and AVaRs, the (negative) essential infimum and the entropic risk measure. Applications to risk allocation problems are discussed.

■ TC54

M - Congressional - Wardman Tower

Advance Studies in Supply Chain I

Contributed Session

Chair: Shitao Yang, Visiting Associate Professor, University of New Haven, 300 Boston Post Road, West Haven, CT, 06516, United States of America, st.yang@gmail.com

1 - A Rationing Policy for an Inventory System with Multiple Stock Locations and Multiple Demand Classes
Muhammad Jalil, PhD Candidate, Rotterdam School of Management - Erasmus University, T9-19,, Burgemeester Oudlaan 50, Rotterdam, 3062 PA, Netherlands, mjalil@rsm.nl, Rob Zuidwijk, Moritz Fleischmann

We study the execution of an inventory system that consists of multiple demand classes and multiple stock locations. Orders from higher priority class need to be satisfied within a smaller deadline. Demand arrives as single units with a specific priority classand can be served from any stock location. We devise a dynamic rationing policy for this setting that follows a quantity-based revenue management approach. In this presentation, we present the model formulation and structural results.

2 - An Empirical Analysis of Collaborative Advantage in the Context of Supply Chain

Mei Cao, University of Wisconsin Superior, PO Box 2000, Superior, WI, United States of America, mcao1@uwsuper.edu, Qingyu Zhang

The objective of the study is to uncover the nature and characteristics of collaborative advantage from a firm's perspective. Collaborative advantage is defined as strategic benefits gained over competitors in the marketplace through supply chain partnering, and it relates to the desired synergistic outcome of collaborative activity that could not have been achieved by any firm acting alone. Reliable and valid instruments were developed through rigorous empirical analysis.

3 - Defining Unique Positioning in Supply Chain Using I/O table

Anand Kumar, PhD Student, Operations and Supply Chain, University of Utah, 1645 E Campus Center Dr Rm 101, Salt Lake City, UT, 84112, United States of America, anands_s@yahoo.com

The present study aims at identifying unique positioning of supply chain members by developing a scale using I/O table from BES. This scale transforms the existing relationship between members, which can be best described in matrix form, into a vertical scale where each member has a unique positioning. We validate at firm level by using primary NAIC code of firm. This enables researchers to analyze the way supply chains are configured and understand supply chain issues on a more granular level.

4 - Free Riding with Selective Rebate and Price Match

Dahai Xing, Oklahoma State University, 84S University PL APT7, Stillwater, 74075, United States of America, dahai.xing@okstate.edu, Tieming Liu, Wenqiang Xiao

We study sales effort coordination for a manufacturer with two retail channels, where an online retailer offers a lower price and free-rides a traditional retailer's sales efforts. The free riding effect reduces traditional retailer's desired effort level, and thus hurts the overall demand and the manufacturer's profit. We show that when demand is influenced by sales efforts, a properly designed rebate given by the manufacturer to traditional retailer can achieve coordination.

5 - Sourcing from Multiple Vendors with Uncertain Yields

Shitao Yang, Visiting Associate Professor, Robins School of Business, University of Richmond, VA, United States of America, st.yang@gmail.com, Jian Yang

We studied a supplier selection problem, where a buyer, while facing random demand, is to decide ordering quantities from a set of suppliers with different yields and prices. We provided the mathematical formulation for the buyer's profit maximization problem and proposed a solution method based on a combination of the active set method and the Newton search procedure. Our computational study shows that the proposed method can solve the problem efficiently and generate some interesting results.

■ TC55

M - Embassy- Wardman Tower

Telecommunications Services

Sponsor: Telecommunications
Sponsored Session

Chair: Yavuz Gunalay, Bahcesehir University, Faculty of Business, Cı ragan Cad. No: 4-6, İ Istanbul, 34100, Turkey, yavuz.gunalay@bahcesehir.edu.tr

1 - Internet Service Resource Optimization

Andrew Vakhutinsky, Akamai Technologies, 8 Cambridge Center, Cambridge, MA, 02142, United States of America, avakhuti@akamai.com, Marcelo Torres

We describe our work-in-progress on an optimization model to minimize the cost of resource usage by dynamically redirecting traffic in response to varying demand levels. We discuss the common structure used to price resource utilization per deployed location. We conclude by describing our solution approach to solving a large-scale problem to manage resource costs across a billing period.

2 - Predicting and Controlling Customer Churn on Multiple Time Scales

Louis A (Tony) Cox, Jr., TCoxDenver@aol.com

Telecommunications customer attributes change on different time scales, from not at all (sex) to relatively slowly (owner vs. renter, account age) to rapidly (number of recent calls to call center). We show how to use information from multiple time scales to better target interventions that reduce loss of high-value customers.

3 - On Performance of Fiber Delay Lines in Optical Packet Switching Systems

Yavuz Gunalay, Bahcesehir University, Faculty of Business, Cıragan Cad. No:4-6, İSTANBUL, 34100, Turkey, yavuz.gunalay@bahcesehir.edu.tr, Nail Akar

An optical packet switching system which has N input-output fibers and W wavelength channels for each fiber is considered. In such systems, fiber delay lines (FDL) can be deployed to resolve contention. The behavior of the FDL is analyzed and packet drop rates are evaluated using a Markov Chain model.

4 - Help Yourself by Helping Others- A Hybrid of P2P and Client-server Network

Jun Shu, Assistant Professor, Penn State, Department of Supply Chain and Informati, 462 Business Building, University Park, PA, 16802, United States of America, junshu@psu.edu, Susan Xu

We propose a queueing-based incentive model for the BitTorrent-like file distribution process assisted by centralized backup servers. We use this model to show analytically the performance of a large-scale distribution network. We also show how incentives to share the bandwidth among the peers can make and break the network.

■ TC56

O - Blue Room

Shipment Consolidation and Logistics Network Design

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Hakan Yildiz, Assistant Professor, Michigan State University, Department of Supply Chain Management, 370 N. Business Complex, East Lansing, MI, 48824, United States of America, yildiz@msu.edu

1 - Optimization of Customer & Supplier Logistics at a Large Automotive Parts Manufacturer

Hakan Yildiz, Assistant Professor, Michigan State University, Department of Supply Chain Management, 370 N. Business Complex, East Lansing, MI, 48824, United States of America, yildiz@msu.edu, R. Ravi

We undertake an integrated study of inbound and outbound logistics at a leading automotive parts manufacturer. We identify the opportunity for significant cost savings over the current system by matching opposite flows of material and containers. We consider the problem from a supply chain coordination perspective, where the parts manufacturer makes all the transportation arrangements for its customers and suppliers based on the results of the centralized optimum solution.

2 - Design of a Reverse Logistics Network for Product Returns

Nizar Zaarour, Northeastern University, 360 Huntington Avenue, Boston, MA, 02115, United States of America, zaarour.n@neu.edu, Emanuel Melachrinoudis, Marius Solomon, Hokey Min

Product returns are an unavoidable cost of doing business. Few studies have addressed the problem of determining the number/location of initial collection points and the location/allocation of centralized return centers. Thus, we present a mixed-integer linear programming model for the design of a reverse logistics network for product returns. The objective function considers facilities costs, inventory carrying and handling costs and shipping costs with quantity discounts and distance penalties.

3 - Network Coordination for Transport Service Providers

Susanne Berger, Martin-Luther-University Halle-Wittenberg, Gr. Steinstr. 73, Halle, 06108, Germany, susanne.berger@wiwi.uni-halle.de, Christian Bierwirth

Object of this talk is a decentralized planning approach for the coordination of independent transport service providers, where the individual routing and market-based coordination mechanisms are combined. The main goal is to discover the effects of this coordination for different scenarios (customer areas, routing problems), especially possible variation of the overall contribution margin for the whole network. The results should be compared with the results of the central planning approach.

4 - Hub and Hub Arc Location Problem Using Shipment Consolidation

Wooseung Jang, Associate Professor, University of Missouri - Columbia, E3437 Lafferre Hall, Columbia, MO, 65211, United States of America, jangw@missouri.edu, Sean Carr

The shipment consolidation has become a key factor that affects the cost and service quality of a logistics operation. This research develops models and solution methodologies for the logistics network problem using shipment consolidation strategies. It is motivated by a diversified, worldwide manufacturer that has approximately 220 US branches.

■ TC57

O - Blue Room Prefunction

Joint Session AAS/TSL: Future Concepts in Air Traffic Management

Sponsor: Aviation Applications, Transportation Science & Logistics Sponsored Session

Chair: Avijit Mukherjee, U.C Santa Cruz, MS 210-10, NASA Ames, Moffett Field, CA, United States of America, itsavijit@gmail.com

1 - Sequential Traffic Flow Decision Making with En Route Weather Constraints

Dr. Shon Grabbe, Research Scientist, NASA, Mail Stop: 210-10, Moffett Field, CA, 94035, United States of America, Shon.R.Grabbe@nasa.gov, Dr. Banavar Sridhar, Dr. Avijit Mukherjee

A hierarchical, sequential traffic flow management approach is proposed for assigning pre-departure delays, tactical reroutes, and airborne holding to flights impacted by en route weather constraints. The results are presented in terms of system-level delays, throughput, and variations in airspace complexity.

2 - Investigating the Relationship between Datalink, Controller Workload, and Vectoring Efficiency

Mark Hansen, Professor, U.C. Berkeley, 114 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, mhansen@ce.berkeley.edu, Sarah Yenson, Jasenka Rakas

Increased air traffic leads to increased radio frequency usage and controller workload. Previous work indicates a link between controller workload and vector distances assigned to potentially conflicting aircraft. We argue that by introducing air-to-ground datalink communications, a reduction in workload, and therefore a reduction in vector distances, can be achieved.

3 - Freeways in the Sky: Exploring Tube Airspace Design Through Mixed Integer Programming

Gautam Gupta, Graduate Student Researcher, U.C. Berkeley, ggupta@berkeley.edu, Avijit Mukherjee, Dr. Banavar Sridhar

This paper presents an optimization model for designing a high capacity en-route tube network. The design problem is formulated as a mixed integer program, and the network is structured as a multi-commodity flow network. Various cost factors crucial in designing the network are identified and incorporated in the formulation. The characteristics of resulting tube networks are compared and the effects of such a network on the traffic are identified.

4 - Integrated Departure Route Planning

Dr. Lixia Song, Lead Modeling & Simulation Engineer, MITRE, 7515 Colshire Dr., Mclean, VA, 22102, United States of America, lixia@mitre.org

This research is to develop algorithms to determine and rank the available reroute options for departure traffic. Filed flight plans and acceptable alternatives, predicted convective weather impacts on airspace resources (route, fix, sector, etc.), predicted airspace congestion, and forecast uncertainty all must be considered in evaluating the reroute options.

■ TC58

O - Capital

Joint Session AAS/TSL: En Route Traffic Optimization

Sponsor: Aviation Applications, Transportation Science & Logistics Sponsored Session

Chair: John-Paul Clarke, Associate Professor, Georgia Institute of Technology, 270 Ferst Drive NW, Atlanta, GA, 30332-0150, United States of America, johnpaul@gatech.edu

1 - A Stochastic Integer Program for Fuel Optimal Conflict Resolution over Predefined Trajectories

Adan Vela, Georgia Institute of Technology, Atlanta, GA, aevela@gatech.edu

In this study we consider the air conflict resolution problem. An optimization model is developed to minimize expected fuel costs while issuing requested arrival times into the air space and speed commands to aircraft over predefined trajectories to avoid conflict. Particular focus is given to the uncertainty in arrival times of aircraft into the airspace. The resulting program is a two-stage stochastic integer program.

2 - A Generalized Random Adaptive Search Procedure for Solving Airspace Congestion Problems

Christine Taylor, Senior Simulation Modeling Engineer, The MITRE Corporation, 7515 Colshire Drive, M/S N450, McLean, VA, 22102, United States of America, ctaylor@mitre.org, Craig Wanke

This research implements a Generalized Random Adaptive Search Procedure (GRASP) for resolving airborne congestion problems. An existing congestion resolution algorithm produces an ordered list of candidate flights, where position in the order influences the likelihood of getting an undesirable resolution maneuver. Utilizing GRASP to create the ordered list enables sort orders to be perturbed slightly and thereby provide a view of the neighboring decision space, resulting in improved solutions.

3 - A Sequential Airspace Congestion Resolution Method

Craig Wanke, Senior Principal Engineer, MITRE, 7515 Colshire Drive, Mailstop N450, McLean, VA, 22101, United States of America, cwanke@mitre.org

A sequential airspace congestion resolution method is proposed, in which traffic and weather forecast prediction uncertainty is quantified and explicitly used to develop efficient solutions. The method is based on Monte Carlo simulation of traffic and weather outcomes from a specific forecast. Candidate sequential decision strategies are evaluated against the range of outcomes to determine the "best" course of action, trading off among metrics of efficiency, cost, and stability.

4 - En Route Traffic Flow Management in the Presence of Uncertainty

Senay Solak, Assistant Professor, University of Massachusetts - Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, solak@som.umass.edu, John-Paul Clarke

We describe some recent results for a stochastic en route traffic flow management model. The model utilizes simulation-based methods to estimate probability distributions for airspace capacity over time. The resulting distributions are then used as input to a multistage stochastic integer program. Approximate solution techniques exploiting the structure of this large scale problem are also discussed.

■ TC59

O - Embassy Room

Topics on Revenue Management and Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited) Sponsored Session

Chair: Victor de Miguel, Associate Professor, London Business School, Regents Park, London, UK, United Kingdom, avmiguel@london.edu

1 - Managing Revenue Risks for Industry Leaders across Automotive, High-tech and Agriculture

Heiko Pieper, Principal, End-to-End Analytics, 505 Gilbert Avenue, Menlo Park, CA, 95054, United States of America, heiko@e2eanalytics.com

Companies are facing significant risks to the top and bottom line with exploding raw material costs and increased competition and price pressure. The ability to effectively manage demand, cost and price risk is becoming a competitive advantage across industries. End-to-End analytics specializes in helping clients to quantify and manage these risk using OR techniques and tools in practice. We will report about our work with some of the largest companies in Automotive, High-Tech and Agriculture.

2 - A Model for Competition in Network Airline Revenue Management

Nishant Mishra, London Business School, Regent's Park, London, NW1 4SA, United Kingdom, nmishra.phd2003@london.edu, Victor de Miguel

We consider oligopolistic competition in network revenue management. Starting with a Cournot type capacity competition, for such a system, we show the existence and uniqueness of Nash Equilibrium under certain regularity conditions. Our approach is using Variational Inequalities and we also discuss how this analysis can be extended to the case of Bertrand price competition. Finally, we present results from numerical experiments and discuss how competition can affect revenue management practice.

3 - Service Provider Competition: Delay-cost Structure, Segmentation and Cost Advantage

Maxim Afanasyev, PhD Candidate, Stanford Graduate School of Business, 518 Memorial Way, S485, Stanford, CA, 94305, United States of America, afanasyev@stanford.edu, Haim Mendelson

We study competition between service providers and show how the customer's delay cost structure, market size, and differences in the providers' costs affect service differentiation and market segmentation. Additive delay costs lead to differentiation, whereas interdependence between customers' service valuations and delay costs may lead to value-based segmentation. Moreover, if the providers have different costs, the market is segmented. We show implications of the results for film production.

4 - Nonatomic-game Models for Dynamic Pricing under Competition

Jian Yang, New Jersey Institute of Technology, Department of IME, Newark, 07102, United States of America, yang@njit.edu, Yusen Xia

We study a revenue management problem involving competing firms. Adopting the nonatomic-game approach, we assume that no individual firm's pricing decision has any discernible impact on the evolution of overall market conditions. For both special deterministic- and stochastic-demand cases, we show the existence of reasonably-behaving equilibria. Our computational study reveals many useful insights.

■ TC60

O - Hampton Room

OR in Rail: Theory and Practice

Sponsor: Railway Applications
Sponsored Session

Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Modeling Network Transition Constraints with Hypergraphs

Steven Harrod, Dr., University of Dayton, Department of MIS, OM, & DS, 300 College Park, Dayton, OH, 45469, United States of America, steven.harrod@udayton.edu

Discrete time dynamic graphs are frequently used to model multicommodity flows or activity paths through constrained resources, but simple graphs fail to capture the interaction effects of resource transitions. A hypergraph formulation is derived to address railway network sequencing constraints, and an experimental problem sample solved to estimate the magnitude of objective inflation when interaction effects are ignored.

2 - Yield Management in Freight Transportation

Long Gao, Assistant Professor, School of Business Administration, University of Dayton, Dayton, OH, 45469, United States of America, gaolong@udayton.edu, Mike Gorman

We study an order acceptance and resource allocation decision problem in freight transportation with random, nonperishable supply and multiple shipping dates. The study provides insights on the value of inventory rationing, order batching, costs of using suboptimal policies, as well as justifications for the management to adopt advanced order acceptance policies.

3 - Timetabling with TS-OPT

Thomas Schlechte, Research Assistant, Zuse Institute Berlin, Takustrasse 7, Berlin, 14195, Germany, schlechte@zib.de, Ralf Borndoerfer

This talk focuses on the macroscopic train timetabling problem, which asks for a conflict free train schedule of maximum value for a given railway infrastructure. We present our optimization module TS-OPT, which solves this problem using sophisticated column generation techniques. Finally, we present first preliminary results on a part of German long distance area; tttplib.zib.de provides these simplified realistic data sets.

4 - Optimal Routing of Geometry Cars

Juan Morales, Sr. Operations Research Specialist, BNSF Railway, 2400 Western Center Blvd., Fort Worth, TX, 76131, United States of America, Juan.Morales@BNSF.com, Anant Balakrishnan, Gang Li

We present an application of a modeling approach used to improve the schedules of Geometry Cars (GC). GC are high value assets used to test track conditions. Conditions can deteriorate at different rates on distinct segments and a schedule needs to ensure that the time between consecutive tests of a track does not exceed a given threshold. We present the approach and discuss some of the techniques used to reduce solutions times. We also illustrate its use to challenge a managerial paradigm.

■ TC61

O - Calvert Room

Emergency Management

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Elise Miller-Hooks, Associate Professor, University of Maryland, Department of Civil & Environmental Engin., 1173 Glenn Martin Hall, College Park, MD, 20742, United States of America, elisemh@umd.edu

1 - Supply Chain Network Models for Humanitarian Logistics: Identifying Synergies and Vulnerabilities

Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, nagurney@gbfin.umass.edu, Trisha Woolley, Qiang Qiang

This paper describes how supply chain network models can be utilized for humanitarian logistics. We discuss issues such as congestion, multicriteria decision-making, as well as the optimization of the delivery of multiple products subject to capacities in the storage and distribution facilities and the transportation links. We identify synergies through the teaming of humanitarian organizations and also discuss appropriate measures for vulnerability analysis.

2 - Using Integrated Disaster Simulation to Enhance Situation Awareness

Shengnan Wu, Research Assistant, University of Pittsburgh, 1048 Benedum Hall, Industrial Engineering, Pittsburgh, PA, 15261, United States of America, SHW14@pitt.edu, Carey Balaban, Matthew Kelley, Bopaya Bidanda, Larry Shuman, Ken Sochats

The term "situation awareness" has appeared in the psychology literature since the 80s. It is complementary to decision making with imperfect information. Since computer simulation models are capable of "looking" into the future, they can be used to aid decision makers where information is often ambiguous, but improves as situational awareness improves, such as a disaster scene. This paper develops an integrated disaster simulation system for making appropriate decisions in these situations.

3 - Optimal Deployment of USAR Personnel in Large-scale Disasters

Lichun (Lisa) Chen, Optimal deployment of USAR personnel in large-scale disasters, University of Maryland, University of Maryland, Department of Civil and Environmental En, College Park, MD, 20742, United States of America, lcchen@umd.edu, Elise Miller-Hooks

This paper is seeking to solve the routing problem of multiple urban search and rescue (USAR) teams in post-disaster situations. The objective is to save the largest number of people considering that the likelihood of survival decreases by time. Because of the dynamic and uncertain nature of post-disaster conditions, the problem is formulated as a stochastic integer program and solved by specially designed algorithm. A case study is applied to illustrate this algorithm.

■ TC62

O - Governor's Boardroom

Pricing and Revenue Management I

Contributed Session

Chair: Shankar Sundaresan, Rutgers, The State University of New Jersey, Rutgers School of Business-Camden, 227 Penn St, Camden, NJ, 08102, United States of America, sundares@crab.rutgers.edu

1 - Optimal Pricing for Install-base Business under Monopoly Using a Logit Choice Model

Takeshi Koide, Univ. Marketing & Distribution Sciences, 3-1, Gakuen-Nishimachi, Nishi-ku, Kobe, 6512188, Japan, koide@umds.ac.jp, Hiroaki Sandoh

This study considers a type of install-base business, where the manufacturer deals in a system body and its expendable supplies, such as razors and water purifiers. Consumers have to buy its expendables to keep using the system. The expendables generally have higher profit rate than the system bodies. This study derives an optimal pricing for manufacturers in such a type of install-base business under a monopoly. A logit choice model is adopted to represent purchase probability of consumers.

2 - Analysis of Time-to-stay in the Market under Declining Economic Value in Time

Aysegul Toptal, Bilkent University, Department of Industrial Engineering, Ankara, Turkey, toptal@bilkent.edu.tr, Sila Cetinkaya

In this study, we consider a buyer-vendor system trading a single item with stochastic demand and declining economic value in time. We assume that the structure of the retail pricing policy is given and study the problem of finding the optimal time-to-stay in the market along with the replenishment problem.

3 - Revenue Managing Opaque Channels

Ben Marcus, Suffolk University, Sawyer Business School, Boston, MA, United States of America, bmarcus@suffolk.edu, Leo MacDonald

We consider a model with a service provider selling a product through two channels - one traditional and one opaque. The customer observes the service provider's posted price then places a bid through the opaque channel for a similar product. We evaluate the provider's optimal reserve and posted pricing policies and provide insight for coordinating sales across multiple channels.

4 - Characterizing Optimization Problems with Shared Integrand and Range Functions

Shankar Sundaresan, Rutgers, The State University of New Jersey, Rutgers School of Business-Camden, 227 Penn St, Camden, NJ, 08102, United States of America, sundares@crab.rutgers.edu, Michael Pangburn

We consider a class of optimization problems with a domain over a continuous range such that the limits of the range define level contours of the objective function integrand. For example, maximizing revenue of a product over time can be formulated as integrating a price curve (over quantity) wherein the sales-quantity limits depend on the price function. We show sufficient conditions under which concavity holds for this class of problems, thus enabling analytic solution methodologies.

5 - Dynamic Pricing in a Non-stationary Finite Selling Horizon

Rupal Rana, Warwick Business School, university of warwick, coventry, CV4 7AL, United Kingdom, rupal.rana06@phd.wbs.ac.uk, Fernando Oliveira

In many industries the manager faces the problem of establishing a pricing policy that maximises the revenue for selling a given inventory of items by a fixed deadline. Examples of these items include seats on a flight, rooms in a hotel and fashion garments. We use a reinforcement learning algorithm to solve the dynamic pricing problem in a non-stationary finite selling horizon. We prove the algorithm converges to an optimal policy and that it converges faster than the q-learning algorithm.

■ TC63

O - Congressional B

Vehicle Routing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu

1 - SR0: A Simulation-based Algorithm for the CVRP

Javier Faulin, Public University of Navarre, Campus Arrosadia s/n, Los Magnolios Building, 1st floor, Pamplona, 31006, Spain, javier.faulin@unavarra.es, Alejandro G. del Valle, Fernando Lera, Jesus M. Pintor, Angel Juan

The Capacitated VRP (CVRP) has been deeply studied during the last decades, and different metaheuristics (genetic algorithms or taboo search) have been developed. Most of these metaheuristics assume that the CVRP conditions are static. We present an algorithm, SR0, is a simulation-based approach to provide alternative solutions to the ones obtained using typical metaheuristics. These alternative solutions can be useful because they can consider multiple criteria to obtain the final decision.

2 - Routing and Allocation in Stochastic Swap Container Management

Thomas Huth, Research Associate, University Braunschweig Institute of Technology, Abt-Jerusalem-Str. 4, Braunschweig, 38106, Germany, t.huth@tu-bs.de, Dirk Mattfeld

The routing of customer requests with reusable resources is mostly associated with decisions about repositioning of these resources empties' because of spatial and temporal unfitted streams of commodities. If customer requests appear stochastically this allocation task becomes more challenging. This talk addresses strategies to incorporate stochastic information about demanded resources in order to support the routing decision that may lead to a benefit for the entire Problem.

3 - An Route Improvement Algorithm for the Vehicle Routing Problem with Time-dependent Travel Times

Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

A new algorithm to solve the Vehicle Routing Problems with Time-Dependent travel times is presented. The solution quality and computational time of the new algorithm is compared against existing results. The algorithm has a strong performance in terms of solution quality and computational time even in instances with a large number of customers.

4 - The Generalized Location Routing Problem with Profits

Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, Jaemyung Ahn, Olivier de Weck

In exploring the surface of a planetary body, a unique routing problem is encountered. It considers profits at sites and resource consumption along routes depends on the selected strategy. We solve the underlying model by branch-and-price. In addition, a novel problem specific heuristic is developed.

■ TC64

O - Congressional A

Advances in Network Design and Applications to Transportation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Teodor Gabriel Crainic, U.Q.A.M., Management & technology, ESG, C.P. 8888, succ. Centre-ville, Montreal, QC, H3C 3P8, Canada, TeodorGabriel.Crainic@CIRRELT.ca

1 - Lagrangean Strategies for the Stochastic Network Design Problem

Walter Rei, Professor, Université du Québec, Montréal (UQ¿M), 315 Ste-Catherine East (R-3570), Montréal, QC, H2X 3X2, Canada, walter@crt.umontreal.ca, Michel Gendreau, Teodor Gabriel Crainic

Applying Lagrangean relaxation to a discretized formulation of a stochastic network design problem yields a problem that may be decomposed following the scenarios of the random event. Heuristic and exact procedures may then be used simultaneously to search efficiently the feasible space of the mixed-integer formulation. A parallel progressive hedging inspired metaheuristic algorithm will be presented to solve the problem.

2 - Deterministic Models for Stochastic Service Network Design Problems

Michal Kaut, Molde University College, PO Box 2110, Molde, NO-6402, Norway, michal.kaut@himolde.no, Teodor Gabriel Crainic, Stein W. Wallace

Real-life service-network design problems are difficult to solve even in a deterministic case, so solving them as stochastic programs is close to impossible. On the other hand, we have earlier demonstrated that introducing stochastic demand into such models produces solutions qualitatively different from the deterministic ones. We thus propose a heuristic that solves the deterministic problem, but at the same time imposes the qualitative properties observed in the stochastic solutions.

3 - Effects of Risk Preferences on Network Design Decision

Yueyue Fan, Assistant Professor, University of California, Department of Civil Engineering, Davis, CA, 95616, United States of America, yyfan@ucdavis.edu, Changzheng Liu

This paper investigates the impacts of different stochastic modeling approaches on the design strategies for network expansion problem under demand uncertainty. Three stochastic models with numerical case studies will be presented, including a stochastic programming model targeting minimum expected system cost, a mean-risk stochastic programming model that balances between expectation and controlling risk, and a robust optimization model emphasizing on the worst case cost.

4 - A Branch-and-cut Algorithm for Multicommodity Capacitated Fixed-charge Network Design

Bernard Gendron, Université de Montréal, C.P. 6128, succ. Centre-ville, Montréal, QC, H3C 3J7, Canada, bernard@crt.umontreal.ca, Mervat Chouman, Teodor Gabriel Crainic

We present a branch-and-cut algorithm for solving large-scale instances of the multicommodity capacitated network design problem. The algorithm combines cutting-plane, Lagrangian relaxation and preprocessing techniques, as well as novel branching methods.

■ TC65

M - Virginia A

Planning and Control Models for Workforce Flexibility

Cluster: Workforce Flexibility/Management
Invited Session

Chair: Esma Gel, Associate Professor, Arizona State University, Dept of Industrial Engineering, Tempe, AZ, 85287, United States of America, Esma.Gel@asu.edu

1 - Is Workforce Flexibility Robust?

Edieal Pinker, Simon School, University of Rochester, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Hsiao-Hui Lee, Oded Berman

We investigate five options for workforce flexibility and their robustness under uncertain demand. In the first stage, a firm makes optimal staffing decision according to estimated demand and workforce flexibility. In the second stage, it reallocates its workforce to react to demand shocks. Our numerical results show that flexibility can lead a firm to staff with too little slack to be flexible to demand shocks, thus leading to higher total costs i.e., staffing and inventory costs.

2 - Workforce Planning Models with Individual Worker Differences

Esma Gel, Associate Professor, Arizona State University, Dept of Industrial Engineering, Tempe, AZ, 85287, United States of America, Esma.Gel@asu.edu, John Fowler, Pornsarun Wirojanagud

We discuss formulations and efficient solution methods for workforce planning. In particular, we consider individual worker differences and a variety of decisions such as hiring, firing, cross-training and the use of contingent workers. Our results demonstrate the importance of modeling worker differences as well as the effectiveness of our heuristics.

■ TC66

O - Cabinet Room

Spreadsheet Issues & Applications in Education

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: Patrick Noonan, Emory University, Goizueta Bus. School, 1300 Clifton Rd NE, Atlanta, GA, 30322, United States of America, patrick_noonan@bus.emory.edu

1 - Having "FUN" with Spreadsheets: Using Spreadsheets for Classroom Games and Teaching Simulations

Sherry Weaver, Instructor, University of Calgary, 2500 University Drive NW, Calgary, AB, T2N 1N4, Canada, sweaver@ucalgary.ca

As our classrooms have become more interactive, we have brought in many interesting 'games' and simulations to help the students gain some hands-on insights into many concepts in OR/OM. Excel-based software to teach inventory management, central limit theorem, SPC, facility layout and yield management will be demonstrated. Each has been developed using Excel with VBA and the author will discuss the benefits (and ease!) of bringing spreadsheets as educational software into the classroom.

2 - Using PivotTables in Business Statistics

Thomas Groleau, Chair, Department of Business Administration, Carthage College, 2001 Alford Park Drive, Kenosha, WI, 53140, United States of America, tgroleau@carthage.edu

Spreadsheets have become a common tool business statistics courses. While textbooks tend to focus on a common set of functions for creating frequency tables, histograms, bar graphs, and manipulating data, PivotTables tend to be minimized or ignored. Based on alumni feedback, we have changed our business statistics course to emphasize PivotTable use. This presentation will discuss these changes.

3 - Improved Techniques for Programming Contingent Logic in Spreadsheets

Thomas Grossman, Universitiy of San Francisco, tagrossman@usfca.edu

Programming complicated logic in spreadsheets is troubling because programmers rely heavily on complex "nested IF" statements that are difficult to program and more difficult to verify. We share some real-world examples of complex nested IF statements, and present spreadsheet programming techniques to replace them them with code that is more transparent, easier to program, and easier to verify.

4 - Spreadsheets & the B-school Bookshelf

Patrick Noonan, Emory University, Goizueta Bus. School, 1300 Clifton Rd NE, Atlanta, GA, 30322, United States of America, patrick_noonan@bus.emory.edu

Spreadsheet skills occupy a challenging place in business schools. They are the standard analytical platform and support learning within and across courses. However, most administrators do not have the expertise to shape training and development of spreadsheet skills, and most faculty do not have the incentives or time. We propose two cross-cutting approaches to spreadsheet competency: aligning with the B-School "canon," and with the natural phases of project-based problem solving.

■ TC67

O - Forum Room

Location Models with Stochastic Components

Sponsor: Location Analysis
Sponsored Session

Chair: Dmitry Krass, Professor, Rotman School of Management, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, Krass@Rotman.Utoronto.Ca

1 - A Newsboy Location-inventory Model with Time-sensitive Demands

M. Mahdi Tajbakhsh, Dr., Rotman School of Management, University of Toronto, 105 St. George St., Toronto, ON, M5S 3E6, Canada, Mahdi.Tajbakhsh@Rotman.Utoronto.Ca, Dmitry Krass, Oded Berman

We consider a supply chain design problem in which facility location and inventory management decisions are integrated. We assume an infinite-horizon newsboy inventory policy at distribution centers (DCs) and allow customer demands to be sensitive to delivery times from the DCs. Our model is general in that it is applicable to a wide range of demand distributions and can handle both shortage costs and service levels.

2 - Facility Location and Revenue Optimization under Equilibrium-driven Demand and Congestion

Dehui Tong, University of Toronto, 105 St. George St. PhD Program, Toronto, ON, M5S3E6, Canada, dehui.tong@rotman.utoronto.ca, Dmitry Krass, Oded Berman

We focus on several important strategic decisions for service facilities operating on a congested network, including finding the locations of the facilities, determining the capacity of the service units and choosing the price to charge for service. The distribution of the customer flows is guided by the traffic equilibrium. The objective is to maximize the profit rate of the facilities.

3 - The Network Design of Spatially Distributed Service Systems with Two Prioritized Call Classes

Seokjin Kim, Assistant Professor, Suffolk University, Sawyer Business School, 8 Ashburton Place, Boston, MA, 02108, United States of America, kim@suffolk.edu, Opher Baron, Oded Berman, Dmitry Krass

We develop location models for an emergency system with mobile servers and two call classes, one for high priority calls and the other for regular calls. The problem is to minimize the number of servers on a network while achieving at least required service levels for the two calls classes. Markovian demands originate at nodes. Servers can be stationed at nodes and provide service to calls within a pre-specified coverage radius.

4 - Designing Production-Inventory-Transportation Systems with Capacitated Cross-docks and Suppliers

Hossein Abouee-Mehrizi, PhD Candidate, Rotman School of Management, University of Toronto, 105 St.George st., Toronto, ON, M5S 3L1, Canada, H.AboueeMehrizi07@rotman.utoronto.ca, Oded Berman, M.Reza Baharnemati

We analyze a production-inventory-transportation system problem where capacitated suppliers and cross-docks are to be established to satisfy the demand of retailers for different products. We consider the pipeline and retailers' inventory together with transportation, facility location and truck capacity costs in determining the optimal number and location of suppliers and cross-docks, allocation of retailers to suppliers, and truck capacity.

5 - The Single Assignment Follower p-Hub Location Problem with Attraction Functions

H.A. Eiselt, Professor, University of New Brunswick, Faculty of Business Administration, University of New Brunswick, Frederickton, NB, E3B 5A3, Canada, haeiselt@unb.ca, Vladimir Marianov

We solve a competitive hub location problem in which a firm is entering a market in which other airlines have hubs already located and seeks maximum capture. Customers choose routes according to gravity-like utility functions that depend on travel time and fare. Each demand is assigned to a single hub.

■ TC68

O - Senate Room

Issues in Chinese Consumer Behavior

Sponsor: Marketing Science
Sponsored Session

Chair: Clyde Warden, Professor, National Chung Hsing University, Department of Marketing, NCHU, 250 Kuo Kuang Road, Taichung, TW, 40227, Taiwan - ROC, cwarden@cwarden.org

1 - Hypermarket Service Quality with a Chinese Flavour

James Stanworth, Assistant Professor, National Changhua University of Education, No. 2 Shi Da Road, Changhua, Taiwan - ROC, jamesstanworth@btinternet.com

Few have studied customer perceptions of hypermarkets and almost none the determinants of (dis)satisfying encounters for Chinese customers. In this study Chinese customers of hypermarkets were surveyed and the findings reveal 18 determinants with 34 sub-determinants of (dis)satisfaction. Three broad groups emerged that were labelled as developers, terminators and influencers in their potential to nurture, hinder and facilitate (respectively) a Chinese Confucian notion of relationship.

2 - Chinese Relationship Marketing in Retailing: The Case of Wet Market in Taiwan

Stephen Huang, Associate Professor, National Kaohsiung First University of Science and Technology, 2 Jhuoyue Rd., Nanzih,

Kaoshiung, Taiwan - ROC, howhowone2000@gmail.com, Nai-Hua Chen, Tung-Sheng Wang, Paul S.H. Wu

The current research aims to explore how customer values and retail service quality impact the customers' relationship quality and their loyalty behavior in the Chinese setting. The findings indicate that Taiwanese customers concern the freshness of the products and the social factors are critical for them to visit traditional markets.The satisfaction positively affects the trust and the latter in turn positively influence the word-of-mouth and repurchasing intention.

3 - Chinese Cultural Influences on Retail Channel Selection

Clyde Warden, Professor, National Chung Hsing University, Department of Marketing, NCHU, 250 Kuo Kuang Road, Taichung, TW, 40227, Taiwan - ROC, cwarden@cwarden.org, Judy Chen

This research examines the drivers behind consumer preferences for traditional wet markets and the role of local Chinese culture. In the case of poultry, a combination of ritual use, emphasis on freshness, and existing convenient retail channels encourages consumers to avoid hypermarkets. Using survey data in a Chinese cultural setting, we proposes a model of how local culture influences this choice. Western retailing formats may benefit firms little when consumers stress local needs.

4 - To Change China: Creating Cultural Change Through Wine Marketing in Taiwan

Michael Turton, PhD Student, National Chengkung University, Da Hsueh Rd, Tainan, Taiwan - ROC, turton.michael@gmail.com

Wine importers in Taiwan faced consumers who were ignorant of how to drink wine, and whose drinking culture was incompatible with wine consumption. How did foreign wine marketers change the way consumers in Taiwan perceived and used wine? This study will replicate of market survey work done in the late 1980s and early 1990s by foreign wine marketers. Individuals working in wine marketing in Taiwan will be interviewed, to document how changes in the drinking culture were carried out.

Tuesday, 4:30pm - 6:00pm

■ TD01

M - Marriott Ballroom 3

Financial Engineering I

Contributed Session

Chair: Nalan Gulpinar, Associate Professor, Warwick University, Warwick Business School, Coventry, United Kingdom, Nalan.Gulpinar@wbs.ac.uk

1 - Preference Learning from Ordinal Judgments

Roman Slowinski, Professor, Poznan University of Technology, Institute of Computing Science, Poznan, 60-965, Poland, roman.slowinski@cs.put.poznan.pl, Jose Rui Figueira, Vincent Mousseau, Salvatore Greco

The judgments concern a set of actions evaluated on n criteria. They are ordinal and partial, and may express: weak preference, comprehensive or marginal intensity of preference, and local trade-offs. The preference model is a complete set of additive value functions compatible with the judgments. It is used on a new set of actions A to obtain: necessary and possible weak preference relations on A and on AxA . They are true for all or for at least one compatible value function, respectively.

2 - Verification of the Effectiveness of the Strategic CR Marketing Model by the Validity Analysis

Tomoko Shikama, Student, The Kyoto College of Graduate Studies for Informatics, 7 Monzen-cho Tanaka Sakyo-ku, Kyoto, 606-8225, Japan, tomoko.sss@gmail.com, Ken Niho, Xiongfei Cai, Hong Seung Ko

We analyze the validity of the marketing process model with retaining customers on e-business. First, we prove the reliability of collected data using the internal consistency method and split-half reliability method, and then we verify the effectiveness of this model by the nomological validity method and the causality analysis.

3 - The Effects of the Debt Financing Constraint in a Real Options Model

Michi Nishihara, Assistant Professor, Center for the Study of Finance and Insurance, Osaka University, 1-3 Machikaneyama-cho, Toyonaka, Osaka, 5608531, Japan, nishihara@sigmath.es.osaka-u.ac.jp, Takashi Shibata

This paper investigates a firm value and an investment strategy (investment, coupon, leverage, and endogenous default) when a firm makes real investment with debt financing. In particular, we concentrate on the effects of the entrepreneural's financial constraint where a part of the investment cost must be financed by debt. Further, we investigate strategic invest games between the entrepreneurs.

4 - Real Options and Capacity Planning

Luke Miller, Professor, Fort Lewis College, 1000 Rim Drive, Durango, CO, 81301, United States of America, miller_l@fortlewis.edu

This paper studies the impact of learning on a multi-staged investment scenario. Real option attributes are discussed from a Bayesian perspective, thresholds are identified for improved decision-making, and information's impact on downstream decision-making is discussed.

5 - Robust Investment Strategies for Asset Liability Management

Nalan Gulpinar, Associate Professor, Warwick University, Warwick Business School, Coventry, United Kingdom, Nalan.Gulpinar@wbs.ac.uk

Financial decision making involves uncertainty and consequently risk. It is well known that asset return forecasts and risk estimates are inherently inaccurate. The inaccuracy in forecasting and estimation can be addressed through the specification of rival scenarios. In this paper, we extend the multi-period asset liability management problem to the robust worst-case design with multiple rival return and risk scenarios.

■ TD02

M - Marriott Ballroom 2

Doing Good with OR: Health Policy

Cluster: Doing Good with Good OR

Invited Session

Chair: Margaret L. Brandeau, Professor of Management Science and Engineering, and Professor of Medicine (by Courtesy), Stanford University

1- Doing Good with OR: Health Policy

Moderator: Margaret L. Brandeau, Professor of Management Science and Engineering, and Professor of Medicine (by Courtesy), Stanford University. Panelists: Carolyn Clancy, Peter Hartsock,

This special series on "Doing Good with Good OR" is aimed at demonstrating how operations research can (and does) provide important insights that can be used to inform and shape public policy. We focus on three daunting societal challenges: energy and the environment; public health; and air congestion. Each focus area will feature a plenary presentation by a leader in the field, followed by a panel discussion involving key stakeholders from government and industry together with academic experts. This session is the panel discussion on health policy.

■ TD03

M - Marriott Ballroom 1

Dantzig Memorial IV

Cluster: Dantzig Memorial

Invited Session

Chair: Saul Gass, Professor Emeritus, University of Maryland, 8809 Maxwell Drive, Potomac, MD, 20854, United States of America, sgass@rhsmith.umd.edu

1 - Network Design for the Internet

Thomas Magnanti, Professor, MIT, Operations Research Center Bldg E40-149, 77 Massachusetts Ave., Cambridge, MA, 02139, United States of America, magnanti@mit.edu, Matthew Fontana

Many network design issues arise in the context of the Internet, ranging from basic protocol design through the design of routing networks for transmission propagation (such as multicasting) as well as the design of the basic underlying network infrastructures and the connections between them. We will highlight some of these design issues and the approaches taken to address them.

2 - On a Theme of Gale and Zimmerman

Alan Hoffman, IBM Fellow Emeritus, 115 Old Mill Road, Greenwich, CT, 06831, United States of America, ajh@us.ibm.com

Let G be a totally ordered abelian group. Inspired by a remark in David Gale's famous paper, "A theorem on flows in networks" (Pac. J. Math. 7, 1957), D. Coppersmith and I have, over the past ten years, studied properties of n-dimensional space whose coordinates are in G: polyhedral combinatorics, convexity topics (Carathedory, Helly, ...). Some conjectures have become theorems, and vice versa. I will also discuss some relevant work by others, most notably, Phil Wolfe and Uwe Zimmerman.

3 - George B. Dantzig's Contributions to Integer Programming

Ellis Johnson, Professor, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, United States of America, ellis.johnson@isye.gatech.edu

We discuss Dantzig's lesser known seminal contributions to integer programming. His joint TSP paper (with Fulkerson & Johnson) pointed the way to several approaches to solving IP problems. We give some historical perspective, details of what was in the paper, and how those methods opened up rich areas of research including: solving the TSP; combinatorial optimization more generally; separation methods for cut generation in integer programming; and combining linear programming and enumeration.

■ TD04

M - Delaware B

Joint Session PPP/To the Memory of Richard Rosenthal: Security Issues

Sponsor: Public Programs and Processes, To the Memory of Richard Rosenthal
Sponsored Session

Chair: Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

1 - Determining the Optimal Search Area for a Serial Criminal
Mike O'Leary, Towson University, Department of Mathematics, Towson University, Towson, MD, 21252, United States of America, moleary@towson.edu

The geographic profiling problem in criminology is to determine a search area for an offender based on knowledge of the offenders crime locations. We describe a new mathematical method for this problem that is able to incorporate geographic and demographic features that influence the selection of a crime site and uses Bayesian methods to generate its predictions. We will present the software tool that we have developed to solve this problem and give examples of its use.

2 - A Study of Vehicle Routing Service Combined with Security Service
Chikong Huang, Professor, National Yunlin University of Science & Technology, 123 University Road, Section 3,, Touliu, 64002, Taiwan - ROC, huangck@yuntech.edu.tw, Poshun Wang

The security companies in Taiwan develop a new way of survival using their logistic capability. A mathematical model is developed for the vehicle routings service combined with security service. The objective of this model is to minimize the number of vehicle as well as the traveling cost. A heuristic algorithm using a typical searching technique is developed for solving the problem. The profitability of this proposed model and the effectiveness of the proposed solution algorithm are tested.

3 - My (Almost) 50 Years In Operations Research in Washington
Howard Eisner, Professor, George Washington University, EMSE/SEAS, 1776 G St. NW, Washington, DC, 20052, United States of America, heisner@gwu.edu

The field of Operations Research (OR) has evolved and changed considerably over the past 50 years. This paper describes the author's journey in OR in Washington, in such application areas as transportation, defense, the environment, information systems, security, aeronautics and space. It also provides some suggestions for the future.

■ TD05

M - Virginia B

Optimization Algorithms: Decomposition Methods and Distributed Implementations

Sponsor: Optimization/ Nonlinear Optimization
Sponsored Session

Chair: Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu

1 - Distributed Multi-agent Convex Optimization
Angelia Nedich, UIUC, angelia@uiuc.edu, Alex Olshevsky, Asu Ozdaglar, John Tsitsiklis

We study the problem of optimization of a sum of convex functions in a network of agents. Each agent maintains and updates his estimate based on his own cost function, and communicates with a subset of agents (his neighbors). We consider the case when agents update the estimates using sub-gradient directions and a constant step-size rule. Our main result provides an error bound on sub-optimality of the agent estimates.

2 - Distributed Optimization in Stochastic Networks
Ilan Lobel, 77 Massachusetts avenue, Cambridge, MA, 02139, United States of America, lobel@mit.edu, Asu Ozdaglar

We study the problem of computing distributedly the minimum of a sum of non-smooth convex functions in a network where communication links fail according to a stochastic process. We show that a consensus-based algorithm coupled with a subgradient method converges to the optimal for i.i.d. stochastic networks and in networks where communication probability is dependent on the optimization solution.

3 - Structural Properties of the Semidefinite Linear Complementarity Problem
Ilan Adler, Professor, UC Berkeley, IEOR Dep, UC Berkeley, Berkeley, CA, 94720, United States of America, adler@ieor.berkeley.edu, Xianzhi Wang

We study the Semidefinite Linear Complementarity Problem (SDLCP) which is a generalization of the Linear Complementarity Problem (LCP) over the cone of semidefinite matrices. Following the traditional line of analysis of LCP, we present several characterizations of the SDLCP related to the structure of the solution set (such as uniqueness and convexity) that are related to specific properties of the underlying linear transformation (such as semimonotonicity and cross commutativity).

4 - Solving Stochastic Quadratic Programs Via Iterative Sampling
Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Peter W. Glynn, Gerd Infanger

The L-shaped method is a standard approach for solving stochastic linear programs. However, when the second-stage distribution governing the randomness of the second-period problems is continuous, computing the expectations of cuts becomes difficult. In this paper, we construct estimators in the context of quadratic programming and provide confidence intervals for the upper and lower bound of the optimal value. We report computational results on a quadratic programming test problem set.

■ TD06

M - Virginia C

Extending Auction Theory: Computational Perspectives

Cluster: Auctions
Invited Session

Chair: Kevin Leyton-Brown, Assistant Professor, University of British Columbia, 2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada, kevinlb@cs.ubc.ca

1 - Progress in Optimal Redistribution Auctions
Vincent Conitzer, Assistant Professor, Duke University, LSRC, Box 90129, Durham, NC, 27708, United States of America, conitzer@cs.duke.edu, Mingyu Guo

In auctions without a seller, a natural goal is to redistribute as much of the revenue as possible to the bidders without losing incentive compatibility. I will talk about our recent progress on this topic, including our work on redistribution mechanisms that are undominated or optimal in expectation, as well as redistribution mechanisms that allocate inefficiently to achieve an increase in the total amount redistributed (which more than compensates for the inefficiency).

2 - Robust Optimization and Regret-based Mechanism Design
Craig Boutilier, Department of Computer Science, University of Toronto, cebly@cs.toronto.edu, Nathanael Hyafil

Classic direct economic mechanisms, like VCG (Vickrey-Clarke Groves), require participating agents to fully reveal their type (i.e., preferences or utility function over potential outcomes). This can be practically impossible in realistic multi-attribute settings. We study partial revelation mechanisns in which an each agent's type space is partitioned into a finite set of partial types, each partial type corresponding to a subset of possibile utility functions. Each agent (should) report the partial type within which their full type lies. While classic impossibility results show that such incentive compatibility is generally impossible without full type revelation, we propose a class of partial revelation mechanisms that use regret-minimization to select outcomes given a partial type vector. We show that it achieves approximate ex-post equilibrium implementation. We use robust optimization techniques to compute the necessary outcomes and show that this can be made computationally tractable in domains of moderate size. We also describe an algorithm for myopically optimizing the partitioning of each agent's type space to reduce manipulability and social welfare loss. This allows for the automated design of one-shot partial revelation mechanisms with worst-case guarantees on both manipulability and efficiency.

3 - Deterministic, Dominant Strategy Auctions for Deliberative Agents: A Characterization and an Impossibility Result

David R.M. Thompson, University of British Columbia, 2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada, daveth@cs.ubc.ca, Kevin Leyton-Brown

Can we make deterministic, dominant strategy auctions for agents whose private information is costly to discover? Given independent private values, only a series of take-it-or-leave-it offers will work. But even this mechanism will not have a dominant strategy equilibrium when values are interdependent or agents are capable of learning about each other's preferences. However, both of these restrictions can be overcome by randomizing.

■ TD07

M - Maryland A

Pricing and Inventory Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Xin Chen, Assistant Professor, University of Illinois at Urbana-Champaign, 216C Transportation Bldg, 104 S. Mathews Ave., Urbana, IL, 61801, United States of America, xinchen@uiuc.edu

1 - Coordination Via Discounts and Rebates in a Two-level System with Lot-sizing Cost Structures

Joseph Geunes, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, geunes@ise.ufl.edu, Wilco van den Heuvel, Yusen Xia, Xiangtong Qi, Edwin Romeijn

We consider a two-stage decentralized supply chain where a supplier serves a retailer with a single item. Both stages face fixed order costs and linear procurement and holding costs over a finite horizon. We analyze the use of rebates, wholesale price discounts, and holding cost subsidies for improving supply chain efficiency in the presence of an uncooperative retailer. Using an efficiency metric, we evaluate the potential for these simple mechanisms to achieve operations coordination.

2 - Demand Shaping through Bundling: A Dynamic Multiproduct Inventory-pricing Model

Jeannette Song, Professor, Duke University, Fuqua School of Business, 1 Towerview Dr., Durham, NC, 27708, United States of America, jssong@duke.edu, Zhengliang Xue

Motivated by the increasingly popular industry practice of using product bundling to shape demand, we present a dynamic model to analyze optimal joint inventory, pricing, and bundling decisions for a firm over a finite horizon. A product can be either a single component or a package of several components. The product demand is random and price-sensitive. Using a dynamic programming formulation, we show how bundling strategies switch according to the inventory status and product features.

3 - Integration of Inventory and Pricing Decisions with Costly Price Adjustments

Sean Zhou, Assistant Professor, Chinese University of Hong Kong, Department SE&EM, Hong Kong, China, zhoux@se.cuhk.edu.hk, Xin Chen, Frank Chen

We consider a periodic-review inventory model with price adjustment costs, that consist of both fixed and variable parts. The firm needs to coordinate the pricing and inventory replenishment decisions in each period to maximize its profit. We develop the general model and characterize the optimal policies for two special cases, namely, a model without fixed price adjustment costs and a model without inventory carryover. An intuitive heuristic for the general system is also provided.

4 - Coordinated Pricing and Inventory Management with Deterministic Demand and Costly Price Adjustment

Xin Chen, Assistant Professor, University of Illinois at Urbana-Champaign, 216C Transportation Bldg, 104 S. Mathews Ave., Urbana, IL, 61801, United States of America, xinchen@uiuc.edu, Peng Sun

We develop an inventory and pricing model with deterministic demand and costly price adjustment. Different from the majority of the literature, a cost is incurred if there is a price change. The objective is to find a pricing and ordering plan so as to maximize the total profit over the planning horizon. Under rather general assumptions, we develop polynomial time algorithms to solve the model, which interestingly vary significantly with the cost structure.

■ TD08

M - Maryland B

Business Engineering: Risk-averse Decision Making under Uncertainty

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Scott Mathews, Associate Technical Fellow, The Boeing Company, PO BOX 3707 MC 42-54, Seattle, WA, 98124, United States of America, scott.h.mathews@boeing.com

1 - The Optimality of Security-level Strategies in Adversarial Settings

Jacomo Corbo, Chief Race Strategist (Visiting Scholar), ING Renault F1 Team Ltd. (The Wharton School, University of Pennsylvania), 33 Oxford Street #219, Cambridge, MA, 02138, United States of America, jacomo@eecs.harvard.edu

We consider devising a pit stop strategy in Formula One (F1) racing. We formulate an F1 race as a full-information game, show how to solve for competitor risk aversion from data, and note that competitors are strongly risk averse. We show that the game compels risk averse play and matches well with a game class where security-level strategies are optimal. We conclude by showing that our game-theoretic approach outperforms other methods, and discuss its extension to R&D portfolio investment.

2 - Valuation of Technology Investment Using an Economic Market Clearing Mechanism

Chris Johnson, Researscher, GE Research, 1 Research Circle, Niskayuna, NY, 12301, United States of America, johnsonch@crd.ge.com, Jason Black, Srinivas Bollapragada

Significant infrastructure investments are being made with uncertain payoffs due to an economic value proposition dominated by regulatory incentives. A method is presented to create a market clearing mechanism to determine price and volume estimates.

3 - Outsourcing for the Risk Adverse Business: A Resource Factorization Analysis

Nathan Caswell, Janus Consulting Inc, One Research Court, Suite 450, Rockville, MD, 20850, United States of America, nathan@myjanus.com

As global options move beyond simple supply sourcing to joint operations and reliance on service providers for critical functions it becomes important to understand, design, and manage the virtual enterprise. We present a service approach using ownership based resource factorization that substantially simplifies and clarifies B2B interfaces while enabling proactive risk reduction and retrospective accountability. Several real world examples demonstrate the benefits of the approach.

4 - Risk Aversion in Decision-making for Strategic and Tactical Investment Options

Scott Mathews, Associate Technical Fellow, The Boeing Company, PO BOX 3707 MC 42-54, Seattle, WA, 98124, United States of America, scott.h.mathews@boeing.com

There is frequently confusion in corporate decision-making about whether investment choices contemplated by senior management are strategic or tactical options. Confusion about the intent and structure of the two investment choices can result in muddled decision-making and poor project governance structuring. New option modeling tools help simplify the quantification of risk-aversion impact under both strategic and tactical investment options, and provide insight to better project governance.

■ TD09

M - Maryland C

Joint Session QSR/CS: Multiresolution Analysis in Statistical Applications

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Rajesh Ganesan, Asst. Professor, George Mason University, 4400 Univ. Dr. MS 4A6, Fairfax, VA, 22030, United States of America, rganesan@gmu.edu

1 - Analysis of Aggregated Signals for Multiple Embedded Operations Using Wavelets

Yong Lei, University of Michigan, IOE Department, Ann Arbor, MI, 48109, United States of America, ylei@umich.edu, Judy Jin

In many complex systems, the measured sensor signals are usually the aggregated responses of multiple embedded operations. This research is develop a new multi-resolution analysis method to enhance the monitoring capability of individual embedded operation based on the aggregated sensing signals.

2 - A Comparison of Classical Wavelets with Diffusion Wavelets
Rajesh Ganesan, Asst. Professor, George Mason University, 4400 Univ. Dr. MS 4A6, Fairfax, VA, 22030, United States of America, rganesan@gmu.edu, Poornima Balakrishna

This talk presents the analogies and differences between classical and diffusion wavelets. A case study to decompose multidimensional data is also presented.

3 - Monitoring Nonlinear Profiles Using Wavelet Filtering and B-Spline Approximation
Shing Chang, Associate Professor, Kansas State University, 228 Durland Hall, Manhatta, Ka, 66506, United States of America, changs@ksu.edu

A statistical process control framework is proposed to monitor nonlinear profiles. The proposed methodology identifies mean shifts or "shape changes" in a profile. Discrete wavelet transformation is applied to separate variation or noise from profile contours. B-splines are adopted to generate critical points to define the shape of a profile.

■ TD10

M - Room 8206

Operations Research Models for Wind Power

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Francois Bouffard, Lecturer, University of Manchester, PO Box 88, Sackville Street, Manchester, M60 1QD, United Kingdom, francois.bouffard@manchester.ac.uk

1 - Optimal Capacity Firming Contracts for Wind Power Generation Firms
Francois Bouffard, Lecturer, University of Manchester, PO Box 88, Sackville Street, Manchester, M60 1QD, United Kingdom, francois.bouffard@manchester.ac.uk

Electricity markets whose operating rules penalize generators for being out of balance put wind power generators in a poor competitive position in comparison to power plants with fully-controllable output. Wind capacity firming contracts, whereby the output of a flexible dispatchable plant is coupled to that of wind, offer a way around this weakness. In this work we investigate how one would model and optimize the terms of such contracts.

2 - Value of Storage for Managing Wind Volatility: Stochastic Unit Commitment-based Models and Analysis
Jeremy Hargreaves, Johns Hopkins University, DoGEE, Baltimore, MD, United States of America, jjh@jhu.edu, Sebastiaan Hers, Joost Van Stralen, Benjamin F. Hobbs, Christos Kolokathis

SDP and Lagrangian Relaxation models are developed for unit commitment and dispatch under random wind production and load. We compare their conclusions concerning the impact of increased wind penetration upon balancing energy costs and operating reserve requirements in the Netherlands, and contrast those results to those of a deterministic analysis.

3 - Short-term Trading for a Wind Power Producer
Antonio J. Conejo, Professor, University of Castilla - La Mancha, Department of Electrical Engineering, Campus Universitario s/n, Ciudad Real, 13071, Spain, Antonio.Conejo@uclm.es, Juan Miguel Morales

A wind power producer participating in a pool-based electricity market should derive its bidding strategies for the day-ahead market as well as for other shorter-term adjustment and balancing markets. This paper provides a multi-stage stochastic programming methodology to derive optimal bidding strategies for such markets. Appropriate examples and case studies are analyzed. Adequate conclusions are provided.

4 - Maximizing the Value of Windpower in Electricity Systems: A Complementarity Programming Approach
Scott Rogers, University of Toronto, Department of Mech and Ind Eng, Toronto, m5s3g8, Canada, scott.rogers@utoronto.ca, Paul Dabrowski

This paper describes an approach to maximizing the value of wind-based generation in a hydro-thermal electricity system under different types of market designs. This work extends the Murphy and Smeers (2005) approach. Examples from the Ontario electricity system are described.

5 - A Power System Planning Model with Intermittent Wind Resources
Richard Chen, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, United States of America, richchen@umich.edu, Duncan Callaway, Amy Cohn

We present a long term capacity planning model with wind resources. The model considers wind intermittency, uncertainty in demand and the trade-offs between system reliability and transmission costs (infrastructure and loss). The proposed model determines how, when and where to build a network of interconnected wind farms.

■ TD11

M - Room 8209

Agent-based Modeling

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Daniel J. Veit, Professor, University of Mannheim Business School, Schloss, Mannheim, BW, 68131, Germany, veit@bwl.uni-mannheim.de

1 - A Decision Support Tool for Generation Capacity Investments in Restructured Power Markets
Vishnu Nanduri, PhD Candidate, Industrial Engineering, University of South Florida, 4202 E Fowler Ave., Tampa, FL, 33620, United States of America, vnanduri@mail.usf.edu, Tapas Das, Patricio Rocha

With a significant number markets trading electricity in restructured settings, a significant proportion of capacity expansion in the future will have to take place in market based environments. However, since a majority of the expansion literature is focused on regulated market structures, there is a critical need for multiperiod, multiplayer, capacity expansion models. We present a 3-Tier game theoretic model to obtain expansion plans, while considering several relevant market features.

2 - Dynamic LMP Response under Alternative Price-cap and Price-sensitive Demand Scenarios
Junjie Sun, Financial Economist, Office of the Comptroller of the Currency, 250 E Street SW, MS 2-1, Washington, DC, 20219, United States of America, junjiesun@gmail.com, Leigh Tesfatsion, Hongyan Li

This study investigates the complicated nonlinear effects of demand-bid price sensitivity and supply-offer price caps on Locational Marginal Prices (LMPs) for bulk electric power when profit-seeking generators can learn over time how to strategize their supply offers. Systematic computational experiments are conducted using AMES, an open-source agent-based test bed developed by the authors, to model a dynamic restructured wholesale power market operating on an AC transmission grid.

3 - Emissions Trading and Electricity Prices in an Agent-based Simulation Model
Daniel Veit, Professor, University of Mannheim, Chair of BA and Information Systems, Schloss, Mannheim, D, 68131, Germany, veit@uni-mannheim.de, Anke Weidlich

The contribution presents an agent-based simulation model of the German wholesale electricity market, which takes the market for CO2 emission allowances into account. It is analyzed how profit-seeking generator agents carry over allowance prices to electricity market bids and how this ultimately influences wholesale power prices.

■ TD12

M - Room 8212

Advanced Data Mining Techniques

Sponsor: Data Mining
Sponsored Session

Chair: Kaizhi Tang, tangkz@yahoo.com

1 - Data Mining Meta-optimization for Biomechanics Data Analysis
Kaizhi Tang, tangkz@yahoo.com, Xiong Liu

We address the problem of meta-optimization of finding an optimal data mining model which has the best performance for a given dataset. We have applied data mining meta-optimization in analyzing biomechanics data. The results show that meta-optimization can significantly improve the performance of data mining algorithms.

2 - Machine Learning Alternative Model to Statistical Regression Models
Bruce Ratner, br@dmstat1.com

The GenIQ Model is a machine learning alternative model to the statistical ordinary least squares and logistic regression models. GenIQ lets the data define the model- automatically data mines for new variables, variable selection, and the model equation. GenIQ requires no programming, produces models that outdo statistical models, and is for modelers who daringly consider a different model: unsuspected equation, ungainly interpretation, and easy implementation.

3 - An Agent-based Data Mining Meta-optimization Engine
Xiong Liu, xliu@i-a-i.com, Kaizhi Tang

Data mining meta-optimization usually involves evaluating a series of configurations for many algorithms. Since each configuration can be evaluated independently, the data mining meta-optimization problem can be solved using distributed computing. We developed an agent-based, distributed computation engine to power the meta-optimization. This engine can significantly reduce computational time.

■ TD13

M - Room 8216

Joint Session DM/CS: Data Exploration for Complex System Decision-Making

Sponsor: Data Mining, Computing Society
Sponsored Session

Chair: Victoria Chen, University of Texas at Arlington, Department of Ind. & Manuf. Sys. Eng., Arlington, TX, 76019, United States of America, vchen@uta.edu

1 - Visual Exploration of Multi-attribute Trade Spaces during Complex Systems Design

David Wolf, Graduate Research Assistant, Penn State University, 332 Leonhard Building, University Park, PA, 16802, United States of America, drw226@psu.edu, Gary Stump, Mike Yukish, Timothy Simpson

Recent advancements in computing power and speed are revolutionizing trade space exploration, particularly for the design of complex systems such as automobiles and aircraft. In this paper, we discuss Visual Steering Commands and a visualization tool that allows designers to interactively navigate multi-dimensional trade spaces. We then describe examples that illustrate the trade space exploration process. Comparisons to previous results and future work will also be discussed.

2 - Sequential Value Function Approximations for Real-world Dynamic Programming

Huiyuan Fan, University of Texas at Arlington, Department of Ind. & Manuf. Sys. Eng., Arlington, TX, 76019, United States of America, hyfan@uta.edu, Victoria Chen

A sequential method for future value function approximations of dynamic programming (DP) is presented based on combining the methods of sequential design of computer experiment and the theory of consistency for a class of nonparametric estimators. Multilayer feed-forward neural networks are taken as the nonparametric models and low discrepancy sequences are used for sequentially sampling the training data. The new method is validated with a nine-dimensional inventory forecasting problem.

3 - Tree-MARS Models

Subrat Sahu, University of Texas at Arlington, 415 South Oak Street #109, Arlington, TX, 76010, United States of America, subrat@exchange.uta.edu, Ching-feng Lin, Victoria Chen

Abstract: We present a tree-MARS model that first fits a regression tree model, then uses multivariate adaptive regression splines (MARS) to refine the model at the terminal nodes of the tree. Comparisons are made to the tree-regression model that uses a similar concept, but only permits the use of linear regression at the terminal nodes. The tree-MARS model is used to represent state transitions for a complex pain management dynamic programming application.

4 - Application of Three-phase Methodology on the Multistage Multiobjective Wastewater Treatment System

Prashant Tarun, Assistant Professor, Steven L. Craig School of Business, Missouri Western State University, 4525 Downs Drive, PH 309P, Saint Joseph, MO, 64507, United States of America, ptarun@missouriwestern.edu, Bill Corley, Victoria Chen

The three-phase methodology presented in (Tarun et al. 2007, Tarun et al. 2008, Tarun 2008) provides a way to involve decision makers in the solution development of multiple stage, multiple objective (MSMO) optimization models. We apply our three-phase methodology in conjunction with an augmented high-dimensional, continuous-state stochastic dynamic programming to solve an MSMO Wastewater Treatment System (WTS). We will present the results and conclusions for the WTS application.

■ TD14

M - Room 8218

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - LINKS-simulations.com - Best-Practice Teaching with a Sophisticated Supply Chain Management Simulation

Randall G. Chapman, LINKS-simulations.com, 329 Forest Haven Dr., Winter Garden, FL, 34787, chapman@chapmanrg.com

Teaching with a sophisticated supply chain management simulation is a daunting instructional endeavor, especially with a full parsing of the adjective "sophisticated." As used here, "sophisticated" includes the implicit descriptors "large-scale," "competitive," "web-based," and "team-based." Drawing on simulation design experience, extensive personal teaching experience in traditional classroom-based and distance-learning modes, and "train-the-trainer" coaching experience with scores of instructors and their 10,000+ students with the LINKS supply chain management simulations over the last nine years, the LINKS author provides and summarizes best-practice insights into the design and execution of successful simulation-based operations management and supply chain management courses. A guided-tour/demo of the LINKS website and associated user resources is provided.

2 - statistics.com – XLMiner: Data Mining Add-In for Excel

Peter Bruce, President, statistics.com, 612 No. Jackson St., Arlington, VA, 22201, peter.bruce@statistics.com

The demonstration will illustrate common data mining classification and prediction techniques using XLMiner, a comprehensive data mining add-in for Excel.

■ TD15

M - Room 8219

Problems in Private, Public and Online Services

Sponsor: Service Science
Sponsored Session

Chair: Shanling Li, Professor of Operations Management, McGill University, 1001 Sherbrooke Street West, Montreal, PQ, H3G1A5, Canada, shanling.li@mcgill.ca

1 - Forecasting Public Transit Ridership

Wen-Chyuan Chiang, Professor of Operations Management, Department of Finance and Operations Management, The University of Tulsa, Tulsa, OK, 74104, United States of America, wen-chiang@utulsa.edu, Timothy Urban, Robert Russell

Public transit systems are heavily subsidized by local, state, and federal agencies. As much as 85 percent of the operating budget for some metropolitan bus systems is obtained from governmental sources. As part of the process for obtaining funding, a relatively accurate forecast of ridership demand is necessary. In this paper, we consider relevant factors that affect the forecast of ridership. Alternative forecasting models are evaluated using data from a metropolitan transit authority.

2 - Estimation, Pricing and Strategic Consumer Behavior

Dan Zhang, Assistant Professor, Desautels Faculty of Management, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A1G5, Canada, dan.zhang@mcgill.ca, Adam Mersereau

Demand estimation is an integral part of revenue management applications and is not considered in the recent literature on strategic consumer behavior. We consider strategic consumer behavior in an integrated estimation-pricing model. Analysis of the model leads to new insights into the effects of strategic consumer behavior on pricing. For example, the long run equilibrium revenue from a two-price policy can be lower than that from a single-price policy.

3 - Impact of Patient Transfers on Hospital Performance

Diwas Kc, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104, United States of America, diwas@wharton.upenn.edu, Christian Terwiesch

Smaller hospitals frequently transfer their severe cases to larger regional hospitals. We examine the inter-hospital transfer patterns to examine whether hospital-level measures of performance are impacted by patient transfers. In particular, we estimate the externalities imposed on receiving hospitals through patient transfers.

4 - Analysis of Online Product Pricing and Shipping Charges

Mehmet Gumus, Assistant Professor, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A1G5, Canada, mehmet.gumus@mcgill.ca, Wonseok Oh, Shanling Li, Ray Saibal

We analyze the interaction between product and shipping pricing decisions under two scenarios. In first (second) scenario, retailer presents shipping (product) price first and then product (shipping) price. We develop stylized model that captures this asymmetric effect on decisions and conduct empirical analysis to validate analytical predictions.

■ TD16

M - Room 8222

Closed-loop Supply Chain Management

Contributed Session

Chair: Jose Cruz, Assistant Professor, University of Connecticut, School of Business, 2100 Hillside Road Unit 1041, Storrs, CT, 06269-1041, United States of America, Jose.Cruz@business.uconn.edu

1 - The Remanufacturing Newsvendor Problem

Matt Drake, Assistant Professor of Supply Chain Management, Duquesne University, Palumbo and Donahue Schools of Business, Pittsburgh, PA, 15282, United States of America, drake987@duq.edu, Dave Pentico, Robert Sroufe

The acquisition of technology products for remanufacturing approximates a single-period inventory environment because a new wave of better units will soon be available. These products, however, have more variable levels of quality and usefulness than new products. The firm has two decisions to make: how many units to acquire and which units to test for product quality. We model the two-stage acquisition and remanufacturing decision to maximize the expected profit from remanufacturing.

2 - Closed-loop Supply Chain Management: A System Dynamics Approach

Jose Cruz, Assistant Professor, University of Connecticut, School of Business, Storrs, CT, 06269-1041, United States of America, jcruz@business.uconn.edu, Sudip Bhattacharjee, Harpreet Singh

Increased concern for the environment has lead to the design of supply chains that are both economically and ecologically feasible. This paper takes a system dynamics approach to explore the factors that impact the sales of new versus remanufacturing products and control the closed-loop supply chains return, remanufacturer and recycling processes.

3 - End-of-life Production Planning: A Smart Partial Disassembly Strategy

Pei-Fang Tsai, Research Assistant Professor, Department of System Science and Industrial Engineering, SUNY Binghamton, PO Box 6000, Binghamton, NY, 13902, United States of America, ptsai@binghamton.edu

A product reaches its end of life when it is malfunctioned or undesirable to the users. Depending on the quality of an end-of-life product, various options available are to repair, remanufacture, retrieve for useable parts, or recycle the raw material from the product. This research proposes a smart partial disassembly strategy when a product can be repaired or remanufactured. The objective is to reduce the environmental burden and promote the benefits in the end-of-life production planning.

4 - Exclusive Channels: The iPhone Introduction

Gangshu Cai, Assistant Professor, Kansas State University, Calvin 101B, Department of Management, Manhattan, KS, 66505, United States of America, gcai@ksu.edu, Yue Dai, Sean Zhou

The launch of iPhone in 2007 and its implementation of exclusive deal with AT&T accompanying with a revenue sharing scheme, has influenced their competitors and the customers. This study provides a theoretical framework to study the drives behind the exclusive deal, the sudden drop of iPhone price, and other managerial insights. Our results show that it can be mutually beneficial for both the phone company and the service retailer to form an exclusive deal if the service rate is relatively high.

5 - How Much is an Announcement Worth? - A Study of Commitment Timing in Supply Chain Contracting

Bo Hu, PhD Candidate, Simon School of Business, Univ. of Rochester, PhD Program ,4th Floor, C.Simon Hall,, University of Rochester, Rochester, NY, 14620, United States of America, hub1@simon.rochester.edu, Harry Groenevelt

We study supply contracts in the presence of a spot market. Both buyer's and supplier's actions influence the spot market price. Supplier decides contract price and quantity supplied to the spot market. Buyer decides contract quantity before downstream demand is known. We find that Supplier can increase her total profit by announcing in advance that she will limit the quantity sold on the spot market. This leads to a higher contract price, and Buyer's total procurement cost increases.

■ TD17

M - Room 8226

Novel Statistical Applications in Manufacturing

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Roshan Josep Vengazhiyil, Associate Professor, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332, United States of America, roshan@isye.gatech.edu

1 - Local Recurrence Modeling for State and Performance Prediction of Nonlinear and Nonstationary Process

Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu, Hui Yang

A local recurrence modeling approach that considers the underlying nonlinear stochastic dynamics and nonstationarities is presented for predicting the state and performance of complex manufacturing systems. The local recurrence characteristics, exhibited over certain sets of time, are used to partition a system trajectory into multiple near-stationary segments. The simulation studies and real world application show significant prediction accuracy improvement compared to stationary predictors.

2 - Analysis of Interaction Structure Among Process Variables in Semiconductor Manufacturing

Qiang Huang, Assistant Professor, University of South Florida, huangq@eng.usf.edu, Xi Zhang

In chemical-mechanical planarization (CMP) process, interaction patterns among chemical and mechanical process variables could be explored to characterize and improve process conditions. We investigate interaction structure among process variables for better understanding of physics of process condition changes.

3 - Statistical Adjustments to Engineering Models with Applications to Machining

Roshan Josep Vengazhiyil, Associate Professor, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, 30332, United States of America, roshan@isye.gatech.edu, Shreyes Melkote

A common problem in engineering is that the models developed based on the underlying physics of the process do not always match satisfactorily with reality. This work proposes engineering-statistical models that combine the advantages of engineering models and statistical models. The usefulness of the methodology is illustrated using the prediction of surface roughness in a micro-cutting process and the optimization of a laser assisted mechanical micromachining process.

4 - Physics-based Response Oriented Bayesian Empirical Surfaces

Ravishankar Rajagopa, The Ohio State University, 1971 Neil Avenue, Columbus, OH, 43210, United States of America, rajagopalan.18@osu.edu, Theodore Allen

Polynomial model forms have been the norm of the researchers working on Response Surface Methodology (RSM) and regression. These model forms are often reasonably accurate within a region of interest. Yet, generally RSM models do not extrapolate accurately outside the experimental design space. Dimensional analysis involves the selection of a relatively small number of dimensionless system inputs and model forms chosen to exploit physics-based knowledge. In this research we propose "Physics-based Response Oriented Bayesian Empirical Models" (PROBEs) that combines the implied assumptions of both standard RSM and physics-based modeling. We demonstrate benefits using real casting and welding process design datasets.

■ TD18

M - Room 8228

Service Innovation: Role of Technology Management

Sponsor: Service Science
Sponsored Session

Chair: Tugrul Daim, Associate Professor, Portland State University, PO Box 751, Portland, OR, 97207, United States of America, tugrul@etm.pdx.edu

1 - Exploring Service Delivery in the United States Coast Guard

Tad Drozdowski, US Coast Guard, Tad.F.Drozdowski@uscg.mil, Tugrul Daim

This paper proposes a framework for the Coast Guard to provide a better customer service with enhanced service provider-stakeholder interactions and better insights from front-line service providers and stakeholders

2 - Industrial Service Project Management Effectiveness for Ship Repair Project Managers

Anthony Erickson, Portland State University, ericksoa@pdx.edu, Timothy Anderson

Countering a lack of formal project management evaluation metrics in the ship repair industry, this paper proposes a project management effectiveness (PME) model, measuring profit contribution, schedule, specification execution/quality, strategic impact, and personal objectives on normalized scales and compares project manager performance both directly and using Data Envelopment Analysis.

3 - Technology Road-mapping process with Feature-based Analysis and Cluster-based Grouping in Healthcare

Nima Behkami, Researcher, Oregon Health & Science University, 3181 S.W. Sam Jackson Park Rd., Mail Code: BICC, Portland, Or, 97239, United States of America, behkamin@hotmail.com, Noah Third, David Dorr

Technology Road Maps are difficult to model in large fields such as HealthCare. Shortcoming include: 1)visually representing a comprehensive TRM for decision making purposes 2)systematically identifying links between market drivers and products. A new three-phased process is purposed that includes Feature-based Analysis and Cluster-based Grouping. For demonstration it's applied to Care Management Plus(CMP) a care management product under development at Oregon Health & Science University(OHSU).

4 - Service Engineering: A Case Study of Productivity Analysis in the Construction Industry

Timothy Anderson, Portland State University, 1900 SW 4th Ave, Suite LL-50-02, Portland, OR, United States of America, tima@etm.pdx.edu, Gerald Williams

As the U.S. economy has shifted from manufacturing to services, the challenge of understanding and improving services has given birth to the field of service engineering. While many of the principles of manufacturing can lend insight, often services are harder to measure. This talk will examine the sources of productivity loss in a segment of the construction industry with a high labor content accounting for close to 1% of GDP.

5 - Technology Management in the Service Sector

Tugrul Daim, tugrul@emp.pdx.edu

This paper briefly reviews results of a symposium held at PICMET 2007 and and a special session held at PICMET 2008 meetings focusing on the service science and how technology management can help or benefit. A research agenda will be included.

■ TD19

M - Lincoln 4

Probability Elicitation, Verification and Combination

Sponsor: Decision Analysis
Sponsored Session

Chair: Victor Richmond Jose, Duke University, Box 90120, Durham, NC, 27708-0120, United States of America, vrj@duke.edu

1 - Strictly Proper Scoring Rules: Theory and Practice

Eric Bickel, Assistant Professor, The University of Texas at Austin, 1 University Station, C2200, ETC 5.128D, Austin, TX, 78712, United States of America, ebickel@mail.utexas.edu

Experiential learning is perhaps the most effective way to teach decision making. One such example of this is the scoring method used for exams in some decision analysis programs. This grading scheme is strictly proper and provides great insight into students' understanding of course material. We will discuss the properties of this scoring rule and demonstrate the insights that can be achieved by both students and instructors.

2 - Combining Probability Forecasts

Roopesh Ranjan, Graduate Student, University of Washington, BOX-354322, Department of Statistics, Seattle, WA, 98105, United States of America, roopesh@stat.washington.edu, Tilmann Gneiting

We propose a method for combining probability forecasts from different sources. The commonly used method of linearly combining probability forecasts has limitations, in that a weighted combination of distinct calibrated forecasts is necessarily uncalibrated.In view of this, we propose a recalibration method. We illustrate our findings with simulation examples and a case study on operational probability of precipitation forecasts.

3 - Calibration of Probability of Precipitation Forecasts

Eric Floehr, President, Intellovations, eric@intellovations.com, Eric Bickel

In this talk we will present the results of a large-scale calibration study involving probability of precipitation (POP) forecasts from multiple forecasting services (The Weather Channel, The National Weather Service, and Custom Weather). This is the largest POP calibration study ever published, involving POP forecasts covering nearly 800 locations over a 4-year timeframe. We will compare the sharpness and calibration of forecasts and determine the optimal weighting of each service.

4 - Sensitivity to Distance and Baseline Distributions in Forecast Evaluation

Victor Richmond Jose, Duke University, Box 90120, Durham, NC, 27708-0120, United States of America, vrj@duke.edu, Robert F. Nau, Robert L. Winkler

Scoring rules typically studied in the literature and used in practice do not take account of any ordering of events, and they evaluate probabilities relative to a default baseline distribution. In this talk, we construct rich families of scoring rules that are strictly proper (thereby encouraging truthful reporting), sensitive to distance (thereby taking into account ordering of events), and incorporate a baseline distribution relative to which the value of a forecast is measured.

■ TD20

M - Lincoln 3

DA Arcade II

Sponsor: Decision Analysis
Sponsored Session

Chair: Prakash P. Shenoy, Distinguished Professor, University of Kansas, School of Business, 1300 Sunnyside Ave, Lawrence, KS, 66045-7585, United States of America, pshenoy@ku.edu

1 - A Clarity-focused DA Process: Integral Decision Analysis

Roberto Ley-Borras, Director, Consultoria en Decisiones, Oriente 13 A No. 1122, Entre Norte 28 y 28 A, Orizaba, Ver., MX, CP94300, Mexico, rley@decidir.org

Decision analysis teaching and practice have been mostly model-oriented, but process-oriented DA can be more complete and efficient. This talk presents a DA process that develops logically from framing to objectives, alternatives, uncertain events, interactions, evaluation, choice and implementation design. In addition to their logical connection, each step is intended as an opportunity to create value and get clarity about the nature of the decision situation.

2 - A Context Dependent Model of Decision Making under Risk

Kanchan Mukherjee, PhD Candidate, INSEAD, Boulevard de Constance, Fontainebelau, 77305, France, Kanchan.MUKHERJEE@insead.edu

This paper proposes a context dependent model of decision making under risk where the valuation of a gamble depends not only on its own probability-outcome structure but also on the other gambles in the choice set. The model draws motivation from the range-frequency theory (Parducci, 1965), uses lesser number of parameters than CPT and explains a large number of empirical phenomena. The model can also predict how behavior patterns change with changes in specific parameters of a choice situation.

3 - Arc Reversals in Hybrid Bayesian Networks with Deterministic Variables

Prakash P. Shenoy, Distinguished Professor, University of Kansas, School of Business, 1300 Sunnyside Ave, Lawrence, KS, 66045-7585, United States of America, pshenoy@ku.edu

Hybrid Bayesian networks contain a mix of discrete and continuous chance variables. A continuous chance variable in a Bayesian network representation is said to be deterministic if the variances of its conditional distributions are all zeroes. Arc reversals are used in making inferences in hybrid Bayesian networks and influence diagrams. We describe arc reversals between all possible kinds of pairs of variables.

4 - The Mathematics of Happiness

Manel Baucells, IESE Business School, mbaucells@iese.edu

We propose three nested modifications of the discounted utility model to capture how a flow of consumption is translated into a flow of happiness. The first incorporates habit formation and addresses the trade-off between adaptive and non-adaptive goods. The second incorporates satiation and addresses the trade-off between maintaining habits and seeking variety. The third incorporates the consumption of goods that yield meaning and purpose.

■ TD21

M - Lincoln 2

Healthcare Quality and Measurement

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Guodong(Gordon) Gao, University of Maryland, 4325 Van Munching Hall, College Park, 20742, United States of America, ggao@rhsmith.umd.edu

1 - Development of Kaiser Permanente™, PCP Performance Metrics

Alex Du, DSPM - Primary Care, Performance Consultant, Kaiser Permanente Mid-Atlantic, 2101 East Jefferson St., Rockville, MD, 20852, United States of America, Alex.S.Du@kp.org, Wade Kramer

This project is to design a program to measure performance of Kaiser Permanente™ employed primary care physicians in its Mid-Atlantic region. Point-of-care data, instead of claim data, is extracted from KP HealthConnect EMR system. Three domains, productivity, clinical quality and patient satisfaction are included in the scope of this project.

2 - The Quality of Medical Information on Wikipedia

Gerald Kane, Assistant Professor, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, 02467, United States of America, gerald.kane@bc.edu

Wikipedia is rapidly becoming a major source of medical information on the Internet, but little is known about the quality and completeness of this

information. Even less is known about who is generating this information and how it is generated. This study explores the quality of medical information on Wikipedia and the collaborative processes that surround it.

3 - Determinants of Voluntary Disclosure of Quality of Care Information among California Hospitals

Jiban Khuntia, PhD Student, Information Systems, Fellow, CHIDS, Robert H. Smith School of Business, 4360, Van Munching Hall, University of Maryalnd, College Park, MD, 20783, United States of America, jiban@umd.edu, Guodong(Gordon) Gao, Corey Angst, Ritu Agarwal

This study investigates a hospital's decision to participate in voluntary quality information disclosure initiatives, by modeling the participation decision as function of financial, institutional, quality, technological and market factors. The modeled 60% California hospitals participating in the CHART initiative exhibited higher quality and better financial performance than non-participating hospitals.

4 - The Demand for Resource Allocation Technologies: The Case of Hospital Surgical Management Software

Eli Snir, Asst. Professor, Southern Methodist University, Cox School of Business, PO Box 750333, Dallas, TX, 75275, United States of America, esnir@cox.smu.edu, Jeffrey McCullough

We study the potential for health IT to increase healthcare resource allocation efficiency. In particular, we model hospital's surgical scheduling software demand. We develop a theoretical software demand. We test this model using IT investment and surgical service data from about 3000 hospitals. Using revealed preference techniques, we find that scheduling software demand is increasing in service scope and is used to enhance surgical service efficiency.

■ TD22

M - Lincoln 1

Scheduling III

Contributed Session

Chair: Su Gao, Assistant Professor, Clark Atlanta University, 2679 Henderson Chase Ct, Tucker, GA, United States of America, speed_gao@yahoo.com

1 - On-line Crane Scheduling with Non-crossing Constraints

Lele Zhang, University of Melbourne, Department of Mechanical Engineering, Melbourne, Australia, l.zhang4@pgrad.unimelb.edu.au, Andrew Wirth

We consider the problem of on-line crane scheduling with release dates and non-crossing constraints to minimize the latest completion time. We provide an optimal competitive ratio heuristic for the problem with unit processing times and a 3-competitive heuristic for the general case, and also study their performance empirically.

2 - Order Acceptance Using Genetic Algorithms

Susan Slotnick, Associate Professor, Department of Operations Management, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH, 44115, United States of America, s.slotnick@csuohio.edu, Walter Rom

We employ a genetic algorithm to solve the order acceptance problem with tardiness penalties. We compare the performance of a myopic heuristic and a genetic algorithm using an upper bound based on assignment relaxation. Our pilot study determines the best settings for diversity operators and local search. Our main computational study shows that the genetic algorithm always dominates the myopic heuristic in terms of objective function, at the cost of increased processing time.

3 - Scheduling the Transition to Lean Depot Maintenance: Opportunities and Challenges

Bogdan Bichescu, Assistant Professor, The University of Tennessee, 618 SMC, 916 Volunteer Blvd, Knoxville, TN, 37996, United States of America, bbichescu@utk.edu, Kenneth Gilbert, Melissa Bowers, Mandyam Srinivasan

One key driver of aircraft availability is the time spent in preventive depot maintenance (PDM). In an effort to reduce maintenance cycle times, the Air Force is experimenting with the concept of high-velocity maintenance (HVM) which consists of breaking the traditional PDM into smaller, more frequent phases. We present scheduling models that assist the AF with this transition given specific constraints and discuss key findings from our analysis.

4 - A Combined Approach of Shifting Bottleneck and Tabu Search

Rodrigo Britto, University of Maryland, College Park, Van Munching Hall, College Park, MD, 20742, United States of America, rbritto@rhsmith.umd.edu, Gonzalo Mejia

This study proposes a compound heuristic for minimizing the total tardiness in a Job Shop Scheduling Problem. The heuristic uses Shifting Bottleneck to generate the initial solution that is improved by applying Tabu Search. The performance of the implemented heuristic shows good results compare to other techniques that have been used in the literature.

5 - Integrated Order Processing and Distribution for Fixed-sequence Customers

Su Gao, Assistant Professor, Clark Atlanta University, 2679 Henderson Chase Ct, Tucker, GA, United States of America, speed_gao@yahoo.com

We consider a production and distribution combined scheduling problem. Because of limited production rate and truck capacity, multiple batches/trips are scheduled for customers. The problem is to cluster customers into batches and to sequence the batches to minimize the completion time. We prove the NP-hardness of the general problem and detail two special cases of properties and polynomial algorithms. A heuristic with a guaranteed performance ratio is proposed for the general problem.

■ TD23

M - Lincoln 5

Multi-server Queueing Models in Heavy Traffic

Sponsor: Applied Probability

Sponsored Session

Chair: David Gamarnik, MIT, E53-353 Sloan School of Management, MIT, 30 Wadsworth street, cambridge, ma, 02139, United States of America, gamarnik@mit.edu

1 - Sample Path Large Deviations for Networks of G/M/N Queues

Kavita Ramanan, Associate Professor, Carnegie Mellon University, Department of Mathematical Sciences, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, kramanan@math.cmu.edu, Soummya Kar

We establish sample path large deviations principles for networks of many-server queues, where simultaneously at each queue, both the number of servers and the arrival rate increase. The arrival processes are assumed to be general, while the servers provide Markovian (possibly time-inhomogeneous) service. For a single node, we explicitly solve the associated variational problem for certain classes of arrival processes to shed insight into the way rare events occur.

2 - On the Exponential Rate of Convergence to Stationarity of the M/M/n Queue in the Halfin-Whitt Regime

David Goldberg, MIT, Operations Research Center, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, dag3141@MIT.EDU, David Gamarnik

We analyze the rate of convergence to stationarity in total variation of the M/M/n queue in the Halfin-Whitt regime, with applications to dynamically staffing call centers. We compute exactly, in a simple closed form, the limiting value of the spectral gap for the M/M/n queue in this regime. We also show that there is a very interesting phase transition , unifying earlier efforts to asymptotically characterize the spectral gap.

3 - Fluid Models and Large Deviations for Monotone Bandwidth Sharing Networks

Bert Zwart, Georgia Institute of Technology, 765 Ferst Drive NW, Atlanta, GA, 30332, United States of America, bertzwart@gatech.edu

We consider uniqueness of fluid models of overloaded monotone bandwidth sharing networks. And apply our fluid limit results to a large deviations problem.

4 - Fluid Models of Multi-server Queues with Abandonment

Jiheng Zhang, Georgia Institute of Technology, 765 ferst dr, Atlanta, GA, 30332, United States of America, jrz@gatech.edu, Jim Dai

We study multi-server queues with abandonment. Customers are assumed to have generally distributed service and patience times, which can can be dependent. The dynamics of the system are modeled using measure valued process, keeping track of the residual service and patience times of each customer. Deterministic fluid models are developed to provide first-order approximations for various performance quantities. The approximation yields insights on the impact of the dependency.

■ TD24

M - Lincoln 6

Joint Session CS/Optimization/Stochastic Programming: Recent Advances on Formulating and Solving SP Models

Sponsor: Computing Society, Optimization

Sponsored Session

Chair: Bjarni Kristjansson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, Bjarni@maximalsoftware.com

1 - Advances in Coin-SMI for Stochastic Integer and Decomposition Solvers

Alan King, IBM Research, PO Box 218, Yorktown Heights, NY, 10598, United States of America, kingaj@us.ibm.com

In this session we discuss technical advances in COIN-OR's Stochastic Modeling Interface to support mixed-integer programming and to support decomposition methods.

2 - Scenario Tree Generation for Stochastic Programming Models Using GAMS/SCENRED

Holger Heitsch, Humboldt-University Berlin, Unter den Linden 6, Berlin, 10099, Germany, heitsch@math.hu-berlin.de, Steven Dirkse

When solving multistage stochastic programs the stochastic input process is approximated by a process having finite support. The scenarios must exhibit tree structure in order to reflect the monotone information structure of the input data. Using the new software tool GAMS/SCENRED such scenario trees can be generated. The tree construction is based on recent scenario tree approximation schemes which rely on approximation and stability results for linear multistage models.

3 - API and Data Structures for Stochastic Programming

Horand Gassmann, Professor, Dalhousie University, Faculty of Management, 6100 University Avenue, Halifax, NS, B3H 3J5, Canada, Horand.Gassmann@Dal.Ca

In contemporary computing practises algebraic modelling systems (AMLs) and solvers are two distinct software components used in the solution of real-world OR problems. Exchange of information between AMLs and solvers can happen through files or in memory. In each case both sides need to agree on the format that is used to describe a problem instance. This talk explores Application Programming Interfaces (APIs) and data structures for use in stochastic programming.

4 - New Stochastic Programming Enhancements for the MPL Modeling Language

Bjarni Kristjansson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, Bjarni@maximalsoftware.com

Formulating stochastic models in a modeling language and deploying it to end-users has long been a challenge in practice. In this presentation we will review how both scenario-based and independent variables stochastic models can be effectively formulated in a modeling language, such as MPL. Several formulations of SP models will be demonstrated.

■ TD25

M - Lincoln 6A

Metaheuristics in Logistics and Transportation

Sponsor: Computing Society: Metaheuristics
Sponsored Session

Chair: Claudio B. Cunha, Associate Professor, University of Sao Paulo, Av. Professor Almeida Prado, Tr.2, n.83, Escola Politecnica - Cid. Universitaria, Sao Paulo, SP, 05508900, Brazil, cbcunha@usp.br

1 - Combination of Heuristic and Exact Methods for Solving Set-covering Type Optimization Problems

Ibrahim Muter, Mr., Sabanci University, Manufacturing Systems/Industrial Eng., Orhanli, Tuzla, Istanbul, 34956, Turkey, imuter@su.sabanciuniv.edu, S. Ilker Birbil, Guvenc Sahin

We develop a hybrid framework that combines some well-known meta-heuristic methods with exact methods to solve combinatorial optimization problems that can be formulated in the form of a set covering problem through Dantzig-Wolfe decomposition. This framework guides the local search to take intensification and diversification decisions. We conduct experiments on well-known test problems for vehicle routing problem with time windows. Our results show that the proposed framework is promising.

2 - A New Heuristic for the Integrated Vehicle Routing and Container Loading Problem

Hugo Yoshizaki, Associate Professor, University of São Paulo, Dept of Production Engineering, Av Prof Almeida Prado Trav 2 no 128, Sao Paulo, SP, 05508-900, Brazil, hugo@usp.br, Danilo Campos

This paper presents a heuristic for the integrated problem of vehicle routing and container loading, which makes k-opt like moves to generate alternative sets of loads. These routes respect the unloading sequence of boxes three-dimensionally packaged into the container. This method uses Ngoi et al (1994) spatial matrix representation, extending it to the selection box strategy by Gehring et al (1990). The heuristic performs well both in quality of the results and in response time.

3 - The Corridor Method – A General Solution Concept with Application to the Blocks Relocation Problem

Stefan Voss, Professor, University of Hamburg, IWI - Von-Melle-Park 5, Hamburg, HH, 20146, Germany, stefan.voss@uni-hamburg.de, Moshe Sniedovich, Marco Caserta

The Corridor Method is a method-based metaheuristic. Based on an algorithm working well at least on small instances of a given problem it defines one or more neighborhoods well suited for the problem and the algorithm. These neighborhoods are viewed as corridors around given solutions. Experiments show that this approach is a successful hybridization between exact and metaheuristic methods. Successful applications for the blocks relocation problem arising, e.g., at container terminals are shown.

4 - A Tabu Search Heuristic for an Integrated Production and Distribution System

Claudio B. Cunha, Associate Professor, University of Sao Paulo, Av. Professor Almeida Prado, Tr.2, n.83, Escola Politecnica - Cid. Universitaria, Sao Paulo, SP, 05508900, Brazil, cbcunha@usp.br, Andrei Znamensky

Motivated by the importance of integrating production and distribution aiming to reduce holding costs and lead times of products across a supply chain, we describe a two-phase tabu search heuristic to solve this problem, which also considers a Vendor Managed Inventory (VMI) policy. Computational experiments for benchmark instances show that our heuristic is effective, and provides better solutions compared to previously reported results.

■ TD26

M - Lincoln 5A

Open Source Software for Optimization

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Andrew Miller, ajmiller5@wisc.edu

Co-Chair: Mahdi Namazifar, PhD Student, University of Wisconsin-Madison, 3239 Mechanical Eng. Building, 1513 University Av., Madison, WI, 53706, United States of America, namazifar@wisc.edu

1 - ASTROS : Active-Set Trust-Region Optimization Solvers

Mustafa Kilinc, PhD Student, University of Wisconsin-Madison, kilinc@wisc.edu, Sven Leyffer, Todd Munson

Filter methods are an alternative to penalty functions for nonlinear optimization methods. A filter accepts a trial point whenever the objective or the constraint violation is improved. We present a flexible active-set trust-region framework that implements sequential quadratic programming, sequential linear-quadratic programming, and other step-computation techniques. Global convergence can be enforced by a range of methodologies, such as a filter, a non-monotone filter, and tolerance tube.

2 - A New Open-source Implementation of the Double Description Method

Matthew Saltzman, Department of Mathematical Sciences, Clemson University, Clemson, SC, United States of America, mjs@clemson.edu, Brian Dandurand

We describe an implementation of the double description algorithm for enumerating vertices and rays of polyhedra. This capability can be very useful in understanding how to exploit polyhedral structure in the development of optimization algorithms. We describe refinements to the basic algorithm that enable our code to outperform existing implementations. Our code will be contributed to the COIN-OR library of open-source software for operations research.

3 - Using the PATH Solver with Open-Source Factorization Routines

Michael Ferris, Computer Sciences Department, University of Wisconsin, 1210 West Dayton Street, Madison, WI, 53706, United States of America, ferris@cs.wisc.edu, Qian Li

The PATH solver is designed for solving Mixed Complementarity Problems and has been used extensively for problems in applied general equilibrium, economics and engineering. It is currently not open-source due to the underlying linear solver technology that is used for pivoting. The extension of PATH to incorporate a number of alternatives to the current (LUSOL) routines will be described, along with their benefits and drawbacks on a number of test problems arising in the literature.

4 - The SYMPHONY MIP Solver

Ashutosh Mahajan, Lehigh University, 200 W Packer Ave, Bethelehem, PA, 18015, United States of America, asm4@Lehigh.edu, Ted Ralphs, Menal Guzelsoy

SYMPHONY is an open source callable library for solving mixed integer linear programs (MILPs) and has several advanced features such as the ability to warm start the solution process. This talk will focus on recent improvements in primal

heuristics, preprocessing, branching and management of valid inequalities that enable it to solve MILPs faster. Computational results are provided to show the effect of these techniques on SYMPHONY's performance as a MILP solver.

■ TD28

M - Washington 1

Integer Programming

Contributed Session

Chair: Raf Jans, Associate Professor, HEC, 3000, Chemin de la Côte-Sainte-Catherine, Montreal, Canada, Rjans@rsm.nl

1 - A Local Search Procedure for the Open Vehicle Routing Problem

Majid Salari, DEIS University of Bologna, Viale Risorgimento, 2, Bologna, Italy, majid.salari2@unibo.it, Paolo Toth, Andrea Tramontani

We address the Open Vehicle Routing Problem (OVRP), a variant of the classical Vehicle Routing Problem (VRP)in which the vehicles are not required to return to the depot after completing their service. We present a local search procedure for OVRP based on Integer Linear Programming (ILP) techniques,reporting computational results on benchmark instances from the literature. In several cases, the proposed algorithm is able to find the new best-known solution for the considered problem.

2 - Scheduling with Deteriorating Jobs with Rate Modifying Activities

Yucel Ozturkoglu, Ph.D Student, Auburn University, 3301 Shelby Center, Auburn University, Auburn, AL, 36849, United States of America, ozturyu@auburn.edu, Robert Bulfin

In many industrial situations, increasing processing times are caused by tiredness or fatigue of workers. A rest period can improve workers performance, thus restoring the original processing times. In this paper, we consider deterioration and rate-modifying activities (RMA) effects in a scheduling environment.We developed a mathematical model which decides the sequence in which jobs should be scheduled, how many RMAs to use, if any, and where to use them in a schedule.

3 - Passenger Allocation to Capacitated Elevator Problem

Mirko Ruokokoski, Researcher, Systems Analysis Laboratory, Helsinki University of Technology, PO Box 1100, Espoo, 02015, Finland, mruokoko@cc.hut.fi, Harri Ehtamo, Marja-Liisa Siikonen, Janne Sorsa

We formulate an elevator group control problem with passengers' destination calls as an integer linear programming problem and study its solution. This challenging problem has not been studied in the literature earlier. Several classes of valid inequalities are used in a new way to strengthen LP-relaxation of this formulation. The problem is solved using a branch-and-cut algorithm. The computational experiments are analyzed with discussion about the significance of this approach.

4 - Exact and Inexact Methods for Solving the OLAP View-and-index-selection Problem

Zohreh Asgharzadeh Talebi, Graduate Student, NC State University, Graduate Program in Operations Research, Box 7913, Raleigh, NC, 27695, United States of America, zasghar@ncsu.edu, Rada Chirkova, Yahya Fathi

We introduce an integer programming (IP) model for the problem of selecting views and indexes for pre-computation and storage in the context of improving query-processing efficiency in on-line analytical processing (OLAP) in database-management systems. We study the structure of the search space for this IP model, propose several exact and heuristic strategies for reducing its size, and evaluate the impact of these size reductions on an empirical basis for a large collection of instances.

5 - Symmetry Breaking Constraints in MIP's

Raf Jans, Associate Professor, HEC, 3000, Chemin de la Côte-Sainte-Catherine, Montreal, Canada, Rjans@rsm.nl

The presence of symmetry in many MIP formulations (such as the assignment of orders to identical machines or clustering into groups) lead to long solution times as alternative optimal solutions cannot be pruned in the B&B tree. We discuss some problems where the introduction of symmetry breaking constraints helps to improve the solution time.

■ TD29

M - Washington 2

Tutorial: Metaheuristic Hybridization with GRASP

Cluster: Tutorials

Invited Session

Chair: Mauricio Resende, Lead Member of Technical Staff, AT&T Labs Research, 180 Park Avenue, Room C241, Florham Park, NJ, 07932, United States of America, mgcr@research.att.com

1 - Metaheuristic Hybridization with GRASP

Mauricio Resende, Lead Member of Technical Staff, AT&T Labs Research, 180 Park Avenue, Room C241, Florham Park, NJ, 07932, United States of America, mgcr@research.att.com

GRASP, or greedy randomized adaptive search procedure, is a multi-start metaheuristic that repeatedly applies local search starting from solutions constructed by a randomized greedy algorithm. In this tutorial we consider ways to hybridize GRASP to create new and more effective metaheuristics. We consider several types of hybridizations: constructive procedures, enhanced local search, memory structures, and cost reformulations.

■ TD30

M - Washington 4

Joint Campaign Analysis

Sponsor: Military Applications

Sponsored Session

Chair: James Treharne, Deputy Division Chief, Center for Army Analysis, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States of America, james.treharne@us.army.mil

1 - Wargaming Process for High-intensity Conflicts

Dan Mahoney, OR Analyst, Center for Army Analysis, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States of America, daniel.mahoney1@us.army.mil

The Center for Army Analysis has developed a High-Intensity Wargaming Process, which is a time-step, man-in-the-loop, force-on-force simulation method that seeks to explore the actions and interactions of modern, high-intensity conflict at the operational level of war. As such, this process is designed to provide insights into operational level issues such as joint effects; force sequencing, allocation and sufficiency; theater sustainment; and lines of communications management, etc.

2 - Counterinsurgency Wargaming

Jason Southerland, Center for Army Analysis, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States of America, jason.a.southerland@us.army.mil

Counterinsurgency is a multi-faceted problem in which all sides attempt to leverage military, political, diplomatic, and economic tools. Wargaming the political, economic, and diplomatic aspects of a counterinsurgency are not as well understood as the military and population security components. The Center for Army Analysis continues to mature a methodology to integrate these aspects into a wargame used to address important issues facing senior military commanders.

3 - Evaluating Non-combatant Evacuation Operations (NEO) Using Optimization

Steven Sparling, Military Analyst, Center for Army Analysis, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States of America, steven.j.sparling@us.army.mil

The U.S. Government is committed to evacuating its citizens and others authorized from host nation countries when conditions exist that place their lives in danger. Given the potential for violence, it is desirable to complete evacuations as fast as possible. This paper presents an integer program optimization model for evaluating non-combatant evacuation alternatives that considers several unique and complicating aspects to this type of problem.

■ TD31

M - Washington 5

WINFORMS: Panel on Best Practices for INFORMS Chapters

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Russell Wooten, Program Manager, Emerging Initiatives, US Department of Homeland Security, 46842 Graham Cove Square, Potomac Falls, VA, 20165-7578, United States of America, russell.wooten@dhs.gov

1 - From ABC to OR in Running an Outstanding INFORMS Local Chapter

Moderator: Russell Wooten, Program Manager, Emerging Initiatives, US Department of Homeland Security, 46842 Graham Cove Square, Potomac Falls, VA, 20165-7578, United States of America, russell.wooten@dhs.gov, Panelists: Doug Samuelson, Russell R Vane III, Armand Weiss, Perk Pedrick, Lawrence Stone

A panel discussion by local chapter experts on the easy and difficulties in running a local INFORMS chapter. This will be highly interactive with welcomed audience participation.

■ TD32

M - Washington 6

Inventory Management

Contributed Session

Chair: James Bradley, Associate Professor, College of William and Mary, Mason School of Business, PO Box 8795, Williamsburg, VA, 23187-8795, United States of America, james.bradley@mason.wm.edu

1 - EOQ Versus JIT Procurement in Dynamic Quantity Competition

Sandra Transchel, Smeal College of Business, Penn State University, State College, United States of America, sandra.transchel@bwl.uni-mannheim.de, Stefan Minner

We study dynamic quantity competition between two retailers who can change their quantities put into the market continuously over time. The market price is decreasing in the total output. Both retailers place their orders with a supplier and can choose between EOQ and JIT delivery. The problem is modeled as a differential game. We analyze the equilibrium output strategies under JIT and EOQ replenishment and the performance of replenishment policies compared to a monopoly.

2 - Non-linear Relaxation for Classical Single-period Inventory Management Problem

Laoucine Kerbache, HEC, Paris, France, Kerbache@hec.fr, Christian van Delft, Kai Luo, Mozart Menezes

This paper extends the classical single-period inventory management problem, known as the news-boy problem, by introducing simultaneously non-linear unit price, unit cost, unit salvage value and unit shortage cost. We assume that the demand of the period is random and we consider an infinite time interval enabling any possible unsold products to be salvaged. We seek to determine an optimal policy that maximizes the expected total profit. The complexity of the resulting model comes from the fact that all the variables are actually non-linear. In this paper, we show the concavity of the total expected profit function (according to different types of non-linear unit price) within a well defined range. Numerical results are provided to show the relevance of our model in various settings.

3 - Life-time Buy Decisions with Multiple Obsolete Parts

James Bradley, Associate Professor, College of William and Mary, Mason School of Business, PO Box 8795, Williamsburg, VA, 23187-8795, United States of America, james.bradley@mason.wm.edu, Hector Guerrero

Life-cycle mismatch occurs when part life cycles end before the life cycles of products that require the parts. Life-time buys can be used to mitigate part obsolescence, where a quantity of parts is purchased for the remaining product life. We extend prior work on optimal life-time buy quantities for one product with one obsolete part, by deriving analytic solutions, heuristic policies, and bounds for optimal life-time buy quantities when many parts become obsolete over a product's life cycle.

■ TD33

M - Johnson

Optimization of Healthcare Delivery

Sponsor: Health Applications Section
Sponsored Session

Chair: Ana Vila-Parrish, North Carolina State University, 400 Daniels Hall, Campus Box 7906, Raleigh, NC, United States of America, anita.vilaparrish@gmail.com

1 - Impact of Organizational Characteristics on Performance in Quality Improvement Collaborative (QIC)

Sarang Deo, Northwestern University, s-deo@kellogg.northwestern.edu, Bruce Landon, Keith McInnes, Paul Cleary, Ira Wilson, Martin Shapiro, Charles Corbett

QIC is an increasingly popular method for improving chronic care in the US. However, there is significant variation among the intervention choices of clinics that participate in a QIC. Using data from a national QIC of HIV clinics, we find that intervention choices of clinics are associated with organizational characteristics such as an open culture, QI focus and use of multidisciplinary teams.

2 - Operating Rooms Capacity Planning: Implementing the Newsvendor Model with Heterogeneous Demand

Polly Biyu He, Stanford University, Graduate School of Business, 518 Memorial Way, Stanford, CA, 94305, United States of America, bhe@stanford.edu, Stefanos Zenios, Alex Macario

In the presence of uncertain duration, operating room schedulers face the challenge of allocating time to the specialties in a hospital. While previous research has studied reserving time for individual cases, we consider allocating block time, which has great impact on staffing costs. Using data from a hospital, we develop a regression-newsvendor model to predict block usage. Compared to lognormal and nonparametric models, the regression lowers the over- and under- staffing costs by over 30%.

3 - MDP and Simulation for Efficient Blood Platelet Production and Improved Platelet Transfusion

Rene Haijema, Wageningen University and Research center, Hollandseweg 1, Wageningen, Netherlands, rene.haijema@wur.nl, Jan van der Wal, Nico van Dijk, Nikky Kortbeek

Blood banks produce platelet pools to meet uncertain demand. Optimal production volumes are obtained by solving a (downsized) Markov decision problem (MDP). Nearly-optimal replenishment levels are read by simulating the MDP strategy. The optimal strategy balances shortages and outdating. The quality of the pools upon transfusion is negatively correlated with their age. We present several ways to improve platelet quality given the MDP-Simulation approach to obtain fixed order-up-to levels.

4 - Dynamic Hospital Inventory Management of Drugs Using Patient Information

Ana Vila-Parrish, North Carolina State University, 400 Daniels Hall, Campus Box 7906, Raleigh, NC, United States of America, anita.vilaparrish@gmail.com, Julie Simmons Ivy, Russell E. King

Hospital pharmacies throughout the United States are experiencing drug inventory problems that result in waste and shortages. We consider the pharmacist's role in managing drug inventory. We formulate their decision as a Markov decision process which determines the optimal inventory policy as a function of the state of the hospital as defined by patient condition and mix.

■ TD34

M - Jefferson

Public Health Modeling at the Centers for Disease Control and Prevention

Sponsor: Health Applications Section
Sponsored Session

Chair: Stephanie Sansom, Team Lead, DHAP/CDC, 1600 Clifton Road, MS E-48, Atlanta, GA, 30333, United States of America, sos9@cdc.gov

Co-Chair: Arielle Lasry, CDC, 1600 Clifton Road, Atlanta, GA, United States of America, alasry@cdc.gov

1 - Allocating CDC's HIV Prevention Funds

Katherine Hicks, RTI International, 3040 Cornwallis Rd, RTP, NC, 27709, United States of America, khicks@rti.org, Arielle Lasry, Stephanie Sansom, Vladislav Uzunangelov

The Centers for Disease Control and Prevention (CDC) funds most HIV prevention programs in the U.S. To guide CDC funding decisions, we developed a resource allocation model aimed at minimizing new infections over five years. New infections are calculated using a dynamic compartmental model structured by infection status, risk group, gender and race. We discuss this model, with a focus on challenges in applying optimization models to public health issues.

2 - Estimating Intervention Effects From Per Contact HIV Transmission Rates

Stephen Sorensen, Mathematical Statistician, Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop E48, Atlanta, GA, 30333, United States of America, zuc7@cdc.gov, Stephanie Sansom

HIV transmission rates per partnership drive our compartmental model of HIV incidence among MSM in an urban city. Rather than using published partnership rates, we estimate them from a Bernoulli formula and data on per contact transmission rates, number of contacts per partnership, contact types and condom use. We compare our estimated partnership rates to those reported in the literature. We indicate the impact of various HIV prevention strategies on our transmission rate estimates.

3 - Differences in Lifetime Expectancy and Costs Among Persons Diagnosed with HIV in Different Settings

Vimalanand Prabhu, P.E. Fellow, CDC, MS E48, Clifton Rd., Atlanta, Ga, 30033, United States of America, gmf9@cdc.gov, Angela Hutchinson, Stephanie Sansom, Paul Farnham

We use a Markov model of HIV disease progression and transmission to determine the most cost-effective hospital setting for HIV screening. Based on average CD4 counts among those diagnosed after hospital admission compared with those diagnosed in emergency departments, emergency department screening was more cost-effective.

4 - Modeling Infectious Diseases as Simply as Possible, but Not More So

John Glasser, Mathematical Epidemiologist, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A-34, Atlanta, GA, 30333, United States of America, jglasser@cdc.gov

As infectious diseases are controlled by interrupting transmission of pathogens among hosts, reliable model-based evaluations of alternative strategies depend on faithful representations of heterogeneity in inter-personal contacts. Opportunities for validation are rare in public health, but population models in which mixing is a convex combination of age-specific activities and preferences reproduce historical observations.

■ TD35

M - Jackson

GIS in the OR/MS Business Curriculum

Sponsor: INFORM-ED
Sponsored Session

Chair: Thomas Groleau, Chair, Department of Business Administration, Carthage College, 2001 Alford Park Drive, Kenosha, WI, 53140, United States of America, tgroleau@carthage.edu

1 - Spatial Analysis in OR/MS Curriculum

Avijit Sarkar, University of Redlands, 1200 East Colton Avenue, Redlands, CA, United States of America, Avijit_Sarkar@redlands.edu

Several OR/MS problems such as site location, shortest path, vehicle routing and other network optimization problems are inherently spatial in nature. This presentation will use freeware and specialized GIS software to demonstrate infusion of spatial analysis in site location, supply chain management and logistics.

2 - Understanding the "G" in GIS for Business

Emil Boasson, Central Michigan University, Ronan 309, Mount Pleasant, MI, United States of America, boass1e@cmich.edu

GIS is an emerging but growing area in IS/IT/MIS curriculum. A better understanding of "G" is needed when teaching GIS to business school students. A case is made to illustrate how GIS concepts and tools can be incorporated with other business courses such as finance, marketing, and international business.

3 - GIS and Business Statistics

Thomas Groleau, Chair, Department of Business Administration, Carthage College, 2001 Alford Park Drive, Kenosha, WI, 53140, United States of America, tgroleau@carthage.edu

Carthage College faculty have paired a Business Statistics with a course in GIS. With the same students in both classes, instructors create ties between the subjects to enhance interdisciplinary learning and improve student stills in both areas. This presentation includes several GIS-specific enhancements to the statistics curriculum.

■ TD37

M - T. Marshall Ballroom West

Tutorial: Simulation and Optimization

Cluster: Tutorials
Invited Session

Chair: Michael Fu, Professor, University of Maryland, College Park, University of Maryland, College Park, MD, 20742, United States of America, mfu@umd.edu

1 - Simulation and Optimization

Michael Fu, Professor, University of Maryland, College Park, University of Maryland, College Park, MD, 20742, United States of America, mfu@umd.edu, Chun-Hung Chen, Leyuan Shi

We consider the problem of optimizing a performance function from a simulation model. We begin by classifying different types of problems, and then provide anoverview of the major approaches, followed by a more in-depth presentation of three specific areas: efficient simulation budget allocation, stochastic gradient estimation, and the nested partitions method.

■ TD38

M - Tyler

Mixed-Integer Programming Theory and Applications

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Simge Kucukyavuz, Assistant Professor, University of Arizona, Systems and Industrial Engineering, Tucson, AZ, United States of America, simge@sie.arizona.edu

1 - Start-up Prices and Shadow Prices in Binary MILP Problems

Suvrajeet Sen, Professor, The Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, sen.22@osu.edu, Talat Genc

The issue of finding a price system in MILP models with attributes of shadow prices has remained a long-standing unresolved problem in both optimization and economic theory. In this presentation, we resolve this issue for binary MILP problems. We provide an important step in allocating charges of indivisible goods, and recover the total costs of inputs. Moreover, we characterize unique (two-sided) shadow prices for resources in binary MILP problems.

2 - Large-scale MIPs for Procurement Auctions

Olga Raskina, Lead Scientist, Emptoris, 200 Wheeler Road, Burlington, MA, 02476, United States of America, ORaskina@emptoris.com

Deciding the best allocation of sourcing awards based on supplier pricing and performance while complying with corporate purchasing policies is one of the most difficult problems in strategic sourcing, with large dense MIPs in its core. We discuss some of the challenges we faced in implementing fast and robust solutions for this problem and the approaches we implemented to tackle them.

3 - A State Based Approach to Emergency Vehicle Location under Dynamic Deployment

Rashid Al Jalahema, University of Arizona, 1127 E. James E. Rogers Way, PO Box 210020, Tucson, AZ, 85719, United States of America, rashid@email.arizona.edu, Jeffrey Goldberg, Simge Kucukyavuz

In EMS dynamic deployment, the locations of the vehicles depend on the number of idle vehicles in the system. When a vehicle is dispatched, the remaining vehicles are moved to better cover the demand lost by the dispatched vehicle. We further propose additional constraints to ensure that the location plans are nested in the sense that they differ by a single location from one state to the next. We study the structure of the various formulations and develop methods to solve them effectively.

4 - A Branch-and-cut Approach for the Multi-dimensional Knapsack Problem with Generalized Upper Bound Constraints

Elif Gokce, Texas A&M University, Department of Industrial and Systems Eng, TAMUS 3131, College Station, TX, 77843-3131, United States of America, elifg@tamu.edu, Wilbert Wilhelm

We derive facet defining valid inequalities for the knapsack problem with generalized upper bound constraints. We then use the inequalities as cuts in a branch-and-cut scheme and report computational results.

■ TD39

M - Truman

Approximation Algorithms

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Konstantin Makarychev, Research Staff Member, IBM, IBM TJ Watson Research Center, PO Box 218, Yorktown Heights, NY, 10601, United States of America, konstantin@us.ibm.com

1 - Integrality Gaps for Sherali-Adams Relaxations

Yury Makarychev, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, yurym@microsoft.com, Konstantin Makarychev, Moses Charikar

We prove strong lower bounds for Sherali-Adams relaxations of the MAX CUT, Vertex Cover and Sparsest Cut problems. Specifically, we show that the integrality gap of MAX CUT and Vertex Cover relaxations is 2 - epsilon after n delta rounds (where delta depends on epsilon); the integrality gap of Sparsest Cut is at least max(sqrt(log n / (log r + log log n)), log n / (r + log log n)).

2 - O(sqrt(log n)) Approximation to SPARSEST CUT in O*(n^2) time

Satyen Kale, Postdoctoral Researcher, Microsoft, 1 Microsoft Way, Redmond, WA, 98121, United States of America, satyen.kale@microsoft.com

We show how to compute O(sqrt(log n))-approximations to SPARSEST CUT and BALANCED SEPARATOR problems in O(n^2) time, thus improving upon the recent algorithm of Arora, Rao and Vazirani (2004). Their algorithm uses semidefinite programming and required O($n^{[4.5]}$) time. Our algorithm relies on efficiently finding expander flows in the graph and does not solve semidefinite programs. The existence of expander flows was also established by Arora, Rao, and Vazirani.

3 - The Santa Claus Problem

Nikhil Bansal, IBM Research, PO Box 218, Yorktown, NY, United States of America, nikhil@us.ibm.com, Maxim Sviridenko

Suppose Santa Claus has a collection of items, and wishes to distribute them to children. Child i receives values pij from item j. If a child receives multiple items, her value is the sum of all the individual values. Santa's goal is to distribute items such that the least happy child is as happy as possible. In this talk I will describe some approximation algorithms for this problem.

4 - Minimizing Movement in Mobile Facility Location Problems

Zachary Friggstad, University of Alberta, 221 Athabasca Hall, University of Alberta, Edmonton, AB, T6G 2E8, Canada, zacharyf@cs.ualberta.ca, MohammadReza Salavatipour

In the mobile facility location problem we are given a set of clients and facilities located throughout a graph. The goal is to find destinations for the clients and facilities so that each client is sent to the same node as some facility while minimizing the total distance traveled by all clients and facilities. We present the first constant-ratio approximation algorithm for this problem and observe substantial lower bounds for this problem and a natural bottleneck variant.

■ TD40

M - Taylor

Complementarity Problems: Theory and Applications I

Sponsor: Optimization/ Linear Programming & Complementarity
Sponsored Session

Chair: Goran Lesaja, Associate Professor, Georgia Southern University, 203 Georgia Avenue, PO Box 8093, Statesboro, GA, 30460, United States of America, goran@georgiasouthern.edu

1 - Convergence of Time-stepping Schemes for Passive and Extended Linear Complementarity Systems

Lanshan Han, hanlsh@uiuc.edu, Alok Tiwari, Kanat Camlibel, Jong-Shi Pang

This talk provides an in-depth analysis of time-stepping methods for solving initial-value and boundary-value, non-Lipschitz linear complementarity systems (LCPs) under passivity and broader assumptions. The novelty of the methods and their analysis lie in the use of "least-norm solutions" in the discrete-time linear complementarity subproblems arising from the numerical scheme; these subproblems are not necessarily monotone and not guaranteed to have convex solution sets.

2 - Computing Safe Dike Heights at Minimal Costs

Kees Roos, Professordr., TU Delft, Mekelweg 4, Delft, ZH, 2628CD, Netherlands, c.roos@tudelft.nl, Ruud Brekelmans, Dick den Hertog

Safe dike heights are crucial for protecting life in the Netherlands and many other regions of the world. We discuss issues that arise when modeling the probability of floods, the expected damage and measures to prevent floods. Our aim is to minimize the sum of future investing costs and expected damage over a long period (of about 300 years). We present some MINLP optimization models and a dynamic programming model, as well as some computational results.

3 - An MINLP Approach for Optimizing Dike-segment Heights in the Netherlands

Dick den Hertog, Professordr.ir., University of Tilburg, PO Box 90153, Tilburg, NB, 5000 LE, Netherlands, D.denHertog@uvt.nl

Dikes in the Netherlands protect a large part of the country against the water. After the serious flood in 1953 a cost-benefit model was developed by van Dantzig to determine optimal dike heights. Recently, Eijgenraam improved and extended van Dantzig's model, to update the dike investment plan. We show how Eijgenraam's approach can be modeled as an MINLP problem. The goal is to minimize the sum of the expected loss for flooding and the costs of heightening the dikes. Preliminary numerical results are given. This talk extends results presented in the previous talk of this session to the multi-segment case.

4 - S-monotone Pivot Rules for Criss-cross Algorithm

Tibor Illes, tibor.illes@strath.ac.uk

Linear complementarity problems (LCP) are usually NP-hard problems. Using the concept of EP-theorem and the LCP duality theorem, we were able to generalize criss-cross algorithm, using a new class of pivot rules - called s-monotone pivot rules - for LCP problems with arbitrary matrices. The well known pivot rules like minimal index rule, LIFO and MOSV belongs to the class of s-monotone pivot rules.

■ TD41

M - Taft

Emerging Topics in NPD

Cluster: New Product Development
Invited Session

Chair: Raul Chao, University of Virginia - Darden School of Business, 100 Darden Blvd., Charlottesville, VA, United States of America, chaor@darden.virginia.edu

1 - Open Innovation: The Solver's Choice

Cheryl Druehl, Assistant Professor, George Mason University, School of Management, Fairfax, VA, 22030, United States of America, cdruehl@gmail.com

In Open Innovation, companies with problems (seekers) search for external individuals with solutions (solvers). Previous work has found that the problems require some expertise and having a higher number of solvers is better for the seeker. But solvers have many choices of problems as well as outside interests. What motivates them to participate and to choose a particular problem? We incorporate previous empirical findings as well as risk aversion into a model of solver choice.

2 - Visualizing Innovation Networks

Rahul C. Basole, Georgia Institute of Technology, 760 Spring Street NW, Atlanta, GA, 30332-0210, United States of America, rahul.basole@ti.gatech.edu, Verna Allee

Today's innovations occur in large, complex inter and intra-firm value networks. Visualization provides valuable insight to the structure, dynamics, and effective design of complex innovation networks. We present salient properties of innovation networks and provide illustrative visualization examples. Challenges and future research opportunities are discussed.

3 - Limits to Front Loading in a Product Development Pipeline

Nitin Joglekar, Boston University, 595 Commonwealth Avenue, Boston, MA 02215, United States of America, joglekar@bu.edu, Paulo Figueiredo

Management of NPD pipeline involves steering several promising projects through a sequence of screens. We explore the effects of relevant decisions in a 3-stage pipeline by varying screen thresholds, complexity of projects and managerial biases while adjusting utilization. Our analysis establishes convex relationships between portfolio value at the end of pipeline and global resource allocation and complexity variables, indicating a limit for front loading practices owing to congestion effects.

4 - New Product Development Management under Time Uncertainty

Leonardo P. Santiago, Assistant Professor, Federal University of Minas Gerais, Escola de Engenharia, Av. Antonio Carlos, 6627 - Pampulha, Belo Horizonte, MG, 31270-901, Brazil, lsantiago@ufmg.br, Thiago Augusto Silva

The development time is one of the key factors that contribute to the new product development success. In this context, the objective of the present paper is to evaluate the development process of new technologies under time uncertainty. The novelty in our approach is to thoroughly blend the stochastic time with a formal approach to the problem.

■ TD42

M - McKinley

Information Sharing and Forecasting in Supply Chain Management

Contributed Session

Chair: Xiaowei (Linda) Zhu, XZhu@wcupa.edu

1 - Benefits of Revealing Market Structure: Illusion of Isolated Retailers

Nuri Bora Keskin, PhD Student, Stanford University, 121 Campus Dr, Apt 3304B, Stanford, CA, 94305, United States of America, bkeskin@stanford.edu, Tayfun Keskin, Hau L. Lee

In this paper, we identify a new kind of uncertainty in the retail level of a supply chain: Market share belief for a new product. In a developing market where a retailer cannot perceive every other retailer in the market, we show how a manufacturer can benefit from revealing the market structure to small-sized, isolated retailers. We motivate our mathematical model by telecom firms targeting small to medium sized enterprises (SMEs) through small-scale channels such as dealers.

2 - The Values of Information Sharing within Supply Chains with Contract and Random Orders

Gary H. Chao, Associate Professor, Kutztown University, P. O. Box 730, Department of Management, Kutztown, PA, 19530, United States of America, chao@kutztown.edu

We consider a supply chain of a manufacturer, a retailer and some random customers. In addition to the long term contractual relationship with his retailer, the manufacturer would like to fulfill the orders from random customers. Through MDP and the myopic method, we can model the production/acceptance policies for the manufacturer under the information sharing or non-information sharing. We analysis the sensitivity from capacity, order size, penalty costs, unit profit and order arrival rate.

3 - Inventory Planning for a Product Based on Two-stage Demand Forecasting

Dogan Serel, Bilkent University, Faculty of Business Administration, Ankara, 06800, Turkey, serel@bilkent.edu.tr

We study a retail supply chain for a product ordered at two different times. The initial order is placed with a supplier using a preliminary demand forecast. Based on new demand information the initial order quantity for the product can be changed prior to the selling period. The retailer's problem is to determine the optimal stocking and price decisions so that its expected profit is maximized. We discuss the solution procedure, and present numerical examples.

4 - Truthful Demand Forecast Sharing in Complementary Demand-related Firms

Xiaowei (Linda) Zhu, XZhu@wcupa.edu, Samar Mukhopadhyay, Xiaohang Yue

We consider a market where two separate firms offer complementary goods in a Stackelberg mode. Each firm has private forecast information about the unknown demand and decides whether to share it with the other firm. We show that information sharing benefits the leader firm but hurts the follower firm as well as the total system if the follower firm shares information unconditionally. We then design an information sharing contract. We also provide sensitivity analysis in a simulation study.

■ TD43

M - Balcony D

Strategic Development Under Dynamic Complexity: Insights for Theory from Practice

Cluster: OR and Strategy

Invited Session

Chair: John Morecroft, Senior Fellow, London Business School, Regent's Park, London, UK, NW1 4SA, United Kingdom, jmorecroft@london.edu

1 - Dynamic Complexity in Love and Interfirm Rivalry

John Morecroft, Senior Fellow, London Business School, Regent's Park, London, UK, NW1 4SA, United Kingdom, jmorecroft@london.edu

A tiny model of dynamic complexity in a love relationship paves the way for modelling and simulation of interfirm rivalry in fast-moving consumer goods. Strategic insights into the launch of liquid soap products (and their growth dynamics) are reported. The role of modelling in such strategic development is discussed.

2 - Strategic Modeling to Support Investment Decision-making in New Technology

Joe Santoro, Dow Chemical, 31 Neudorfstrasse, Horgen, 8810, Switzerland, GSANTORO@dow.com

A model of the Biodiesel industry is used to understand the future development of the glycerine industry. Insights from the simulation are used to develop long term strategy to support a multi million dollar investment in new technology and a new chemical plant.

3 - Better Before Worse Performance Dynamics in Product Line Expansion Strategies

Shayne Gary, Australian Graduate School of Management, UNSW, Sydney, Australia, sgary@agsm.edu.au

We combine in-depth fieldwork and formal simulation modeling to develop a process explanation for poor performance results often encountered in product diversification strategies. Decision rules adopted by a global medical devices firm during a product line expansion are shown to generate 'better-before-worse' performance dynamics. This dynamic complexity undermines the strategy, even when the potential economies of scope benefits are significant.

■ TD44

M - Balcony C

Infrastructure Design for Risk Management

Cluster: Managing Disruptions in Supply Chains

Invited Session

Chair: Sang-Hyun Kim, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, sang.kim@yale.edu

1 - The Curse of Reliability: Outsourcing Restoration Services for Infrequent Equipment Failures

Sang-Hyun Kim, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, sang.kim@yale.edu, Morris Cohen, Serguei Netessine, Senthil Veeraraghavan

Manufacturing firms cannot afford significant operational downtime of mission-critical equipment. Although resolving problems quickly is essential to minimizing the impact of disruptions, incentivizing the suppliers to provide prompt restoration services is challenging because of infrequent nature of failures. We investigate contracting efficiency in this environment, and find that firms may face a paradoxical situation in which high equipment reliability corresponds to high contracting cost.

2 - Strategic Risk from Supply Chain Disruptions

Zigeng Yin, PhD Candidate, Northwestern University, 2145 Sheridan Road, Tech C231, Evanston, IL, 60208, United States of America, z-yin@northwestern.edu, Wallace Hopp, Seyed Iravani

Supply chain disruptions can result in both tactical (e.g., loss of short-term sales) and strategic (e.g., loss of long-term market share) consequences. In this talk, we present a model that captures the impact of supply disruptions on competing supply chains. We use our analytic and numerical results to highlight the situations that present the greatest risk and to identify policies for mitigating these risks.

3 - A Firm's Supply Chain Agility for Risk Management: Cultural Antecedents

Mike Braunscheidel, Assistant Professor, The College at Brockport, The State University of New York, 350 New Campus Drive, Hartwell Hall, Brockport, NY, 14420-2914, United States of America, mjbraunscheidel@verizon.net, Nallan C. Suresh

Agility has been touted as being a necessary component for risk management and mitigation in supply chains. Additionally, organizational culture is important for the adoption of organizational practices such as agility. In this paper, the effect of organizational culture, as measured by the competing values framework, upon four constructs important to agility is considered.

■ TD45

M - Balcony B

Empirical Research in Operations Economics

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management

Sponsored Session

Chair: Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu

1 - Operations Based Data and Earnings Prediction

Taylor Randall, University of Utah, Campus Center Drive, Salt Lake City, UT, United States of America, taylor.randall@business.utah.edu, Jim Cannon, Christian Terwiesch

This paper examines the importance and relevance of using operations based variables to predict future accounting earnings. We use the U.S. airline industry to show and identify what type of operational variables provide incremental predictive information beyond that which is found in earnings and accountings information. Further, we show that stock market analysts do not fully incorporate the predictive information found in certain operational variables into earnings estimates.

2 - Inverse Principal-Agent Paradigm: Application to Health Care Delivery

Donald Lee, Yale School of Management, 135 Prospect St, Box 208200, New Haven, CT, United States of America, dkklee@cantab.net, Stefanos Zenios

How should dialysis providers be paid for patient outcomes along multiple dimensions? Principal-agent models can in theory be used to construct a pay-for-performance system for Medicare's dialysis program, but little is known about the underlying model parameters. We develop a procedure for inferring the provider's cost parameters from its past outcomes, making it possible to implement the optimal payment system. Numerical results will be presented.

3 - Rank Versus Full Feedback in Procurement Auctions

Wedad Elmaghraby, University of Maryland, College Park, MD, Wedad_Elmaghraby@rhsmith.umd.edu, Elena Katok

There has been a move in recent years away from full feedback auctions (where bidders can see each others prices in realtime) towards rank feedback auction. Under Rank feedback, bidders see only their current bid ranking. Via experiments, we test the theoretical prediction of rank and full feedback when bidders have asymmetric quality and costs. We find that rank feedback, combined with uniform reserve prices, sometimes induces bidders to behave equivalently to a sealed-bid format.

4 - Empirical Analysis of a Combinatorial Auction

Marcelo Olivares, mo2338@columbia.edu, Rafael Epstein, Gabriel Weintraub, Daniel Yung

In this work we study a unique data set on the Chilean combinatorial auction for school meals, which runs every year to feed 1.3 million children with a budget of $200 million. We use bidding data to identify important features of the firms' cost structure. We use this information to evaluate changes to the allocation mechanism, such as changes in the set of combination bids allowed. More generally, our work shows how empirical analysis can be used to improve combinatorial auction design.

■ TD46

M - Balcony A

Collaborative Research with Industry in Operations Management

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Jeremie Gallien, MIT Sloan School of Management, 77 Massachusetts Avenue, Cambridge, MA, United States of America, jgallien@mit.edu

1 - Dynamic Supply Routing for a Make-to-order Manufacturing Network

Jeremie Gallien, MIT Sloan School of Management, 77 Massachusetts Avenue, Cambridge, MA, United States of America, jgallien@mit.edu, Rohit Bhatnagar, Teo Chee Chong, John Foreman, Julie Alspaugh, Charles Dubois

Dell's supply chain for desktops involves Asian vendors shipping components by sea to several U.S. plants. While suppliers are responsible for shipping enough inventory, Dell can reroute and expedite their shipments while in transit to balance inventory across sites and dynamically track geographic demand patterns. We present optimization models developed with Dell to address this routing challenge and some insights gained from their implementation.

2 - A Testbed for HP's Dual Channel Policies

Ozalp Ozer, Stanford University, Stanford, CA, United States of America, oozer@stanford.edu, Murat Kaya

We present results from collaboration between Hewlett Packard and Stanford University. We study how HP can manage its dual sales channels: a direct channel, hpshopping.com, alongside an independent retail channel. We determine optimum channel policies for HP under different channel scenarios. To this end, we develop a game-theoretic model and an experimental study. The approach allows HP to test channel policies with human decision makers before implementing it in the market place.

3 - Integrated Planning of Spare Parts and Tools for Corrective Maintenance of Capital Goods

Geert-Jan van Houtum, Professor, Eindhoven University of Technology, PO Box 513, Eindhoven, 5600 MB, Netherlands, G.J.v.Houtum@tue.nl, Ana Busic, Alan Scheller-Wolf, Ingrid Vliegen

We present on the inventory planning of spare parts and service tools by an Original Equipment Manufacturer in the semiconductor supplier industry. For the corrective maintenance of machines installed at customers, a quick provisioning of parts and tools is essential in order to realize high availabilities of the machines. We compare two methods that integrate the planning of parts and tools and show the benefits relative to a non-integrated planning.

4 - Supporting a Bundling, Lane and Price Sheet Strategy for a Fortune 500 Industrial Manufacturer

Sridhar Tayur, SmartOps Corporation, Suite 400, 12 Federal Street, One North Shore Center, Pittsburgh, PA, 15212, United States of America, stayur@smartops.com, Valerie Tardif, Alan Scheller-Wolf, Tallys Yunes, Masha Shunko, Natalya Trapp

One of the most exciting decisions in a Fortune 500 company is the setting of the annual price sheet: what products are to be sold, in what bundles, at what price and at what quoted lead times. The trade-off is increased revenue through more appropriate segmentation, product availability and pricing that more than off-sets the costs of increased complexity due to variety. A multi-year collaboration between Caterpillar, SmartOps and CMU has helped in the setting of the 2008/9 price sheet.

■ TD47

M - Hoover

Joint Session HAS/OPTIM: Preparing for Public Health and Medical Emergencies II

Sponsor: Health Applications Section, Optimization
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - Developing Federal Resource Allocation Strategies to Mitigate Cross-regional Pandemic Outbreaks

Alex Savachkin, Industrial Engineering, University of South Florida, 4202 E Fowler Ave, Tampa, FL, United States of America, savachki@eng.usf.edu, Tapas Das, Diana Prieto, Andres Uribe

We present a simulation based optimization methodology to develop strategies for deploying scarce federal resources (vaccines, anti-viral drugs, medical personnel, temporary hospital beds) during the spread of cross-regional pandemic outbreaks. The model is implemented on a four-city (Tampa, Miami, Jacksonville, and Orlando) outbreak and the effectiveness of the resulting allocation strategies is compared with that from existing governmental distribution policies.

2 - Analysis of Disease Transmission and Mitigation Strategies in a Clinical Facility

Chien-Hung Chen, Georgia Institute of Technology, Industrial & Systems Engineering, Atlanta, GA, United States of America, cchen@isye.gatech.edu, Eva Lee

We consider a local outbreak of a highly infectious disease (e.g., smallpox, pneumonic plague, pandemic flu), analyze the potential of disease propagation within a vaccination/drug distribution clinic, and provide insights on how to minimize this risk. We will demonstrate how mathematical modelling can help quantify this risk and assist in the design of an emergency clinic, and show the use of a real-time simulator for mounting an effective monitoring and response against such an event.

3 - Facility Layout and Design for Mass Dispensing for Biological Attack or Pandemic Outbreaks

Hannah Smalley, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, hkolberg3@isye.gatech.edu, Eva Lee

We analyze the clinic layout for mass dispensing of the general population against biological attack or pandemic outbreaks. This work is in collaboration with CDC researchers.

4 - Optimizing Health Care Delivery in Sub-Saharan Africa

Jacqueline Griffin, PhD Student, Georgia Institute of Technology, School of Industrial & Systems Engineering, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, jgriffin3@mail.gatech.edu, Martin Savelsbergh, Paul Griffin

Providing access to essential medicines and health treatments is a major challenge in Africa. Using an integer programming model, we explore the trade off between optimizing for "outcome" and for "fairness" given a limited health care budget. We also examine how delivery strategies are affected by infrastructure and spatial characteristics of a region.

■ TD48

M - Coolidge

Managing Knowledge-intensive Processes

Sponsor: Technology Management
Sponsored Session

Chair: Enno Siemsen, Assistant Professor, University of Illinois, 350 Wohler Hall, 1206 S. Sixth Street, Champaign, IL, 61820, United States of America, siemsen@uiuc.edu

1 - The Role of Informational Spillovers on Competitive R&D Search

Nektarios Oraiopoulos, Georgia Institute of Technology, 800 West Peachtree St., NW, Atlanta, GA, 30308, United States of America, nektarios@gatech.edu, Stylianos Kavadias

A long tradition in the economics literature has argued that knowledge cannot be fully contractible but it gets disseminated through noisy channels. While prior research has studied the impact of those informational spillovers on the R&D intensity, we focus on the direction of the R&D search path. Our analysis reveals strong path dependencies and characterizes the conditions under which a firm benefits from exploiting past research efforts (generated by rivals) versus exploring a new domain.

2 - Why Do We Rework? The Role of Some Dyadic Interactions at Work

Manuel Sosa, Associate Professor of Technology and Operations Management, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, manuel.sosa@insead.edu

Rework is the (full or partial) repetition of tasks due to arrival of new or updated information. I study the rework phenomenon at the dyadic level. What characterizes dyadic interactions that lead to rework? I examine knowledge-based and social networks determinants of rework in a software development organization.

3 - Decentralized Balancing of Complementary Tasks

Enno Siemsen, Assistant Professor, University of Illinois, 350 Wohler Hall, 1206 S. Sixth Street, Champaign, IL, 61820, United States of America, siemsen@uiuc.edu, Sridhar Balasubramanian, Pradeep Bhardwaj

Much is known about resource balancing in a centralized context. If decision making is decentralized, such as in white collar teams working on knowledge intensive projects, much less is known about how team members allocate resources and respond to their mutual interdependence. Two means of balancing are possible: either team members help out at the bottleneck, or they adjust their efforts to the bottleneck. We compare these two ways of balancing in a game theoretic framework.

■ TD49

M - Harding

Simulation and Application

Contributed Session

Chair: Hongbo Zhang, Industrial and Systems Engineering, Virginia Tech, 121 hearthstone drv APT 4, Blacksburg, United States of America, hbzhang@vt.edu

1 - Simulation Technologies in Customer-centric Branch Channel Reconfiguration

Jin Yan Shao, Dr., IBM China Research Laboratory, Diamond Building, Zhongguancun SoftPark, Beijing, BJ, China, shaojiny@cn.ibm.com, Ming Xie, Li Xia, Wenjun Yin, Jin Dong

Channel reconfiguration for service outlets is a complex decision-making process which integrates many dependant factors. It is hard to use mathematical models to find satisfied solutions. Simulation, as a typical nonparametric technology, is able to accommodate the elements that cannot be described by analytical models. After extensive simulations and what-if analysis, the solution candidates can be evaluated before implementation and the performance can be forecasted simultaneously.

2 - Restricted Bucket Brigades

Lindsay Àlvarez, Industrial Engineer, Universidad Distrital, Calle 64A # 57-23 Torre 10 Apto 503, Carrera 7 # 40-53 Piso 5, Bogotà, DC, 57, Colombia, lindsayalvarez@yahoo.com, Germàn Méndez

The Bucket Brigades as a way of organizing workers require some conditions in order to do an implementation in the real world. So, many systems have these features but is impossible to implement it strictly because of preempt the process is forbidden in each moment for many reasons. We analyze the case, when the process can be preempted only in a specific level of advance and identify the most important implications about the changes.

3 - A Web-based Stochastic Simulation Model for Evaluating Strategies to Address Aging Infrastructure

Patrick Delaney, Vice-President Analytic Solutions, Davies Consulting, 6935 Wisconsin Ave, Suite 600, Chevy Chase, MD, 20815, United States of America, pdelaney@daviescon.com, Wiko Kabiling

Electric utilities are faced with the challenge of managing aging assets whose performance is critical to system reliability. This paper presents a web-based simulation model for forecasting future capital replacement and maintenance costs as well as the impact on overall system reliability. The model incorporates the stochastic nature of failures as well as various strategies such as run-to-fail, proactive replacement and preventive maintenance.

4 - Development of Dynamic Value Pricing Model through Enhancements of TRANSIMS

Hongbo Zhang, Industrial and Systems Engineering, Virginia Tech, 121 hearthstone drv APT 4, Blacksburg, United States of America, hbzhang@vt.edu, Antoine Hobeika, Kwang-Sub Lee

The objective of this research is to enhance TRANSIMS to model HOT (high occupancy toll)lane applications using individual-based VOT (value of time) function. The transportation information for a segment of I-5 S from Hwy 217 to I-405 was used. A nonlinear VOT and dynamic toll rate that vary by level of volume-to capacity ratio were applied yielding the modified Dijkstra's algorithm. The model is able to present the dynamic toll rates and showed the impacts of various tolls on route choices.

■ TD50

M - Wilson C

Decomposition and Large Scale Optimization

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Samir Elhedhli, PhD Associate Professor, University of Waterloo, 200 University Ave. West, Waterloo, ON, N2L 3G1, Canada, elhedhli@uwaterloo.ca

1 - A New Lagrangean Approach to the Pooling

Hossa Almutairi, University of Waterloo, UW, Waterloo, Canada, halmutei@engmail.uwaterloo.ca, Samir Elhedhli

We present a new Lagrangean approach for the pooling problem where the resulting nonlinear subproblem is reformulated as an MIP. Besides being used to generate lower bounds, the subproblem solutions are exploited within Lagrangean heuristics. Valid cuts are added to the subproblem. The procedure is applied to a benchmark set of fifteen problems from the literature. The Lagrangean lower bound and the heuristics are on average 8.2% and 0.043% from the optimum, respectively.

2 - Column Generation for Large-scale MIP Reformulations

Bernard Gendron, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montréal, QC, H3C 3J7, Canada, Bernard.Gendron@cirrelt.ca, Antonio Frangioni

We present a general column generation algorithm to solve large-scale models that arise from well-known reformulation techniques in MIP, such as discretization and disaggregation. We compare this algorithm with the standard Dantzig-Wolfe method and show computational results on various instances of the multicommodity capacitated network design problem.

3 - A Hybrid Decomposition/ Genetic Algorithm for Minimax-regret Stochastic Programming

Helene Tokou, Student, The University of Iowa, Department of Computer Science, Iowa City, United States of America, htokou@engineering.uiowa.edu, Dennis Bricker

A minimax-regret stochastic program with binary first-stage decisions is solved using a genetic algorithm, where the fitness function is an outer linearization of the maximum second-stage regret. This function is first approximated using cross-decomposition (a hybrid algorithm incorporating subproblems of Benders' decomposition and Lagrangian relaxation) and further refined during the GA. Computational experience is described.

■ TD51

M - Wilson B

Pricing and Resource Allocation

Sponsor: Information Systems
Sponsored Session

Chair: Sanjukta Smith, Assistant Professor, SUNY Buffalo, 325 Jacobs Management Center, Buffalo, NY, 14260, United States of America, sdsmith4@buffalo.edu

1 - Identification and Prediction of Economic Regimes to Guide Decision Making in Multiagent Marketplace

Wolfgang Ketter, Rotterdam School of Management, Erasmus University, Rotterdam, Netherlands, WKetter@rsm.nl, Maria Gini, Paul Schrater, John Collins, Alok Gupta

We present an approach that enables software agents to make tactical decisions, such as product pricing, and strategic decisions, such as production planning. Using a combination of machine learning and optimization techniques, agents characterize economic regimes, which are microeconomic conditions reflecting situations such as over-supply or scarcity.

2 - Bidding in Online Slot Auctions

Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Vadim Cherapanov

We study optimal bidding in slot auctions run by search engines. These auctions are run as variants of second-price auctions but have been shown to be incentive incompatible. Thus advertisers have to be strategic about bidding. We present an analytical model to characterize the optimal bidding strategy and illustrate its application using real-world data. We find that the proposed strategies are very effective in practice.

3 - The Value of Online Social Commerce: An Empirical Investigation

Mingfeng Lin, University of Maryland, mingfeng@rhsmith.umd.edu, Siva Viswanathan

Social commerce, or e-commerce building upon online social networks, is starting to attract significant interest among practitioners and researchers. Drawing upon social-network theories and methodologies, we empirically examine the network features of some online social commerce websites and investigate in particular, their role in mitigating risk.

4 - Beyond Plug and Play: Alliances in the Software Market

Ashish Agarwal, 5000 Forbes Avenue, 357 Posner Hall, Pittsburgh, PA, 15213, United States of America, ashish1agarwal@cmu.edu, Tridas Mukhopadhyay, Pei-yu Chen

Consumers in software market can gain additional interaction utility when they buy multiple components that are also compatible. Choice of partners and the magnitude of interaction utility are strategic variables for the component vendors. We evaluate these choices in an oligopoly market for two components using a game-theoretical setup. We find that the vendors always prefer to have mutually exclusive links with higher interaction utility instead of forming links with all the vendors.

■ TD52

M - Wilson A

Role of Operational Research in Health Care and Development Assistance for Least Developed Countries: Insights and Panel Discussion

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es

1 - Examples of Operational Research in World Bank Health, Nutrition and Population Programs

Jed Friedman, Development Research Group, The World Bank, 1818 H Street NW, Washington DC, DC, 20433, United States of America, jfriedman@worldbank.org, Edit Velenyi

The inclusion of operational research in the design of World Bank sponsored health programs is growing increasingly common. This talk will review the motivation, goals, and common designs of such research as well as present salient examples from on-going and planned work.

2 - Demand Estimation for Point of Care CD4 Diagnostics

Megan O'Brien, Research Director, CSHOR, Clinton Foundation HIV/AIDS OR Initiative, 383 Dorchester Avenue, Suite 400, Boston, MA, United States of America, mobrien@clintonfoundation.org, Justin Cohen

Point of care (POC) CD4 count technologies in the development pipeline have the potential to expand and streamline HIV treatment in resource-limited settings. We estimated the likely demand ceiling and created uptake algorithms for different clinical settings to estimate demand at various product price points. We then used resource estimation models to describe the potential impact of POC products on system-wide costs, resource allocation, and throughput for HIV care and treatment programs.

3 - Discussion on Insights and Areas for Research

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es, Justin Cohen, Ozlem Ergun, Jed Friedman, Megan O'Brien, Edit Velenyi

The presenters and panelists discuss areas and opportunities where operations research, applied economics and management science can help in improving health and development outcomes in developing countries.

■ TD53

M - Nathan Hale- Wardman Tower

Credit Risk Modeling

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Vadim Linetsky, Professor, Northwestern University, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, linetsky@iems.northwestern.edu

1 - Optimizing a Portfolio of Credit Derivatives

Jack Kim, Stanford University, Terman Center, Stanford, CA, 94305, United States of America, jackkim@stanford.edu, Kay Giesecke

We develop computationally tractable methods for optimizing the future mark-to-market value of a portfolio consisting of credit derivatives such as credit swaps or collateralized debt obligations.

2 - Connecting the Top-down to the Bottom-up: Pricing CDO under a Conditional Survival (CS) Model

Steven Kou, Columbia University, 312 Mudd, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States of America, sk75@columbia.edu, Xianhua Peng

The current subprime mortgage crisis showed that prevalent CDO pricing models incorrectly valuated default risk. We propose a new dynamic model, the conditional survival (CS) model, which provides excellent calibration to both iTraxx tranche and underlying single name CDS on March 14, 2008, the day before the collapse of Bear Stern, when the market was highly volatile. The CS model generates strong correlation among underlying names and allows fast CDO tranche pricing through exact simulation.

3 - Time Changed Markov Processes in United Credit-equity Modeling

Rafael Mendoza, PhD Student, Northwestern University, 2145 Sheridan Rd. Room C151, Evanston, IL, 60208-3119, United States of America, rafaelmendoza2008@u.northwestern.edu, Vadim Linetsky, Peter Carr

Hybrid credit-equity models are developed with state-dependent jumps, local-stochastic volatility and default intensity based on time changes of Markov processes. We model the stock price process as a time changed Markov process with state-dependent local volatility and killing rate. When the time change is a Levy process in turn time changed with a time integral of an activity rate process, the stock price process has state-dependent jumps, stochastic volatility and default intensity.

4 - A Modeling Framework for Equipment Financing and Leasing with Default Risk

Vadim Linetsky, Professor, Northwestern University, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, linetsky@iems.northwestern.edu

We develop a modeling framework for financing and leasing big-ticket heavy equipment such as aircraft, ships, rail stock, etc. taking into account the risk of default as well as the collateral asset price risk. As an application, we present a model for the valuation of export credit guarantees in the aircraft sector.

■ TD54

M - Congressional - Wardman Tower

Advance Studies in Supply Chain II

Contributed Session

Chair: Baris Hasdemir, Isenberg School of Management, Finance and Operations Management, UMASS Amherst, Amherst, MA, 01003, United States of America, hasdemir@som.umass.edu

1 - Buyer's Option Selection and Purchasing Strategies with Mutiple Call Options Available

Xiangling Hu, Grand Valley State University, 100 Marin Center Dr. Apt 4, San Rafael, CA, 94903, United States of America, huxiangling@hotmail.com

In this paper, we analyze how the buyer select call options and how the buyer purchase from the spot market or implement its call options to maximize its profit when there are multiple bonds and some call options to choose from. We also evaluate the expected profit, the possible loss and the corresponding probability, and the expected best gain of the buyer and then we study how the order quantity, the expiration date, the strike price, and the premium influence buyer's decisions.

2 - A Larger Slice or a Larger Pie? An Empirical Investigation of Bargaining Power in the Distribution C

Michaela Draganska, Stanford University, Graduate School of Business, Stanford, CA, United States of America, draganska_michaela@gsb.stanford.edu

Departing from the standard empirical channel literature, which assumes that manufacturers set wholesale prices unilaterally, we explicitly model negotiations between manuf'ers and retailers. Nash bargaining determines wholesale prices. Margins are a function of demand primitives and of retailer and manuf'er barg power. Applying our model to the German ground coffee industry, we find that size is a key driver of bargaining power.

3 - Analysis of Future Air Cargo Demand in the United States

Joohyun Cho, Penn State Univ., 424 Waupelani Dr. APT O-310, State College, PA, 16801, United States of America, turtlev@gmail.com, Minseok Seo

Air cargo transportation has contributed in soaring international and domestic trade in the U.S. market. For this reason, extensive researches have been conducted to forecast the future demand. This research illustrates the future air cargo demand in the U.S. Based on the analysis of some significant factors affecting air cargo demand and the impact of Asian financial crisis and September 11, 2001 attacks, the future air cargo demand in the U.S. is forecasted over next 10 years.

4 - The Impact of Urbanization and Population Shifts on Supply Chain Infrastructure and Configuration.

Baris Hasdemir, Isenberg School of Management, Finance and Operations Management, UMASS Amherst, Amherst, MA, 01003, United States of America, hasdemir@som.umass.edu, Iqbal Agha

Over the next two decades the increase in populations of cities, where over half of the world's population now lives, is expected to be over fifty percent. The impact of population shifts and increasing urbanization on supply chain infrastructures in the US, whose top fifty cities have just over sixteen percent of the population, has not received due attention. We examine such impacts on the design of distribution systems using US population data.

5 - An Optimization Framework of the Box Sizing Problem for Supply Chain Reengineering

Mabel XU, Student, Hong Kong Univ. of Sci and Tech, Room312C, Tower A, HKUST, Clear Water Bay Road, Kowloon, Hong Kong, Hong Kong - China, xujing@ust.hk, Andrew Lim

The Box Sizing Problem is new in supply chain reengineering. To shift repacking from retailer side to supplier side, a redesign in size is needed for two layers of boxes. To decide the number of box types and the 3D sizes to maximize the volume utilization of containers for shipping, we build a Cut/Pack/Select framework and an IP model making use of a heuristic algorithm. We prove the sizes can be fixed before demand is realized. Numerical results show good solutions can be efficiently generated

■ TD55

M - Embassy- Wardman Tower

Networks & Graphs

Contributed Session

Chair: Alex Sprintson, Assistant Professor, Texas A&M University, TAMU 3128, College Station, TX, 77843, United States of America, spalex@tamu.edu

1 - A Network Model for a Graduate and Undergraduate Program Timetabling

Ilgin Acar, Doctoral Associate, Western Michigan University, Dept of IME College of Engineering and, Applied Science Parkview Campus, Kalamazoo, MI, 49008-5336, United States of America, ilgin.acar@wmich.edu, Ashley Hovenkamp, Steven Butt

We consider a class-timetabling problem for an Industrial and Manufacturing Engineering Department's graduate and undergraduate programs. The model includes constraints that take into consideration student perspectives, including student degree completion plans, and faculty course and timing preferences. Background will be briefly discussed, results and analysis will be presented.

2 - Group Chromatic Number of Multi-graphs

Hao Li, Phd Candidate, West Virginia University, 332 Green Str, Morgantown, WV, 26501, United States of America, hli@math.wvu.edu

Let G be a graph with an orientation and let A be a group. The graph G is A-colorable if for any function f:E(G)->A, there is a function c:V(G)->A such that for every directed e=uv, c(u)-c(v) does not equal to f(e). The group chromatic number O_g/x2 of a graph is the minimum m such that G is A-colorable for any group A of order at least m under a given orientation. In this paper, we investigated the properties of O_g/x2 and found an upper bound for multi-graphs, especially K_5-minor free graphs.

3 - Branch and Price Mechanism for Multimodal Transportation Problem

Ashwin Arulselvan, University of Florida, 303 weil hall, Gainesville, FL, 32611, United States of America, ashwin@ufl.edu, Panos Pardalos, Lily Elefteriadou

We provide a branch and price mechanism to solve the multimodal transportation problem. We consider private cars and buses as carriers and we determine the optimal paths of cars and frequencies of pre-established bus routes. The problem is specifically applied to management of events such as emergency transportation, evacuation and establishing exit routes for stadiums on a game-day.

4 - Fast Methods for Constructing Efficient Network Codes Using Path-based Assignments

Alex Sprintson, Assistant Professor, Texas A&M University, TAMU 3128, College Station, TX, 77843, United States of America, spalex@tamu.edu, Mohammad Asad R Chaudhry, Salim ElRouayheb

We present efficient algorithms for network coding in multicast networks using path information. Our methods allow to find feasible network codes in near-linear time, but require a higher field size than the previous solutions. We show applications of the proposed techniques in network security, design of reliable network codes, as well as for establishing dynamic multicast connections.

■ TD56

O - Blue Room

Intelligent Map Segmentation and Transportation

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: John Carlsson, Stanford University, 238 Ayrshire Farm Ct, Apt 101, Stanford, CA, United States of America, johngcarlsson@stanford.edu

Co-Chair: Yinyu Ye, Stanford University, Management Science and Engineering, stanford, ca, 94305, United States of America, yyye@stanford.edu

1 - Distributed Vehicle Routing for Street-level Map Scanning

Dongdong Ge, Stanford University, 37 Angell Ct Apt 201, STANFORD, CA, 94305, United States of America, dongdong@stanford.edu

Recently, large-scale instances of the Chinese Postman Problem (CPP) have become of significant practical importance for internet-based map companies in scanning roads to generate street-level views of a location in a map. We describe a two-stage method for distributing CPP among a group of vehicles that balances workloads between vehicles and attempts to minimize the time spent at intersections.

2 - Generalized Convex Equitable Partitions and Applications

John Carlsson, Stanford University, 238 Ayrshire Farm Ct, Apt 101, Stanford, CA, United States of America, johngcarlsson@stanford.edu

We have previously developed an algorithm for finding a convex partition that divides a convex polygon into n convex pieces, each having equal area and containing one element of a given point set. The initial motivation for this problem is a vehicle routing heuristic. In a related problem (also motivated by vehicle routing), we require each piece to contain a fixed amount of points and an equal fraction of the area of a polygon. We describe an algorithm that solves this problem polynomially.

3 - Robust Partitioning for Stochastic Vehicle Routing

Erick Delage, Stanford University, Packard 069, Stanford, CA, United States of America, edelage@stanford.edu, Yinyu Ye, John Carlsson

We consider the problem of region assignment for stochastic vehicle routing. In our framework, one wishes to assigned regions of the territory to a number of vehicles prior to knowing the actual location of demand points. Based on historical realizations of demand, our approach suggests formulating a set which is known to contain the true distribution of demand and finds an optimal partition which guarantees a maximum TSP cost over the set of vehicles for any of the distributions in this set.

4 - A Fast Swap Heuristic for Location-allocation Problems Using Spatial Indices

Rahul Nair, Graduate Student, University of Maryland, 1173 Glenn Martin Hall, College Park, MD, 20742, United States of America, rahul@umd.edu, Elise Miller-Hooks

We present a fast swap heuristic for the location-allocation problems that uses a spatial index. By maintaining additional information at nodes of the spatial index, the number of swap evaluations can be reduced significantly compared to traditional exchange implementations. These gains are attractive since swap procedures are the mainstay of heuristic approaches to the problem. These results indicate the role of specialized heuristics for spatial problems.

■ TD57

O - Blue Room Prefunction

Joint Session AAS/TSL: Equity and Fairness in Air Traffic Flow Management

Sponsor: Aviation Applications, Transportation Science & Logistics Sponsored Session

Chair: Michael Hanowsky, MIT, 77 Massachusetts Ave, Room 1-235D, Cambridge, MA, 02139, United States of America, hanowsky@MIT.EDU

1 - An Equity-based Algorithm to Plan A Ground Delay Program under Uncertainty

Avijit Mukherjee, Associate Research Scientist, University of California Santa Cruz, NASA Ames Research Center, Mail Stop 210-8, Moffett Field, CA, 94035, United States of America, avijit@ucsc.edu, Michael Ball, Robert Hoffman

This paper presents an algorithm for allocating landing slots to aircraft during ground delay programs. It is shown that the algorithm minimizes total expected delay, when there is a probability of the ground delay program canceling earlier than originally planned. A constrained version of the algorithm address both equity and efficiency of slot allocation. Experiments performed with realistic flight schedules exhibit superior overall performance of the algorithm compared to existing procedures.

2 - Correcting Flight Exemption Bias in Ground Delay Programs

Michael Brennan, Chief Scientist, Metron Aviation, Inc., 131 Elden Street, Herndon, VA, 20170, United States of America, brennan@metronaviation.com

When executing Ground Delay Programs for airports FAA traffic managers often hedge against uncertain weather by exempting long-distance flights from imposed delays. This introduces an inequitable distribution of delay among carriers. We describe here a Lagrangian relaxation approach to providing equity for all carriers while hedging against risk.

3 - Fair Allocation Algorithm to Support Proposed LGA Slot Reassignment

Shin-Lai Tien, University of Maryland, Dept of Civil and Environmental Eng, College Park, MD, 20742, United States of America, alextien@umd.edu, Michael Ball

The FAA has proposed the use of market-based mechanisms to both alleviate delay and maintain competitive access at LaGuadia airport. Under the proposal, a percentage of air carrier slots revert to the FAA over time. We propose a fair allocation process for specifying this slot transfer.

4 - Computational Approaches to ATFM with Fairness Constraints

Douglas Fearing, PhD Student, MIT Operations Research Center, 77 Massachusetts Ave., Cambridge, MA, 02139, United States of America, dfearing@mit.edu, Constantine Caramanis

In this talk we analyze the national ATFM problem with fairness constraints derived from the industry-standard RBS approach. Prior research has shown that there are nice computational properties of the network ATFM model. With the introduction of fairness constraints, we find that many of these properties are lost. In order to regain computationally tractability, we develop two techniques that apply not only with fairness considerations, but also to the general network ATFM problem.

5 - GDP Fairness In Consideration of Passengers

Michael Hanowsky, MIT, 77 Massachusetts Ave, Room 1-235D, Cambridge, MA, 02139, United States of America, hanowsky@MIT.EDU, Eugene Gilbo

Ground delay programs have significant impacts on passengers. In current practice, however, the FAA does not explicitly consider the delay-related costs incurred by passengers; but permits airlines to adjust assigned delays (where passengers may be considered). We show that if the FAA were to directly consider the delays incurred by passengers, it could be substantially reduce (30-40%) the overall delay cost incurred by passengers during a GDP.

■ TD58

O - Capital

Joint Session AAS/TSL: Stochastic Optimization in Aviation

Sponsor: Aviation Applications, Transportation Science & Logistics Sponsored Session

Chair: Senay Solak, Assistant Professor, University of Massachusetts - Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, solak@som.umass.edu

1 - A Scenario Based Approach for Scheduling in a Fractional Ownership Program

Fei Qian, ISyE Georgia Tech, Atlanta, GA, gtg120s@mail.gatech.edu, Ozlem Ergun, Ellis Johnson, William Hall

In the recent years although the fractional aircraft ownership programs as a whole has experi-enced significant growth, most of the major fractional jet management companies have been un-profitable. Two major drivers for high operating costs are the stochasticity in demand and the high number of daily unscheduled maintenance events. We discuss a stochastic programming approach based on generating scenarios and solving the scheduling problem for minimizing the expected cost over these scenarios.

2 - Optimal Arrival Stream Spacing for Continuous Descent Approach (CDA)

John-Paul Clarke, Associate Professor, Georgia Institute of Technology, 270 Ferst Drive NW, Atlanta, GA, 30332-0150, United States of America, johnpaul@gatech.edu, Liling Ren, Senay Solak

We describe an optimization model and solution methodology to determine target spacing values for arriving aircraft in a Continuous Descent Approach (CDA) implementation. Assuming a sequence of metering points during the arrival procedure and given probability distributions of deviation in trajectories, the problem deals with the determination of target spacing values such that the total expected fuel burn cost required to achieve desired spacing is minimized.

3 - Stochastic Speed Optimization for Continuous Descent Arrival Spacing

Marcus Lowther, Research Engineer, Georgia Institute of Technology, 270 Ferst Dr. NW, Atlanta, GA, 30332, United States of America, marcus.lowther@gmail.com, John-Paul Clarke, Liling Ren

Successful implementation of continuous descent arrivals requires precise spacing of aircraft at a metering point near the top of descent. We present the details of and computational results for a stochastic program to determine the fleet-wide, fuel burn-optimal speed changes required upstream of the metering point to achieve the desired spacing.

4 - Environmental Factors in Stochastic Optimization Problems in Air Transportation

Terry Thompson, Director, Strategic Development, Metron Aviation, 45300 Catalina Court, Suite 101, Dulles, VA, 20166, United States of America, thompson@metronaviation.com

We discuss on-going research in stochastic optimization problems in air transportation involving both operational efficiency and environmental goals and constraints. The environmental perspective involves objectives associated with climate, local air quality, and noise effects. These objectives operate on significantly different time scales and across different affected populations, leading to challenging problem formulations.

■ TD59

O - Embassy Room

Game Theory for Networks and Services

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Parijat Dube, IBM T J Watson Research Center, Yorktown Heights NY, 10598, pdube@us.ibm.com

Co-Chair: Rahul Jain, rahul.jain@us.ibm.com

1 - Information Concealing Games
Saswati Sarkar, Associate Professor, University of Pennsylvania, 200 S. 33rd St., Philadelphia, PA, 19104, United States of America, swati@seas.upenn.edu, Eitan Altman

We consider a system with two players that have different information about the state of the system. Each player needs to chose the amount of information it reveals about the system state to the other player subject to certain system constraints. We show that the decision problems for the entities can be formulated as a signaling game, and provide policies that attain the perfect Bayesian equilibrium of this game.

2 - Mechanism Implementing in Nash Equilibria the Optimal Centralized Solution of a Supply Chain Problem
Shrutivandana Sharma, PhD Student, University of Michigan, Department of EECS, 1301 Beal Ave., Ann Arbor, MI, 48109, United States of America, svandana@umich.edu, Volodymyr Babich, Mark Van Oyen, Demosthenis Teneketzis

We study the coordination of production decisions for multiple products among many manufacturers and many suppliers, each with private information about its own objective and its own production capabilities. We do not assume a probabilistic model on the beliefs of each decision maker regarding asymmetric information. We discover a game form (mechanism) which implements in Nash Equilibria the solution of the corresponding centralized supply chain problem.

3 - Dynamic Spectrum Allocation for Cognitive Radio
Richard La, Associate Professor, University of Maryland, A. V. Williams Bldg. Department of ECE, University of Maryland, College Park, MD, 20742, United States of America, hyongla@eng.umd.edu, Sung Chun

We study the problem of dynamically re-allocating underutilized spectrum in cognitive radio. Primary users can re-sell a portion of purchased spectrum when it is underutilized to recover parts of their cost. Interested primary users can cooperate among themselves to auction away available spectrum to secondary users that are assumed selfish. We investigate if there is an incentive for the primary users (sellers) to cooperate to increase their expected revenue.

4 - Queueing Game Models for Differentiated Services
Parijat Dube, IBM T J Watson Research Center, Yorktown Heights NY, 10598, pdube@us.ibm.com, Rahul Jain

We develop queueing game models and a framework to study competition between network providers, each of whom offer multiple (differentiated) classes of service.We study the pricing (or Bertrand) game between the providers. A Nash equilibrium may not exist in general but we provide sufficient conditions for its existence.

■ TD60

O - Hampton Room

Dynamic Pricing Strategy

Contributed Session

Chair: Nagihan Comez, Bilkent University, Bilkent, Ankara, 06800, Turkey, comez@bilkent.edu.tr

1 - Dynamic Pricing Strategy for Subscription-based Information Goods
Ziping Wang, UW-Milwaukee, PO Box 742, Milwaukee, WI, 53201, United States of America, wangz@uwm.edu, Samar Mukhopadhyay

An IT company, which rolls out a new information product to individual customers, needs to price the product each stage to maximize its revenue. With dynamic programming approach, we find the company's revenue increases in the expected length of the product's life cycle. In addition, the optimal pricing decreases monotonically at each stage and corresponding demand increases when renewal rate is higher; however the optimal prices may fluctuate over its life cycle when renewal rate is lower.

2 - Dynamic Cross-selling and Pricing with Promotional Products
Lerzan Ormeci, Koc University, Sariyer, Istanbul, TR, 34450, Turkey, lormeci@ku.edu.tr, Ferda Tanguner, Zeynep Aksin

We consider a firm which sells a "regular product" with unlimited inventory, a "promotional product" with limited inventory, and a service with unlimited inventory. The firm cross-sells every regular-product customer either a promotional product or a service or both in a bundle at a dynamically adjusted price. Our aim is to decide which item to offer and at which price in order to maximize the total expected revenue over a finite horizon by using the Markov Decision Processes.

3 - Dynamic Pricing of Substitutable Products under Logit Demand
Minsuh Suh, University of Michigan, 1205 Beal ave, Ann Arbor, MI, 48109, United States of America, mssuh@umich.edu, Goker Aydin

We consider the problem of dynamically pricing two substitutable products over a predetermined, finite selling season. We use a choice model that captures the effect of prices and stock-outs on customer choice. Interestingly, the optimal price of a product may decrease as the end of the season approaches or the other product's stock level decreases. We prove, however, that the optimal price difference between the two products and the optimal purchase probabilities behave in predictable ways.

4 - Price Alteration of Inventories as an Emergency Action
Nagihan Comez, Bilkent University, Bilkent, Ankara, 06800, Turkey, comez@bilkent.edu.tr, Kathryn E. Stecke

We study the dynamic pricing strategy as a hedge to demand-supply mismatch by approaching from the demand side in a price dependent demand market. While a competitive market price is charged under regular inventory levels, during the long order lead time, a retailer may apply a temporal price change to better utilize current inventory and optimize his expected profit. Our interest is to gain insight about the benefits of dynamic pricing and its effects on regular replenishments.

5 - Optimal Fences and Joint Price and Inventory Decisions in Distinct Markets with Demand Leakage
Michael Zhang, Dr., Saint Mary's University, 903 Robie Street, Halifax, NS, B3H3C3, Canada, michael.zhang@smu.ca

This paper addresses the simultaneous determination of price and inventory replenishment when a firm faces demand from distinct market segments where it can set different prices. The firm uses fences to maintain separation of its market segments but we assume that the fences are imperfect. We show the impact of imperfect fences on the firm's profitability, and show that there can be an optimum cost to the firm of maintaining fences to limit demand leakage.

■ TD61

O - Calvert Room

Decision and Operations for Evacuation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Pam Murray-Tuite, Assistant Professor, Virginia Tech, 7054 Haycock Road, Falls Church, VA, 22043, United States of America, murraytu@vt.edu

1 - A DSS for Workforce Scheduling at an Emergency Services Call Center
Gerald Evans, Professor, University of Louisville, Department of Industrial Engineering, Louisville, KY, 40292, United States of America, gwevan01@louisville.edu

This presentation describes a simulation-based tool for workforce scheduling at an emergency services calling center for a large metropolitan area. The tool also employs an optimization model which allows for the analysis of tradeoffs between two objectives: 1) minimization of the fraction of calls which are not answered within 12 seconds, and 2) minimization of the number of call taker hours scheduled.

2 - Reducing No-notice Evacuation Time by Relocating Family Dependents to More Assessable Sites
Sirui Liu, Virginia Tech, 7054 Haycock Road, Falls Church, VA, United States of America, lius77@vt.edu, Pam Murray-Tuite

Under no-notice disasters, dependents in facilities such as schools and daycare centers usually wait for their families to pick them up. This pattern increases individual evacuation time and might cause extra delay for other vehicles, and therefore increases total evacuation time. This study focuses on reducing total evacuation time by relocating dependents to more accessible sites. A mathematical program to select the optimal sites is presented.

3 - Insights from the Development of the Behavior-robust Adaptive EvacuationTraffic Management
Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Pitu Mirchandani

Real-world route choice behavior during evacuation has not been fully understood. Most existing models, descriptive or prescriptive in nature, do not necessarily produce accurate performance measures due to the lack of realism in the evacuation route choice behavior modeling. In this talk we attempt to shed the light on how adaptive traffic management strategy could lead to robust evacuation performance regardless of the lack of accurate behavior modeling capability.

4 - Modeling of Consolidation by Household for Emergency Evacuation Events

Ke Liu, PhD Student, University of Maryland, 1173 Martin Hall, Department of Civil Engineering, College Park, MD, 20742, United States of America, ke.liu@fhwa.dot.gov, David Lovell, Peter Chang

Evacuation studies have grown in importance over the years.One effective method to evaluate different evacuation strategies is the use of simulation.In this study,we develop a computerized tool for modeling evacuation dynamics with household consolidation,and then incorporate it into a traffic-simulation software platform.This tool will allow a percentage of the population to consolidate as a family before they evacuate.

■ TD62

O - Governor's Boardroom

Revenue Management and Pricing Games

Sponsor: Revenue Management & Pricing (Sponsored/Invited) Sponsored Session

Chair: Victor Martinez de Albeniz, Assistant Professor, IESE Business School, Av. Pearson 21, Barcelona, 08034, Spain, valbeniz@iese.edu

Co-Chair: Guillaume Roels, UCLA, Anderson School of Management, Los Angeles, CA, 90095, United States of America, groels@anderson.ucla.edu

1 - Inter-temporal Pricing and Consumer Stockpiling

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

We study a dynamic pricing problem for a class of products with stable consumption patterns over an infinite time horizon (e.g., household items, staple foods). Consumers may stock up the product at current prices for future consumption, but they incur inventory holding costs. We analyze the firm's equilibrium pricing strategies and consumers' equilibrium stockpiling strategies.

2 - Managing Revenues in Alliances under Incomplete Information

Christopher Wright, Simon Graduate School of Business, University of Rochester, Rochester, NY, 14627, United States of America, WRIGHTC1@simon.rochester.edu, Harry Groenevelt, Robert Shumsky

We examine dynamic transfer price schemes in airline alliances, under the assumption that the airlines do not share information about demand forecasts and inventory. We explore the airlines' equilibrium policies under this game and compare the policies, as well as the overall performance of the alliance, to both the centralized control (first-best) alliance and an alliance that shares complete information.

3 - Selling to Conspicuous Consumers

Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu, Necati Tereyagoglu

We model the value of stockouts for products which are consumed or purchased conspicuously. We examine the influence of scarcity on the valuation of the customer for the product, leading to its effects on the demand, and pricing and production decisions of a monopolist.

4 - Competing for Shelf Space

Victor Martinez de Albeniz, Assistant Professor, IESE Business School, Av. Pearson 21, Barcelona, 08034, Spain, valbeniz@iese.edu, Guillaume Roels

We study competition for shelf space in a multi-supplier retail point. We consider a retailer that seeks to allocate its shelf space among different products to maximize its profit. To obtain larger shelf space allocations, product manufacturers can set lower wholesale prices, thereby increasing the retailer's profit margin on their products. We analyze the competitive dynamics arising from the scarcity of space.

■ TD63

O - Congressional B

Clustering and Vehicle Routing

Sponsor: Transportation Science & Logistics Sponsored Session

Chair: Ahmad Jarrah, Associate Professor, George Washington University, Department of Decision Sciences, Washington, DC, 20052, United States of America, jarrah@gwu.edu

1 - Integrated Sourcing and Delivery Planning for Bulk Materials

Xiajun Amy Pan, PhD Student, University of Texas at Austin, IROM Department, 1 University Station B6500, Austin, TX, 78712-0212, United States of America, Xiajun.Pan@phd.mccombs.utexas.edu, Anant Balakrishnan

Given the full-load material requirements for a set of geographically-dispersed customers and available sources of supply, we address the problem of selecting suppliers for each customer, sequencing material pickup and delivery operations to meet customer demand on time at minimum procurement, transportation, and delivery cost. We formulate the problem as an integer-programming model, develop model enhancements, and provide computational results to demonstrate the effectiveness of our approach.

2 - Cyclic-order Neighborhood Search for Vehicle Routing Problems

Justin Goodson, University of Iowa, S210 Pappajohn Bldg., Iowa City, IA, 52242, United States of America, justin-goodson@uiowa.edu, Jeffrey Ohlmann, Barrett Thomas

We examine the use of a cyclic-order solution representation for solving VRPs. Using simulated annealing, we obtain high quality solutions for the VRP and the VRP with stochastic demands. We propose an updating procedure and demonstrate its ability to reduce the computational expense of our approach. We also present computational results that show that cyclic order neighborhoods are superior to traditional route-based neighborhoods with respect to their ability to minimize fleet size.

3 - An Empirical Analysis of Real-time Heuristics for the Dynamic Traveling Salesman Problem

Barrett Thomas, Assistant Professor, University of Iowa, W272 Pappajohn Business Bldg, Iowa City, IA, 52242- 199, United States of America, barrett-thomas@uiowa.edu, Emanuele Manni, Gianpaolo Ghiani

We compare real-time dynamic insertion heuristics to sample-scenario planning under varying degrees of dynamism. With the objective of maximizing the number of late-requesting customers served, the goal of our research is to show under what conditions the more computationally intensive and more managerially demanding sample-scenario approach offers significant benefits. We also explore the benefits of stochastic information in the development of a priori tour for the insertion approach.

4 - Pickup and Delivery Work Area Segmentation via Constrained Contiguous Clustering

Ahmad Jarrah, Associate Professor, George Washington University, Department of Decision Sciences, Washington, DC, 20052, United States of America, jarrah@gwu.edu, Jonathan Bard

The focus of this problem class is that of partitioning a region into geographically contiguous sub-areas while optimizing an objective measure and adhering to capacity constraints. The motivating application is that of large pickup-and-delivery networks involving thousands of loads each day. A column-generation based heuristic approach is developed to address large-scale instances of the problem. Modeling paradigms, solution schemes and computational experiences are discussed.

■ TD64

O - Congressional A

Advances in Warehouse Design I

Sponsor: Transportation Science & Logistics Sponsored Session

Chair: Kevin Gue, Associate Professor, Auburn University, Department of Industrial and Systems Eng, Auburn, AL, 36830, United States of America, kevin.gue@auburn.edu

1 - Multi-floor Facility Layout Technique with Location Matrix

Takashi Irohara, Associate Professor, Sophia University, 7-1 Kipi-cho, Chiyoda-ku, Tokyo, 1028554, Japan, irohara@sophia.ac.jp

In this paper, a new layout design methodology was proposed, in which detailed locations of departments and ELVs can be decided simultaneously, by using the integrated approach of combinatorial optimization and mathematical programming approaches. In addition, it is also considered to select the ELV used in each pair of departments in different floors.

2 - The Performance of New Warehouse Aisle Designs with Turnover-based Storage Policies

Russell Meller, University of Arkansas, 4207 Bell Engineering, Department of Industrial Engineering, Fayetteville, AR, 72701, United States of America, rmeller@uark.edu, Letitia Pohl, Kevin Gue

Turnover-based storage policies can reduce the average travel time in traditional warehouses. The question we investigate is whether these policies can be effectively applied to the new warehouse aisle designs, flying-V and fishbone. We use a heuristic search to determine the turnover-based layout in a warehouse with the new aisle designs. Our results indicate that the average travel time is reduced by applying turnover-based storage policies in the new warehouse aisle designs.

3 - Simultaneous Optimization of Warehouse Layout and Control Policies

Kees Jan Roodbergen, Rotterdam School of Management, PO Box 1738, Rotterdam, 3000DR, Netherlands, kroodbergen@rsm.nl, Soren G. Johansen, G. Don Taylor

We present a design method for the simultaneous optimization of warehouse layout and control policies in a general warehouse environment. A screening and selection procedure is employed to reduce computational requirements. It is demonstrated that a robust improvement in performance can be obtained as measured by the average travel distances.

4 - The Optimal Shape for a Middle Aisle in a Warehouse with Multiple Pickup & Deposit Points

Kevin Gue, Associate Professor, Auburn University, Department of Industrial and Systems Eng, Auburn, AL, 36830, United States of America, kevin.gue@auburn.edu, Russell Meller, Goran Ivanovic,

We show how to configure the middle aisle in a unit-load warehouse to minimize expected travel distance when travel can begin or end from many points on one side of the warehouse, as, for example, when doors are arranged to form a shipping dock. We show that there is a benefit to considering new aisle designs, but the benefit is more modest than in the single point case.

■ TD65

M - Virginia A

Bucket Brigade Production Systems

Cluster: Workforce Flexibility/Management
Invited Session

Chair: Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg

1 - Dynamics of Bucket Brigades in Systems with Fixed Stations

Esma Gel, Associate Professor, Arizona State University, Dept of Industrial Engineering, Tempe, AZ, 85287, United States of America, Esma.Gel@asu.edu, Erika Murguia, Dieter Armbruster

We study the dynamics and throughput of a bucket brigade when work has to be conducted in stations that can only be occupied by a single worker. We first analyze the case of two worker lines, and extend some results to more general systems. We provide several managerial insights on the performance of bucket brigades in such environments using the amount of blocking that the line incurs under various assumptions.

2 - Impact of Product Stocking Decisions on a Bucket Brigade in an E-commerce Fulfillment Warehouse

Scott Webster, Syracuse University, Whitman School of Management, Syracuse, NY, 13244, United States of America, stwebste@syr.edu, Robert Ruben, Kum-Khiong Yang

Bucket brigade order picking is a method for retrieving orders from a storage rack. We analyze how the manner in which products are stocked in the rack affects the output rate. We identify conditions where stocking decisions can have a large impact on the output rate and conditions where the impact is minimal. Conditions associated with high impact are high variation in worker skill, high variation in product line volume, and a moderate level of walking-to-picking work content per pick list.

3 - A Mixed Integer Programming Formulation to Balance a Dynamic Production Line with Discrete Tasks

Natasa Vidic, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, United States of America, nav9@pitt.edu, Bryan Norman

In this research we focus on a serial production environment with dynamic worksharing, similar to bucket brigade systems. We develop a mixed integer programming formulation that models one-cycle balanced line behavior where workers exchange parts at exactly one position. This formulation is extended to incorporate multiple production lines. We also developed a two-cycle formulation that models a condition when workers exchange parts at exactly two positions in a periodic manner.

4 - Cellular Bucket Brigades

Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg

Workers in a bucket brigade production line perform unproductive travel when they walk to get new work from their colleagues. Excessive unproductive travel could hurt the throughput of the line significantly. We propose a new design of bucket brigade production lines in which this unproductive travel is reduced and so a higher level of throughput can be attained with fewer and slower workers.

■ TD66

O - Cabinet Room

Spreadsheet Possibilities: Best Practices & Future Directions

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: Jeffrey Keisler, Assoc. Professor, Univ. of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA, 02125, United States of America, Jeff.Keisler@umb.edu

1 - The Spreadsheet as a Smart Programming Language for OR Applications

Thomas Grossman, tagrossman@usfca.edu

We explore when spreadsheets can be the programming language of choice for OR models. Drawing on the 2008 Interfaces special issue on spreadsheet applications of MS/OR, we describe examples of high-impact OR application using spreadsheets. We discuss the features of the spreadsheet computer programming language, and explain why Excel is an integrated development environment, a rapid-development language, and a 4th-generation language.

2 - Spreadsheet Formula Generation

Raymond Payette, Retired, 107-3825 ave des Compagnons, Quebec, QC, G1X 5E4, Canada, raypayette@hotmail.com

Spreadsheets are intelligent and clever. They can detect many input errors and propose solutions. They can monitor data input from a text, a database or the Internet and trigger a specified action. They can generate the appropriate formulas when a specific term is entered; accordingly terms used in formulas should be standardized; if the user enters the word "Total" at the top of a column, the spreadsheet would enter the correct formula in the proper cells without the user's intervention.

3 - The Future of Spreadsheet Modeling: A Presentation and Facilitated Discussion

Jeffrey Keisler, Assoc. Professor, Univ. of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA, 02125, United States of America, Jeff.Keisler@umb.edu, Patrick Noonan

What could spreadsheet modelers do, what would they like to do, and what will they do in the future? We will speculate on how spreadsheet modeling may change with changes in technological capabilities, user capabilities, user needs and user generated ideas. In the near term, some concepts that have already been demonstrated will become mainstream. To think about the long term, we need to think broadly about the concept of the spreadsheet.

■ TD67

O - Forum Room

Network Design and Location Analysis for Supply Chain Management

Sponsor: Location Analysis
Sponsored Session

Chair: Erhan Kutanoglu, The University of Texas at Austin, 1 University Station C2200, Austin, TX, 78712, United States of America, erhank@mail.utexas.edu

1 - Pool Points for Peeps: A Network Design Model for a Candy Supply Chain

Lawrence V. Snyder, Assistant Professor, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, larry.snyder@lehigh.edu

We discuss a network design model built and implemented for a candy company with a national distribution network. The model chooses which pool points (distribution centers) to use, which customers to serve direct and which to serve LTL, which shipping arcs to use (incurring a fixed cost), and the timing and routing of trucks through the network. We present the model and solution methods and discuss data-processing challenges and implications of the solution for the company's supply chain.

2 - Efficient Metaheuristics for Large-scale Integrated Network Design and Inventory Stocking Problems

Erhan Kutanoglu, The University of Texas at Austin, 1 University Station C2200, Austin, TX, 78712, United States of America, erhank@mail.utexas.edu, Yi Sui, Wes Barnes

Integrated logistics network design and inventory stocking problems are computationally challenging due to their size and inherent complexity, especially due to service level constraints. Considering that exact methods take prohibitely long time to even find a feasible solution to such problems, we develop a reactive tabu search-based method that finds near-optimal integrated solutions. In this talk, we present our preliminary but promising tabu search results.

3 - Methods for Assessing Inventory Pooling Effects in Facility Location

Michael Bucci, PhD Student, North Carolina State University, 3300 Drexel Hill Court, Apex, NC, 27539, United States of America, mbucci@nc.rr.com, Donald Warsing, Michael Kay, Reha Uzsoy

We investigate several approaches for computing inventory levels that account for pooling effects in facility location models with uncertain demand. We assess the "Square Root Law," a more general concave cost function, and the explicit inventory cost calculation, comparing overall solution cost/structure, solution time, and computational effort. We then extend our analysis to explore inventory pooling effects in models with inter-customer correlation in demand.

■ TD68

O - Senate Room

Joint Session MK/Information Systems: Marketing Science and the Google Online Marketing Challenge

Sponsor: Marketing Science, Information Systems
Sponsored Session

Chair: Jamie Murphy, Associate Professor, University of Western Australia, School of Business, M261, Stirling Highway, Crawley, WA, 6009, Australia, jmurphy@biz.uwa.edu.au

1 - Marketing Science and the Google Online Marketing Challenge Overview

Jamie Murphy, Associate Professor, University of Western Australia, School of Business, M261, Stirling Highway, Crawley, WA, 6009, Australia, jmurphy@biz.uwa.edu.au

This lively session focusing on the Google Online Marketing Challenge, a global student competition, will interest marketing scientists in two complementary areas - teaching and research. The inaugural Challenge comprises about 10,000 students in 400 universities and 40 countries. After a brief overview of the Challenge and search advertising, the panelists will share marketing science applications in search advertising and a meta-analysis of about 2,000 advertising campaigns in the Challenge.

2 - Overview of Search Engine Marketing

Theresa Flaherty, Professor of Marketing, James Madison University, MSC 0205, Department of Marketing, COB, Harrisonburg, VA, 22807, United States of America, flahertb@jmu.edu

This overview provides a brief introduction to search engine marketing (SEM) and discussion of some of the current trends and practices. Two distinct, but interrelated, SEM strategies will be presented: Search Engine Optimization (SEO) and Paid Search (PPC). Additional topics include key phrase identification, site submission, optimization caveats, sitemap protocol, Google AdWords, relevant SEM metrics, and link building strategies.

3 - Geographical Challenges of Online Advertising

Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu

Online firms are keen on understanding different geographical markets from where their customers come from and how their preferences vary across these markets. Such an understanding can be useful in developing the right product mix and targeting the right customers, through local market advertising, direct marketing, and cross channel promotion. We will discuss why geography matters online and we will outline different challenges of online advertising in a spatially-connected world.

4 - Google Online Marketing Challenge Scoring and Results

Alex Scott, Quant Analyst, Google, Inc, 1600 Amphitheatre Pkwy, Mountain View, CA, 94043, United States of America, alexscott@google.com, Lizzy Van Alstine

The Google Online Marketing Challenge is a global student AdWords competition developed by professors from across the globe in collaboration with Google. We will give an overview of the challenge and then briefly discuss the scoring algorithm employed to score student Advertisers around the world. We will also show distributions and results by region for the competition and end with key insights we took away from the competition and its results.

5 - Marketing Science Research Opportunities in Search Marketing

Jim Oliver, Google, Inc, 1600 Amphitheatre Pkwy, Mountain View, CA, 94043, United States of America, joliver@google.com

Thanks to Google's massive scale of personalized search advertising, and the digital nature of the data, the researcher's problem is no longer gathering data. Similar to the early days of scanner data, the problem is tackling the data. The challenges and opportunities are abundant. This presentation will highlight a few of the data sources, modeling issues and research opportunities associated with Google's flagship advertising vehicle, AdWords.

Wednesday, 8:00am - 9:30am

■ WA01

M - Marriott Ballroom 3

Financial Engineering II

Contributed Session

Chair: Hongming Huang, Assistant Professor, National Central University, Department of Finance, NCU, Jung-Li, 320, Taiwan - ROC, hongming@ncu.edu.tw

1 - Optimal Cash Management under Uncertainty

Anshuman Chutani, Student, University of Texas at Dallas, School of Management, PO Box 830688, SM 30, Richardson, TX, 75083, United States of America, axc059000@utdallas.edu, Alain Bensoussan, Suresh Sethi

The problem of optimal investment in two types of assets over time is formulated as a stochastic optimal control problem. The two assets considered are a bank account and stocks. The earnings derived from stocks consist of two parts, an increase in value of stocks and a dividend stream in form of cash. The randomness in return on stocks is modeled as a standard Brownian motion. Using the stochastic maximum principle an explicit decision rule of bang-bang type is derived for optimal investments.

2 - Valuing Australian Real Options in Infrastructure Project Government Guarantee Based on O-U Process

Li Gong, Doctoral Student, The School of Management Xian Jiaotong University, Xian Jiaotong University 2308#, Xi'an, 710049, China, gongli.xjtu@gmail.com, Guoxing Zhang, Ju-e Guo

This paper introduces Ornstein-Uhlenbeck (O-U) process into Australian option pricing theory, constructs multi-period and min-revenue government guarantee value model in infrastructure project, by Dynamic-Programming (D-P) method, (long-term balanced level and return speed of revenue) and the constraint of executive time has significant impact on government guarantee value, which provides an effective way to calculate the government guarantee value.

3 - A Multigrid Method for Reconstructing Local Volatility

Zaiwen Wen Wen, Columbia University, 500 West 120th Street, New York, 10027, United States of America, zw2109@columbia.edu

The aim of this paper is to identify the volatility function in Dupire's equation from given option prices. The inverse problem is formulated as an infinite dimensional minimization problem with PDE constraints. To solve the problem effectively, a multigrid method is presented to explore the hierarchical structures of the discretized problems on different levels. Numerical results are presented to demonstrate the efficiency of the proposed method.

4 - Bivariate Option Pricing under Regime-switching Copulas

Hongming Huang, Assistant Professor, National Central University, Department of Finance, NCU, Jung-Li, 320, Taiwan - ROC, hongming@ncu.edu.tw, Howard Qi, Chih-Wei Huang

This paper develops approaches for pricing bivaraite contingent claims under Switching-Regime ARCH (SWARCH) of Ramchand and Susmel (1998) and Switching-Regime Mixed Copulas (SWMC) of Rodriguez (2007). Our approaches are illustrated with better-of-two-markets options(max options) by Monte-Carlo simulations. The numerical results will be compared with the results obtained from the standard close-form formula, e.g.: Johnson (1987), Stulz (1982).

5 - Pricing in a Discrete-time Illiquid Market

Selim Gokay, Koc University, Rumelifeneri Yolu Sariyer, Istanbul, 34450, Turkey, selimgokay2003@yahoo.com, Mete Soner

We focus on the discrete time superreplication problem in an illiquid market. We use the supply curve developed by Cetin, Jarrow and Protter. In the continuous time setting Cetin, Soner and Touzi showed that under certain restrictions on the admissibility class there is a liquidity premium. We show that in the discrete-time framework one has the same liquidity premium in the limit without any constraints on the admissibility class.

■ WA03

M - Marriott Ballroom 1

Military Applications I

Contributed Session

Chair: Eduardo Pasiliao, Air Force Research Laboratory, 101 West Eglin Boulevard, Eglin AFB, United States of America, pasiliao@eglin.af.mil

1 - Unguided Air-to-ground Weapon Releases: Analysis of Usual Probability Distribution Hypothesis

Hélcio Vieira Junior, ITA - Tecnological Institute of Aeronautics, Praça Marechal Eduardo Gomes, 50, Vila das Acàcias, São José dos Campos, SP, 12228-900, Brazil, helcio@ita.br, Ricardo Sutério, Karl Heinz Kienitz, Mischel Carmen Neyra Belderrain

This work aims to proven, by using Design of Experiments and Monte-Carlo Simulation techniques, of a so far unverified statement of Driels (Weaponeering: Conventional Weapon System Effectiveness. AIAA, 2004) about the probability distribution of weapon releases: "the usual assumption made in the analysis of accuracy data is that the distributions of impact points in range and deflection is Gaussian, or normal, and there is no cross correlation, that is, they are independent in these directions".

2 - Improving Maintenance Decision Making in the Finnish Air Force through Simulation

Ville Mattila, Researcher, Systems Analysis Laboratory, Helsinki University of Technology, Otakaari 1M, 02150 Espoo, Finland, Espoo, Finland, ville.a.mattila@hut.fi, Tuomas Raivio, Kai Virtanen

We use discrete-event simulation to model the maintenance of fighter aircraft and improve maintenance-related decision making within the Finnish Air Force. The model supports maintenance designers in studying the impact of maintenance resources, policies, and operating conditions on aircraft availability. Thus, it advances the operational capability of the aircraft fleet. The main challenge of this simulation study was the scarcity and confidentiality of data needed in model construction.

3 - High Leverage Interventions: Three Operations Researchers Take Defensive Action

David Lane, Dr, London School of Economics and Political Science, Houghton Street, London, WC2A 2AE, United Kingdom, d.c.lane@lse.ac.uk

Three cases from the history of OR are examined, all concerning defensive systems: Blackett and the air defence of Britain in WWII; Forrester and the SAGE system for North America in the Cold War; Archimedes' work resisting the siege of Syracuse during the Second Punic War. The talk considers how the individuals' accomplishments in other fields shaped their defence work, and how personal and situational factors influence the successful implementation of OR interventions.

4 - A Stochastic Combat Simulation with Heterogeneous Weapon Systems

Yoon G. Hong, Professor, Department of ISE at Hansung University, 389 2-Ga, Samseon-dong, Seongbuk-gu, Seoul, 136-792, Korea, Republic of, yhong@hansung.ac.kr, Yong-Hun Chung

Heterogeneous weapon systems are considered in a modeling of combat simulation. Empirical data may be available from real field exercises and these can be utilized in a manageable way in the analysis of stochastic combat situation. Some sets of weapon systems are applied to this study to compare the output measures between existing results and the one from the proposed model. This study is an essential work to develop a series of mini battles combat situation.

5 - Parallel Processing for the Multidimensional Assignment Problem

Eduardo Pasiliao, Air Force Research Laboratory, 101 West Eglin Boulevard, Eglin AFB, United States of America, pasiliao@eglin.af.mil

The multidimensional assignment problem (MAP), which arises in the multitarget multisensor tracking problem, is an NP-complete extension of the classical linear assignment problem. We propose approaches for dividing the computational effort over multiple processors. The proposed solutions approaches are based on specific forms of tree-based representations of the MAP, which allow for efficiently decomposing its feasible set into several regions.

■ WA04

M - Delaware B

Joint Session PPP/Voting: Access and Accountability Issues in Presidential Elections

Sponsor: Public Programs and Processes, Voting, Elections, and Political Institutions

Sponsored Session

Chair: Theodore Allen, Associate Professor, Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, allen.515@osu.edu

Discussant:

Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

1 - Case Study in Ohio Establishing Voting Allocation Methods For the USA

Theodore Allen, Associate Professor, Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, allen.515@osu.edu, Mike Bernshteyn

We describe our real world case study to apply queuing theory and operations research that will affect approximately one half million people in Franklin County Ohio, where Columbus is. We show how pretty good allocation based on machine utilization will likely avoid the discrimination experienced in 2004. We also describe how simulation generated a useful warning spurring helpful actions by government and campaign officials.

2 - National Election Scorecard

Edward Mulrow, National Opinion Research Center, 4350 East-West Highway, Suite 800, Bethesda, MD, 20814, mulrow-edward@norc.org, Fritz Scheuren

Typically, in every recent election, we have been inundated with polling results. The focus of these has been on the potential winning candidate and who will or did vote for him or her. Seldom have there been surveys that asked voters about the voting experience itself. This paper discusses a proposal for such a poll. Issues of design are covered, with sampling and especially nonsampling issues given prominence. There have been smaller efforts of this sort in 2004 and 2006, but not a national attempt. Our focus then will be on what in other contexts might be called a national customer satisfaction survey. Key here, of course, is obtaining the interviews before the winners are announced.

3 - Route Designs for Delivery of Optical Scan Voting Machines

Michael Fu, Professor, University of Maryland, College Park, University of Maryland, College Park, MD, 20742, United States of America, mfu@umd.edu

The 2002 Help America Vote Act required election boards to move to electronic voting by 2006. This change greatly increases the operational complexities of administering elections. We describe our work with Hamilton County, Ohio, to (1) solve a vehicle routing problem with time windows problem to deliver optical scanning voting machines; and (2) modify the means in which poll workers choose machine delivery times in order to gain greater flexibility in our solutions.

■ WA05

M - Virginia B

Optimization in Finance

Sponsor: Optimization/ Nonlinear Optimization
Sponsored Session

Chair: Victor de Miguel, Associate Professor, London Business School, Regents Park, London, UK, United Kingdom, avmiguel@london.edu

1 - Arbitrage Bounds on European Basket Options via Linear Programming

Javier Pena, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, jfp@andrew.cmu.edu, Luis Zuluaga, Juan Vera

We provide efficient linear programming formulations for computing sharp upper and lower bounds on the price of an European basket option, given prices of similar options and absence of arbitrage. Our approach yields closed-form solutions for special cases of the problem. It also enables the modeling of features such as options with negative weights and bid/ask spreads.

2 - Stochastic Risk-factor Model for Portfolio Optimization

Miguel Lejeune, Assistant Professor, United States of America, mlejeune@gwu.edu

We propose a stochastic risk-factor asset allocation model. We consider the cases in which the asset returns have skewed probability distribution and/or investment constraints are imposed. We derive a solution method. Numerical results will illustrate its efficacy.

3 - Improving Portfolio Performance by Constraining the Portfolio Norms

Victor de Miguel, Associate Professor, London Business School, Regents Park, London, UK, United Kingdom, avmiguel@london.edu, Francisco Nogales

To reduce the impact of estimation error on portfolio performance, we propose computing the portfolios that minimize the sample variance subject to the additional constraint that the norm of the portfolio-weight vector must be smaller than a certain threshold. We show that these portfolios generalize several policies from the literature. Our empirical results show that the proposed portfolios perform very well out-of-sample.

■ WA06

M - Virginia C

Auctions in Marketing - Information

Cluster: Auctions
Invited Session

Chair: Peter Popkowski Leszczyc, University of Alberta, 4-20F School of Business, Edmonton, AB, T6G2R6, Canada, ppopkows@ualberta.ca

1 - The Effect of Information on Bidding Aggressiveness in Auctions

Chun Qiu, McGill University, chun.qiu@mcgill.ca, Peter Popkowski Leszczyc

This study investigates the effect of information on bidding behavior in auctions. Several studies examine the impact of seller supplied information on auction outcomes and bidder valuations. We identify instances where, contrary to auction theory, bidders bid more aggressively when less information is provided.

2 - Understanding the Impact of Promotional Messages in Internet English Auctions

Eric Greenleaf, Professor of Marketing, New York University, 40 West 4th Street, New York, NY, 10012, United States of America, egreenle@stern.nyu.edu, Sha Yang, Caroline Ducarroz

Auctioneers often direct promotional messages at bidders and potential bidders during live and internet auctions. We model the impact of these messages on bidder behavior, auction prices, and future messages in the auction. We distinguish between informational and urging messages, propose that messages influence prices through dual paths, and that auctioneers issue messages depending on past auction events and messages. We test the model using data from real-time internet auctions.

3 - Data Mining, Automated Bidding and the Cost of Information

Wolfgang Jank, University of Maryland, 4322 Van Munching Hall, College Park, MD, 20742, United States of America, wjank@rhsmith.umd.edu, Louiqa Rashid, Shu Zhang, Avigdor Gal

We discuss an automated bidding strategy for online auctions. The strategy is based on a data mining model for predicting price in competing auctions in a forward-looking manner. In order to make accurate decisions, the model needs information as input, ideally real-time information that is most up-to-date. In this research, we investigate the costs of such information in making bidding decisions and their impact on extracting maximum consumer surplus.

■ WA07

M - Maryland A

Scheduling For Competitive Advantage

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Neil Geismar, Assistant Professor, Mays Business School, Texas A&M University, College Station, TX, United States of America, NGeismar@mays.tamu.edu

1 - Capacitated Models for Designing Dispatching Rules for Semiconductor Fab

Jayant Kalagnanam, IBM Research, 1101 Kitchawan Rd, Yorktown Hts 10591, United States of America, jayant@us.ibm.com, Soumyadip Ghosh, James Luedtke

Semiconductor fabs are typically managed using priority based dispatching. We introduce a linear program to optimize the throughput while managing the product mix and use this solution to set priorities.

2 - A Scheduling Model for Order Processing Operation at Blockbuster

Casey Chung, University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75083, United States of America, chc022000@utdallas.edu, Chelliah Sriskandarajah

Blockbuster distribution maintains multiple processing and packing operations which must be scheduled through a variety of parallel departments which compete for subsequent merge conveyors and sortations systems. We describe here the creation and implementation of a short range scheduling model developed for Blockbuster which uses mixed integer programming which has resulted in annual cost savings of over $1.5 million in addition to an increased system capacity of over 21%.

3 - Using Integer Programming to Evaluate the Impact of the Fed's New Currency Recirculation Policy

Mili Mehrotra, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, United States of America, mxm057000@utdallas.edu, Milind Dawande, Chelliah Sriskandarajah

The Fed's new currency recirculation policy came into effect from June 2007. We evaluate the impact of two main components of this policy: recirculation fees and custodial inventories. Using a mixed-integer linear programming model, we analyze the currency supply network and offer managers of depository institutions with effective cyclic policies for their transactions with the Fed.

4 - Comments on the Complexity of Revenue Maximization under Two Movie-screening Policies

Tharanga Rajapakshe, University of Texas at Dallas, 800 West Campbell Road, Richardson, Tx, 75080-3021, United States of America, tharanga@utdallas.edu, Milind Dawande, Chelliah Sriskandarajah, Inna Drobouchevitch

We consider the problem of the selection and scheduling of movies for a multiplex to maximize the exhibitor's cumulative revenue over a fixed planning horizon. We investigate two popular screening policies: preempt-resume and non-preempt. We show that the problem of optimizing under the non-preempt policy is polynomially solvable while that under the preempt-resume policy is strongly NP-hard. Using a comprehensive test bed of realistic instances, we compare the revenues from these two policies.

■ WA08

M - Maryland B

Interface between Finance, Operations and Risk Management

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Anupam Agrawal, University of Illinois at Urbana Champaign, Champaign, Champaign, IL, United States of America, anupam@illinois.edu

1 - Integrating Long-term and Short-term Contracting in Fed-cattle Supply Chains

Onur Boyabatli, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, Singapore, oboyabatli@smu.edu.sg, Paul Kleindorfer, Stephen Koontz

This paper analyzes the optimal contracting portfolio choice of a meatpacker in fed-cattle supply chains. The meatpacker can source cattle from option-like, unreliable marketing agreement contracts and from the spot market on the spot day. We incorporate several particularities of fed-cattle supply chain (quality and cost differences between different contracted cattle, substitutability between beef products etc.).

2 - Capacity Planning with Financial Hedging in Offshoring/ Outsourcing

Letian Wang, PhD Student, McGill University, 1001 Sherbrooke Street West, Montreal, QC, H3A1G5, Canada, letian.wang@mail.mcgill.ca, Shanling Li

Multinational firms often sell their products in foreign countries and the prices of the products have to be denominated to local currencies. When the exchange rate and demand for the product in foreign countries are uncertain, the firms may engage in both operational and financial hedging. In this research, we develop an analytical model to demonstrate when and how a risk-averse firm may use financial hedging contract to mitigate the risk in the exchange rate.

3 - Incentive and Quantity Decisions for Remanufacturing in Closed-loop Supply Chains

Onur Kaya, Asst. Professor, Koc University, Eng 206, Rumelifeneri Yolu, Sariyer, Istanbul, 34450, Turkey, okaya@ku.edu.tr

We consider a manufacturer producing original products using virgin materials and remanufactured products using returns where the amount of returns depend on the incentive offered. We determine the optimal value of the incentive and the optimal production quantities in a stochastic demand setting with partial substitution. We analyze 3 different models in centralized and decentralized settings. We also analyze coordinating contracts and present our computational findings.

4 - Risk Trade-offs between Duration and Resource Idleness in Linear Projects

Pandelis Ipsilandis, Professor, Technological Education Institute of Larissa, School of Business, Larissa, 41110, Greece, ipsil@teilar.gr

Linear repetitive projects employ resources used in a sequential manner. Thus effective resource management is very important both in terms of project cost and duration. Existing methodologies (CPM, RSM) optimize the schedule with respect to a single factor, duration or work continuity. Here we present a multi objective model that takes into consideration cost elements regarding duration, idle time of resources, and delays in unit deliverable's, to define a range of alternative schedules.

5 - The Sourcing Hub and Supplier Networks

Anupam Agrawal, University of Illinois at Urbana Champaign, Champaign, Champaign, IL, United States of America, anupam@illinois.edu, Arnoud Meyer, Luk Van Wassenhove

In this paper, We explore the concept of the sourcing hub. We model non-cooperative and cooperative sourcing hub scenarios, anchoring to our three-year empirical work and examine the resulting profits along the supply chain. Overall, my results show that active management of upstream sourcing can add value to supply chains.

■ WA09

M - Maryland C

Monitoring and Diagnosis Methods for Quality Control

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Yong Chen, University of Iowa, 2138 Seamans Center, Iowa City, IA, 52242, United States of America, yongchen@engineering.uiowa.edu

1 - Diagnosis of Process and Sensor Faults in Manufacturing Processes

Shan Li, University of Iowa, Iowa City, IA, 52242, United States of America, shanli@engineering.uiowa.edu, Yong Chen

This paper presents a Bayesian variable selection based diagnosis approach to identify process mean shift fault and sensor mean shift fault simultaneously in manufacturing processes. The potential process faults and sensor faults always outnumbers the number of sensor measurements. The proposed approach utilizes the fact that only a few process and sensor faults can occur simultaneously. A guideline on how to select the values of hyperparameters in the Bayesian variable selection is also given.

2 - On-sensor Data Processing for Efficient System Monitoring

Yu Ding, Associate Professor, Texas A&M University, Industrial and Systems Engineering, 3131 TAMU, College Station, TX, 77843, United States of America, yuding@iemail.tamu.edu, Chiwoo Park

Wireless sensor networks become more and more popular in the applications of monitoring, detection, and diagnosis. On-sensor data processing and reduction is critical for a wireless sensor network to fulfill its monitoring mission efficiently because of the network's power and communication limitations. This talk discusses a few on-sensor data processing techniques that can help remove data redundancy in a sensor network and reduce the data transmission rate.

3 - Multivariate Process Capability Analysis with Non-Parametric Bootstrap Method

Wenzhen Huang, Assistant Professor, University of Massachusetts Dartmouth, Dartmouth, MA, United States of America, whuang@umassd.edu, Ankit Pahwa, Zhenyu (James) Kong

A method is proposed to analyze multivariate process capability (MPC). For a MP process the widely used Cp, Cpk for individuals do not provide complete conformance information. Yield is used for simultaneous conformity in MPC evaluation. A non-parametric bootstrap method is developed, i.e., approximating the pdf by sampled data and a kernel model and sampling the pdf for yield estimation. A case study compares the estimated yield from 50 samples with the benchmark from a Beta distribution.

4 - Optimal Variance Sensitive Condition Based Maintenance via Simulation

Nan Chen, University of Wisconsin Madison, Room 3255, 1513 University Ave, Madison, WI, 53705, United States of America, nchen3@wisc.edu, Shiyu Zhou, Yong Chen, Zhiguo Li

In this paper, variance sensitive condition based maintenance policies are considered to better control the risk and plan for the budget. Instead of traditional methods, a simulation optimization approach is given to find the optimal solution and investigate the sensitivity of the parameters.

■ WA10

M - Room 8206

Energy Models in a Carbon Constrained World

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Julian Barquin, Comillas University, Alberto Aguilera, 23, Madrid, Ma, 28015, Spain, julian.barquin@iit.upcomillas.es

1 - Economic and Emissions Implications of Load-based, Source-based and First-seller Emissions Trading Programs under California AB32

Yihsu Chen, University of California, Merced, 5200 N. Lake Rd., Merced, CA, United States of America, yihsu.chen@ucmerced.edu, Andrew Liu, Benjamin F. Hobbs

In response to Assembly Bill 32, California is considering three types of carbon emissions trading programs: load-based, source-based, and first-seller. We formulate a market equilibrium model for each of the approaches, considering transmission limitations and emissions trading, analyze their properties, and show the equivalence of the three approaches. The equivalence results show that load-based trading has no inherent advantage compared to other systems in terms of costs to consumers, contrary to claims elsewhere.

2 - Average Cost Based Power Contracts Can Mitigate Carbon Leakage

Yves Smeers, Professor, Universite Catholique de Louvain, 34 Voie du Roman Pays, Louvain la Neuve, 1348, Belgium, smeers@core.ucl.ac.be, Giorgia Oggioni

Electricity intensive industries have responded to the introduction of the EU-ETS by asking for special power contracts whereby they would be supplied from dedicated power capacities at average (capacity, fuel, transmission and emission allowance) cost. We model this situation on a prototype power system calibrated on four countries and show that this can constitute a partial remedy to their treat of leaving the EU to environmentally more tolerant countries.

3 - Corporate Investment Behaviour under Climate Change Policy Risk

Janne Kettunen, London Business School, Regents Park, London, NW1 4SA, United Kingdom, jkettunen@london.edu, William Blyth, Derek Bunn

We analyze the effects of policy and regulatory risk on investment behavior in the electricity sector. We derive a multistage stochastic optimization model with uncertainty in carbon price. We demonstrate how the effects of various carbon policies and market instruments on investment can depend on the characteristics of the companies, and therefore may promote market structure as well as technology change.

4 - Selling Wind Power in Mid-term Energy Auctions

Javier Garcia-Gonzalez, Professor, Comillas University, Alberto Aguilera, 23, Madrid, 28015, Spain, javier_garcia_gonzalez@yahoo.es, Miguel Vazquez, Tomas Gomez

Displacement of fossil fuel generation technologies by intermittent renewable sources, and more specifically wind power, requires new methodologies in order to successfully provide base-load energy. We present a novel approach, focused on procurement of regulated demand.

■ WA11

M - Room 8209

Environment and Energy I

Contributed Session

Chair: Deniz Tursun, Research Assistant, University of Illinois Urbana-Champaign, Energy Biosciences Institute, 1206 W. Gregory Ave., Urbana, IL, 61801, United States of America, umitdeniz.tursun@gmail.com

1 - The Expected Value of More Informative Observations in Presence-absence Studies

David Tomberlin, NOAA Fisheries, 1315 East West Highway #12339, Silver Spring, MD, 20910, United States of America, david.tomberlin@noaa.gov

Presence-absence surveys are often used to estimate the probability that an area is inhabited by protected species, thus requiring special management. Because more accurate surveys are more expensive, managers face a trade-off between the costs and benefits of more-informative surveys. We apply a partially observable Markov decision process to estimate the value of better observations in presence-absence surveys of the marbled murrelet, an endangered bird that nests in old-growth forest.

2 - Modeling the Market Potential of Renewable Electricity

Walter Short, Principal Researcher, National Renewable Energy Laboratory, 1617 Cole Blvd, Golden, CO, 80401, United States of America, Walter_Short@nrel.gov, Nate Blair

NREL has developed the WinDS model for the sequential optimization through time of generation and transmission capacity expansion in the electric sector with an emphasis on the primary issues associated with renewable electric technologies - resource intermittency and transmission. This model addresses these issues using 358 regions and a statistical approach to the reserves required by renewables. WinDS was the primary analytical tool used for the DOE 20% Wind Energy by 2030 Study.

3 - Optimal Routing in Residential Rain Barrel Delivery

Luiz Freitas, Graduate Student, University of Illinois, Urbana-Champaign, Department of Ag. and Consumer Economics, Urbana, IL, 61801, United States of America, lfreita2@illinois.edu, Hayri Onal, Amy Ando

The City of Chicago has, among its water conservation measures, a subsidized rain barrel program that requires residents to pick up purchased rain barrels at distribution centers. We use the results of an econometric study of rain barrel adoption in Chicago to estimate the cost effectiveness and increase in barrel adoption if barrels are delivered to residents' homes rather than picked up. We solve the problem of optimal routing of barrel delivery using a MIP model.

4 - Food vs. Energy: Beginning of a Global Crisis

Deniz Tursun, Research Assistant, University of Illinois Urbana-Champaign, Energy Biosciences Institute, 1206 W. Gregory Ave., Urbana, IL, 61801, United States of America, umitdeniz.tursun@gmail.com, Xiaoli Liao, Hayri Onal

In recent years consumers, especially in developing countries, are hit with a double shock of higher food prices and higher oil prices. We address this issue using a dynamic economic simulation model involving multiple interacting international subsystems and investigate the impacts of increased bioenergy production on food markets and resource utilization in a global perspective.

■ WA12

M - Room 8212

DEA Applications & Theory

Cluster: Data Envelopment Analysis

Invited Session

Chair: Warren Sutton, PhD Candidate, Unversity of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, wsutton@umich.edu

1 - Handling Estimated Proportions in DEA Via Monte Carlo Sampling

Mehmet Ceyhan, PhD Candidate, Northeastern University, 150 Huntington Ave Apt #NG9, Boston, MA, 02115, United States of America, ceyhan.m@neu.edu, James Benneyan

Frequently data envelopment analysis is conducted on empirical data that are either proportions, estimated, or both. When proportional rates are estimated either from a sample of data or by expert judgment, point and interval estimates for efficiency scores, projection targets, and reference sets can be developed via Monte Carlo sampling. We illustrate this approach on several data sets taken from literature.

2 - Embedding Preferences in DEA: A Penalty Function Approach to Restricting Weights

Warren Sutton, PhD Candidate, Unversity of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, wsutton@umich.edu, Stanko Dimitrov

Traditional DEA models assume total flexibility in selection of weights, however this assumption can lead to several variables being ignored in determining the efficiency score. Existing methods constrain weight flexibility thus removing possible feasible solutions, but the proposed method does not effect feasibility.

3 - Testing the Regular Ultra Passum (RUP) Law with a Convex DEA-technology

Ole Bent Olesen, Professor, University of Southern Denmark, Department of Business and Economics, Campusvej 55, Odense M, DK 5230, Denmark, ole@sam.sdu.dk, Niels Christian Petersen

The nature of scale properties in DEA is at focus. DEA may have some irregular properties concerning the shape of the optimal scale curve/the M-locus. Imposing a maintained hypothesis of the Regular Ultra Passum (RUP) law (R. Frisch) on a piecewise linear estimator of the technology would stabilize these properties. Concerning the convex hull estimator (the BCC-model) we derive a test for this hypothesis and propose some modifications of this estimator if the RUP-law is violated.

4 - Competing Output-sensitive Frame Algorithms for DEA

Jose Dula, Associate Professor, Virginia Commonwealth University, School of Business, Richmond, VA, United States of America, jdula@vcu.edu, Francisco Lopez

Two output-sensitive procedures for identifying the extreme efficient DMUs (the "frame") of the PPS are currently available: one by Dula (2007) and the other based on Ottmann et al. (2001). The two procedures are in dual spaces and differ enough to motivate the question as to how they compare in a fair competition. We derive an improved dualized version of the procedure in Ottmann et al. and compare it to the one by Dula using a well-structured, large-scale, problem suite.

■ WA13

M - Room 8216

Joint Session DM/CS: Data Mining in Computational Neuroscience

Sponsor: Data Mining, Computing Society
Sponsored Session

Chair: Petros Xanthopoulos, University of Florida, 303 Weil Hall, PO Box 11659, Gainesville, FL, United States of America, petrosx@ufl.edu

1 - Petit Mal Seizure Detection Algorithm for Evaluating Antiepileptic Drug Effect

Petros Xanthopoulos, University of Florida, 303 Weil Hall, PO Box 11659, Gainesville, FL, United States of America, petrosx@ufl.edu, Gregory Holmes, Steffen Rebennack, Jicong Zhang, Panos Pardalos, Basim Uthman

For typical absence seizures there is sudden onset of 3 Hz generalized bilaterally synchronous and symmetrical spike- or multiple spike-and-slow wave complexes. In this study we present a wavelet variance based algorithm for detecting continuous spike and wave activity. Then this activity is classified in seizure and non seizure activity and the effect of the antiepileptic drug (AED) under investigation is studied.

2 - Analysis on Brain Cortical Networks for Patients with Epilepsy

Jicong Zhang, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, United States of America, jicongzhang@hotmail.com, Chang-Chia Liu, Basim Uthman, Panos Pardalos, Art Chaovaitwongse, Petros Xanthopoulos

Recent advances in nonlinear dynamics performed on EEG recordings have shown the ability to characterize changes in the connectivity structure among different brain cortical regions. In this work, we study the relationship between these changes and treatment effect for patient with epilepsy. The results indicate that connectivity between different cortical regions could provide a new insight for developing a novel outcome measure for patients with epilepsy.

3 - EEG Biomarkers for Vagus Nerve Stimulation Therapy: A Data Mining Approach

Nikita Boyko, PhD Student, University of Florida, Department of Industrial and Systems Engineering, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, nikita@ufl.edu, Vitaliy Yatsenko, Panos Pardalos, Michael Bewernitz, Georges Ghacibeh, Basim Uthman

This study presents an application of logistic regression, and support vector machines to the analysis of scalp electroencephalograms obtained from epilepsy patients implanted with the Vagus nerve stimulator (VNS) used in VNS Therapy. The separation quality for Local Lyapunov Exponents is studied as a potential electroencephalographic marker of optimal VNS stimulation parameters.

4 - Efficient Algorithms for the Maximum Clique Problem in Very Large Graphs

Behnam Behdani, Industrial and Systems Engineering Department, University of Florida, 303 Weil Hall PO Box 116595, Gainesville, FL, 32611, United States of America, behdani@ufl.edu, Panos Pardalos

The maximum clique problem is one of the classical problems in graph theory with applications in many fields including computational neuroscience. In some applications, the underlying graph is very large which makes it extremely hard to find the maximum clique. Here we present an efficient algorithm for finding a near maximum clique in very large graphs.

■ WA14

M - Room 8218

Leasing Operations Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Kate Li, The Pennsylvania State University, Smeal College Business, University Park, PA, 16802, United States of America, jzl120@psu.edu

1 - Manufacturer Lease Pricing and Adverse Selection

Lamar Pierce, Assistant Professor of Strategy, Washington University in St. Louis, One Brookings Drive, Box 1133, St. Louis, MO, 63130, United States of America, pierce@wustl.edu

This paper uses one million car lease transactions to identify how car manufacturers use lease buyback prices to address problems of adverse selection in the secondary market. We isolate the effects of lease subsidization and adverse selection while controlling for the importance of factory warranties. This paper is the first to use micro-level data to test theories of leasing as a solution to adverse selection.

2 - Pricing Lease Contracts with Options in an Imperfect Market of Durable-Goods

Suzhou Huang, Ford Motor Company, Research & Innovation Center, Dearborn, MI, 48121, United States of America, shuang10@ford.com

We develop a game theoretical model to value lease contracts with options in an imperfect market of durable-goods. The economic environment of our model differs sharply from that of the standard approach in corporate finance. We illustrate the dual roles of the lease contract with options: price discrimination of heterogeneous consumers and hedge of uncertain residual values of off-lease goods.

3 - Implications of Product Lifecycle and Channel Structure upon Optimal Investment in Durability

Stephen Gilbert, Professor, University of Texas at Austin, IROM Department, McCombs School of Business, Austin, TX, 78712, United States of America, Steve.Gilbert@mccombs.utexas.edu, Sreekumar Bhaskaran

We investigate how the use of intermediaries in the channel of distribution affects a manufacturer's investment in the durability of a product. Depending upon the product and technology life-cycles, the nature production technology and manufacturing costs, we find that a manufacturer can have an incentive to invest more in durability when he sells through intermediaries than when he sells directly.

4 - Leasing and Its Relationship with Company Growth and Technology Innovation

Kate Li, The Pennsylvania State University, Smeal College Business, University Park, PA, 16802, United States of America, jzl120@psu.edu, Susan Xu

Leasing helps to expand consumer base and eliminate the uncertainty of product return. Moreover, by coordinating lease design with product introduction, companies can effectively guide customers through desired product migration path. We use a dynamic programming framework to study leasing and its relationship with company growth, secondary market development and product innovation, and provide insights on the impact of leasing under different scenarios.

■ WA15

M - Room 8219

Joint Session Service Science/CS: Creating Semantic Models for Service Science

Sponsor: Service Science, Computing Society
Sponsored Session

Chair: Kunal Verma, Research Manager, Accenture, 50 W. Fernando Street, Suite 12, San Jose, CA, United States of America, k.verma@accenture.com

1 - The 4 x 4 Semantic Model: Exploiting Data, Functional, Non-functional and Execution Semantics

Amit Sheth, amit.sheth@wright.edu, Karthik Gomadam

We show how semantic Web technologies can help create a comprehensive model, called 4 X 4 Model that extends from business process modeling issues to very detailed descriptions of implementation and enactment. The tiers of our model are: (1) Business Process Specification Tier, (2) Workflow Enactment Tier, (3) Partner Services Tier, and (4) Middleware Services Tier. Adding semantics enhances the process and partner level objectives and constraints captured at each of these tiers.

■ WA16

M - Room 8222

Supply Chain Risk Management

Contributed Session

Chair: Shenghan Xu, Assistant Professor, University of Idaho, College of Business and Economics, Moscow, ID, 83844, United States of America, shenghan@uidaho.edu

1 - Joint Pricing and Inventory Control with Uncertainty Supply and Fixed Order Cost

Yuyue Song, Assistant Professor, Memorial University of Newfoundland, Faculty of Buisness Administration, St. John's, Canada, ysong@mun.ca

We study a periodic review joint pricing and inventory control problem for a single item. But the received quantity for each order is uncertain, a random varaible. Even further, there is a fixed cost for each order. It has been an open problem in the literature about the structure of the optimal policy. Some very interesting characterization about the optimal policy is provided in this paper.

2 - Optimal Customer Mix for Supply Chain Cash Flows

Chih-Yang Tsai, SUNY at New Paltz, 1 Hawk Drive, New Paltz, NY, 12561, United States of America, tsaic@newpaltz.edu

This study proposes a stochastic optimization model to identify an optimal customer mix so as to maximize the total net cash flow during a multi-period planning horizon subject to a service level and a risk tolerance level of cash balances in each period. It focuses on supply chain related operational cash flows. The risk factors considered in this model include uncertainties in demands, early payment for discounts, and delinquent accounts.

3 - You Get What You Pay For: How to Make Suppliers Avoid Product Recalls

Ana Groznik, Indiana University, 1309 East Tenth Street, Bloomington, IN, 47405, United States of America, agroznik@indiana.edu, Hans Sebastian Heese

A general belief links the cost pressure on suppliers in developing countries to the increasing frequency of product recalls. To study these dynamics, we model a supply chain where the supplier decides on unobservable and thus not contractible costly effort, which affects the probability of a recall. We compare the effects of wholesale price increases and long-term contractual commitment on a supplier's incentives to exert effort and thus decrease the likelihood of product recalls.

4 - Global Supply Chain Throughput in the Northeast Mexico–South Texas Region

Malini Natarajarathinam, Assistant Professor, Texas A&M University, 3367 TAMU, College Station, TX, 77840, United States of America, malini@entc.tamu.edu, F. Barry Lawrence

The Texas A&M Global Research Center will bring together companies, logistics providers, and government entities to conduct research and develop solutions for 'Global Supply Chain Throughput' in the Northeast Mexico - South Texas region. The consortium will focus on ways to make the area a preferred regional manufacturing and logistics corridor of the future. The initial findings will be presented.

5 - Formal Analysis of Risks in Stochastic Supply Chains

Shenghan Xu, Assistant Professor, University of Idaho, College of Business and Economics, Moscow, ID, 83844, United States of America, shenghan@uidaho.edu, Li Tan

We propose a formal-verification-based approach for evaluating risks in supply chains. The new "push-button" approach improves the efficiency and scalability of risk analysis algorithms by extending decision procedures developed in Computer Science for analyzing large-scale computer-based systems. It enables us to query a rich set of stochastic behaviors of a supply chain using temporal logics. To facilitate formal analysis, we also establish a formal modeling framework for risk analysis of a stochastic supply chain.

■ WA17

M - Room 8226

Design and Analysis of Experiments

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: James Delaney, Visiting Assistant Professor, Carnegie Mellon University, Department of Statistics, Baker/Porter Hall 132B, Pittsburgh, PA, 15213-3890, United States of America, jdelaney@cmu.edu

1 - Design and Analysis for Mixture-of-mixture Experiments

Lulu Kang, Georgia Institute of Technology, 350440 Gatech Station, Atlanta, GA, 30332, United States of America, lulu@gatech.edu, William Brenneman, Roshan Josep Vengazhiyil

In mixture-of-mixture (MoM) experiments, major components are defined as the components which themselves are mixtures of some other components, or minor components. In this paper, we propose a new modeling approach called major-minor model. It overcomes some of the limitations of multiple-Scheffe model. We also introduce a major-minor D-optimal design strategy for designing the experiment.

2 - Stochastic Kriging for Simulation Metamodeling

Bruce Ankenman, Associate Professor, Northwestern University, Department of Ind. Eng., 2145 Sheridan Rd., Evanston, IL, 60208, United States of America, ankenman@northwestern.edu, Barry L Nelson, Jeremy Staum

We extend the theory of kriging, as applied to the design and analysis of computer experiments, to a stochastic simulation setting. Kriging provides a flexible response surface which can fit an underlying surface well even if no structure is known. This expanded version of kriging allows us to characterize the uncertainty in the response surface estimation and the variability inherent in the simulation itself. We discuss the analysis and implications on sequential design of the experiment.

3 - Some Results on Availability Designs Using Hadamard Matrices

Damaraju Raghavarao, Laura H. Carnell Professor of Statistics, Temple University, Speakman Hall 343, Philadelphia, PA, 19122, United States of America, draghava@temple.edu, James Wiley

When a set of brands of a product class are presented to respondents, the presence or absence of brands may affect the choice of other brands. Availability experiments are used to infer these effects. In this talk some properties of availability designs constructed from Hadamard matrices will be discussed.

4 - Optimal Design of Cumulative Sum Schemes for Unknown Shift Sizes

Jonghyun Ryu, ryuj@purdue.edu, Hong Wan, Kim Sujin

The cumulative sum (CUSUM) control chart is widely used to detect a shift in the parameter of the underlying probability distribution of the quality characteristic. In this work, an optimal design of CUSUM charts is studied when the shift size is random with a known probability distribution. Based on several performance criteria, the optimally designed CUSUM chart is compared to other available control charts by using the simulation method.

■ WA18

M - Room 8228

Joint Session Service Science/CS: Supply Chain Services in Web-2.0 Age —I

Sponsor: Service Science, Computing Society
Sponsored Session

Chair: Jin Dong, Dr., IBM China Research Laboratory, Diamond Building, Zhongguancun SoftPark, Beijing, BJ, 100193, China, dongjin@cn.ibm.com

1 - Gaming Analysis System with Information Security: An Initiative Framework for Supply Chain Simulatio

Yueting Chai, Professor, Tsinghua University, Room 608 Main Building, Tsinghua University, Beijing, be, 100084, China, chaiyt@tsinghua.edu.cn, Linlin Cui

Web-2.0 technology provides opportunities to the supply chain simulation method to develop its advantages of visualization and transparency as web services. Aiming at the problem of information insecurity during simulation modeling processes, a simulation based gaming analysis framework is proposed incorporating with the multi-agent modeling method. Platform architecture is described based on a survey of current supply chain simulation models and tools. Future work is discussed in the end.

2 - Improving Distributor Performance in IBM's Extended Supply Chain

Mamnoon Jamil, Dr., IBM, 525 Lincoln Drive West, Marlton, NJ 08053, NJ, 08053, United States of America, mamnoon@us.ibm.com, Markus Ettl

In this talk we present a service-oriented architecture based collaboration system that was recently implemented in IBM's extended supply chain to improve the operational efficiency of distribution channel partners. We also discuss the use of innovative forecasting and inventory analytics for risk-optimized optimized replenishment decisions based on up-to-date inventory and channel sales information.

3 - Modeling the Impact of Carbon Footprint in a Supply Chain with Multiple Transportation Options

Feng Cheng, Dr., IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, fcheng@us.ibm.com, Jin Dong, Young Lee, Tom Ervolina, Hongwei Ding, Wei Wang, Changrui Ren

With the increased awareness on environmentally friendly supply chain, we develop an inventory optimization model that takes into account the impact of carbon emissions associated with the transportation options for the inbound logistics of a supply chain with offshore manufacturing. The model optimizes jointly the order quantity and the transportation mode while minimizing the total transportation and inventory costs subject to service level targets and carbon emission constraints.

■ WA19

M - Lincoln 4

Real Options and Financial Decisions

Sponsor: Decision Analysis
Sponsored Session

Chair: Dharma Kwon, Assistant Professor, University of Illinois at Urbana-Champaign, Department of Business Administration, Champaign, IL, 61820, United States of America, dharma.kwon@gmail.com

1 - Information Relaxations and Duality in Stochastic Dynamic Programs

David Brown, Assistant Professor, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States of America, dbbrown@duke.edu, Peng Sun, James Smith

We describe a dual approach to stochastic dynamic programming: we relax the constraint that the chosen policy must be temporarily feasible and impose a penalty that punishes violations of temporal feasibility. We describe the theory underlying this dual approach and demonstrate its use in dynamic programming models related to inventory control, option pricing, and oil exploration.

2 - The Effects of Diversification on the Evaluations of Ambiguous Investment Decisions

Dolchai La-ornual, PhD Candidate, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, Dolchai.LA-ORNUAL@insead.edu

We investigate whether individuals benefit from diversification when decisions are ambiguous and how this benefit compares to that when decisions are risky. We examine predictions based on conventional models of decision-making under ambiguity. Experimental results suggest that individuals derive less benefit from diversification when decisions involve ambiguity than when they involve risk. There also seems to be no perceived benefit in diversifying investments under pure uncertainty.

3 - Investment Timing under Competition with a General Stochastic Process Model

Joe Hahn, Assistant Professor, Pepperdine University, 24217 Baxter Drive, Malibu, CA, 90265, United States of America, Joe.Hahn@pepperdine.edu

In this paper we utilize a generalized recombining binomial lattice approach for valuing investment options under competition. By using this approach, we are able to extend the work of Smit and Ankum (1993) and others who have synthesized discrete time option pricing models and game theory under the assumption of a Geometric Brownian Motion (GBM) stochastic process for the value of the underlying asset.

4 - When to Adjust Price under Incomplete Information

Dharma Kwon, Assistant Professor, University of Illinois at Urbana-Champaign, Department of Business Administration, Champaign, IL, 61820, United States of America, dharma.kwon@gmail.com, Steven Lippman, Chris Tang

When, if ever, should the manufacturer of a new product whose demand is at yet unknown reduce its price? We model cumulative demand as a Brownian motion with unknown drift. This drift is the mean demand per unit time, and the posterior distribution of the unknown drift is continuously Bayesianly-updated. The manufacturer's policy is a triple: the initial price, the reduced price, and the (stopping) time when the price is to be reduced. We find the optimal policy and its comparative statics.

■ WA20

M - Lincoln 3

Business Applications of Risk Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Lea Deleris, IBM Watson Research Lab, 1101 Kitchawan Road, Route 134, Yorktown Heights, NY, 10598, United States of America, Lea.Deleris@us.ibm.com

1 - Modeling and Measuring Operational Process Risk

Eric Cope, IBM Zurich Research Lab, Saeumerstrasse 4, Rueschlikon, 8135, Switzerland, erc@zurich.ibm.com, Jochen Kuester, Dominik Etzweiler, Bonnie Ray, Lea Deleris

A large class of operational risks can be thought of as threats to business process objectives. We discuss how formal metamodels can incorporate risk-relevant information directly into business process models, and how those models can be transformed into quantitative models for estimating risk to process objectives. Various quantitative methods, including Bayesian networks and discrete-event simulation will be discussed, in the context of HR processes and IT infrastructure risk

2 - Managing Technical and Business Risk in Software Development

Clay Williams, Manager, Governance Science Research, IBM, IBM Research, Hawthorne, NY, 10532, United States of America, clayw@us.ibm.com, Peri Tarr

Software has gone from running back office applications to being central for the operation of businesses. The risk associated with developing software has not decreased as rapidly as the pervasiveness of software, meaning that the risk to the business has actually increased. We present an overview of the technical factors that contribute to software risk, and show how they map to business risk. We also discuss strategies and tools for understanding and mitigating risk in software development.

3 - An Application of Risk Analysis of an R&D Pharmaceutical Portfolio

Jack Kloeber, Partner, Kromite, LLC, 82 Nelson Drive, Churchville, 18966, United States of America, jkloeber@kromite.com

The risk of an R&D Portfolio in the Pharmaceuticals Industry is most often tied to the technical risk of launching a new drug. The uncertainty of the marketplace, once a drug is approved, provides another source of risk. A risk analysis of a large portfolio (>50 drugs),should also include scientific, medical, manufacturing, regulatory, and marketplace dependencies. I will briefly discuss an effort in which we attempted such an analysis, and the challenges and opportunities for future efforts.

4 - A Novel Algorithm for Stochastic Linear Programs with Conditional-value-at-risk Constraints

Dharmashankar Subramanian, IBM Research, 1101 Kitchawan Rd, Yorktown Hts, 10591, United States of America, dharmash@us.ibm.com, Pu Huang

We present a novel algorithm for stochastic linear and convex programs with Conditional-Value-at-Risk constraints. It iteratively constructs and solves a sequence of compact-sized linear, or convex, optimization problems. The problem size in each iteration is unaffected by the size of random samples, which makes it extremely efficient for large-scale problems. We prove that it converges to the true optimal solution. Applications include practical problems, such as, portfolio optimization.

■ WA21

M - Lincoln 2

Process Efficiency and Quality Improvement in Healthcare: The Role of Information Technology

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Roopa Raman, PhD Candidate, Emory University, Goizueta Business School, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, roopa_raman@bus.emory.edu

1 - Sub-optimal Assimilation of Clinical Information Systems in Healthcare Organizations: Antecedents

Roopa Raman, PhD Candidate, Emory University, Goizueta Business School, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, roopa_raman@bus.emory.edu

Process improvement enabled by clinical information systems is often challenged in hospitals due to sub-optimal and uneven assimilation of the technology across different patient care units within the same organization. In an empirical study, a large hospital faced persistent inter-unit assimilation problems, even though all units were using the same technology features, had access to the same resources, and were subject to the same concurrent implementation effort. I seek to understand why.

2 - Multimodal Networks in Healthcare Teams

Gerald Kane, Assistant Professor, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, 02467, United States of America, gerald.kane@bc.edu

In many healthcare teams, multiple people and multiple information systems work together to conduct shared tasks. This paper examines the network structures that emerge as a result of these complex interactions. It finds that the network structure between both people and informations systems explains performance of the healthcare team in ways that the purely social network or the information systems alone do not. Implications are discussed.

3 - Demand Management in Health Care Clinics with Variable Service Times

Stephen Lawrence, Associate Professor, University of Colorado, 419 UCB, 995 Regent Drive, Boulder, CO, 80309, United States of America, Stephen.Lawrence@colorado.edu, Linda LaGanga

In this paper we extend our previous results regarding yield management in health care clinics to include appointments with variable service times. Our algorithm allows a clinic to schedule patient appointments so that aggregate clinic utility is maximized, balancing clinic productivity benefits with patient waiting and clinic overtime penalties. Computational experiments show that our results are superior to other methods used in practice and proposed in the literature.

■ WA23

M - Lincoln 5

Call Center Performance Models

Sponsor: Applied Probability
Sponsored Session

Chair: Ger Koole, VU University Amsterdam, De Boelelaan 1081a, Amsterdam, ZH, 1081 HV, Netherlands, koole@few.vu.nl

1 - Call Center Performance Models and Indicators

Oualid Jouini, Assistant Professor, Ecole Centrale Paris, Laboratoire Genie Industriel, Grande Voie des Vignes, Chatenay-Malabry, 92290, France, walid.jouini@ecp.fr, Ger Koole

We consider a single-skill call center including abandonments. We focus on different service level definitions related to queueing delays. We show how these performance definitions, that are used in practice, can be modeled and calculated. We also gain additional insights from simulations.

2 - Modeling Time-dependent Overflows in Call Centers

Raik Stolletz, Dr., Leibniz University Hannover, Department of Production Management, Koenigsworther Plat 1, Hannover, 30167, Germany, raik.stolletz@prod.uni-hannover.de, Michael Manitz

The considered call center consists of a front and a back office. A fraction b of customers receiving service in the front office will be routed to the back office. An overflow of waiting calls from the front-office queue to the back office happens, if the waiting time exceeds t time units and a back-office agent is available. The analysis is reduced to a CTMC with state-dependent overflows. Numerical experiments demonstrate the reliability of this Markovian performance approximation.

3 - A Phase-type Approach to Modelling Multi-skill Call Centers

Thomas Bang Nielsen, PhD Student, Department of Informatics and Mathematical Modeling, Technical University of Denmark, Richard Petersens Plads DTU, bld. 321, Lyngby, 2800, Denmark, tbn@imm.dtu.dk, Ger Koole, Bo Friis Nielsen

Routing schemes based on the waiting time of the customers in queue are common in call centers. These often take the form of thresholds at which overflow to other groups of agents is allowed. Using phase-type distributions an approximation for the waiting-time distribution in such systems is obtained.

4 - Dynamic Routing Policies for Multi-skill Call Centers

Sandjai Bhulai, VU University Amsterdam, Faculty of Sciences, De Boelelaan 1081a, Amsterdam, 1081 HV, Netherlands, sbhulai@few.vu.nl

We consider a multi-skill call center to which calls from different skill classes are offered and need to be routed to agents that are grouped according to their heterogeneous skill sets. We study both the scenario with call pooling and with blocking when no agent is available. We obtain nearly optimal dynamic routing policies that are scalable with the problem instance and can be computed online. Numerical experiments demonstrate that these routing policies have very good performance.

■ WA24

M - Lincoln 6

Ant Colony Algorithms and Applications

Sponsor: Computing Society
Sponsored Session

Chair: Marjorie Greene, Senior Program Manager, Science Applications International Corporation, 1710 SAIC Drive, McLean, VA, 22102, United States of America, marjorie.j.greene@saic.com

1 - Bio-inspired Emergent Behavior: Can It Be Applied to Catastrophic Incident Response?

Marjorie Greene, Senior Program Manager, Science Applications International Corporation, 1710 SAIC Drive, McLean, VA, 22102, United States of America, marjorie.j.greene@saic.com

This presentation suggests an approach to effective communications when local disasters "spread" to the state and federal levels. Building on research into biologically-inspired emergent behavior of social insects, it illustrates how communications paths during catastrophic incidents can be derived from ant routing algorithms in ant colony optimization.

■ WA25

M - Lincoln 6A

Metaheuristics for Design Problems

Contributed Session

Chair: Kuilin Zhang, Northwestern University, 600 Foster St, Evanston, IL, 60208, United States of America, klzhang@northwestern.edu

1 - Restart Strategies in Optimization: Parallel and Serial Cases.

Oleg Shylo, student, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611-6595, United States of America, shylo@ufl.edu, Timothy Middelkoop, Panos Pardalos

We study the potential of restart strategies for a speedup of Las Vegas-type algorithms. By considering optimality conditions for restart strategies, the relationship between the optimal restart periods in serial and parallel environments was derived. Our results indicate that the optimal set of parameters for serial algorithm is not optimal when used in parallel environment. An existence of restart-distributions for state-of-the-art tabu algorithm for job shop scheduling problem is reported.

2 - Optimization of Grocery Store Design

Shrideep Sadhale, Graduate Student, University at Buffalo (SUNY), 438 Bell Hall, Buffalo, NY, 14260, United States of America, ssadhale@buffalo.edu, Joy Bhadury, Rajan Batta

We apply a p-dispersion heuristic to maximize the total distance between the common "must-have" items applicable to customer categories. We then apply a simulated annealing algorithm, where we define an exchange neighborhood to obtain a sequence of layouts and eventually results in a layout with an improved score. A practical case study is used to illustrate our findings. The overall goal is to develop a robust layout which will maximize the "impulsive" item revenue of the store.

3 - An Electromagnetism Based Metaheuristic for the Unicost Set Covering Problem

Zahra Naji Azimi, DEIS University of Bologna, Viale Risorgimento 2, Bologna, 40136, Italy, zahra.najiazimi2@unibo.it, Laura Galli, Paolo Toth

In this paper we investigate a new method to solve the Unicost Set Covering Problem. This method is based on the Electromagnetism Metaheuristic principles. The algorithm first creates a group of solutions, then applies a fixed number of local search and movement iterations based on the solution fitness. This heuristic was tested on 80 datasets of the OR library and it is not only able to find the best known solutions in a shorter computing time, but sometimes improves the best known ones.

4 - An Adaptive Heuristic Concentration Solution Algorithm for Large-scale P-median Problems

Kuilin Zhang, Northwestern University, 600 Foster St, Evanston, IL, 60208, United States of America, klzhang@northwestern.edu

This presentation proposes an Adaptive Heuristic Concentration (AHC) solution algorithm to improve computational efficiency and solution effectiveness of a two-stage Heuristic Concentration (HC) algorithm by Rosing and ReVelle (1997) for large-scale P-Median problems by importing a learning mechanism to obtain more information from each heuristic random run.

■ WA26

M - Lincoln 5A

Joint Session CS/OPTIM: MINLP Theory and Algorithms

Sponsor: Computing Society: Mixed Integer Nonlinear Programming (Joint Cluster Optimization)
Sponsored Session

Chair: Kevin Furman, ExxonMobil, 1545 Route 22 East, Annandale, NJ, 08801, United States of America, kevin.c.furman@exxonmobil.com

1 - Computational Solution of MINLPs with BARON

Nick Sahinidis, John E. Swearingen Professor, Carnegie Mellon University, Department of Chemical Engineering, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, sahinidis@cmu.edu, Mohit Tawarmalani

We present extensive computational experience with a new version of BARON for the solution of MINLPs that possess convex or nonconvex relaxations when integrality requirements are relaxed.

2 - Branching Techniques for MINLP

Pietro Belotti, Tepper S. of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, United States of America, belotti@andrew.cmu.edu, Francois Margot, Jon Lee, Andreas Waechter

Non-convex constraints are very common in reformulation techniques for MINLP and can be handled by partitioning the solution space. We study several branching techniques in a branch & bound algorithm for non-convex MINLP problems; these techniques naturally extend from solvers for Mixed-Integer Linear Programming. We compare them with classical branching strategies used in Global Optimization software.

3 - Mixed Integer Nonlinear Programming Using Interior-point Methods

Hande Benson, Assistant Professor, Drexel University, 3141 Chestnut Street, Philadelphia, PA, 19104, United States of America, hvb22@drexel.edu

We outline a bilevel approach for solving mixed integer nonlinear programming problems, combining a branch-and-bound algorithm in the outer iterations and an infeasible interior-point method in the inner iterations. We report on implementation details, including efficient pruning of the branch-and-bound tree via equilibrium constraints, warmstart strategies for interior-point methods, and handling of infeasible subproblems, and present numerical results.

4 - A Comparison of Approaches for Solving the Product Family Platform Selection and Design Problem

Aida Khajavirad, Graduate Student, Carnegie Mellon University, 5000 Forbes Ave., Hamerschlag Hall B129, Pittsburgh, PA, 15213, United States of America, aida@cmu.edu, Jeremy Michalek

An important challenge in product development is to design a set of products that target distinct market segments while maximizing component sharing to reduce manufacturing cost. This joint platform-selection and design problem is a large-scale nonconvex MINLP. We propose and compare several approaches to solving the joint problem, including a heuristic NLP, a decomposed genetic algorithm, and a deterministic global optimization approach using branch-and-reduce with Lagrangian decomposition.

■ WA28

M - Washington 1

Systems Analysis

Contributed Session

Chair: Chandramouli Madhuranthakam, Research Associate, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, cmmadhur@engmail.uwaterloo.ca

1 - A Streamlined Architecture Framework for Analyzing Systems of Systems

Clarke Ansel, Principal Analyst, HSI, 2900 South Quincy Street, Suite 800, Arlington, VA, 22206, United States of America, Clarke.Ansel@hsi.dhs.gov, Annette Pacella, Georganne John

The Zachman, Federal Enterprise Architecture, and Department of Defense Architecture Framework are well-known frameworks; however, their manifestations are often resource intensive. This paper presents a streamlined framework of landscape, process, and strategic architecture views applied to the US imported food inspection system, and discusses its application to other types of systems.

2 - Learning Control Policies in System Dynamics Models

Saeideh Fallah Fini, PhD Student, Virginia Tech, 250 Durham Hall, Blacksburg, VA, 24061, United States of America, fallah@vt.edu, Hazhir Rahmandad

We introduce the application of reinforcement learning for controlling continuous non-linear organizational systems, e.g. system dynamics models. We apply the Q-learning algorithm to optimally determine management demand in a very simple non-linear model of a product development organization. In addition, we extend an adaptive state aggregation and partitioning algorithm for continuous time and space problems. The properties of the proposed algorithm are analyzed through simulation experiments.

3 - A Coordinator Control Recipe Propose with Petri Nets and Elements of Non-linear Control

Francisco Briones, Director of Research and Academic Development, Polytechnic University of Aguascalientes, Av Prol Mahatma Gandhi km 2, San Francisco del Arenal, Aguascalientes, Ag, 20280, Mexico, francisco.briones@upa.edu.mx

The aim of this article is propose a control strategy related with the design of coordinator control recipe associated with batch processes. The control strategy has elements of: Petri nets, non-linear control, agglutination of uncertainties and its reconstruction with experimental measures, and different options of control formulation, and it is focused to explain the implications of using hybrid dynamical models in terms of problem control and its relation with the norm ISA S88.02.

4 - The Robust Beauty of Near-decomposable Complex Systems

Victor W. Tang, Scientist, MIT, 55 Deerfield Lane South, Pleasantville, 10570, United States of America, victor.w.tang@gmail.com, Kevin Otto, Warren Seering

Can the behavior of complex systems be represented by a simple near-decomposable structure? How and why? Using a high-technology enterprise, modeled by over 600 equations, we show non-trivial examples of its system behavior. We show how this business enterprise can be described in a near-decomposable representation using a small number of variables. Statistically significant data support this claim. We argue that "scale" is the key to near-decomposable representation of complex systems.

5 - Waste Minimization by Optimization of SOHIO Process

Chandramouli Madhuranthakam, Research Associate, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, cmmadhur@engmail.uwaterloo.ca, Ali Elkamel

Optimal reactor conditions are obtained for SOHIO process with the objective of minimizing the waste generated in the process. The process variables manipulated include temperature, pressure, mean residence time. The optimal reactor conditions obtained from the optimization led to higher selectivity and conversion for the production of acrylonitrile.

■ WA29

M - Washington 2

Tutorial: VaR vs CVaR in Risk Management and Optimization

Cluster: Tutorials

Invited Session

Chair: Stan Uryasev, University of Florida, ISE Department, Gainesville, FL, United States of America, uryasev@ufl.edu

1 - VaR vs. CVaR in Risk Management and Optimization

Stan Uryasev, University of Florida, ISE Department, Gainesville, FL, United States of America, uryasev@ufl.edu, Gaia Serraino, Sergey Sarykalin

From a mathematical perspective risk management is a procedure for shaping a risk distribution.Value-at-Risk (VaR)and Conditional Value-at-Risk(CVaR)are key percentile risk measures.Differences in mathematical properties, stability of estimation, ease of optimization, acceptance by regulators affect the choice between VaR and CVaR.We present our experience with these functions and explain their strong and weak features.We show optimization case studies conducted with Portfolio Safeguard package.

■ WA30

M - Washington 4

Military Operations Analysis for Force RESET Problems

Sponsor: Military Applications

Sponsored Session

Chair: Norman Reitter, Director, Operations Research, Concurrent Technologies Corporation, 100 CTC Drive, Johnstown, PA, 15904, United States of America, reittern@ctc.com

1 - US Army Equipment Sourcing Decisions for Arforgen Reset

Jeff Eaton, Manager, Operations Research, Concurrent Technologies Corporation, 9570 Regency Square Blvd., Suite 400, Jacksonville, FL, 32225, United States of America, eatonj@ctc.com, Jake Enholm

This presentation will review the assumptions and methodology used to create the Prototype Logistics Innovation Agency's RESET Equipment Sourcing model. This model aims to provide an equipment sourcing plan that seeks to meet unit readiness goals in the ARFORGEN process across multiple types of equipment sources including procurement, Depot maintenance, and equipment pools.

2 - Reset Challenges

Jose Mata, Deputy, Director of Integration, US Army, HQ DA G8, 700 Pentagon Drive, Washington, DC, DC, United States of America, jose.mata@hqda.army.mil

Discuss the challenges associated with the Reset of Army Equipment during most dynamic time in our Army history - fighting a war, transforming and Resetting.

3 - Analysis and Modeling of the U.S. Marine Corps OIF and OEF Ground Equipment Reset Requirements

Matt Reuter, Head, Logistics Operations Analysis Branch, USMC / Installations and Logistics Department, HQMC, 2 Navy Annex, Washington, DC, 20380-1775, United States of America, matthew.reuter@usmc.mil

The fulfillment of OIF and OEF ground equipment Reset requirements is critical to future warfighting capabilities. Modeling the cost of ground equipment Reset supports the budgetary requirements of the Planning, Programming, Budgeting and Execution System. Modeling and analysis of the ground equipment Retrograde and Reset process supports operational-level planning and decision-making.

4 - Reliability Analysis and Modeling of the U.S. Marine Corps Medium Tactical Wheeled Vehicle in OIF

Matt Reuter, Head, Logistics Operations Analysis Branch, USMC / Installations and Logistics Department, HQMC, 2 Navy Annex, Washington, DC, 20380-1775, United States of America, matthew.reuter@usmc.mil

An analysis of the reliability of the Medium Tactical Vehicle Replacement (MTVR) in Operation Iraqi Freedom. Analysis and modeling of this vehicle's failure modes are conducted to understand the vehicle's usage and performance. Nonparametric and parametric statistical methods are utilized, with failure mode recurrence data, to measure reliability.

■ WA31

M - Washington 5

Practical Analysis Tools for Public Policy Challenges

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Michael Wilmer, COL, USA, Studies & Analysis Program Director, Army Capabilities Integration Center, USA, ARCIC, Fort Monroe, VA, 223651, United States of America, michael.wilmer@us.army.mil

1 - Application of Strategic Management Tools in Public Organizations

Nate Sledge, PhD, Principal, Trophy Management Solutions LLC, 7021 Ashleigh Manor Court, Alexandria, VA, 22315, United States of America, natesledge@tms.us.com

Strategic management can help shape the future of an organization, guide it through change, and help it meet strategic challenges. This talk will demonstrate how selected strategic planning and management tools can be tailored to specific contexts. Strategic planning tools are applied to real world examples. The tools are used to define roles, missions, and functions; describe processes; identify issues, gaps, and inefficiencies; and finally, to develop strategic improvement plans.

2 - Answer the Question Clearly and On Time

Michael Wilmer, COL, USA, Studies & Analysis Program Director, Army Capabilities Integration Center, USA, ARCIC, Fort Monroe, VA, 223651, United States of America, michael.wilmer@us.army.mil

Informing policy decisions requires that analysts are in tune with changing political and organizational dynamics, are directly engaged with the decision maker, and answer the key questions clearly and on time. This talk will describe how the analyst can inform senior military and civilian leaders' decision processes by employing a range of qualitative and quantitative techniques; scoping the work to the question at hand and time available; and delivering the results in a clear, concise manner.

3 - OR and Public Policy in the Large and in the Small: Linking Models to Outcomes

Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu

OR/MS is well-suited for applications in which problems are easily quantified, objectives are commonly understood and decisions can be implemented quickly. However, public-sector problems often face political and administrative barriers in implementation, and uncertainty about the impact of solutions on social outcomes. I review applications in community-based OR and humanitarian logistics that address these difficulties, and suggest ways that OR can maximize its contributions to public affairs.

■ WA32

M - Washington 6

Inventory Management Under Stochastic Demand I

Contributed Session

Chair: Xi Chen, University of Washington, Industrial Engineering, Box 352650, Seattle, WA, 98195, United States of America, chenxi07@u.washington.edu

1 - The Cost of Relaxing the Assumption of Non-stationary on Stochastic Demand

Huseyin Tunc, Mississippi State University, Department of Industrial and Systems Eng, Mississippi State University, Starkville, MS, 39762, United States of America, ht100@msstate.edu, Burak Eksioglu

Stationary vs nonstationary dichotomy is one the most distinguishing features of stochastic inventory control models. However, non-stationary demand assumption is not usually adopted in real life applications because of computational complexity. This paper aims at investigating the additional cost incurred by relaxing the demand assumption of nonstationarity and giving some inference about under which circumstances stationary models provide good approximations for non-stationary models.

2 - An Empirical Study of Product Ramp-up Success

Jan Fransoo, Eindhoven University of Technology, School of Industrial Engineering, PO Box 513, Pav F4, Eindhoven, Netherlands, j.c.fransoo@tm.tue.nl, Andreas Pufall, Ton de Kok

Product rampup is a crucial process in companies with a fast innovation pace and complex products. While a number of empirical studies have been conducted, studies using actual operational data have not been done. In this paper, we build an empirical model product and process characteristics to rampup success based on a dataset of product launches of a consumer electronics company.

3 - Pricing the Penalty of Inventory Overage and Stockout

Junmin Shi, Rutgers Business School, 180 University Ave, PhD Program, Newark, NJ, 07102, United States of America, jshi@andromeda.rutgers.edu

Consider an inventory driven by compound Poisson aggregate demands and constant replenishment rate. We seek a formulation of a reasonable penalty for overage and stockout, such that expected discount penalty is constant. To this end, we associate a martingale with the system as an auxiliary process to aid in determining the expected discount penalty, given the base-stock level and inventory capacity.

4 - Multiple Period Optimal Procurement of Substitutable Products with Discretionary

Mustafa Karakul, Associate Professor, York University, 4700 Keele St, Toronto, ON, M3J 1P3, Canada, mkarakul@yorku.ca, Lap Mui Ann Chan

We study a multiple-period stochastic inventory of two substitutable products. We assume nonstationary demand and parameters, and any shortage is lost. Allowing discretionary sales, each product can be used to substitute the demand for the other product or set aside for future demand even if some present demand for it is lost. Hence, we not only determine the optimal procurement quantity of each product at each period, but also their usage. We provide concavity and submodularity results.

5 - Planning for Inventory and Procurement in Humanitarian Relief Chain

Xi Chen, University of Washington, Industrial Engineering, Box 352650, Seattle, WA, 98195, United States of America, chenxi07@u.washington.edu, Benita Beamon, Burcu Balcik

Carrying appropriate amount of supplies in global warehouses and procuring effectively from other sources is essential for effective response in disaster relief. We propose a two-stage stochastic programming model for inventory and procurement decision making in a quick-onset disaster environment, taking into account the presence of local spot market. We optimize inventory level subject to service level requirements by balancing costs, promptness and risks associated different supply sources.

■ WA33

M - Johnson

Modeling and Analysis of Healthcare Provider's Operations

Sponsor: Health Applications Section
Sponsored Session

Chair: Bo Zeng, Postdoctoral Research Associate, Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, 47906, United States of America, bzeng@purdue.edu

1 - Scheduling Low-Acuity Patients in Emergency Department

Shengyong Wang, Research Assistant Professor, Department of Systems Science & Industrial Engineering, State University of New York at Binghamton, Binghamton, NY, 13902, United States of America, wangs@binghamton.edu

Traditionally, Emergency Department (ED) does not operate based on appointments. While most low-acuity patients experience prolonged waiting time before being seen by a physician, mainly due to bed availability, they have some flexibility on their arrival time to the ED. Aiming at creating a balanced system and improving the patients' experience at the ED, a mathematical model combining historical trends and real-time information is established to schedule low-acuity patients at ED.

2 - A Multi-agent Modeling Approach to Decision Making for Intervention of Colorectal Cancer Care (CRC)

Chaitra Gopalappa, Student, University of South Florida, 4202 E. Fowler Ave., Tampa, Fl, 33620, United States of America, chaitrag@gmail.com, Tapas Das

Performance of a populations cancer care system is dependent on the behavior of a number of independent decision making agents, like patients, service providers, and insurers, whose goals could sometimes be conflicting. The objective of the research is to develop a prototype cyber enabled multi-agent simulation decision model. The prototype, demonstrated on CRC care system of Indiana, will serve as a decision tool for analyzing intervention strategies for early detection of CRC.

3 - The Effects of Patient No-shows on Appointment Scheduling Policies

Lawrence W. Robinson, Johnson Graduate School of Management, Cornell University, 433 Sage Hall, Ithaca, NY, 14850, United States of America, lwr2@cornell.edu, Rachel Chen

We compare traditional and open-access appointment scheduling systems. Under traditional scheduling, some number of customers are booked well in advance, but may not show up for their appointment. Under open-access scheduling, patients call each morning to make an appointment for that day. In most cases the open-access schedule will significantly outperform the traditional schedule in terms of a weighted average of patients' waiting time, the doctor's idle time, and the doctor's overtime.

4 - Is Overbooking Always Beneficial? A Game Theoretic Perspective

Bo Zeng, Postdoctoral Research Associate, Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, 47906, United States of America, bzeng@purdue.edu, Hui Zhao, Mark Lawley

Clinic overbooking has been proposed to reduce the negative effect of patient no-shows. However, patient responses have been neglected in various overbooking algorithms. We develop game theoretic models to investigate the interactions between clinics and patients and derive conditions under which there is unique Nash Equilibrium or multiple equilibria. We further discuss cases where overbooking is beneficial when patient responses are considered.

■ WA34

M - Jefferson

Stochastic Programming in Healthcare

Sponsor: Health Applications Section

Sponsored Session

Chair: Osman Y. Ozaltin, Graduate Student, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, oyo1@pitt.edu

1 - Designing Liver Transplant Regions under Uncertainty

Mehmet C. Demirci, SmartOps Corporation, One North Shore Center, 12 Federal St Suite 400, Pittsburgh, PA, 15212, United States of America, mdemirci@smartops.com, Mark Roberts, Andrew Schaefer

Currently in the U.S. liver allocation system, Organ Procurement Organizations are grouped into 11 regions, and a three-tier mechanism that prioritizes local and regional patients is utilized to balance organ preservation and medical urgency. We introduce stochastic programming models that capture uncertainty and maximize the expected benefit of liver transplants through region design. Our results are estimated to increase expected life-time gained per transplant operation by up to 7 per cent.

2 - Optimal Allocation of Surgeries to Days and ORs

Serhat Gul, PhD Student, Arizona State University, Dept of Industrial Engineering, Tempe, AZ, 85287, United States of America, serhat.gul@asu.edu, Brian Denton, John Fowler

The assignment of surgeries to operating rooms (ORs) and days is a challenging combinatorial optimization problem. In this talk, we present a two-stage stochastic programming model for the assignment of surgeries to days and ORs. The objective includes a fixed cost of opening ORs, surgical staff overtime cost, and tardiness cost relative to the due date of a surgery. We solve the program with binary decisions in the first stage and simple recourse in the second stage using the L-shaped method.

3 - Optimizing Influenza Vaccine Strain Selection

Osman Y. Ozaltin, Graduate Student, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, oyo1@pitt.edu, Andrew Schaefer, Oleg Prokopyev

Seasonal flu epidemics caused by antigenic drifts and the high rate of influenza transmission require annual updates in the flu shot composition. The World Health Organization recommends which strains of influenza to include in each year's vaccine based on surveillance data and epidemiological analysis. We propose a class of multi-stage stochastic mixed-integer programming models addressing the optimal design of the annual flu shot in terms of timing and composition.

■ WA35

M - Jackson

In Memoriam: Mike Rothkopf's Influence on OR Pedagogy

Sponsor: INFORM-ED

Sponsored Session

Chair: James Cochran, Louisiana Tech University, PO Box 10318, College of Business, Ruston, LA, 71272, United States of America, jcochran@cab.latech.edu

1 - A Conversation About Critical Thinking in OR Classes

Natalia Santamaria, Smeal College of Business, Penn State, 471B Business Building, Penn State, University Park, PA, 16802, United States of America, nsantam@psu.edu

Dr.Rothkopf was my adviser while I was PhD Student at Rutgers and during his time at Penn State. In this period of time I learned a great deal from him about how to be a good researcher and a good teacher also. In this presentation I'll share one of the conversations I had with him related to the importance of including critical thinking in OR classes.

2 - Mike Rothkopf's Approach to Teaching Analysis of Applications

Dave Shanno, Professor, Rutgers University, RUTCOR, 640 Bartholomew Road, Piscataway, NJ, 08854, United States of America, shanno@rutcor.rutgers.edu

Mike Rothkopf was my colleague at Rutgers for nineteen years. He was heavily involved in teaching how to analyze complex business problems and arrive at practical solutions, both through case studies and through practical experience. His involvement of associated faculty led to more balance between theory and applications in general classroom teaching.

3 - On Keeping Theoretical OR Models Relevant

Sasa Pekec, Duke University - The Fuqua School of Business, 1 Towerview Road, Durham, NC, 27708-0120, United States of America, pekec@duke.edu

Mike Rothkopf had a unique blend of skills and experiences that allowed him to assess applicability of theoretical models to address concrete business problems. He was successful in transferring his critical reasoning to his students. I will illustrate this with several examples of my interactions with Mike who was my teacher, mentor, and coauthor.

■ WA36

M - T. Marshall Ballroom East

Information Systems I

Contributed Session

Chair: Sydney Chu, Professor, University of Hong Kong, Department of Mathematics, Pokfulam Road, Hong Kong, China, schu@hku.hk

1 - Security Governance Surcharges Levied Towards Meeting Compliance Requirements

Manish Gupta, PhD Candidate, SUNY, Buffalo, 72 Raintree Is, Apt 10, Tonawanda, NY, 14150, United States of America, mgupta3@buffalo.edu, H. Raghav Rao

The presentation will discuss role of information security governance in meeting compliance requirements in offshoring and how it is affected to ensure compliance. There are unique structural and technological accommodations, to organizational security governance framework, to enforce safeguards in offshoring relationship. How risks are effectively managed through these changes to security governance for offshoring and a brief financial services case study will be presented.

2 - The Role of Quality and HR Management Practices in Outsourcing Value Creation: A Study of India BPO

Oliver Lin, Robert H. Smith School of Business, University of Maryland, College Park, United States of America, olin@rhsmith.umd.edu, Jonathan Whitaker, Sunil Mithas, Anjali Kaushik

Firms are increasingly utilizing offshore business process outsourcing (BPO) to manage their primary and support functions and achieve their strategic objectives. However, there has been limited academic research on the mechanisms that create value for client firms in outsourcing engagements. This paper will study vendor's quality and human resource management practices as a source of value creation for client firms in outsourcing engagements, using data from India BPO vendors.

3 - The Effects of Success Factors of CRM on the Mobile Banking Systems

Sang Hee Lee, Doctoral Consortium, PhD Student, Kyungpook National University, 101-306 Palgong Bosung APT Jimyo-Dong, Dong-Gu, Daegu, ko, Korea, Republic of, good@knu.ac.kr

The purpose of this study is to examine major factors affecting the CRM performance and modulation effect such as organization characteristics. This study may provide companies with valuable guidelines for the implementation of CRM systems. We propose a research model that covers from various features of CRM systems to financial performance which is one of the most important domains of study on the CRM success factors.

4 - Learning from Participation in Online Auctions

Daniel Malter, Robert H. Smith School of Business, Van Munching Hall, College Park, MD, 20742, United States of America, dmalter@rhsmith.umd.edu

We study bidders' prior participation in online auctions for a single product and model its effect on price. Prior participation benefits winners. The median benefit ranges from 3-4.5 %. However, we find the relationship between prior participations and price U-shaped. Bidders with much experience might inappropriately overgeneralize their earlier experiences. The shape of the curve suggests that bidders are better off erring on the side of too much, rather than to little, experience.

5 - Topological and Optimization Analysis of Maximum Resolution Dichotomies

Sydney Chu, Professor, University of Hong Kong, Department of Mathematics, Pokfulam Road, Hong Kong, China, schu@hku.hk, James Ho, S.S. Lam

A topological model is presented for complex data sets in which the attributes can be cast into a dichotomy. It is shown that the relative dominance of the two parts in such a dichotomy can be measured by the corresponding areas in its star plot. An optimization model is proposed to maximize the resolution of such a measure by choice of configuration of the attributes, as well as the angles among them.

■ WA37

M - T. Marshall Ballroom West

Operations Research in Education I

Contributed Session

Chair: Steven Harper, Assistant Professor of Managment, James Madison University, 540 Zane Showker Hall, Harrisonburg, VA, 22801, United States of America, harpe2sr@jmu.edu

1 - Teaching in the 21st Century

Anil Aggarwal, Professor, University of Baltimore, Merrick School of Business, 1420 North Charles Street, Baltimore, MD, 21201, United States of America, aaggarwal@ubalt.edu

As universities expand into e-learning, they may be losing focus of traditional student. Administrators must decide how best to serve both traditional and non-traditional student at a reasonable cost. One recent approach is to use a hybrid model where both traditional and non-traditional are grouped in one section. This paper will look at the advantages and disadvantages of such a model from the student and faculty perspective in a web-based information system course.

2 - The Why and the How of a Hybrid Course

Henry Amato, Professor of Supply Chain Management, University of Nevada Reno, 1664 Virginia St., Reno, NV, 89557, United States of America, hna@unr.edu, Ronald Tibben-Lembke

A hybrid course uses the Internet to disseminate course information(syllabus, lectures, assignments, etc.) and uses the classroom for discussion(Q&A, applications, and problem solving). This presentation discusses concepts and tools to create hybrid courses that are readily available, that can be quickly learned, and easily applied. Part of an existing Operations Management course will be used to illustrate the concepts and tools.

3 - Basic Social Math—A New Direction in Social Dynamics Research and Education Systems Engineering

Jared Lee Hanson, Al Yamamah Business College, PO Box 45180, Riyadh, 11512, Saudi Arabia, info@themop.org

Recent studies in neuroscience show that traditional approaches to research and education are proving inadequate in the changing dynamics of the global age. This paper examines how the rigors of math can be combined with the core dynamics of decision making to create a general framework for systemic innovation. It seeks to develop tools that objectively analyze social dynamics in order to overcome deeply entrenched traditional practices in social and educational systems.

4 - Using Social Network Analysis to Determine an Institution Status

Steven Harper, Assistant Professor of Managment, James Madison University, 540 Zane Showker Hall, Harrisonburg, VA, 22801, United States of America, harpe2sr@jmu.edu

The status of institutions has been measured from data such as the number of applicants, magazine rankings, the number of patents written, or the number of research articles published. This study takes a different view of status of these institutes by receiving input from the behavior of other institutes to determine different level of status. Social network analysis is used to determine the status of an institution based upon other institutions pointing to them as a peer.

■ WA38

M - Tyler

Joint Session Optimization/CS: Recent Advances in Computational Integer Programming

Sponsor: Optimization/ Discrete Optimization, Computing Society Sponsored Session

Chair: Zeki Caner Taskin, PhD Candidate, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, taskin@ufl.edu

1 - A Branch-and-price-and-cut Algorithm For Determining Branchwidth

Sibel Bilge Sonuc, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, sibel.bilge@ufl.edu, J. Cole Smith, Illya Hicks

We present a methodology to determine branchwidth of a general graph. Our methodology exploits the relationship between branchwidth and bramble number of a graph. In contrast to prior studies, our algorithm is not specific to certain types of graphs. We use a branch-and-price-and-cut approach to find the bramble number of a given graph.

2 - Selecting Optimal Alternatives and Risk Reduction Strategies in Decision Trees

Evrim Dalkiran, PhD Student, Virginia Tech, 250 Durham Hall, ISE Department (0118), Blacksburg, VA, 24061, United States of America, dalkiran@vt.edu, Theodore S. Glickman, Hanif Sherali

In this study, a strategic risk management problem involving allocation of resources and selection of decision alternatives is investigated to minimize the risk in the event of a hazardous occurrence.Using a decision tree to represent the cascading sequences of events as controlled by decisions and investment alternatives, problem is modeled as a nonconvex mixed-integer 0-1 factorable program.A branch-and-bound algorithm is developed for which convergence and computational results are discussed.

3 - Optimal Multileaf Collimator Leaf Sequencing in IMRT Treatment Planning

Zeki Caner Taskin, PhD Candidate, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, taskin@ufl.edu, J. Cole Smith, Edwin Romeijn, James Dempsey

Intensity modulated radiotherapy (IMRT) is a powerful technique for radiotherapy treatment delivery. We discuss the problem of efficiently delivering a given beam intensity profile. In particular, we need to decompose the intensity profile into a set of beam shapes satisfying the consecutive-ones property. We propose an exact algorithm to solve this problem under different efficiency criteria. Our results indicate that several clinical instances can be solved to optimality within a few minutes.

4 - An Integer Program Model for United States Postal Service (USPS) Test Mail Induction

Mariah Jeffery, Managing Consultant, IBM Global Business Services, 12902 Federal Systems Park Dr, Fairfax, VA, United States of America, mjeffery@us.ibm.com, Noriah din Daily, Hua Ni

IBM contracts with the USPS to report its on time performance by service standards by creating test mail and tracking it through the network. An integer programming model is used for developing mail induction schedules. The problem structure, unique challenges encountered, history of the model, and performance with several optimization packages will be discussed.

■ WA39

M - Truman

Algorithms and Economics of the Internet

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu

1 - Local Graph Algorithms for Clustering

Reid Andersen, Postdoctoral Researcher, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, reidan@microsoft.com

Local graph clustering algorithms find clusters of related vertices while examining only small local neighborhoods of the input graph. This talk is a survey of recently developed algorithms and techniques for local graph clustering, including local algorithms for the sparsest cut problem based on truncated random walks, personalized PageRank, and the 'evolving set' process.

2 - Network Creation Games

MohammadTaghi Hajiaghayi, Senior Researcher, AT&T Labs-Research, Rm: C225, 180 Park Ave., Florham Park, NJ, 08904, United States of America, hajiagha@mit.edu

We study Nash equilibria in the setting of network creation games introduced recently by Fabrikant, Luthra, Maneva, Papadimitriou and Shenker. In this game we have a set of selfish node players, each creating some incident links, and the goal is to minimize x times the cost of the created links plus sum of the distances to all other players. Fabrikant et al. proved an upper bound O(sqrt{n}) on the price of anarchy. In this talk, we prove the first o(n^\epsilon) upper bound for general x.

3 - Sponsored Search Auctions with Markovian Users

Jon Feldman, Google Research, NYC, 76 Ninth Avenue, 4th Floor, New York, NY, 10011, United States of America, jonfeld@google.com, Martin Pal, Gagan Aggarwal, S. Muthukrishnan

Sponsored search involves running an auction among advertisers who bid to have their ad shown next to search results at various positions. The value of these positions depends on how the search engine user interacts with the search results page. We propose a new Markovian model for this interaction, and present an algorithm to determine the most efficient ad assignment under this model. We show that this assignment has many desirable incentive properties that make bidding strategy intuitive.

4 - Advertisement Allocation for Generalized Second Pricing Schemes

Hamid Nazerzadeh, Stanford University, Palo Alto, CA, Palo Alto, CA, United States of America, hamidnz@stanford.edu, Ashish Goel, Mohammad Mahdian, Amin Saberi

Recently, there has been a surge of interest in algorithms that allocate advertisement space in an online revenue-competitive manner. Most such algorithms, however, assume a pay-as-you-bid pricing scheme. We show these algorithms fail to achieve a bounded competitive ratio if the ad space is priced using the widely-used generalized second price (GSP) scheme. On the positive side, we present algorithms to achieve constant competitive ratio.

■ WA40

M - Taylor

Complementarity Problems: Theory and Applications II

Sponsor: Optimization/ Linear Programming & Complementarity
Sponsored Session

Chair: Goran Lesaja, Associate Professor, Georgia Southern University, 203 Georgia Avenue, PO Box 8093, Statesboro, GA, 30460, United States of America, goran@georgiasouthern.edu

1 - On Interior Point Trajectories for Conic Complementarity Problems

Akiko Yoshise, University of Tsukuba, 1-1-1 Tennoudai, Tsukuba, Ib, 305-8573, Japan, yoshise@sk.tsukuba.ac.jp

We will discuss some theoretical aspects of a class of complementarity problems over homogeneous cones in terms of interior point maps, interior point trajectories and their limiting behavior. The class includes monotone complementarity problems over nonnegative orthants, second-order cones and semideinite matrix cones.

2 - Iterative Solvers for Cone Complementarity Problems: Applications to Large-scale Rigid Body Dynamics

Mihai Anitescu, Argonne National Laboratory, 9700 S Cass Ave, Argonne, IL, 60439, United States of America, anitescu@mcs.anl.gov, Alessandro Tasora

We discuss the resolution of optimization subproblems with conic constraints that appear in time-stepping schemes for rigid body dynamics. We present a Gauss Seidel like iteration and prove that it is globally convergent. We demonstrate that the method scales well, that it is very competitive for the simulation of granular flow dynamics and that it benefits from parallel implementation using a Graphical Processing Unit (GPU) coprocessor.

3 - Kernel Functions and Interior-point Methods for Conic Linear Complementarity Problems

Goran Lesaja, Associate Professor, Georgia Southern University, 203 Georgia Avenue, PO Box 8093, Statesboro, GA, 30460, United States of America, goran@georgiasouthern.edu, Kees Roos, Yanqin Bai

We present a class of polynomial primal-dual interior-point algorithms for conic linear commplementarity problems based on a new class of kernel functions. This class is fairly general and includes the classical logarithmic function, the prototype self-regular function, and non-self-regular kernel functions as special cases. The obtained complexity results are favorable; they match the currently best known iteration bounds obtained for these problems and these methods.

■ WA41

M - Taft

Innovation and Entrepreneurship I

Contributed Session

Chair: Qiancheng Zheng, University of Utah, 1645 E Campus Center Dr Rm 101, Salt Lake City, United States of America, q.zheng@business.utah.edu

1 - IT Investments, R&D Productivity, and Firm Performance

Gokcen Arkali, PhD Student, University of Texas at Dallas, School of Management, Richardson, TX, 75083, United States of America, gokcen.arkali@utdallas.edu, Indranil Bardhan, Vish Krishnan

We study the joint impact of IT and R&D investments on firm performance using an archival data from 1998-2006 for a panel of 80 firms, and investigate whether their interaction makes a difference under different scenarios. Our results suggest that IT moderates the relationship between R&D and firm performance in the computers/electronics and pharmaceutical industries in different ways. These results shed new light on the relationship between investments in innovation and firm performance.

2 - The Many Faces of Technological Innovations in China

Kenneth Huang, Assistant Professor of Management, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Road #05-01, Singapore, SG, 178899, Singapore, kennethhuang@smu.edu.sg

What are the important attributes and trajectories of technological innovations in China? As the first study of its kind, I ascertain the characteristics of Chinese technological innovations captured by patents versus U.S. innovations, and the technology diffusion trajectory of a sample of Chinese patents with U.S. counterparts versus those without. These findings shed light on the innovation landscape in China and have strategic implications for technology firms entering the Chinese market.

3 - Corporate Venture Capital's Effect on Absorptive Capacity

Scott Lindsey, Operations Management PhD Student, University of Utah - David Eccles School of Business, Kendall D. Garff Building, 1645 E Campus Center Dr Rm 101, Salt Lake City, UT, 84112, United States of America, scott.lindsey@business.utah.edu

A conceptual paper exploring effects of corporate venture capital (CVC) upon an investing firm's absorptive capacity (AC). This paper critiques and extends prior research, suggesting academic / managerial implications of CVC/AC upon firm autonomy and innovative output compared to acquisition activity. Several potential AC proxies and research methodologies are presented.

4 - A Dynamic Model of Sustainable Supply Chain

Pietro De Giovanni, Essec Business School, Avenue Bernard Hirsch, B.P. 105, 95021, Paris, France, pietro.degiovanni@essec.fr

This research develops a dynamic model of Sustainable Supply Chain (SC) Management. By comparing economic and environmental performance at firm and SC level, it evidences SC effectiveness in eliminating several environmental externalities by developing appropriate coordination mechanisms. Qualitative analyses compare economical/environmental advantages carried-out by Sustainable SC Management.

■ WA42

M - McKinley

Supply Chain Management I

Contributed Session

Chair: Chun-Lan Chang, University of Queensland, St Lucia, Brisbane, Australia, chunlan_chang@hotmail.com

1 - Relational Factors and Inventory Decisions

Daniel Corsten, Professor, IE Business School, Maria de Molina 13, Madrid, 28004, Spain, daniel.corsten@ie.edu, Ananth Iyer, Dorothea Wegener

Over the last decades analytical models and empirical studies have investigated the impact of relational factors on inventory decisions. However, to our knowledge no comprehensive model has tried to reconcile these research streams. First, we extend the model of Iyer and Bergen (1997) and develop hypothesis on the impact of relational factors on supplier service level and conditional inventory adjustments. We then proceed to test these hypotheses using two combined datasets on buyer-supplier relationships; a unique archival data set of inventory movements 266 suppliers to a large retailer and a corresponding data set of the suppliers' perception of the relationship with this retailer. Overall, the findings support the hypothesis, yet shed some new light on the importance of relational factors.

2 - Operational Supply Chain Planning under Uncertainty - The Impact of Flexibility

Peter Schütz, SINTEF Technology and Society, Applied Economics and Operations Researc, Trondheim, TR, 7465, Norway, peter.schutz@sintef.no, Asgeir Tomasgard

We present an operational supply chain planning problem with a planning horizon of 4 weeks and rolling schedules. Demand is known for the first week, whereas forecasts are used for the remaining 3 weeks. We use both stochastic and deterministic forecasts to study their impact on supply chain profits when operating the supply chain for 1 year. We also examine the effect of reduced production capacities, different penalties on unsatisfied demand, and backlogging unsatisfied demand vs. lost sales.

3 - Entrepreneurial Orientation, Communication, and New Product Development in the Supply Chain

Chun-Lan Chang, University of Queensland, St Lucia, Brisbane, Australia, chunlan_chang@hotmail.com

Based on the sector of information technology hardware products, entrepreneurial orientation is the resource that implements communication strategies and presents competitive supply chain advantages (quality, cost, speed, and flexibility) like operations management to provide new products and win market success. The thread concludes a model for prosperous information product development.

■ WA43

M - Balcony D

Operations Management I

Contributed Session

Chair: Margaret Pierson, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, mpierson05@gsb.columbia.edu

1 - Pricing and Inventory Rationing for Multiple Class Deterministic Demand Fulillment

Siqun Wang, Singapore Management Univ., 50 Stamford Road, LKC school of Business, Singapore, Singapore, sqwang@smu.edu.sg

We consider how a firm should price a product and allocate inventory to multiple customer classes that differ based on the price they pay and their willingness to incur delay in fulfillment of their demand. The problem is set in a deterministic demand, EOQ-like environment with holding, backorder and setup costs. We determine the sufficient condition for the existence of the optimal solution and provide a partial closed form for the solution.

2 - Transshipment: Better Alternative of Price Discounts

Deniz Ozdemir, Professor, Universidad Autonoma de Nuevo Leon, Graduate Program in Systems Engineering, San Nicolas de los Garza, 66420, Mexico, deniz@yalma.fime.uanl.mx

For the products with short life cycles, the price discounts at the end of the product life to deplete the existing inventories generate significant profit loses. Lateral transshipment of the product among the retailers is a valid alternative to serve the purpose. In this study, the timing and magnitude of the price discount and transshipment price is studied. Analyzing the end-of-season discounts and transshipment pricing, an alternative price policy is developed for inventory management.

3 - POM Survey Research: An Alternative to Multiple-item Measures

Christopher Swanton, PhD Student, University of Minnesota, 3-150 CSOM, 321 19th Ave S, Minneapolis, MN, 55455, United States of America, swant006@umn.edu, Fabrizio Salvador, Cipriano Forza, M. Johnny Rungtusanatham

Survey researchers often develop multi-item measurement scales to operationalize dimensions of phenomena, with scores for these scales aggregated to study the phenomena's antecedents and consequences. We demonstrate, via an example, the value of aggregating multiple single-item measurement scales to study the impact of total quality management on customer satisfaction.

4 - Competition in the Fast Food Drive-Through Industry

Margaret Pierson, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, mpierson05@gsb.columbia.edu, Awi Federgruen, Gad Allon

In the fast food drive-through industry, chains compete heavily in terms of prices, customer service and waiting times. Based on our analytical competition models, we report on a large scale empirical industrial organization study in which the demand equations for restaurants in various counties are estimated based on structural estimation methods. We discuss the implications for the equilibrium behavior in the industry.

■ WA44

M - Balcony C

Product and Pricing Decision Under Disruptions Risk

Cluster: Managing Disruptions in Supply Chains

Invited Session

Chair: Abhijit Gosavi, Missouri S & T, 219 Engineering Management, Rolla, MO, 65409, United States of America, gosavia@mst.edu

1 - Effect of Product Substitution and Unavailability Correlation on Mitigating Supply Chain Disruptions

Mengshi Lu, Department of Industrial Engineering, Tsinghua University, Shunde Building Tsinghua University, Beijing, 100084, China, lmd03@mails.tsinghua.edu.cn, Simin Huang

Enabling product substitution can be an effective way of mitigating supply chain disruptions. However, since substitutable products may share more components in common, they are more likely to be unavailable simultaneously, which impairs the effect. We studied a system with two substitutable products subject to correlated random supply disruptions. We showed the effect of product substitution in terms of reducing lost sales and the value of decoupling the supply of substitutable products.

2 - Risk Averse Price Setting Newsvendor

Johannes Fichtinger, Wirtschaftsuniversität Wien, Nordbergstrasse 15, Wien, 1090, Austria, johannes.fichtinger@wu-wien.ac.at, Werner Jammernegg, Emel Arikan

In the newsvendor framework empirical observations show that actual order quantities deviate from optimal quantities suggested by the model, so that risk averse decision making behavior is introduced. On the other hand, including pricing as a decision has become another important stream of research. We combine those streams by modeling risk aversion using the conditional value-at-risk and simultaneously optimizing on price and order quantity. We illustrate our approach with numerical examples.

3 - Capacity Choice under Demand Uncertainty: Postponement Effects on Product Flexibility

Dipankar Bose, Doctoral Student, Indian Institute of Management Calcutta, Indian Institute of Management Calcutta, Diamond Harbour Road , Joka, Kolkata, WB, 700104, India, dbose.iimc@gmail.com, Ashis Kumar Chatterjee

We develop two-stage stochastic programme to study the economics of price and production postponement decisions on dedicated versus product-flexible plant in context of capacity planning. Assuming demand intercept follows multivariate normal distribution, for three-product-case we analyze variance, correlation and cross-price effects. Due to analytical intractability, simulated-data based optimization is used.

4 - Disruption Management with Responsive Pricing and Contingent Capacity

Sharethram Hariharan, Research Associate, Oklahoma State University, 322 EN OSU Stillwater Campus, Stillwater, OK, 74074, United States of America, sharethramh@gmail.com, Tieming Liu

We study the capacity investment and disruption management decisions for a firm selling two products with responsive pricing and contingent capacity. The contingent capacity is available to produce a product when its capacity is insufficient. We formulate the problem as a stochastic programming model, study the impact of demand uncertainty (risk) on the optimal investment levels and characterize the structure of the optimal policy.

5 - A Comparison of Optimal Pricing Strategies under Various Risk Considerations

Chase Murray, PhD Candidate, University at Buffalo, 308A Bell Hall, Department of Industrial and Systems Eng, Buffalo, NY, 14260-1900, United States of America, cmurray3@eng.buffalo.edu, Mark Karwan, Abhijit Gosavi

We consider the single-product, single-period pricing problem with stochastic demand. Our work focuses on the comparison of the optimal pricing strategy across several ways of quantifying risk (e.g., the probability that expected revenues fall below a target level, variance, or variance below a target revenue). Efficient solution techniques for problems where no closed-form solution exists are presented. Extensions to the multi-product, multi-period problem will also be discussed.

■ WA45

M - Balcony B

Managing Supply Chain Uncertainties

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Yusen Xia, Georgia State University, Robinson College of Business, Atlanta, GA, 30303, United States of America, mgtyxx@langate.gsu.edu

1 - Continuous-time Portfolio Optimization with Finite Element Methods

Zhen Liu, Assistant Professor, Missouri University of Science & Technology, Rolla, MO, 65401, United States of America, zliu@mst.edu, John Birge

To study a portfolio optimization problem with transaction costs we set up a buy-and-hold problem, which can be transformed into a convection-dominated PDE problem. To solve the problem with high-order numerical scheme and overcome the spurious oscillations, we use the Local Discontinuous Galerkin method and a sequential optimization process to effectively determine the no-trade region. Our error estimate will help stochastic optimization approach by providing reliable benchmarks.

2 - The Impact of Low End Competition with a Strategic Supplier

Liwen Chen, PhD Candidate, University of Texas at Austin, IROM Department, McCombs School of Business, Austin, TX, 78712, United States of America, liwen.chen@mail.utexas.edu, Stephen Gilbert, Yusen Xia

We consider how the entry of a lower quality rival affects an incumbent OEM when there is a strategic supplier. Interestingly, we find that if the rival's quality is neither too high nor too low, his entry can benefit the incumbent OEM. Although the rival cannibalizes some of the incumbent's demand, his entry also causes the strategic supplier to lower the wholesale price. This latter effect dominates the former when the rival's quality is not too high.

3 - Distribution Channel Design to Manage Supply Disruptions

Yusen Xia, Georgia State University, Robinson College of Business, Atlanta, GA, 30303, United States of America, mgtyxx@langate.gsu.edu, Haresh Gurnani, Karthik Ramachandran

The buyer can control supply disruption risk by its choice of a distribution mechanism. One strategy includes insulating the supplier from inventory risk by acting as an intermediary. Alternately, the supplier may drop-ship products directly to the consumers. We model the distribution channel design for the buyer and study the incentive for the supplier to invest in improving reliability. Co-operative mechanisms to invest in supply reliability are also discussed.

■ WA46

M - Balcony A

Pricing Issues in Stochastic Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Srinagesh Gavirneni, Assistant Professor, Johnson School, Cornell University, 325 Sage Hall, Ithaca, NY, 14853, United States of America, sg337@johnson.cornell.edu

1 - Offshoring and Transfer Pricing Decisions of Global Firms in the Presence of Tax Advantages

Masha Shunko, CMU, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, mshunko@cmu.edu, Laurens Debo, Srinagesh Gavirneni

We study offshoring decisions of global firms in the presence of tax advantages. We consider transfer pricing as an income shifting tool that allows to benefit from tax differential and that also serves as an incentive tool within the firm. We show that the optimal offshoring policy for a centralized firm has an all-or-nothing structure. Under information asymmetry, the firm benefits from decentralizing pricing or offshoring decisions, in which case the policy changes to partial offshoring.

2 - The Implications of Cost, Capacity and Competition on Product Line Selection

Rui Yin, Assistant Professor, Arizona State University, Department of Supply Chain Management, W. P. Carey School of Business, Tempe, AZ, 85287, United States of America, rui.yin@asu.edu, Chris Tang

We present a model in which a firm makes the optimal product line selection, production, and pricing decisions in the presence of utility-maximizing consumers. There are 2 substitutable products in the consideration set, where product 2 has a higher quality than product 1. We examine the impact of costs, capacity and competition on the firm's optimal product line selection, optimal price and optimal production quantity.

3 - Games Among Manufacturers Producing Complementary Products

Xiang Fang, Assistant Professor, University of Wisconsin-Milwaukee, Lubar School of Business, 3202 N Maryland Ave, Milwaukee, WI, 53201, United States of America, fangx@uwm.edu, Yunzeng Wang

We consider a general industrial setting where multiple manufacturers each produce a different product and sell it to the markets. These produts are partially complementary. Facing multiple uncertain demand streams, each manufacturer chooses a production quantity to maximize its own expected profit. The manufacturers' equilibrium solutions are studied. Managerial insights are drawn as to how system parameters and control mechanisms affect firms' decisions and performance.

4 - Quality Investment, Pricing, and Inspection Decisions in Supply Chains

Murat Erkoc, Assistant Professor, University of Miami, College of Engineering, PO Box 248294, Coral Gables, FL, 33124, United States of America, merkoc@miami.edu, Haresh Gurnani, Mingzhou Jin

We consider a decentralized supply chain where market demand depends on the supplier's quality investment and the buyer's inspection policies. The supplier chooses the quality level and the wholesale price, whereas the buyer sets the inspection policy and the resale price. Higher quality and inspection do not only enhance demand through improved consumer perception but also reduce external and internal failure costs caused by defective products.

■ WA47

M - Hoover

Joint Session HAS/ DAS: Health Care Decision Aids

Sponsor: Health Applications Section, Decision Analysis
Sponsored Session

Chair: Jenna Marquard, Assistant Professor, University of Massachusetts-Amherst, 219 Engineering Lab I, 160 Governor's Drive, Amherst, MA, 01002, United States of America, jlmarquard@ecs.umass.edu

1 - Improving Mass Vaccination and Dispensing Operations and Logistics

Jeffrey Herrmann, University of Maryland, Department of Mechanical Engineering, College Park, MD, United States of America, jwh2@umd.edu

To prepare for a biological attack or epidemic, public health departments must plan mass dispensing and vaccination clinics. We have been collaborating with public health professionals to develop models to improve clinic operations and logistics. Based on key clinic parameters, clinic planning models estimate clinic capacity and the time patients spend in the clinic. Resupply planning models are used for planning the continuous resupply of clinics during mass dispensing.

2 - Instant Message Dialogs Sent as Negotiated Interruptions for Updated Task Duration Estimates

Franklin Dexter, Professor, University of Iowa, Anesthesia 6JCP, Iowa City, IA, 52242, United States of America, franklin-dexter@uiowa.edu

Operating room whiteboards (status displays) communicate times remaining in ongoing surgical cases to perioperative stakeholders (eg, post-anesthesia care unit, anesthesiologists, and control desks). We derived the conditional Bayesian lower prediction bound of a case's duration, conditional on the minutes that the case has been ongoing. We implemented on the hospital's anesthesia information management system server database the automatic (every 5 min) update of times remaining for every case.

3 - The Impact of Web-based Risk Calculators on Health Risk Perceptions and Information Processing

Christopher Harle, Carnegie Mellon University, Heinz School, HBH 242, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, charle@andrew.cmu.edu, Rema Padman, Julie Downs

Through statistical models embedded in "health risk calculators" Internet users can obtain personalized disease risk assessments. The perceptual and behavioral responses to these websites are unclear. We experimentally measured the impact of a personalized diabetes risk calculator on user information processing and subjective risk perceptions. Results suggest personalized risk estimates may actually reduce information usage and motivate modest changes in subjective risk beliefs.

4 - Developing a Decision Aid for Laypeople Choosing Whether to Share Their Medication Information

Jenna Marquard, Assistant Professor, University of Massachusetts-Amherst, 219 Engineering Lab I, 160 Governor's Drive, Amherst, MA, 01002, United States of America, jlmarquard@ecs.umass.edu

Current policy discussions and technical developments suggest laypeople will need to make complex choices regarding whether to electronically share their health information through tools such as personal health records (PHRs). We created a balanced scorecard-based analysis to aid laypeople in weighing the potential clinical care benefits and information disclosure concerns related to sharing information about each of their medications.

■ WA48

M - Coolidge

Collaborative Innovation

Sponsor: Technology Management
Sponsored Session

Chair: Paulo Gomes, Assistant Professor, Universidade Nova Lisboa, Campus de Campolide, Lisbon, PT, 1099-032, Portugal, pgomes@fe.unl.pt

1 - Open Source Software: What We Know (and do not know) About Motives to Contribute

Stefan Haefliger, Lecturer, ETH Zurich, Kreuzplatz 5, Zurich, ZH, 8032, Switzerland, shaefliger@ethz.ch, Sebastian Spaeth, Martin Wallin, Georg von Krogh

A substantial amount of academic work has examined Open Source software developer motivations. We critically review this work and show that it can be divided into a Phase 1 in which scholars argued why developers contribute to open source software, and a Phase 2 that aimed at explaining the relationship between motivations and the institutional context. We argue for entering a third phase of research that considers the social practice of software development and the institutional context.

2 - Performance Measurement in Collaborative Product Development

Paulo Gomes, Assistant Professor, Universidade Nova Lisboa, Campus de Campolide, Lisbon, PT, 1099-032, Portugal, pgomes@fe.unl.pt

We offer a framework that identifies key metrics and integration points across collaborative development processes. We identify areas in which these metrics may be misaligned. We discuss how goal setting, measurement, adaptation and corrective actions determine the effectiveness of outcomes in terms of the desired alignment.

3 - Commercializing Component Innovations: The Role of Network Effects and Firm Capabilities

Sinan Erzurumlu, Assistant Professor, Babson College, 231 Forest St, Babson Park, MA, 02457, United States of America, serzurumlu@babson.edu, Stephen Gilbert, Karthik Ramachandran

We analyze the issue of when and how an innovator would transfer its technology to another firm with which he also competes in the product market. Our analysis focuses on the structure of the network effects, the transferability of the innovation, and the market position of the innovator.

4 - Beyond Strategic Alliances: The Role of Informal Collaborations in the Biotechnology Industry

Paul Almeida, Associate Professor of Strategy & International Business Academic Director, Global Executive MBA Dean's Faculty Fellow McDonough School of Business Georgetown University, Washington, DC, 20057, almeidap@georgetown.edu

Research in strategic management has shown that strategic alliances facilitate inter-firm learning and innovation. Previous research has paid less attention to individual collaborations across firms and the associated benefits to firm innovativeness. Our paper investigates the role and impact of individual research collaborations, as evidenced by co-authorship of publications by biotechnology scientists, on the patented innovative output of the firm. We find that while strategic alliances are formed primarily with other firms, individual collaborations are usually formed with university scientists. The total number of individual collaborations aggregated at the firm level positively impacts the patenting output of biotechnology firms, but this effect decreases with firm age and size. Our findings reveal that firms are most innovative when they rely primarily on one form of collaborative activity - the highest levels of firm innovativeness are, in fact, achieved for high levels of individual collaborations and low levels of strategic alliances.

■ WA49

M - Harding

Stochastic Simulation Methodologies

Contributed Session

Chair: Demet Batur, Post-doctoral Research Associate, IMSE, University of Nebraska-Lincoln, 175 Nebraska Hall, Lincoln, NE, 68588, United States of America, dbatur2@unl.edu

1 - Exact Simulation of Stochastic Differential Equations

Nan Chen, Assistant Professor, Chinese University of Hong Kong, 709A, William Mong Engineering Building, Chinese University of Hong Kong, Hong Kong, China, nchen@se.cuhk.edu.hk

In the article we investigate a Monte Carlo method to exactly generate the distributions for stochastic differential equations (SDEs). Discretization methods can be used for simulating but they also introduce bias into the simulation and thus a large number of time steps are needed. This article suggests an acceptance-rejection approach based on probability measure decomposition to simulate. Financial applications such as path-dependent option pricing are also considered.

2 - An Elegant Method for Generating Multivariate Poisson Random Variables

Inbal Yahav, UMD, 4358 VMH, RH Smith School of Business, College Park, United States of America, iyahav@rhsmith.umd.edu

Generating multivariate Poisson random variables is essential in many applications. Current simulation methods suffer from limitations ranging from computational complexity to restrictions on the structure of the correlation matrix. We propose a computationally efficient and conceptually appealing method for generating multivariate Poisson data. The method is based on simulating multivariate Normal data and converting them to achieve a specific correlation matrix and Poisson rate vector.

3 - A Quantiles Approach to System Selection

Demet Batur, Post-doctoral Research Associate, IMSE, University of Nebraska-Lincoln, 175 Nebraska Hall, Lincoln, NE, 68588, United States of America, dbatur2@unl.edu, Fred Choobineh

We present a quantiles-based ranking and selection procedure to choose the best system from a set of stochastic systems based on a performance metric of interest via simulation experiments. It differs from the common mean-based selection-of-the-best procedures because it defines the best system based on the distribution function of the performance metric, not the mean. The comparison can be performed based on the most appropriate region (downside, upside, central) of the distribution function.

4 - Analyzing Inventory Models with Markovian Auto-correlated Demand Via Simulation Optimization

Rafael Diaz, Research Assistant Professor, Virginia Modeling, Analysis, & Simulation Center, 1030 University Blvd., Suffolk, VA, 23435, United States of America, rdiaz@odu.edu

This research considers a stochastic lost sales inventory model in which the control review system is a (R, s, S)-type. The demand pattern behaves as a discrete Markov chain that contains autocorrelated components. An enhanced simulated annealing algorithm by pattern search and ranking and selection is used to approximate solutions through stochastic-deterministic search process. The effects of autocorrelation levels, holding cost, and ordering costs on inventory performance will be presented.

■ WA50

M - Wilson C

Quadratic Assignment Problems

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Peter Hahn, Adjunct Associate Professor, University of Pennsylvania, 2127 Tryon Street, Philadelphia, PA, 19146, United States of America, hahn@seas.upenn.edu

1 - Strengthened Quadratic Programming Bounds for QAP

Kurt Anstreicher, Professor, Department of Management Sciences, University of Iowa, S210 PBB, Iowa City, IA, 52242, United States of America, kurt-anstreicher@uiowa.edu

The Quadratic Programming Bound (QPB) has proved useful in solving large-scale QAP problems to optimality within a Branch-and-Bound (B&B) framework.

For many problems QPB provides a good quality bound at modest computational expense. However it would be desirable to strengthen QPB on problems where the bound is less good, especially near the root of the B&B tree. We describe methodologies for strengthening QPB that continue to utilize convex quadratic programming for the bound computation.

2 - The Multi-story Space Assignment Problem

Peter Hahn, Adjunct Associate Professor, University of Pennsylvania, 2127 Tryon Street, Philadelphia, PA, 19146, United States of America, hahn@seas.upenn.edu, Yi-Rong Zhu, James MacGregor Smith

The Multi-story Space Assignment Problem (MSAP) models the location of departments of unequal size within multi-story facilities as a Generalized Quadratic 3-dimensional Assignment Problem (GQ3AP). Not only can the MSAP generate the design of the location of the departments in the facility, it also includes the evacuation planning for the facility. The formulation, background mathematical development, and computational experience with a branch and bound algorithm for the MSAP are also presented.

3 - An Improved Algorithm for the Generalized Quadratic Assignment Problem

Artur Pessoa, Adjunct Professor, Universidade Federal Fluminense, Rua Passo da Patria 156 Bloco D, sala 306, Sao Domingos, Niteroi, RJ, 24210-240, Brazil, artur@producao.uff.br, Monique Guignard-Spielberg, Yi-Rong Zhu, Peter Hahn

In the Generalized Quadratic Assignment Problem (GQAP), given M facilities and N locations, one must assign each facility to one location so as to satisfy the given facility space requirements, minimizing the sum of installation and facility interaction costs. In this paper, we propose a new Lagrangean relaxation and a lower bounding procedure for the GQAP. The new method allowed us to optimally solve 17 out of 19 instances from the literature with up to 35 facilities, 6 of which were open.

4 - New SDP Relaxations for QAPs Based on Matrix Splitting

Jiming Peng, Professor, University of Illinois at Urbana-Champaign, Department of Industrial & Enterprise Systems, 104 S. Mathews Ave., Urbana, IL, 61801, United States of America, pengj@uiuc.edu, Hans Mittelmann

QAPs are known to be among the hardest discrete optimization problems. Solving QAP instances of size n=30 has been recognized as a computational challeng. Moreover, even finding a strong lower bound for QAPs of size n>=30 is nontrivial. In this talk, we introduce several new SDP relaxations for QAPs based on matrix splitting and show that strong bounds can obtained effectively for large scale QAP instances upto n=200.

■ WA51

M - Wilson B

Virtual World and Virtual Community

Sponsor: Information Systems
Sponsored Session

Chair: Dan Kim, Associate Professor, University of Houston - Clear Lake, 2700 Bay Area Blvd, Houston, TX, 77058, United States of America, KimDan@UHCL.edu

1 - A Quasi Experimental Study on the Effects of Website Interactivity on Online Shopping Behavior

Hafizul Islam, PhD Student, University of Melbourne, PhD Student, MBS, 200 Leicester Street, Carlton, Vi, 3056, Australia, h.islam@mbs.edu

Multimedia rich online retail websites can influence online consumers shopping motivations and browsing behavior through sophisticated and aesthetic levels of interactive features. This study proposes an attitudinal framework based on the Technology Acceptance Model and uses a quasi-experimental analysis to explore the effects of design characteristics of interactive online shopping sites on online consumer's purchase intentions.

2 - Doing Business in Second Life: e-Commerce in a 3D Online Environment

Prabodh Shrestha, University of Maryland, Baltimore County, 1000 Hilltop Circle, Department of Information Systems, Baltimore, MD 21250, MD, United States of America, s.prabodh@gmail.com, Dongsong Zhang

The general idea behind 3D e-Commerce is to enable users to experience online shopping as they do in a real-life store. Many existing 3D virtual worlds are currently lack of some critical components for successful e-Commerce. Some virtual economy is only limited to virtual items. In this paper, we analyze the 3D platform, demonstrate that current 3D virtual worlds need significant improvement in their current systems to propel a real world e-commerce to prosper in such environments.

3 - Examining Moderator Use of Activity-tracking in a Nascent Online Community for Adolescents

Kevin White, UMBC, Dept. of Information Systems, 1000 Hilltop Circle, ITE 404, Baltimore MD 21250, United States of America, kwhite2@umbc.edu, Lee Boot, David Gurzick, Wayne Lutters

Despite the importance of moderation to the success of an online community, minimal attention has been given to understanding how the moderators function. To this end, this study focuses on the strategies surrounding moderators' use of an activity-tracking tool in moderating an adolescent-centric online community. Specifically, it reports on their use of this tool as a window into the entire community operation and as a mechanism to identify indirect opportunities to engage participants.

4 - Hide or Show: Can eTailers Benefit from Providing More Information about Their Products?

Han Zhang, Associate Professor, Georgia Institute of Technology, 800 West Peachtree Street, NW, Atlanta, GA, 30308, United States of America, Han.Zhang@mgt.gatech.edu, Peng Mei, Minxue Huang

Based on Economics of Information (EOI) theory and Signal theory, this research combines two competitive theories to explore how e-Tailers' information provision about their products influences consumers' cognition and products' price premium in electronic markets. The results indicate that providing more information, regardless of product information (e.g., reviews of products) or price information (e.g., competitor price information), all can lead to higher price premium.

■ WA52

M - Wilson A

Humanitarian Relief Logistics

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Marco Gutierrez, Georgia Institute of Technology, 1009 Mcmillan St, Atlanta, United States of America, marco.gutierrez@gatech.edu

1 - Prioritizing Relief Aid Supplies: Post-disaster Emergency Shelter

Marco Gutierrez, Georgia Institute of Technology, 1009 Mcmillan St, Atlanta, United States of America, marco.gutierrez@gatech.edu, John H. Vande Vate

We study the process of delivering post-disaster emergency shelter to people rendered homeless by disasters. During a response, relief aid providers may deliver different types of shelters (e.g. plastic sheets, tents, etc.) with different characteristics (i.e. quality, cost and size). We characterize the optimal shelter delivery policy to minimize suffering when there are two shelter options, delivery channels' capacity is constrained, and the total budget for the response is limited.

2 - Vehicle Replacement in the International Committee of the Red Cross – ICRC

Alfonso Pedraza Martinez, Alfonso.pedrazamartinez@insead.edu, Luk Van Wassenhove

We study vehicle replacement within the ICRC, one of the largest humanitarian organisations in the world. This research focuses on the fleet of 700 4x4 vehicles in Ethiopia, Sudan, Georgia and Afghanistan, 4 countries that cover most of the ICRC operational spectrum. ICRC policy sets the replacement of vehicles at 5 years or 150000 Km. Using real data provided by the ICRC headquarters, we test the current policy and find that it is not optimal from a cost perspective. We analyse the operational lifecycle of vehicles using econometric models and dynamic programming. Our results suggest that the organisation can make considerable savings by adjusting their replacement policy. This study contributes to the area of transportation research in humanitarian operations.

3 - Tools for Decision-making under Deep Uncertainty

Jaime Menoyo, University of Wisconsin-Madison, Madison, WI, jmmenoyo@wisc.edu, Vicki Bier

Decision-making under risk and uncertainty is widely studied; however, there is always the opportunity to improve. I seek to describe how certain organizational structures and cultures fare in the face of deep uncertainty, and give an example of an organizational culture that performed well in a situation involving deep uncertainty.

4 - Disaster Response and Relief Facility Location for Istanbul

Nihan Görmez, Research Assistant, Middle East Technical University, Middle East Technical University, Department of Industrial Engineering, Ankara, 06531, Turkey, nihan@ie.metu.edu.tr, Murat Köksalan, F. Sibel Salman

We study disaster response and relief facility location problem for the anticipated earthquake in Istanbul. The municipality plans to locate disaster response facilities to execute post-disaster relief operations. We develop a mathematical model that optimizes the travel time and the number of facilities to be opened. We analyze the trade-off between these two objectives under various circumstances and present the results.

■ WA53

M - Nathan Hale- Wardman Tower

Models and Analysis in Financial Engineering

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Siu-Tang (Tim) Leung, Princeton University, Department of OR&FE, Princeton, NJ, 08544, United States of America, siutang@Princeton.EDU

1 - Risk Management with Value-at-risk and Stress Testing: An Alternative to Conditional Value-at-risk

Alexandre Baptista, Assistant Professor of Finance, The George Washington University, Funger Hall, Suite 501, 2201 G Street, NW, Washington, DC, 20052, United States of America, alexbapt@gwu.edu, Gordon Alexander, Shu Yan

The popularity of VaR and Stress Testing (ST) raises the question of whether a risk management system based on both VaR and ST constraints is an effective alternative to one based on CVaR. When the VaR and ST bounds are properly chosen and short sales are disallowed, the constraints lead to the selection of portfolios with relatively small CVaRs. However, that is not necessarily true when short sales are allowed. Thus, the effectiveness of the constraints depends on the allowance of short sales.

2 - An Efficient Simulation Procedure for Point Estimation of Expected Shortfall

Ming Liu, PhD Student, Northwestern University, 2145 Sheridan Rd, Room C231, Evanston, IL, 60208, United States of America, ming-liu@northwestern.edu, Barry L Nelson, Jeremy Staum

Given a set of scenarios, expected shortfall is an average of the largest losses that occur in any scenario. We consider the case where a portfolio's loss in each scenario is estimated by simulation. We present a simulation procedure that allocates a fixed computational budget efficiently among scenarios and show that it estimates expected shortfall with a much smaller mean squared error than a standard simulation procedure, which allocates equal computational resources to each scenario.

3 - A Regime Switching Model for the Optimal Intervention of a Central Bank in the Exchange Rate Market

Luz Rocio Sotomayor, University of Alberta, 632 Central Academic Building, Edmonton, AB, T6G 2G1, Canada, rsotomayor@math.ualberta.ca, Abel Cadenillas

We consider an exchange rate market with different regimes generated by the conditions of the monetary fundamentals. Specifically, we model the exchange rate as a geometric BM with parameters modulated by an observable Markov chain. Under this setup, we solve the problem of a Central Bank that selects the intervention strategy that minimizes the total cost of keeping the exchange rate as close as possible to a given target, by using stochastic impulse control with regime switching techniques.

4 - Static Hedging of Barrier Options under Zero-drift CEV

Sergey Nadtochiy, Princeton University, snadtoch@Princeton.edu

We consider the underlying given by the Constant Elasticity Volatility model with zero drift, and derive the analytical solution for the problem of static hedging of barrier options in this model, using the theory of generalized functional transforms. We also provide the approximation of the above hedging strategy through the use vanilla options only, and test its performance under more general models.

■ WA55

M - Room 8217

Network Optimization

Contributed Session

Chair: Hernan Abeledo,Associate Professor, The George Washington University, 1776 G Street NW, Washington DC 20052, United States of America, abeledo@gwu.edu

1 - Where Are All the Cars? Characteristics of Optimal Solutions to the Sensor Location Problem

David Morrison, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, drmorr0@gmail.com, Susan Martonosi

Monitoring traffic flow over the roads in a traffic network is an important first step to solving the problem of congestion and over-saturated roads. We examine the Sensor Location Problem: What is the smallest subset of intersections that can be monitored such that traffic on the entire network can be determined? We present a necessary condition under which a set of monitored vertices can produce a unique traffic flow solution and disprove a previously posed necessary and sufficient condition.

2 - New Formulation for the Hierachical Network Design Problem

Macarena Donoso, Phd Student, Pontificia Universidad Catòlica de Chile, Ejército 441, Santiago Chile, Santiago, Chile, macarena.donoso@udp.cl, Gabriel Gutierrez

This work consists of the formulation, modeling and solving of a particular hierarchical network design problem. A path is built between two points of the network, and secondary paths start at each node of the path. The objective is minimize the construction cost, maximized the covered demand and, for the nodes that to be not covered, the distance to the most nearby node of network is minimized. We propose an integer programming formulation and an algorithm of resolution.

3 - Efficient and Secure Information Exchange Using Network Coding

Salim ElRouayheb, Texas A&M University, 3128 TAMU, College Station, TX, United States of America, salim@ece.tamu.edu, Alex Sprintson

We focus on the problem of secure exchange of information over a communication network. In this problem, a stream of data is multicasted from a source node to receiver nodes in the presence of an adversary that can overhear the information exchange over a limited number of network links. It has being shown that the network coding technique is beneficial for achieving information-theoretic security. We present several efficient methods for computing secure network codes over small finite fields.

4 - An Efficient Algorithm for Routing and Wavelength Assignment in Optical Ring Networks

Rudy Sultana, Decisive Analytics Corp, 1235 South Clark Street , Suite 400, Arlington, VA, 22202, United States of America, kusnadi@gwu.edu, Hernan Abeledo

We propose a method for solving the Routing and Wavelength Assignment (RWA) problem for ring networks which decomposes it into two integer programming sub-problems. In the first subproblem path routes are selected by solving an integer multicommodity flow problem. The second subproblem assigns wavelengths to the selected paths while minimizing the total number of required wavelengths. Empirical results show that this approach produces optimal solutions consistently and efficiently.

■ WA56

O - Blue Room

OR in Health Care and Non-profit Industries

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Elizabeth Durango-Cohen, Assistant Professor, Illinois Institute of Technology, 3424 S. State Street, Chicago, IL, United States of America, durango-cohen@iit.edu

1 - Dynamic Periodic Scheduling of Home Health Practitioners

Ashlea Bennett, Georgia Institute of Technology, Georgia Tech - ISyE, 765 Ferst Dr NW, Atlanta, GA, 30332-0205, United States of America, ashlea@gatech.edu, Alan Erera

We study the challenge of increasing resource utilization in the home care industry by improving the scheduling of home visits by nurses. The specific resultant problems are highly constrained dynamic periodic routing problems. Solution approaches are presented and the sensitivity of productivity objectives to the enforcement of various patient service constraints is analyzed.

2 - Optimizing Direct-marketing Strategies for a Public Broadcasting Institution

Elizabeth Durango-Cohen, Assistant Professor, Illinois Institute of Technology, 3424 S. State Street, Chicago, IL, United States of America, durango-cohen@iit.edu, Pablo Durango-Cohen

We develop a framework to support marketing (e.g., direct mailing) efforts at a public broadcasting station. We develop/implement an instance of the Expectation-Maximization (EM) Algorithm to cluster the target population into homogeneous segments, and to optimize (revenue-maximize) the marketing strategy for each segment. Computational results and managerial insights will be discussed.

■ WA57

O - Blue Room Prefunction

Queuing Applications in Air Traffic Management

Sponsor: Aviation Applications
Sponsored Session

Chair: Jasenka Rakas, University of California at Berkeley, 107B McLaughlin Hall, NEXTOR, Berkeley, CA, 94720, United States of America, jrakas@berkeley.edu

1 - Application of Queuing Models to Assess the Value of 4DT Trajectory Performance

Mark Hansen, Professor, U.C. Berkeley, 114 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, mhansen@ce.berkeley.edu

Future concepts for the National Aviation System emphasize the use of 4D trajectories (4DTs) as a means of increasing efficiency. We investigate the use of queuing models to assess the value of precise 4DT adherence. Comparison of stochastic and deterministic models allows an estimate of the delay savings of a shift from a highly stochastic system to one with perfect 4DT adherence. Alternatives for modeling intermediate cases, featuring improved but not perfect precision, are also presented.

2 - Continuum Queuing Network Models in Aviation

Kleoniki Vlachou, PhD Student, University of Maryland, 1173 Glen L. Martin Hall, College Park, MD, 20742, United States of America, kvlachou@umd.edu, David Lovell

Numerous network queuing models have been developed to estimate the propagation of uncertainty in networks of airports. These models approximate networks with either low precision (stochastic models) or high precision (deterministic models). As new technologies are introduced in Air Traffic Management systems, intermediate precision cases must be examined. We explore the use of families of diffusion equations to solve these problems.

3 - Real-time Inter-modal Diversion for Airline Schedule Perturbation Recovery

Yu Zhang, Assistant Professor, University of South Florida, 1023 Foster City Blvd,, Apt.C, Foster City, CA, 94404, United States of America, zhangyu@berkeley.edu, Mark Hansen

Propose a new analytical framework and supporting optimization model that will encourage the aviation industry to incorporate alternative transportation modes when major airports in the system encounter temporary closures or severe capacity deficiencies, provide a way to reduce passenger disutility, help airlines reduce operating cost and recover schedule more promptly, and assist air traffic flow managers to utilize and distribute scarce resources more efficiently and equitably.

4 - Nested Queuing Models for En Route Traffic and Controller-pilot Communication Messages

Jasenka Rakas, Institute of Transportation Studies, 107 McLaughlin Hall, Berkeley, CA, United States of America, jrakas@ce.berkeley.edu

This paper uses nested queuing for modeling en route traffic and controller-pilot communication messages. Communication is maintained either by radios or data link. The concept of priority queuing is introduced, where voice messages have higher priority and text messages have lower priority. Based on a mathematical model, it is proved that the use of data link reduces (1) congestion in communications and (2) the expected waiting time of the message queue.

■ WA58

O - Capital

Safety and Performance: Now and NextGen

Sponsor: Aviation Applications
Sponsored Session

Chair: Dave Knorr, FAA Liasion at DFS, FAA, 800 Independence Avenue, Washington, DC, 200008, United States of America, Dave.Knorr@faa.gov

1 - NextGen High Density Operations Case Study

Shahab Hasan, Program Manager, LMI, 2000 Corporate Ridge, McLean, VA, 22102, United States of America, SHASAN@lmi.org, Gregory Carr, Yuri Gawdiak

We present the results of a case study of NextGen High Density Operations. The purpose of the case study was to exercise a portfolio process, test coordination and integration across JPDO divisions and FAA, test workflow integration, and identify lessons, gaps, and requirements.

2 - Safety vs Capacity- The Safety Operating Characteristic for NextGen

Sherry Borener, Senior Scientist, AVS/FAA, 800 Independence Avenue, Washington, DC, 200008, United States of America, Sherry.Borener@faa.gov

The relationship bewteen the safe, desired and delivered number of flight operations per day defines a "Safety Operating Characteristic". If we normalize events against the number of operations delivered in the NAS we obscure the impact of safety constraints. Capacity and number of operations delivered are distinct, and informative. The SOC can be applied to forecast the potential improvement in enabled operations due to NextGen improvements.

3 - NextGen Deployment Scenarios- Safety and Financial Considerations

Richard Golaszewski, Executive Vice President, GRA, Incorporated, 115 West Av., Suite 201, Jenkintown, PA, 19046, United States of America, richg@gra-inc.com

The implementation of major changes to the air traffic control system has safety and financial implications for air traffic service providers and users. NextGen costs are expected to be signiificant for both operators and FAA. Changing technology and procedures also raises issues in terms of safety assurance. This presentation will explore the ways in which these considerations can best be managed, and will provide potential analytic frameworks for this.

4 - Lean Safety Assessment of Airborne Merging & Spacing Technologies

Robert Hemm, Research Fellow, LMI, 2000 Corporate Ridge, McLean, VA, 22102, United States of America, rhemm@lmi.org

Using the assessment of airborne merging and spacing in the terminal area as an example, we describe the functional and quantitative framework for preliminary, "lean" safety assessments (LSAs) of NextGen operational improvements. The assessment includes a system description, hazard/failure identification, and both qualitative and quantitative risk analyses.

5 - Estimating Potential Fuel Savings from Continuous Descent Arrivals (CDAs)

Joseph Post, Manager, Modeling and Simulation, FAA/ATO-P, 800 Independence Avenue, SW, Washington, DC, 20591, United States of America, Joseph.Post@faa.gov, Daniel Murphy, Michael Wells

Aircraft arrival procedures often involve a "stepped" descent from cruise altitude. These periods of low-altitude flight cause aircraft to burn more fuel. In contrast, continuous descent arrival (CDAs) allow the aircraft to fly higher, longer. We estimate the potential benefits of using CDAs using BADA performance tables, radar track data, and forecasts of future traffic. Our results compare favorably with data from actual flight tests.

■ WA59

O - Embassy Room

Traditional and Non-Traditional Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Kristin Fridgeirsdottir, Assistant Professor, London Business School, Regent's Park, London, W1U 5HW, United Kingdom, kfridgeirsdottir@london.edu

1 - Contract Timing with Forecast Updates

Ozge Sahin, University of Michigan, ozge@bus.umich.edu, Izak Duenyas, Bowei Cheng

The goal of the research is to investigate the value of forecasting the demand of the retailer in a decentralized supply chain. We consider a two period, single retailer and single supplier problem. The retailer's type and subtype after the forecast update are private information. We compare and contrast three contract types and show that contrary to the common belief the supplier and retailer do not always benefit from more information.

2 - The Revenue Driven Newsvendor under Information Asymmetries

Adam Zhu Wansha, Assistant Professor, Singapore Management University, 50 stamford 0401, Singapore, 178899, Singapore, adamzhu@smu.edu.sg, Zhengping Wu, Pascale Crama

We study the inventory decisions of a manufacturer who derives revenue not only from its product sales, but also from a second source such as advertisement revenue of a magazine publisher, cell phone carriers' subsidize revenue of a phone maker, and etc. We use the principle-agent model to study the manufacturer's relationship with the second revenue source provider. The manufacturer's optimal decisions are derived and its managerial insights are discussed.

3 - Revenue Management for Online Advertising: Pay-per-click Pricing

Kristin Fridgeirsdottir, Assistant Professor, London Business School, Regent's Park, London, W1U 5HW, United Kingdom, kfridgeirsdottir@london.edu, Sami Najafi-Asadolahi

We consider a web publisher that generates revenues from displaying ads on its website. The web publisher charges the advertisers according to a pay-per-click pricing scheme. We compare this scheme to another common pricing scheme, pay-per-impression. We model the operation of the web publisher as a queuing system with no waiting spaces and derive a closed-form solution for its steady-state probabilities. We then determine the optimal pricing policy and provide managerial insights.

■ WA60

O - Hampton Room

Models for Rail Transportation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Teodor Gabriel Crainic, Professor, Department Management & Technology, ESG, UQAM, C.P. 8888, succ. Centre-ville, Montreal, QC, H3C 3P8, Canada, theo@crt.umontreal.ca

1 - Integrated Rail Service Network Design Model

Endong Zhu, PhD Student, Université de Montréal, Cirrelt, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, endong@crt.umontreal.ca, Teodor Gabriel Crainic, Michel Gendreau

Service network design for rail transportation concerns the selection and scheduling of train services, car distribution, blocking and train make-up policies. A two-layer time-space network is proposed to model the traffic flow and the decisions on blocks and services. The MIP model is difficult and heuristic methods are explored.

2 - Managing Locomotives in Freight Rail Transportation Systems

Mervat Chouman, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montréal, QC, H3C 3J7, Canada, mervat@crt.umontreal.ca, Teodor Gabriel Crainic

The problem concerns the planning of locomotive fleet management for a freight rail carrier. It consits in assigning a set of heterogeneous locomotives to scheduled trains, such that all trains have the required power during their entire journay, while a number of restrictions, e.g. power availability and maintenance rules, are satisfied. We present an integer formulation and propose a heuristic approach to obtain high-quality solutions.

3 - On Track – Modeling the Strategic Railway Crew Scheduling at Deutsche Bahn (Part I)

Dominik Malcherek, University of Cologne, Department of Information Systems, and Operations Research (WINFORS), Cologne, 50969, Germany, d.malcherek@uni-koeln.de, Ulrich Derigs, Simon Schäfer

An essential step in the strategic planning process at railway companies is the optimal allocation of crew bases and suitable staff sizes. We present concepts of the crew scheduling problem at Deutsche Bahn and a corresponding mathematical model. Our experiences are based on a joint research project with Deutsche Bahn, Germany's largest railway company.

4 - On Track – Solving the Strategic Railway Crew Scheduling at Deutsche Bahn (Part II)

Simon Schäfer, University of Cologne, Department of Information Systems, and Operations Research (WINFORS), Cologne, 50969, Germany, simon.schaefer@uni-koeln.de, Dominik Malcherek, Ulrich Derigs

Solving large-scale crew scheduling problems is extremely difficult. We report on a joint project with Deutsche Bahn, where we have developed a MIP-crew scheduling model and a column generation based optimization system to perform scenario analyses on future timetables with respect to alternative crew base configurations and service levels.

■ WA61

O - Calvert Room

Dynamic Evacuation Planning and Operations Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Mark Hickman, University of Arizona, Civil Engineering, PO Box 210072, Tucson, AZ, 85721-0072, United States of America, mhickman@email.arizona.edu

1 - A Network Flow Algorithm for Mass Evacuation Traffic Flow Optimization

Hong Zheng, Graduate Student, University of Arizona, 1209 E 2nd St, Tucson, AZ, 85721, United States of America, hzheng@email.arizona.edu, Yi-Chang Chiu

We show that the cell transmission model (CTM) based system optimal evacuation problem for infinite horizon equals to the earliest arrival flow/universal maximum flow problem under certain condition.We propose a dynamic network flow algorithm to solve it on time expanded network.It applies "scaled flow" scheme taking account of ratio of backward wave speed over free flow speed;solution overcomes "holding" phenomena for diverge and general cells. Numerical examples will be discussed.

2 - A Dynamic Evacuation Network Optimization Problem: Lane Reversal and Crossing Elimination

Chi Xie, Research Fellow, The University of Texas at Austin, 1 University Station, C1761, Austin, TX, 78712, United States of America, chi.xie@mail.utexas.edu, Dung-Ying Lin, Travis Waller

We define and solve a dynamic evacuation planning problem with two planning strategies: lane reversal and crossing elimination. The formulated network optimization model has a bi-level structure: the upper-level part is aimed at optimizing the allocation of network capacity and connectivity; the lower-level problem serves as a network flow evaluation framed into a cell transmission model. An integrated Lagrangian relaxation and tabu search method is developed to search for optimal solutions.

3 - Towards an Integrated Demand Management for Emergency Evacuation

Hossam Abdelgawad, PhD Candidate, University of Toronto, 30 Charles St. West, Apt 924, Toronto, ON, M4Y 1R5, Canada, h.abdel.gawad@utoronto.ca, Baher Abdulhai

We integrated demand scheduling and destination choice to synergize their potential benefits to emergency evacuation.The result is an optimal spatio-temporal evacuation (OSTE) model and tool that helps evacuees to decide where to go, when to go, and how to get there. A case study applying the model to a portion of Downtown Toronto in a simulated environment is also presented. The model results and findings are discussed.

4 - Short-notice, Multi-modal Evacuation Modeling

Mark Hickman, University of Arizona, Civil Engineering, PO Box 210072, Tucson, AZ, 85721-0072, United States of America, mhickman@email.arizona.edu, Yi-Chang Chiu, Hyunsoo Noh

A major flooding event is considered for short-notice evacuation modeling. Both the evacuation of persons by automobiles and the evacuation of the "carless" by transit buses are considered. An actual flooding scenario from Phoenix, Arizona is used to illustrate the evacuation needs and the potential evacuation strategies that could be employed. Both modeling and computational aspects are discussed.

■ WA62

O - Governor's Boardroom

Inventory and Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Aurelie Thiele, P.C. Rossin Asst Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@lehigh.edu

1 - Optimal Pricing and Product Development Policies under Consumer Memory

Hasan Arslan, Suffolk University, Boston, MA, 02108, United States of America, harslan@suffolk.edu, Soulaymane Kachani, Kyrylo Shmatov

We consider pricing and product development policies for successive product generations, when demand is impacted by the reference price and reference innovation level formed by consumers. We characterize the pricing and product development policies explicitly for two successive generations, and propose a general quasi-analytic solution. We also extend the analysis to a competitive environment. We derive Nash equilibria among firms adopting different pricing and product development policies.

2 - Pricing Decisions during Inter-generational Product Transition

Hongmin Li, Assistant Professor, Arizona State University, Dept of Supply Chain Management, W.P. Carey School of Business, Tempe, AZ, 85287, United States of America, hongmin.li@asu.edu, Stephen Graves

We study the optimal pricing decisions in a product transition, i.e., when a new generation product replaces an old one. We formulate the dynamic pricing problem and derive the optimal prices for both the old and new products. Our analysis identifies the key dynamics affecting the optimal prices: product replacement, scarcity, inventory, and internal and external competition. In addition, we propose a simple and pragmatic approach to incorporate demand learning into the pricing decisions.

3 - Robust Optimal Control with an Application to Inventory Management

Changhyun Kwon, Assistant Professor, University at Buffalo, SUNY, Dept of Industrial & Systems Engineering, 438 Bell Hall, Buffalo, NY, 14260, United States of America, chkwon@buffalo.edu, Terry Friesz, Matthew Rigdon

We present a method for handling uncertainty in optimal control problems via a robust optimization approach. We extend prior work on robust optimal control by treating an objective function that is nonlinear in states, controls, and uncertain parameters. An application to inventory management is provided.

4 - Integrated Scenario Design and Inventory Control

Aurelie Thiele, P.C. Rossin Asst Professor, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, aurelie.thiele@lehigh.edu, Gokhan Metan

We integrate scenario design and inventory control in a robust framework for a new product; the demand distribution is not available, but the manager receives advance information on the success (high, low or moderate) of the product and knows range forecasts in each scenario. We derive the optimal order in closed form and provide insights into the impact of the cost parameters. We also compute the critical probability of the baseline scenario for which the manager switches between strategies.

■ WA63

O - Congressional B

Stochastic Networks and Adaptive Routing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: James Moore, University of Southern California, Los Angeles, CA, United States of America, jmoore@usc.edu

1 - Exact and Heuristic Solution Algorithms for Real-time Multi-purpose Trip Optimization in LBS

T. John Kim, Endowed Professor of Urban & Regional Systems, University of Illinois at Urbana-Champaign, Dept of Urban & Regional Planning, 111 Temple Buell Hall, 611 Taft Drive, Champaign, IL, 61820, United States of America, tjohnkim@uiuc.edu, Seungmo Kang

A new type of Location-Based Services (LBS) is to guide users with a route and locations of multiple point-of-interests to visit with minimum cost including the purchasing, stopping, and travel costs. For a real-time application, we developed dynamic programming methods. Heuristic solution algorithms are also applied where exact solutions exceed the time limit.

2 - Heuristic Solution Algorithms for a Traffic Sensor Optimization Problem

Praveen Edara, Assistant Professor, University of Missouri-Columbia, E 3502 Lafferre Hall, Dept of Civil &Environmental Engineering, Columbia, MO, 65211, United States of America, EdaraP@missouri.edu, Milica Selmic, Dusan Teodorovic

A traffic sensor placement problem addressing the travel time estimation on freeways is studied. Two relatively new heuristic algorithms, 1) Variable Neighborhood Search and 2) Bee-Colony Optimization are explored in a case study of Interstate 66 in Northern Virginia. Ground truth travel times were obtained using GPS probe vehicles driven during the peak periods. The performed numerical experiments show that the proposed algorithms generate high-quality solutions in reasonable CPU times.

3 - Optimizing Routes for the Transportation Disadvantaged at Center for Transportation Excellence, NY

Rajan Batta, Professor, Department of Industrial & Systems Engineering, University at Buffalo (SUNY), 420 Bell Hall, Buffalo, NY, 14260, United States of America, batta@eng.buffalo.edu, Elif Tokar-Erdermir

We develop routing algorithms for clients in a bussing environment. The clients are transportation disadvantaged, e.g. handicapped, elderly, mentally disabled. There are two route categories, fixed and on-demand. There are special constraints in addition to classical vehicle routing problem with time windows. Developed algorithms are based on cheapest insertion and tabu search heuristics. The algorithms are used for both static(offline) and dynamic(online) planning of the routes.

■ WA64

O - Congressional A

Advances in Warehouse Design II

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Marc Schleyer, Department of Systems and Industrial Engineering, Auburn University, United States of America, marc.schleyer@auburn.edu

1 - Order-picking Path Optimization with Multi Picks Per Route Using Pallet Stackability in a Warehouse

Ahmed Hassan Aly, Teaching Assistant and PhD Student, Industrial Engineering Department at Clemson University, 813, College Avenue, Apt # 11, Clemson, SC, 29631, United States of America, ahassan@clemson.edu, William Ferrell

Order-picking typically accounts for about 65% of warehouse operating costs and traveling compromises 55% of the order-picking time. This research focuses on the real situation where order line items are in pallet quantities, multiple picks are allowed and the pallets can be stacked. A model is developed to determine optimal or near optimal solutions.

2 - A New Facility Design Method for Third-party Warehouse Based on Optimal Revenue Management

Yeming Gong, Mr., Rotterdam School of Management, Versijdenstraat 6, Rotterdam, 3033TK, Netherlands, ygong@rsm.nl, Rene de Koster

Based on a leading 3P(third-party) warehouse case, we identify the relation between market segment and facility type, and present a new facility design method. We show new facility designed by our method can significantly improve the revenue. This paper reports a novel RM application industry,3P warehouse, is the first to apply RM theory as a methodological foundation to facility design, and identifies a new direction,the interface between RM and facility logistics.

3 - Design of Warehouses under the Constraint of On-time Order Fulfillment

Marc Schleyer, Department of Systems and Industrial Engineering, Auburn University, United States of America, marc.schleyer@auburn.edu, Clemens van Dinther

Logistic systems have to be designed in a way that on-time order fulfillment is guaranteed with a given high probability. Our research presents a novel analytical approach which enables the determination of the order throughput time distribution in warehouses under various system settings. We use discrete time queueing models for the calculation of the throughput time distribution leading to the probability of on-time order fulfillment.

4 - A Linear Storage-Retrieval Policy for Robust Warehouse Management

Marcus Ang, Research Fellow, Singapore-MIT Alliance, 4 Engineering Drive 3, Singapore, 117576, Singapore, g0300273@nus.edu.sg, Yun Fong Lim, Melvyn Sim

In a unit-load warehouse, assigning products to and retrieving products from proper storage locations is crucial in minimizing its operating cost. The problem becomes intractable when demand is uncertain. We assume a factor-based demand and introduce a robust optimization model that minimizes the worst-case expected travel under distributional ambiguity. By restricting to a linear decision rule, we can derive an efficient policy. The results are verified via numerical studies.

■ WA65

M - Virginia A

Workforce Management Challenges in Global Services Delivery Organizations

Cluster: Workforce Flexibility/Management
Invited Session

Chair: Gyana Parija, IBM Research, IBM India Research Lab, Plot-4, Block-C, Inst. Area, Vasant Kunj, New Delhi, DL, 110070, India, gyana.parija@in.ibm.com

1 - Workforce Optimization for IT Application Service Providers

Rohit Lotlikar, Research Staff Member, IBM India Research Lab, EGL Block D,, Domulr Inner Ring Rd, Bangalore, KA, 560034, India, rohitmlo@in.ibm.com, Guruduth Banavar, Munish Goyal, Nandakishore Kambhatla, Debapriyo Majumdar, Gyana Parija, Sambuddha Roy, Soujanya Soni

In large IT Services organizations, efficient matching of practitioners to project openings is critical to profitability. Practitioners and project openings are characterized by certain structured and unstructured attributes. Complexity arises due to inter-relationships between attributes, missing or incorrect data, as well as the need to be customize to user needs. We use constrained optimization and machine learning techniques, packaged in a customizable web based user interface.

2 - Models for Manpower Planning at Different Time Horizons
Dagan Gilat, IBM, IBM Haifa Research Lab, Haifa, NA, Israel, dagang@il.ibm.com, Segev Wasserkrug, Yossi Richter

Manpower planning needs to be addressed at three different time horizons: Operational, tactical and strategic. We present several analytical models and techniques that have been applied to these planning horizons. These include techniques from a variety of fields, such as mixed integer programming, constraint programming, and stochastic models. We also dive into two approaches that have been used successfully by the IBM Haifa Research lab.

3 - Stochastic Analysis and Optimization of Workforce Evolution
Mayank Sharma, IBM Research, IBM T.J. Watson Research Center, Yorktown Heights, NY, 10598, United States of America, mxsharma@us.ibm.com, Yingdong Lu, Mark Squillante

We develop stochastic models for estimating the evolution of a workforce over time based on a given set of policies and conditions. A set of transition probabilities are extracted from historical data and used as base model parameters. We solve the corresponding stochastic optimization problem to determine how the workforce should evolve over time to maximize financial/business objectives. Our solutions can be generally applied to address a broad class of strategic workforce management issues.

■ WA66

M - Delaware A

Spreadsheet Applications in OM & OR

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: John Raffensperger, Senior Lecturer, University of Canterbury, Private Bag 4800, Department of Management, Christchurch, 8140, New Zealand, john.raffensperger@canterbury.ac.nz

1 - A Model to Assist in Selecting Bid Prices in the Truckload Market
Keith Ware, OR Manager, UPS, 1400 N. Hurstbourne Pkwy, Louisville, KY, 40242, United States of America, kware@ups.com

When truckload carriers develop bid prices, they want to leverage their existing transportation network to reduce their costs and submit a very competitive bid. However, the demands that make up the network are stochastic and the exact timing of any particular move is not known until 24 hours before it actually occurs. We describe a spreadsheet model using Monte Carlo techniques and a series of min cost network flow models to assist a carrier during the price setting process.

2 - Using Spreadsheet to Optimize Transportation Problem in a Large Consumer and Industrial Company
Xu Yang, Graduate Research Assistant, University of Louisville, Department of Industrial Engineering, J B Speed School of Engineering, Louisville, KY, 40292, United States of America, x0yang07@louisville.edu, Sunderesh S Heragu, Gerald W Evans

A large transportation model is formulated in spreadsheet and solved by XPRESS Solver Engine on Premium Solver Platform. The objective is to minimize total shipping cost in a large consumer and industrial company. The solution goes into a decision support tool which is also a spreadsheet. This user-friendly tool is developed for operations managers to make a final decision based on optimal solution given by optimization model as well as some real-world considerations.

3 - Min Spanning Tree in a Spreadsheet? The Limits of Spreadsheet Modeling
John Raffensperger, Senior Lecturer, University of Canterbury, Private Bag 4800, Department of Management, Christchurch, 8140, New Zealand, john.raffensperger@canterbury.ac.nz

The min spanning tree is an easy problem, but solution in Excel is annoying. We can make an MST by a macro with a standard algorithm, or with an LP in Solver with subtour rows. Without macros or Solver, I give a spreadsheet to find an MST, and also Held-Karp subgradient optimization for the TSP. With constructive complexity analysis, I show Excel is sufficiently expressive for these models, but they would be easier to write in procedural code. This points to the limits of spreadsheet modeling.

■ WA67

O - Forum Room

Decision Analysis I

Contributed Session

Chair: Richard Staats, Department Head, MITRE, Box 1232, McLean, VA, 22101, United States of America, staats@alum.mit.edu

1 - Predicting the Impact of an Animal Disease Outbreak: A Decision Tree Model
Sarah Riddell, Lawrence Livermore National Laboratory, PO Box 808, L-229, Livermore, CA, United States of America, sriddell@llnl.gov

Using simulated data for animal disease outbreaks, we consider predictors of the magnitude of disease spread. Based on developed leading indicators, a decision tree model is constructed to guide expert response in the face of an outbreak.

2 - An Integrated Framework for Firm Level Outsourcing Decisions
Youxu Tjader, Doctoral Candidate, University of Pittsburby, 9123 Willoughby Rd, Pittsburgh, PA, 15237, United States of America, yotst1@katz.pitt.edu, Jennifer Shang

We propose a framework of using Analytical Network Process to integrate the four perspectives of Balanced Scorecard into an interconnected decision network for selecting the best IT outsourcing strategy at individual firm level. A thorough "what-if" analysis helps boost the model's applicability to a wide range of vastly different companies.

3 - Decomposition of Large Scale Man-power Planning Problems: Assignment, Loading and Scheduling
Alper Uygur, PhD Candidate in Industrial Engineering, Lehigh University, 520 Cedar Hill Dr., Allentown, PA, 18109, United States of America, alu2@lehigh.edu, George Wilson

Model decompositions for manpower planning problems utilizing time-based hierarchical structuring of the decisions and predictor-corrector iterative control schemes are investigated. Our proposed method consists of 3 stages: (1) determination of the number of employees for stochastic demand data in a given service region, (2) the loading problem in which jobs are distributed to appropriately skilled employees, (3) scheduling to shifts, subject to work rules and back-up requirements.

4 - A Rational for the Payback Criterion- An Application of Almost Stochastic Dominance
Hermann Jahnke, Professor, University of Bielefeld, Universitaetsstrasse 25, Bielefeld, 33615, Germany, hjahnke@uni-bielefeld.de, Dirk Simons

Despite the shortcomings of the payback criterion, empirical evidence shows that it is used regularly in capital budgeting. We provide a decision theoretical explanation for it's popularity. Gathering information from various management levels requires a multi-stage capital budgeting process. Using almost stochastic dominance as modeling device, we demonstrate how relying on payback times simplifies investment decisions in such circumstances.

5 - Measurement Hierarchy: The Keystone to Modeling
Richard Staats, Department Head, MITRE, Box 1232, McLean, VA, 22101, United States of America, rstaats@mitre.org

Good metrics can propel an organization toward sound investments, increased participation, and ownership of critical processes. Conversely poor metrics can lead to lost opportunities or alienation. This paper describes a proposed metrics development effort at a high level to include both methodology as well as practical metrics exemplars.

■ WA68

O - Senate Room

Marketing I

Contributed Session

Chair: Valery Petrushin, The Nielsen Company, 150 N. Martingale Rd, Shaumburg, IL, 60173, United States of America, valery.petrushin@nielsen.com

1 - Country-of-origin Effect and Products Evaluation: The Moderating Effect of Foreign Cultural Identity
Stephen Huang, Associate Professor, National Kaohsiung First University of Science and Technology, 2 Jhuoyue Rd., Nanzih, Kaoshiung, Taiwan - ROC, howhowone2000@gmail.com, Paul S.H. Wu

This research examines the moderating effects of consumer's foreign cultural identities on the relationship between country-of-origin effect and advertising attitude and product evaluation. A experimental design of 4 °— 2 was manipulated to test the hypotheses. The results reveal that country-of-origin would affect consumer's product evaluation, and consumer's foreign cultural identities also moderate the country-of-origin effects on product evaluation and advertising attitudes.

2 - Coupons and Rebates: An Incentive-based Theory of Promotion Instruments
Lu Hsiao, National Chung-Hsing University, No. 250, Kuo-Kuang Road, Taichung, Taiwan - ROC, hsiaolu@dragon.nchu.edu.tw, Shan-Yu Chou, Chyi-Mei Chen

This paper develops a theory of coupons and rebates based on the seller's post-transaction opportunism. We show that the seller's optimal pull promotion vehicles in this context depend on its brand image: (i) for a high-quality brand coupons and rebates are equivalent and optimal; (ii) for an intermediate-level brand only a rebate is optimal; and (iii) for a low-quality brand a coupon accompanied by costly price advertising is optimal.

3 - Estimating Customer Lifetime Value Using Panel Data

Valery Petrushin, The Nielsen Company, 150 N. Martingale Rd, Shaumburg, IL, 60173, United States of America, valery.petrushin@nielsen.com, Eugene Roytburg

There is a growing interest by CPG manufacturers to utilize customer lifetime value (CLV) to optimize their marketing spend. Lack of customer data is a barrier in estimating CLV.Nielsen's HomeScan panel database can overcome this obstacle. It contains purchase and socio-demographic data for ~260K households in the US and 27 other countries. At Nielsen we have developed an approach that applies survival analysis techniques to estimate CLV on brand level and use it for marketing mix optimization

Wednesday, 11:00am - 12:30pm

■ WB01

M - Marriott Ballroom 3

Politics & Voting

Contributed Session

Chair: Susan Palocsay, Professor of Computer Information Systems and Management Science, James Madison University, CIS & MS Department, MSC 0202, Harrisonburg, VA, 22807, United States of America, palocssw@jmu.edu

1 - A Choice Model in Voting for a Political Party

Ilkay Gultas, Research Assistant, Istanbul Kultur University, IKU Atakoy Campus Bakirkoy, Istanbul, 34156, Turkey, ilkaygultas@gmail.com

I tried to model a voters preference relation between party A and B. The voter have some worries about both social and economical. The basic benefit-loss analysis of model will be between the probabilities of economic growth and the continuation of the remaining regime. I assumed that a probability that the regime stability will erode if party A will have the political power without a coalition. I will give the conditions in which the voter will vote for party A or party B.

2 - Architecting the Open Extended Enterprise: The 2008 US Presidential Campaign

Robert Edson, ANSER, 2900 S. Quincy St., Suite 800, Arlington, VA, 20169, United States of America, robert.edson@anser.org

Political campaigns have historically been hierarchical, rigid operations with a well established organizational structure. Since the mid-1900s, however, political campaigns have started to take on the characteristics of open organizations which are in fact vast extended enterprises with emergent behavior and multiple tiers of campaign activity "suppliers" and "consumers". In this research, the extended enterprise is architected through three distinct views: landscape, strategy, and process.

3 - Efficiency and Effectiveness of Political Campaigns in New York State House Races

Thomas Sexton, Srony Brook University, College of Business, Stony Brook, NY, United States of America, tsexton@notes.cc.sunysb.edu, Herbert Lewis

We analyze the efficiency and effectiveness of political campaigns in the 2002, 2004, and 2006 House races in New York State. We develop DEA-like models to measure the efficiency and effectiveness of each candidate in the use of campaign funds to acquire votes and take away votes from competitors. We also determine if efficiency and effectiveness can alter the outcome of a race and, consequently, the political composition of the state's Congressional representation.

4 - Political Redistricting: A Case Study of Japanese Election System

Keisuke Hotta, Bunkyo University, 1100 Namegaya, Chigasaki, Kanagawa, 253-8550, Japan, khotta@shonan.bunkyo.ac.jp, Toshio Nemoto

In Japan, the population disparity ratio between districts is more than 2 and get worse for years. In past research, we explored numerically the cause of this large disparity and showed the limit of reduction in the disparity ratio, and also showed the difference in the weight of one vote cannot be improved significantly. In this talk, we analyze the effect of some idea by changing the redistricting guidelines in Japan to decrease the disparity below 2 for the next redistricting in 2010.

5 - Ranked Voting with Paired Comparisons from Generalized Ballots

Susan Palocsay, Professor of Computer Information Systems and Management Science, James Madison University, CIS & MS Department, MSC 0202, Harrisonburg, VA, 22807, United States of America, palocssw@jmu.edu, Bruce Anderson, James Falk

We introduce a generalized ranked ballot that supports multi-criteria decisions and allows abstentions. In contrast to a traditional ranked ballot where all unranked alternatives are considered inferior to all ranked alternatives, no inferences are made about a voter's preferences when comparisons are omitted between two or more alternatives. We use these ballots to construct a matrix of each voter's stated opinions for input to a well-known method of paired comparisons.

■ WB02

M - Marriott Ballroom 2

Doing Good with OR: Aviation Congestion

Cluster: Doing Good with Good OR

Invited Session

Chairs: Michael Ball, University of Maryland; Cynthia Barnhart, MIT; Karla Hoffman, George Mason University

1 - Doing Good with OR: Aviation Congestion

Moderator: Jane F. Garvey, Head of U.S. Public Private Partnerships in Transportation, JP Morgan Former Administrator, Federal Aviation Administration (FAA), Lecturer and Research Scientist, MIT Center for Transportation and Logistics. Panelists: Daniel M. Kasper, James M. (Jim) Crites, D.J. Gribbon, David Gillen, Dorothy Robyn

This special series on "Doing Good with Good OR" is aimed at demonstrating how operations research can (and does) provide important insights that can be used to inform and shape public policy. We focus on three daunting societal challenges: energy and the environment; public health; and air congestion. Each focus area will feature a plenary presentation by a leader in the field, followed by a panel discussion involving key stakeholders from government and industry together with academic experts. This session is the panel discussion on aviation congestion.

■ WB03

M - Marriott Ballroom 1

Military Applications II

Contributed Session

Chair: Darby Grande, Aptima, Inc., 12 Gill Street, Ste. 1400, Woburn, MA, 01801, United States of America, dgrande@aptima.com

1 - Military Troop Leave Scheduling During Wartime

Willie Montgomery, University of Arkansas, 4207 Bell Engineering Ctr, Fayetteville, AR, 72701, United States of America, wmontgo@uark.edu, Scott Mason, Edward Pohl

During OIF/OEF, company commanders faced for the first time the challenging task of assigning soldiers to squads and missions over a 365-day planning horizon in light of a new allowance for soldiers to take leave. Manual methods pose problems as commanders must consider many factors in determining leave assignments to maintain soldier morale while satisfying other mission requirements. We present models for scheduling soldiers and leave during wartime operations in an acceptable amount of time.

2 - Developing Operations Research Techniques in Military Officers

Hise Gibson, Instructor, Department of Math At the U.S. Military Academy, 606 Swift Road, West Point, NY, 10996, United States of America, hise.gibson@usma.edu, Stephen Gauthier, Robert Dees

We will discuss how we integrate operations research techniques at the United States Military Academy. Every cadet, regardless of their academic major, is exposed to mathematical modeling, optimization, and simple simulation during their first two years of academic course work. In this presentation we will present a brief overview operations research techniques taught to all West Point cadets.

3 - A Design of Experiments Approach to Quantifying Homeland Protection

David Flanigan, Systems Engineer, JHU/APL, 11100 Johns Hopkins Road, Laurel, MD, 20723, United States of America, david.flanigan@jhuapl.edu

A design of experiments approach is used to measure the relative effectiveness of platforms and capabilities in the mission of homeland protection. Multi-variable factors are considered to identify needs and shortfalls and quantify values desirable for early warning, communication, and decision-making. Several illustrative scenarios are used to highlight the Washington DC region,Âôs complexity.

4 - Biosensor Location Problem in Urban Area

Kedar Sambhoos, CUBRC, 306 Sundown Trail, Unit 1F, Williamsville, NY, 14221, United States of America, sambhoos@cubrc.org, Moises Sudit, Melih Temel, Feng Pan

Complex biological sensor performance drives the decision of which sensors to include into the tiered testing approach of a combined sensor system to achieve high confidence results. This research develops a standard language and mathematical framework to evaluate the system level performance of deployed sensors and aims to predict confidence levels for the presence of threat agent. The mathematical formulation for solving the BLP is derived with an Ontological approach toward Sensor Management.

5 - Automated Identification of Facility Networks

Darby Grande, Aptima, Inc., 12 Gill Street, Ste. 1400, Woburn, MA, 01801, United States of America, dgrande@aptima.com, Georgiy Levchuk

We present an algorithm for identifying networks of facilities through probabilistic pattern identification. This approach leverages the typical inertia of an urban built environment to find structures supporting repetitive crimes, such as the production of improvised explosive devices (IEDs) or illegal drugs trade. We frame the discussion with an illustrative use case.

■ WB04

M - Delaware B

Joint Session PPP/Homeland: Mass Egress and Evacuation

Sponsor: Public Programs and Processes, Homeland Security Sponsored Session

Chair: Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 chippendale Court, Annandale, BA 22003, United States of America, samuelsondoug@yahoo.com

1 - An Application of Agent Based Simulation – The Evacuation Planning Tool

Jenish Joseph,Regal Decision Systems, 4692 Millennium Dr, Suite 410, Belcamp MD 21017, United States of America, jjoseph@regaldecision.com

The Evacuation Planning Tool (EPT) developed by Regal Decision Systems Inc for DHS is a PC based software application that consists of a 3D Editor, an agent based model, a 3D animation component and a reporting module. The EPT simulates movements of crowds and provides users with the ability to control security teams at a command level. Entities and groups of entities are created with decision branching intelligence, dynamic selection of destinations, routes, and behaviors.

2 - Agent-Based Modeling of Mass Egress After Disasters

Chair: Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale VA 22003, United States of America, samuelsondoug@yahoo.com

We summarize and review recent work in agent-based simulation of mass egress and evacuation after a disaster. Technical advances make it possible to model large crowds fairly realistically in real time. Issues remaining to be addressed by recent work include variations in movement speeds, group behaviors, counter-flow due to arriving rescue personnel, factors that change urgency and cooperation, and effects of secondary events such as smoke and debris plumes.

■ WB05

M - Virginia B

Game Theory I

Contributed Session

Chair: Fei Pan, Purdue University, 403 W. State Street, West Lafayette, IN, United States of America, fpan@purdue.edu

1 - Pricing Lease Contracts with Options in an Imperfect Market of Durable-goods

Suzhou Huang, Ford Motor Company, Research & Innovation Center, Dearborn, MI, 48121, United States of America, shuang10@ford.com

We develop a game theoretical model to value lease contracts with options in an imperfect market of durable-goods. The economic environment of our model differs sharply from that of the standard approach in corporate finance. We illustrate the dual roles of the lease contract with options: price discrimination of heterogeneous consumers and hedge of uncertain residual values of off-lease goods.

2 - Repeated Congestion Games on Networks

Marco Scarsini, Professor, LUISS, Viale Romania 32, Roma, RM, 00196, Italy, marco.scarsini@luiss.it, Tristan Tomala

Consider n agents who travel on a network. The cost of every path is increasing in the number of agents who use that path. Consider a Pareto optimal cost profile that is strictly better than an equilibrium cost profile for each agent. By the folk theorem the optimum can be achieved as an equilibrium of the repeated game, if all agents observe the actions of all other agents. We devise a strategy that achieves the optimum as equilibrium of the repeated game even under imperfect monitoring.

3 - Iterated Games and Mechanism Design in Maritime Sector

Xiaoning Shi, PhD Student, University of Antwerp, S B 418, Prinsstraat 13, Antwerp, 2000, Belgium, xiaoning.shi@ua.ac.be

In shipping business, games among shipping carriers are iterated year by year no matter they are based on cooperative or non-cooperative assumptions. From the perspective of homogeneous shipping carriers, such iterations make previous confidential commercial information more transparent. From the perspective of market regulators, more effective policy could be made to direct maritime sector. Therefore, mechanism design in maritime sector is valuable to be discussed regarding game iterations.

4 - Looking for an Explanation of Organizational Performance on Networks Using Administrative Costs

Nelson Lammoglia, Doctoral Student, Universidad de los Andes, Calle 1E 19A-40, Bogotà, Colombia, n-lammog@uniandes.edu.co, Roberto Zarama Urdaneta

According to previous studies, networks centrality is related with performance. Bavelas and Leavitt reported that the more centralized the network, the better the performance. However, Shaw showed the opposite. This is explained by the complexity of the task, for simple tasks the centralized structures work better and vice versa. We propose a formalization of this based on game theory and microeconomics. This formalization may be useful to organizational and knowledge management systems design.

5 - The Impact of Competition on Manager Compensation: Theory and Evidence in Hedge Funds

Fei Pan, Purdue University, 403 W. State Street, West Lafayette, IN, United States of America, fpan@purdue.edu, Hui Zhao, Kwei Tang

This paper investigates the competition among hedge fund (HF) managers in their compensation contracting when the managers' skill levels are private information. We develop a signaling game framework and characterize the conditions under which HF managers use high-water mark (HWM) to signal their skill types. We find that the managers are willing to use HWM when they face high competition. We also use empirical analysis to test our results from 4,390 hedge funds over the period of 1991-2006.

■ WB06

M - Virginia C

Auctions and Mechanism Design

Cluster: Auctions

Invited Session

Chair: Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu

1 - Computational Methods for Analyzing Complex Markets: Solving Ad Auctions

Kevin Leyton-Brown, Assistant Professor, University of British Columbia, 2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada, kevinlb@cs.ubc.ca, David R.M. Thompson

We show that it is feasible to perform computational equilibrium analysis of complex, realistic microeconomic problems like advertising auctions. By using the Action-Graph Game representation, these auctions can be represented compactly and their Nash equilibria can be computed efficiently. This allows us to relax many of the assumptions that have typically been required by closed-form analysis.

2 - Dynamic Pivotal Mechanism

Dirk Bergemann, dirk.bergemann@yale.edu, Juuso Valimaki

We consider truthful implementation of the socially efficient allocation in a dynamic private value environment in which agents receive private information over time. We propose a generalization of the pivotal mechanism, based on the marginal contribution of each agent. In the dynamic pivotal mechanism, the ex post incentive and ex post participations constraints are satisfied for all agents after all histories.

3 - New Directions in False-name-proofness

Vincent Conitzer, Assistant Professor, Duke University, LSRC, Box 90129, Durham, NC, 27708, United States of America, conitzer@cs.duke.edu, Liad Wagman, Naoki Ohta, Yasufumi Satoh, Atsushi Iwasaki, Makoto Yokoo

A mechanism is false-name-proof if it is never beneficial for an agent to use more than one identifier. Yokoo et al. have studied false-name-proofness in detail in combinatorial auctions and their variants. I will talk about some of our recent work that applies the concept in other settings, such as voting and coalitional games.

4 - Theory of Expressiveness in Mechanism Design with Uses in Combinatorial Auctions and Sponsored Search

Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu, Michael Benisch, Norman Sadeh

In many mechanism design settings it has been observed that increasing the expressiveness of the participants increases efficiency in practice. We show this holds generally: we derive a domain-independent upper bound on efficiency, which increases with expressiveness. We present instantiations in combinatorial auctions and sponsored search, with some experiments.

■ WB07

M - Maryland A

Optimization Issues in Operations Planning

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Disruption Management in Aircraft Departure Sequencing

Ieyasu Sugimoto, University of Graz, Department for Statistics and OR, Graz, Austria, ieyasu@sugimoto.at, Hans Kellerer, Celia Glass

Because of operational and infrastructural restrictions and fairness among airlines changes within aircraft departure sequences are limited at many airports. One well known concept to cope with this problem is Constrained Position Shifting. To include priorities this concept has been adapted by assigning individual shifting ranges to aircrafts instead of constant ranges. A dynamic programming based algorithm is presented to solve the problem to optimality and compared with a genetic algorithm.

2 - An Algorithm for Evacuation Planning

Emrah Cimren, The Ohio State University, Department of Integrated Systems Engineering, 211 Baker Systems Eng., 1971 Neil Ave., Columbus, OH, 43210, United States of America, cimren.1@osu.edu, Marc E. Posner

We present a mixed integer nonlinear programming model for evacuation planning. The model considers shelter selection, contra-flow implementations and road availability. This model is solved using a branch-and-cut approach with preprocessing. Data from Hurricane Katrina and existing studies establish the viability of our methodology.

3 - A Strongly Polynomial Algorithm for Convex Quadratic Programming with a Fixed Number of Constraints

Hans Kellerer, University of Graz, Department for Statistics and OR, Graz, E3 8010, Austria, hans.kellerer@uni-graz.at

We consider convex quadratic programming problems in n variables with a fixed number of linear constraints and n box constraints. Such problems may serve as continuous relaxations for scheduling problems. We use the Cholesky decomposition to transform the problem into a quadratic programming problem with linear constraints of a special structure, The running time of the obtained algorithm is strongly polynomial.

4 - New Facets for the K-median Problem

Wenhui Zhao, Research Fellow, Washington University at St. Louis, John M. Olin School of Business, One Brookings Drive, St. Louis, MO, 63130, United States of America, zhao@olin.wustl.edu, Marc E. Posner

The polyhedral structure of the K-median problem is examined. We establish two basic properties of facets. Then, we apply these properties to generalize three existing classes of facets. Also, we establish that a class of k-cover inequalities are facet inducing.

■ WB08

M - Maryland B

Customer & Service Oriented Operations Models

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Robert Swinney, Graduate School of Business, Stanford University, 518 Memorial Way, Stanford, CA, 94305-5015, United States of America, swinney_robert@gsb.stanford.edu

1 - Strategic Use of Shortages in Price Competition Among Differentiated Products

Hyo-duk Shin, Stanford university, 518 Memorial way, stanford, CA, 94305, United States of America, hshin@stanford.edu, Evan Porteus, Tunay Tunca

Two single product firms with different quality levels and fixed limited capacities, engage in sequential price competition in an essentially deterministic model where customers have heterogeneous valuations for both products. We show that under certain circumstances the leader can take strategic advantage of its limited capacity, by pricing relatively low, purposefully creating shortages, and leaving some leftover demand for the follower to feast on, avoiding a price war.

2 - Risk Aversion and the Single Server Queue

Martin Lariviere, Kellogg School of Management, Evanston, IL, United States of America, m-lariviere@northwestern.edu, Wuqin Lin

We consider managing a queuing system when the decision maker is risk averse. Of particular interest is whether risk aversion results in too little capacity (a standard result for newsvendor models) or too much capacity relative the risk neutral case.

3 - Inventories and Consumer Search Behavior when Product Quality is Uncertain

Laurens Debo, Assistant Professor, University of Chicago, 5807 S. Woodlawn Ave., Chiciago, IL, 60637, United States of America, ldebo@chicagogsb.edu, Garrett van Ryzin

Inventory availability can influence customers' perceptions of product quality, especially with new, unknown or innovative products. Customers who find products out of stock at several retailers may infer that many other customers bought and therefore value it. We develop and analyze a model that allows better understanding of the key determinants of the realized sales when taking such consumer behavior into account.

4 - Using a Fast Fashion System for Rapid Product Design with Strategic Customers

Robert Swinney, Graduate School of Business, Stanford University, 518 Memorial Way, Stanford, CA, 94305-5015, United States of America, swinney@stanford.edu, Gerard Cachon

Fast fashion systems, which allow a firm to rapidly design and produce new products to meet changing consumer trends, have become increasingly popular in recent years. While the ability of a fast fashion system to match supply and demand via reduced production leadtimes has been well explored, its ability to match product design to shifting consumer preferences has received less attention. We focus on this aspect of a fast fashion system, and discuss the costs and benefits of such a strategy.

■ WB09

M - Maryland C

Joint Session QSR/CS: Statistical Models and Analyses of Medical and Biological Data

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Art Chaovaitwongse, Assistant Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, 08854, United States of America, wchaoval@rci.rutgers.edu

Co-Chair: Hang Zhang, Arizona State University, PO Box 875906, Tempe, AZ, 85287, United States of America, hzhang12@asu.edu

1 - Identification of Ancestry Informative Blocks

Dingxi Qiu, Assistant Professor, University of Miami, McArthur Engineering Building, Room 276, 1251 Memorial Drive, Coral Gables, FL, 33146, United States of America, dingxi@miami.edu, Richard Morris

Linkage association studies are often used to improve our understanding of genetic causes of complex human diseases. One difficulty lies in the confounding effects caused by the ancestry substructures. In our study, we propose a heuristic procedure to identify the ancestry-informative blocks, and to decompose the human genes into segments at different ancestry-informative levels. This study aims to provide more accurate estimation of the background allele frequencies for the association studies.

2 - Autoregressive Approach to Synchronization Among Multiple Components of Complex Integrated System

Alla Kammerdiner, ISE, University of Florida, 303 Weil Hall, Gainesville, FL, United States of America, alla.ua@gmail.com, Lisa Maillart, Nagi Gebraeel

A novel approach for studying synchrony in complex integrated systems is proposed based on multivariate statistical analysis by modeling cointegrated vector autoregressive processes. The method is illustrated by applying it to multichannel electroencephalogram recordings.

3 - Impacts of Multiple Interactive Behavioral Factors on Neuronal Population Dependency

Hang Zhang, Arizona State University, PO Box 875906, Tempe, AZ, 85287, United States of America, hzhang12@asu.edu, Jiping He, Nong Ye, Auttawut Roontiva, Jose J. Aguayo

Brain neural activities interact with behaviors. We use two-way ANOVA to identify the significance of the impacts of two behavioral factors (motion direction and detouring for obstacle) and their interaction on the dependency among a neuronal ensemble in the dorsal premotor (PMd) area of a monkey during a reaching motion.

4 - Nonlinearity Analysis of EEG from Patients with Absence Seizure

Jicong Zhang, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, United States of America, jicongzhang@hotmail.com, Art Chaovaitwongse, Panos Pardalos, Basim Uthman, Petros Xanthopoulos, Jicong Zhang

Electroencephalograph (EEG) recordings of absence patient patients suffering were analyzed using the method of approximate entropy (ApEn). The nonlinearity analysis was performed on both before and after medical treatment. The degree of nonlinearity was determined by the differences in ApEn between original and surrogate EEG data sets. The systematic analysis and results from five patient with absence is presented.

■ WB10

M - Room 8206

Incorporating Sustainability Into Energy Modeling

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Pedro Linares, Professor, Universidad Pontificia Comillas, Alberto Aguilera 23, Madrid, 28015, Spain, pedro.linares@upcomillas.es

1 - Future Scenarios for the Spanish Electricity Sector: Is It on the Right Path Towards Sustainability

Pedro Linares, Professor, Universidad Pontificia Comillas, Alberto Aguilera 23, Madrid, 28015, Spain, pedro.linares@upcomillas.es, Francisco Javie Santos, Ignacio Pérez-Arriaga

The Spanish electricity model is clearly unsustainable: the large increase in electricity demand, a huge dependency on energy imports, and significant environmental impacts are reasons for concern. In this paper we take a look at its possible evolution under different policy scenarios, and try to identify which may be the more sustainable policies. Results are optimistic in that carbon emissions and energy imports may be reduced at reasonable costs.

2 - Land Use and Carbon Implications of a Global Biofuels Industry in a CGE Model

Angelo Gurgel, Post-doc Associate, MIT Joint Program on the Science and Policy of Global Change, 77 Massachusetts Ave, Bldg E40-411, Cambridge, MA, 02139, United States of America, gurgel@mit.edu, Sergey Paltsev, Xiaodong Wang, Timothy Cronin, Andrei Sokolov, Jerry Melillo, David Kicklighter, Adam Schlosser, John Reilly

We develop an approach to integrate a computable general equilibrium model of the economy with detailed representation of energy systems (the MIT Emissions Prediction and Policy Analysis Model) to a terrestrial biogeochemistry model (the Terrestrial Ecosystem Model). We used the integrated system to investigate the implications of the development of a global second generation biofuels industry for land use and the carbon emissions that result from land conversion.

3 - Modeling the Future Environmental Impact of Aviation

Antony D. Evans, Mr, University of Cambridge, 1-5 Scroope Terrace, Cambridge, CB, CB4-3AL, United Kingdom, ade26@cam.ac.uk

Growth in the world economy and aviation have occurred in unison. Significant further growth is anticipated, along with an increase in energy use and associated emissions. The Aviation Integrated Modelling (AIM) project develops an integrated assessment model to enable analysis of aviation, environment and economic interactions at local and global levels. Operations research methods are used extensively, and particularly in the estimation of future air traffic given airport capacity constraints.

4 - The EU's Climate and Energy Package - An Assessment with a Hybrid CGE Model

Andreas Löschel, Centre for European Economic Research (ZEW), L7,1, Mannheim, Germany, loeschel@zew.de, Ulf Moslener

We summarize the main elements of the European Commission's proposal to implement the ambitious carbon dioxide reduction targets until 2020. We then quantitatively analyse the proposal using a hybrid CGE model where we implemented the carbon dioxide reduction targets, the auctioning rules and the redistribution mechanisms. The simulation analysis shows carbon prices, welfare implications of the proposal on a member state level and sectoral competitiveness impacts.

■ WB11

M - Room 8209

Environment and Energy II

Contributed Session

Chair: Jogeir Myklebust, PhD Student, NTNU, Gloeshaugen, Trondheim 7491, Norway, jogeir.myklebust@iot.ntnu.no

1 - Natural Gas Storage: Value, Trading and its Role in Risk Management

Zhan Pang, Postdoctoral Research Fellow, University of Calgary, R476 Math Sci Building, 612 Campus Plac, 2500 University Drive, NW, Calgary, AB, T2N1N4, Canada, silfamars@hotmail.com, Youyi Feng

The operational flexibilities of natural gas storage can be treated as a portfolio of real options. We exploit the arbitrage value and trading strategies of physical storage facilities for a risk neutral marketer. We characterize the structure of the optimal trading policy. We also identify the conditions on market dynamics under which which the optimal trading policy follows the rule of "selling low" and "buying high". Finally, we discuss the role of storage facility in risk management.

2 - New Innovative Product Design Method Based on Energy Factor Concept

Hua Li, Industrial Engineering Department at Texas Tech University, 2500 Broadway, Lubbock, TX, 79409, United States of America, hua.li@ttu.edu, Hong-chao Zhang, Derrick Tate, John Carrell

With the objective to promote energy-saving throughout the entire life cycle of general products or systems, the authors develop a new product design method by integrating the engineering design theory (such as Axiomatic Design) and two new concepts (Energy Factor and Design Unit).

3 - Effects of Load Factors in the Mean-variance Analysis for Fuel Diversification

Suriya Ruangpattana, Graduate Research Assistant, Purdue University, 500 Central Drive, West Lafayette, IN, 47907, United States of America, sruangpa@purdue.edu, Douglas J. Gotham, Kumar Muthuraman, Paul V. Preckel, Ronald L. Rardin

This research is involved with the development of a method for analyzing portfolios of fuels/technologies in long-term planning for electric power generation. It was inspired by interest in constructing a method to overcome inadequacies seen in the standard mean-variance approach to the analysis of electric power generation planning. Load cycles play critical roles in fuel selection yet the standard mean-variance methodology does not account for the ability of various fuels/technologies to adapt to varying loads. To account for such issues and still retain the convenience of the mean-variance approach, a variant of the mean-variance analysis using the decomposition of the load into various types and utilizing the load factors of each load type has been developed. Use of the method is demonstrated in model applications with data for the state of Indiana whose case studies have provided results for a formal study of long-term fuel diversification. Results to be discussed include diversification effects of load factors in the case of higher carbon dioxide costs or when a certain technology or fuel choice is eliminated.

4 - Simulation-optimization of an Liquefied Energy Chain

Jogeir Myklebust, PhD Student, NTNU, Gloeshaugen, Trondheim, 7491, Norway, jogeir.myklebust@iot.ntnu.no, Matthias Nowak, Asgeir Tomasgard, Audun Aspelund

The efficiency as well as the investment of a ship based LNG/CO2 chain is optimized with a Tabu Search combined with a Nelder Mead descent. All endogenous variables are calculated in a sequential process simulator. The efficiency and ship utilization depends on the chosen pressures, which again affects several other states. It is shown that the strategic decisions such as shipment volume and distance will influence the optimal transport pressures and flow rates, and hence the process variables.

■ WB12

M - Room 8212

Development and Application of DEA Based Methods

Cluster: Data Envelopment Analysis

Invited Session

Chair: Andy Johnson, Assistant Professor, Texas A&M University, 237K Zachry Engineering Center, College Station, TX, 77845-3131, United States of America, ajohnson@tamu.edu

1 - Measurements of Technical Change under Variable Returns to Scale

Hao Tang, Research Assistant, Texas A&M University, 241 Zachry, 3131 TAMU, College Station, TX, 77843-3131, United States of America, haotang630@gmail.com, Andy Johnson

Given that Malmquist productivity index can be decomposed to identify technical change relative to a variable returns to scale technology, it is shown that the "technical change" component does not fully characterize the shift in the frontier if the change is "non-neutral", meaning the frontier shift is not uniform across all input and output combinations. A general model and the nonparametric regression is presented to solve the problem. The method is applied to a commercial banking data set.

2 - Network Migration Strategies

Warren Sutton, PhD Candidate, Unversity of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, wsutton@umich.edu, Lawrence M. Seiford

This study examines several properties of network topologies and how these properties change during periods of transition. Transitions periods could include a redesign of the existing network topology or merging of two different topologies. Case studies will be given in each scenario to determine efficiency strategies for change.

3 - A Nonparametric Analysis of CEO Compensation

John Ruggiero, Associate Professor of Economics, University of Dayton, John.Ruggiero@notes.udayton.edu, Nancy Mohan

In this paper, we apply DEA to perform a compensation gap analysis for CEOs. The approach measures a range of CEO value based on comparison of wages and company performance measures.

4 - A Parallel Development of Nonparametric Models

Andy Johnson, Assistant Professor, Texas A&M University, 237K Zachry Engineering Center, College Station, TX, 77845-3131, United States of America, ajohnson@tamu.edu, Timo Kuosmanen

The single output multi-input DEA model will be shown to be a constrained special case of convex nonparametric least squares. Also, DEA will be shown to be a nonparametric generalization of parametric programming. Through similar arguments Stochastic Nonparametric Envelopment of Data (StoNED) is also a nonparametric generalization of SFA. A new model that generalizes COLS to the nonparametric setting called corrected convex nonparametric least squares (C2NLS) is described.

■ WB13

M - Room 8216

Data Mining Methods

Sponsor: Data Mining
Sponsored Session

Chair: Syed Shahabuddin, Professor, Central Michigan University, 1306 E Preston, Mt Pleasant, MI, 48858, United States of America, shaha1s@cmich.edu

1 - Time Series Forecasting Methods- Is One Better?

Syed Shahabuddin, Professor, Central Michigan University, 1306 E Preston, Mt Pleasant, MI, 48858, United States of America, shaha1s@cmich.edu

There are many time series forecasting methods, e.g., moving average, Holt. Each one supposed to be used for different type of time series data. The question is: which one is better? My paper will evaluate the time series methods to determine which method does better for which type of data.

2 - Social Network Analysis for Data Mining

Wei Wang, Stevens Institue of Tech., Castle Point on Hudson, Hoboken, NJ, United States of America, wwang3@stevens.edu, Hong Man

Social network analysis provides a mathematical framework for analyzing human and economy relationships, as well as information propagation in networks. In this paper, we explore how the social network as a tool to deploy data mining on digging suspicious activities of mobile nodes in ad hoc networks based on social relationship rules. Comparable metrics from traditional data mining algorithms can also be presented by social networks, such as the famous rule based mining schemes.

3 - The Inverse Optimal Value Problem of Quadratic Programming

Siming Huang, Professor, Inst. of Policy and Management, Chinese Academy of Science, Beijing, 100190, China, simhua@casipm.ac.cn

We consider the inverse optimal value problem of convex quadratic programming problem. We show that in general it is a "hard" problem. For some special cases, it can be reduce to a semidefinite programming problem, therefore can solved efficiently. We will discuss its applications in machine learning and nonlinear classfication of data mining.

4 - Logical Analysis of Survival Data: Prognostic Survival Models by Detecting High-degree Interactions in Right-censored Data

Anupama Reddy, Graduate Student, RUTCOR, 640 Bartholomew Rd, Piscataway, NJ, 08854, United States of America, areddy@rutcor.rutger.edu, Louis-Philippe Kronek

Survival analysis involves predicting the time to event for patients in a dataset, based on a set of recorded attributes. We propose a new methodology, Logical Analysis of Survival Data (LASD), to identify interactions between variables (survival patterns) without any prior hypotheses. Using these set of patterns, we predict survival distributions for each observation. To evaluate LASD we select two publicly available datasets: a lung adenocarcinoma dataset (gene-expression profiles) and the other a breast cancer dataset (clinical profiles).

■ WB14

M - Room 8218

Production Planning

Contributed Session

Chair: Mesut Yavuz, Assistant Professor, Shenandoah University, 1460 University Dr., Winchester, VA, 22601, United States of America, myavuz@su.edu

1 - Production Planning with Deterioration and Perishability

Julia Pahl, Research Assistant, University of Hamburg, Von-Melle-Park 5, Hamburg, HH, 20146, Germany, pahl@econ.uni-hamburg.de, Stefan Voss, David Woodruff

Constraints on the lifetime of products force organizations to carefully plan their production in cooperation with their supply chain partners. This is important as waiting times due to suboptimal planning give rise to increasing lead times and decreasing quality of items. We survey and extend the literature on deterioration/perishability in production planning models. Extensions are referring to load dependent lead times as well as options regarding the adoption of existing mathematical models.

2 - Integrating Forecast Evolution with Production / Inventory Planning

Nesim Erkip, Professor, Bilkent University, Bilkent Univ., Department of IE, Ankara, 06800, Turkey, nesim@bilkent.edu.tr, Refik Gullu, Mehmet Kayhan

In this article we focus a master production scheduling (MPS) problem. Through a multiplicative forecast evolution model we are able to capture interactions across products and in time with the aim of producing a better explanation of demand and forecast variability. We modify the existing MPS model to accommodate the proposed safety stock method.

3 - Optimal Two-component Acquisition Problem for an Assemble-to-order System with Expediting

Zhishuang Yao, National University of Singapore, Computing Lab, ISE Dept, NUS, Singapore, 119260, Singapore, g0500727@nus.edu.sg, Loo Hay Lee, Vernon Ning Hsu, Wikrom Jaruphongsa, Ek Peng Chew

We study a component acquisition problem for a manufacturer who faces a one-time stochastic demand of a single product consisting of two components. In order to achieve maximum total profit, the manufacturer must decide pre-stock quantities of components before demand is revealed, timing and quantities of additional components to order by normal process or expediting process after demand is confirmed and final product delivery schedule. Valuable properties and optimal solution are acquired.

4 - Application of an Optimization Model in Thermoformed Plastics Manufacturing

Elizabeth Evans, Western Michigan University, IME Department, Kalamazoo, MI, 49008-5336, United States of America, e3evans1@wmich.edu, Steven Butt

The problem of optimizing the product mix on each of the machines at a thermoformed plastic manufacturer can be formulated as integer optimization problem. Tooling and products are simultaneously assigned to machines to meet yearly product demands while adhering to tooling constraints. Model formulation, solution procedure, and results are discussed.

5 - Safety Stock Minimization in Mixed-model Supply Chains via Production Smoothing

Mesut Yavuz, Assistant Professor, Shenandoah University, 1460 University Dr., Winchester, VA, 22601, United States of America, myavuz@su.edu

Efficient operation of mixed-model systems in just-in-time manufacturing requires that usage rate variation of the parts are minimized, i.e., smooth/level production. Recent studies have considered production smoothing at the supply chain level, and focused on its effect on safety stocks. In this talk, we present a mathematical formulation of a new production smoothing problem for mixed-model supply chains. We also propose heuristic algorithms to solve the problem and compare their performances.

■ WB15

M - Room 8219

Modeling the Human Behavior in Services

Sponsor: Service Science
Sponsored Session

Chair: Christoph Heitz, Zurich University of Applied Sciences, Postfach, Wintherthur, ZH, 8401, Switzerland, heit@zhaw.ch

1 - Innovation in Industrial Service Operations - How People Integration Matters
Gerhard Gudergan, FIR at Aachen University, Pontdriesch 14/16, Aachen, Germany, Gerhard.Gudergan@fir.rwth-aachen.de

Why are some industrial service firms more successful in innovating then others? Organization and people based integration in particular are con-sidered to be a main success factor for reaching innovation capability. How-ever, the effects of organizational design and personal linkages on successful industrial service innovation are not sufficiently explored so far. Results from a large scale empirical study in the German industrial service industry and mana-gerial recommendations are presented.

2 - Learning to Contract – Insights from a Simulation Study
Eugen Scheinker, University of Muenster, Leonardo Campus 18, Muenster, 48149, Germany, scheinker@ism.uni-muenster.de, Thomas Ehrmann

In this article, we use an evolutionary model to analyze how contracts are adjusted. We construct agent-based simulations in which firms face contractual problems. Building on this model, we examine how different levels of bounded rationality and adjustment costs influence the change of contracts. Furthermore, we investigate how the impacts of bounded rationality and adjustment costs are moderated by the complexity of contractual problems.

3 - Maximizing Service Productivity through Task Routing Rules
Geoff Ryder, PhD Candidate, University of California - Santa Cruz, 4190 Sophia Way, San Jose, CA, 95134, United States of America, gryder@gmail.com, Kevin Ross, Christoph Heitz

Call center routing rules assign incoming customer traffic to agents in order to meet pressing short-term goals. Here we add a new objective: we seek to develop and maintain agent expertise over time by taking into account on-the-job learning, forgetting, and turnover trends. We present routing rules that balance skill development with other objectives, and in so doing we optimize the distribution of skills among the workforce of agents.

4 - Resource Planning in Professional Service Organizations
Vincent Hargaden, PhD Student, Centre for Doctoral Studies, UCD Michael Smurfit School of Business, University College Dublin, Blackrock, Co. Dublin, Ireland, vincent.hargaden@ucd.ie, Jennifer Ryan

A model is developed for the human resource planning and allocation process in professional service organisations. This provides insights into the strategic issues surrounding the matching of firm resources to client requirements and allows the impact of changes in utilisation levels, skills acquisition, cross training and team formation on the optimal solution to be evaluated.

5 - Direct Marketing of Service Contracts under Autonomous Customer Dynamics
Christoph Heitz, Zurich University of Applied Sciences, Postfach, Wintherthur, ZH, 8401, Switzerland, heit@zhaw.ch

Service provicers often sell service contracts that are terminated by autonomous customer action. We study the cost/return problem of direct marketing campaigns in this context. For an example from the telecom industry, it is shown that the optimum selection of customers must include not only the classical acceptance probability, but also the autonomous dynamics of this particular customer. By including these dynamics, the return-on-investment could be improved up to a factor 10.

■ WB16

M - Room 8222

Models and Analysis in Supply Chain Competition

Contributed Session

Chair: Suleyman Demirel, PhD Candidate, University of Michigan, 701 Tappan Ave, Ann Arbor, MI, 48109-1234, United States of America, sdemirel@umich.edu

1 - Channel Structure for Chain-to-chain Competition with Price and Lead-time Sensitive Demand
Zhengping Wu, Assistant Professor, Singapore Management University, 50 Stamford Road, Singapore, 178899, Singapore, zpwu@smu.edu.sg, Jihong Ou, Lucy Chen

Consider two supply chains each consisting of a supplier and a retailer. They compete for customers on both pricing and lead time. We investigate the optimal supply chain structure — we analytically characterize the Nash equilibrium for different structures, and identify conditions under which each structure is optimal. We find that the decentralized chain may outperform the centralized system in some cases, and discuss the driver of such an apparently counter-intuitive result.

2 - Suppliers Competition and Pricing in Emerging Markets
Mingcheng Wei, The Pennsylvania State University, 1000 W. Aaron Dr., Apt J-2, State College, PA, 16803, United States of America, mwei@psu.edu, Tao Yao, Bin Jiang

This paper shows that, in emerging market, the survival behavior and rationality of suppliers aggregated the competition and reduce price in short term. Consequently, this cut-throat completion leads to few giant suppliers, who rapidly raise their price because of gaining bargaining power, in long term. Hence, this paper suggests that appropriated subsidy from buyer to suppliers might help to alleviate the short term competition for suppliers and stabilize the surge price for buyers.

3 - Competition for Supply Contracts under Supply Discruptions
Suleyman Demirel, PhD Candidate, University of Michigan, 701 Tappan Ave, Ann Arbor, MI, 48109-1234, United States of America, sdemirel@umich.edu, Roman Kapuscinski, Ching-hua Chen-ritzo

We analyze a multi-period model where a reliable supplier and an unreliable one compete for the buyer's business. Unreliable supplier faces random disruptions. The equilibrium contracts are significantly different than Bertrand price competition outcome. In the equilibrium, the buyer could be sole-sourcing from either of the suppliers, or keep the reliable one as a backup supplier. Unreliable supplier may offer compensation for buyer's loss during a disruption to entice long term relationship.

4 - Non-linear Model for the Minimization of Supply Chain Costs with Non-quality and Inspection Costs
Gina Galindo, Adjunct Professor, Universidad del Norte, Km. 5 via a Puerto Colombia, Barranquilla, AT, Colombia, ggalindo@uninorte.edu.co, Carlos Paternina-Arboleda

This work consists on the minimization of the total cost in a supply chain, including non quality and inspection plan costs. The methodology proposed consists of a non linear programming model, based on statistical concepts. The results will help to make decisions such as if it is economically convenient to implement inspection plans for guaranteeing a specific quality level. When inspection plans are suggested, the model also provides the parameters values involved in the plans selected.

■ WB17

M - Room 8226

Quality Control for Nanomanufacturing

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Qiang Huang, Assistant Professor, University of South Florida, huangq@eng.usf.edu

Co-Chair: Tirthankar Dasgupta, Assistant Professor, Harvard University, 1 Oxford Street, Department of Statistics, Cambridge, MA, 02138, United States of America, dasgupta@stat.harvard.edu

1 - Length Bias in the Measurements of Carbon Nanotubes
Paul Kvam, Professor, Georgia Tech, 765 Ferst Drive NW, Atlanta, GA, 30332, United States of America, pkvam@isye.gatech.edu

A nonparametric maximum likelihood estimator is constructed for the length distribution of carbon nanotubes, whose lengths are measured by atomic force microscopy on a square grid and nanotubes crossing the grid are not included. Consequences of the length bias arising are examined using a generalization of Buffon's needle problem. The corrected length distribution provides a better fit to the Weibull distribution than the original selection biased observations.

2 - A Physical-statistical Model for Controlling Density of Zinc Oxide Nanorods
Tirthankar Dasgupta, Assistant Professor, Harvard University, 1 Oxford Street, Department of Statistics, Cambridge, MA, 02138, United States of America, dasgupta@stat.harvard.edu, Roshan Josep Vengazhiyil, Benjamin Weintraub

In order to develop a simple, scalable and cost-effective technique for controlling Zinc nanorod array growth density, layer-by-layer polymer thin films were used in a wet chemical growth process. The objective was to fit a model connecting the thickness of polymer films to the observed density of nanorods. A physical-statistical model fitted with the experimental data helped in better understanding of the underlying growth mechanism.

3 - Multiscale Hierarchical Modeling of Nanowire Growth Processes
Qiang Huang, Assistant Professor, University of South Florida, huangq@eng.usf.edu

Quality control of nanomanufacturing processes faces new challenges of scale effects. This talk presents multiscale hierarchical modeling of nanowire growth processes. The model integrates growth kinetics which facilitates in situ control in nanomanufacturing.

4 - An Improved R2R Process Control Scheme for Categorical Observations with Misclassification Errors
Yanfen Shang, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, Hong Kong, China, shangyf@ust.hk, Fugee Tsung, Kaibo Wang

When product quality characteristics are evaluated by exclusive categories, measure errors (misclassification) always exist. A categorical controller has been developed for R2R process adjustment with categorical variables. However, if process outputs are misclassified, an adjustment bias will be introduced by the controller. In this research, an improved categorical R2R controller is proposed. Simulation results show that the proposed controller performs better when misclassification exists.

■ WB18

M - Room 8228

Joint Session Service Science/CS: Supply Chain Services in Web-2.0 Age —II

Sponsor: Service Science, Computing Society
Sponsored Session

Chair: Jin Dong, Dr., IBM China Research Laboratory, Diamond Building, Zhongguancun SoftPark, Beijing, BJ, 100193, China, dongjin@cn.ibm.com

1 - Sales and Operations Planning: Using Optimization and Analytics in a Collaborative Process
Tom Ervolina, Dr., IBM Research, Watson Research Center, Yorktown Heights, NY, 10598, United States of America, ervolina@us.ibm.com, Pawan Chowdhary, Michael Geroulo, Feng Cheng

The S&OP process seeks to find a plan that optimizes business performance yet is also achievable. In practice, achievability is a blend of hard constraints and acceptable risks against soft constraints. In practice, the S&OP is a collaborative process where functional owners of each constraint and objective must reach an optimal plan through consensus. We will present a web services based framework that uses optimization and analytics to support this collaborative process.

2 - Rough Sets Based Data Mining for Predicting Product Qualities of Nonlinear Process
Zhihua Xiong, Professor, Tsinghua University, Department of Automation, Tsinghua University, Beijing, 100084, China, zhxiong@tsinghua.edu.cn, Xiong Wang, Kai Jiao

Rough set based data mining is proposed to predict product qualities in industrial process. Fuzzy c-mean method is used to preprocess data samples. Emergence frequency threshold of decision-making rule is introduced to adjust its confidence threshold. Compared with Apriori and neural network, it can distinguish significance of attributes effectively and immune from local minimum, so it can improve accuracy of product predictions. The proposed method is illustrated on an acetone refining process.

3 - Simulation of City Evolution for the Planning of Facility Networks
Wenjun Yin, Dr., IBM China Research Lab, Zuanshi Build, Zhongguancun Software par, Beijing, BJ, 100084, China, yinwenj@cn.ibm.com, Bin Zhang, Ming Xie, Jin Yan Shao, Jin Dong, Li Xia

The amounts and locations of facilities (e.g., bank branches, retail stores) are heavily dependent on the geographical and economic environments of the whole city. This paper uses a simulation-based technique to predict the evolution of city, concerning the main factors such as the distribution of residents and marketplace. The simulation results of the city evolution have potential to be beneficial to instruct the amount and location planning of facility networks.

■ WB19

M - Lincoln 4

Game-Theoretic Models

Sponsor: Decision Analysis
Sponsored Session

Chair: Barry Cobb, Associate Professor, Virginia Military Institute, 335 Scott Shipp Hall, Lexington, VA, 24018, United States of America, cobbbr@vmi.edu

1 - Modeling Investments in Preparedness in a Cournot Duopoly Market
Vicki Bier, Professor, University of Wisconsin - Madison, 3234 Mechanical Engineering Building, 1513 University Ave, Madison, WI, 53706, United States of America, bier@engr.wisc.edu, Taher Jamshidi

This paper models the decision-making process of two firms in a Cournot duopoly about whether to invest in disaster preparedness. We consider both fixed and variable preparedness costs. Some cases result in multiple equilibrium strategies, where each firm wishes to "bet" on a different outcome (disaster or not).

2 - New Non-nash Equilibria for Noncooperative Games
Bill Corley, Professor, IMSE Department, Box 19017, Arlington, TX, 76019, United States of America, corley@uta.edu

A new equilibrium embodying an intrinsic cooperative aspect is presented for noncooperative games. It addresses some well-known issues in game theory. For example, in contrast to the Nash equilibrium, it provides one-time sensible solutions for Prisoner's Dilemma and Traveler's Dilemma agreeing with experimental results. Existence of the new equilibrium is established, its implications are discussed, and applications are presented.

3 - Management of Systems' Development under Tight Constraints: A Principal-agent Approach
Elisabeth Paté-Cornell, Professor and chair, Stanford University, Terman Building Room 340, Stanford, CA, 94305, United States of America, mep@stanford.edu, Russ Garber

We present a model of system development under tight resource constraints as a game between a manager and an employee or a contractor. To assess the effects on system failure risks of some management decisions and of corner-cutting on the part of the agent, we use both a principal-agent model and a probabilistic risk analysis of system failure.

4 - Game Theoretic Approach to Air Combat Simulation
Kai Virtanen, Teaching Research Scientist, Systems Analysis Laboratory, Otakaari 1M, 02150 Espoo, Espoo, Finland, Jirka Poropudas

We present a game theoretic approach to the validation of a discrete event air combat simulation model and the analysis of simulation data. Statistical techniques are applied for estimating games from simulation data. The validity of the simulation model is assessed by comparing the properties of the games to practices in air combat. The games are also applied for analyzing the effectiveness of air combat tactics and technologies.

■ WB20

M - Lincoln 3

Team Processes for Effective Decision-Making

Sponsor: Decision Analysis
Sponsored Session

Chair: Deanna Kennedy, University of Massachusetts Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01003, United States of America, dkennedy@som.umass.edu

Co-Chair: Sara A. McComb, University of Massachusetts Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01003, United States of America, mccomb@som.umass.edu

1 - Can Meritocracy Eliminate Workplace Discrimination?
Justin Tumlinson, University of California, Berkeley, F405 Student Services Bldg. #1900, Berkeley, CA, 94720, United States of America, tumlinson@haas.berkeley.edu

Meritocracy motivates employment discrimination law. A sorting model of production driven by worker ability with endogenous team formation shows, even when a manager apportions credit amongst team members proportional to expected relative contribution, statistical discrimination is sustainable in equilibrium. In this setting, discrimination can be socially optimal, victims produce better expected solo output than beneficiaries, and beneficiaries' credit increases more than victims' with synergy.

2 - Collaborative Decision Making Processes Within Dispersed Environments
Joy Oguntebi, PhD Candidate, University of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, ogunjoy@umich.edu

We observe a growing interest in distributed work within the small group literature as technical advancements have led to a reduction in operational boundaries. Concurrently, corporations are increasingly using dispersed teams as a mechanism for accomplishing organizational work. This research study explores the relationship-building development within such dispersed settings and related processes that enable collaborative decision making and improved knowledge management.

3 - Congruence Gaps and Their Effect on Distributed Software Development Teams

Mary Helander, IBM Research, T.J. Watson Research Center, Yorktown Heights, NY, 10603, United States of America, helandm@us.ibm.com, Kate Ehrlich, Giuseppe Valetto, Clay Williams, Stephen Davies

Software projects are frequently distributed across multiple sites. While this practice takes advantage of local expertise and differential cost structures, there is a hidden coordination cost. Modularity and even agile methods have had mixed success in addressing distributed development. We used a variation of organizational congruence that focuses on gaps in communication to examine coordination decisions in distributed development teams.

4 - Optimal Team Communication: Examining Differences Across Communication Media and Project Complexity

Deanna Kennedy, University of Massachusetts Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01003, United States of America, dkennedy@som.umass.edu, Ralitza R. Vozdolska, Sara A. McComb

Research has established a curvilinear relationship between team communication and performance. We extend this research by employing a technique, using empirical data as a basis, to simulate teams. These simulated teams communicate via three different media and are completing projects of varying complexity. Our results have important implications for practice as they indicate the optimal communication levels where these teams achieve their best performance.

■ WB21

M - Lincoln 2

Health IT and Strategic Implications for Use by Multiple Stakeholders

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Corey Angst, Asst. Professor, University of Notre Dame, 348 Mendoza, Notre Dame, IN, 46556, United States of America, cangst@nd.edu

1 - Conducting Drug Safety Surveillance Using Electronic Data Sources

Ross Martin, Director, Health Information Convergence, BearingPoint, Inc, 18426 Crownsgate Circle, Germantown, MD, 20874, United States of America, ross.martin@bearingpoint.com

Traditional methods for the voluntary reporting of adverse drug events have proven to be suboptimal for the effective conduct of drug safety surveillance. This presentation reviews some of the current US-based efforts to query and analyze various electronic sources of clinical and healthcare claims data in order to detect clearer signals of possible adverse medical events and discusses ways to create a national electronic drug safety surveillance program.

2 - Implementation of CPOE Systems – An Empirical Analysis of the Antecedents and Impact on Performance

Kingshuk Sinha, Curtis L. Carlson Family Foundation Professor, University of Minnesota, Minneapolis, MN, United States of America, ksinha@umn.edu, Asoke Dey, Sriram Thirumalai

This talk will report the findings of a study on the implementation of computerized physician order entry (CPOE) systems used by physicians to enter orders for medications, diagnostic tests, and ancillary services. Key antecedents and performance implications of CPOE implementation are examined. The study sample contains 188 acute care hospitals.

3 - The Information Security Repercussions of the Sourcing of Healthcare Technology

Sam Ransbotham, Asst Professor, Boston College, Boston, MA, United States of America, sam.ransbotham@bc.edu

Healthcare systems invite security attacks. Each healthcare transaction requires that detailed, private and valuable data be exchanged by many interconnected firms, providing many opportunities for weak links. Unfortunately, there is little empirical research that specifically examines these attacks. Preliminary analysis suggests that strategic decisions about technology sourcing have important security implications not only for the firm adopting the technology but for partner firms as well.

4 - Boundary Risks, Affect, and Consumer Willingness to Disclose Personal Health Information

Catherine Anderson, PhD Candidate, University of Maryland, Van Munching Hall, College Park, MD, 20742, United States of America, canderso@rhsmith.umd.edu, Ritu Agarwal

The healthcare context is unique in many respects because of the variety of risks raised with the potential privacy loss of sensitive health information, as well as the emotion linked to one's medical state. Using privacy boundary theory, recent developments in the literature related to risk-as-affect, and synthesizing research from IS, communications and psychology, we theorize where, when, and how much personal medical information an individual is willing to disclose about herself.

■ WB22

M - Lincoln 1

Queueing Models III

Contributed Session

Chair: Paul Enders, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, Pa, 15213, United States of America, penders@cmu.edu

1 - Analysis of a Queueing-inventory System with Priority

Ning Zhao, FBA, University of Macau, University of Macau, Macau, China, ninazhao@umac.mo, Zhaotong Lian

We study a queueing-inventory system with priority involving both queueing delay and stock control. We model the system as a level-expanding QBD process with expanding-block-structured generator matrix. We develop some new approaches and computing algorithms which enable us to analyze performance measures of the system. We also figure out optimal service disciplines and inventory replenishment policies.

2 - A Queuing Model for a Bed Allocation

Jaehun Sim, Penn State, 310 Leonhard Building, University Park, PA, 16802, United States of America, jus238@psu.edu, Seok Gli Lee, Seung Ki Moon

Bed utilization has been a primary issue under the control of hospital management. We propose a queuing model to investigate bed utilization in an emergency room using M/M/s queue. We consider two types of patients and two types of finite beds. We determine bed utilization and average length of queue under different thresholds and acceptance levels of critical patients. In the cost analysis, we find the proper number of threshold that maximizes operational profits in the emergency room.

3 - Optimal Release Policies for Kanban Control Systems with Advance Demand Information

Deng Ge, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI, 53706, United States of America, dge@wisc.edu, Ananth Krishnamurthy, Oguzhan Alagoz

This paper investigates the benefits of integration of advance demand information (ADI) with the Kanban Control System. Under Markovian assumptions, a production system is analyzed and system performance is characterized in terms of optimal release policies and its influence on service levels and reductions in base stock levels, and costs.

4 - Queueing: A Behavioral Approach

Karthik Sankaranarayanan, PhD Student, University of Lugano, Institute of Management,, Via Buffi 13, Lugano, TI, 6900, Switzerland, karthik.sankaranarayanan@lu.unisi.ch, Christian Scheiber, Ann van Ackere, Erik R. Larsen

We investigate to what extent the conclusions of classical queueing models hold when dealing with "intelligent" repeat customers. We adopt a simulation approach where customers are represented by cellular automata with memory and limited communication. We consider both expected waiting and variability in waiting as criteria of choice.

5 - A Token-based Implementation of Shortest Remaining Processing Time (SRPT)

Paul Enders, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, Pa, 15213, United States of America, penders@cmu.edu, Mor Harchol-Balter, Laurens Debo, Varun Gupta, Anshul Gandhi, Alan Scheller-Wolf

Can administrators, without the use of real money, extract private job size information from self-interested users, to increase scheduling efficiency? Yes, we show that, by the introduction of a scheduling game using tokens (a virtual currency), users can be motivated to reveal information on their remaining sizes. Using this information the administrator can implement a version of the SRPT scheduling policy. This way the self-interested user behavior results in improved system performance.

■ WB23

M - Lincoln 5

Control of Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Serhan Ziya, University of North Carolina, 213 Smith Building CB# 3260, Chapel Hill, NC, United States of America, ziya@unc.edu

1 - Optimal Control in a Netflix-like Closed Rental System

Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu, Ramandeep Randhawa

We consider the introduction of a new product in a closed rental system, such as Netflix, with two types of customers who differ on their mean rental time. All customers desire this new product. We assume that if the customer's request for this product is denied, she receives a substitue product and requests for the new product upon return. We study the control problem of minimizing the mean delay encountered before obtaining the new product.

2 - Control of a Queueing System with Nonidentical Servers

Mike Pinedo, Professor, NYU, Stern School of Business, New York University, NY, NY, 10012, United States of America, mpinedo@stern.nyu.edu, Xiuli Chao

Consider a queueing system with m nonidentical servers in parallel. Customers arrive according to an arbitrary renewal process. A customer of type j can only be served by a specific subset of the m servers. The service time of a customer is arbitrarily distributed according to F. We assume that the subsets of the servers of the different classes are nested and we develop conditions under which a scheme that gives priority to the least flexible customer performs optimally.

3 - Joining Longer Queues: Information Externalities in Queue Choice

Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu, Laurens Debo

A classic example that illustrates how observed customer behavior impacts other customers' decisions is the selection of a restaurant whose quality is uncertain. Customers often choose the busier restaurant, inferring that other customers in that restaurant know something that they do not. Queue lengths could signal two factors - potentially higher arrivals, or slower service at the server. We study the effect of both arrival and service rates on the inference made by an arriving customer.

4 - Priority Assignment under Imperfect Information on Customer Type Identities

Serhan Ziya, University of North Carolina, 213 Smith Building CB# 3260, Chapel Hill, NC, United States of America, ziya@unc.edu, Nilay Argon

We consider a single server queue with two types of customers who do not reveal their type identities, but provide signals which indicate the likelihood of their being type 1, the type that is favored by the c-mu rule. We find that the policy that prioritizes customers according to their probabilities of being type 1 outperforms all finite-class priority policies and identify conditions under which prioritizing according to signals outperforms FCFS when information provided by signals is weaker.

■ WB24

M - Lincoln 6

Neural Network Approaches and Applications

Sponsor: Computing Society
Sponsored Session

Chair: Selcuk Colak, Cukurova University, Department of Business, Balcali, Adana, 01330, Turkey, scolak@cu.edu.tr

1 - Evaluating Artificial Neural Network Approaches Used for Time Series Forecasting

Erkam Guresen, Istanbul Technical University, Department of Industrial Engineering, Maçka,, Istanbul, 34367, Turkey, erkamguresen@gmail.com, Gülgün Kayakutlu

During the last few years, a number of ANN models and hybrid models have been proposed for obtaining accurate prediction results, in an attempt to outperform the traditional linear and nonlinear approaches. This study evaluates the effectiveness of neural network models; MLP, LTS, RNN, DAN2 and the hybrid neural networks which use GARCH and EGARCH to extract new input variables. The performance comparisons of these models are realized on daily exchange rates of ISE index XU100 using MSE and MAD.

2 - Quantitative Analysis on Japanese Corporate Ratings by Neural Networks

Katsuaki Tanaka, professor, Setsunan University, 17-8 Ikedanakamachi, neyagawa, osaka, 572-8508, Japan, k-tanaka@kjo.setsunan.ac.jp, Hideki Katsuda, Motohiro Hagiwara

Investors have begun to use corporate ratings given by 4 major rating agencies as an index to measure the credit risk of each company in Japan. Corporate ratings are based on the quantitative data and qualitative data that investors do not obtain it completely. In this paper we propose the method to evaluate the determinant structure of corporate ratings given by the above four agencies using a hierarchical type neural networks method with the quantitative data of Japanese companies only.

3 - Option Pricing with Artificial Neural Networks and Adaptive Neuro Fuzzy Inference Systems

Nagendra Nagarur, Associate Professor, Binghamton University, SSIE Department, Binghamton University, Binghamton, NY, 13902, United States of America, nnagarur@binghamton.edu, Domnic Ojala

Two heuristic systems, Artificial Neural Networks and Adaptive Neuro Fuzzy Inference Systems, are developed to estimate option prices. The models are tested on S&P-500 Index options. The results are compared to those obtained by Black-Scholes method. A detailed error analysis is carried out comparing the relative efficiencies of all the three methods.

4 - A Neurogenetic Approach for Vehicle Routing Problem

Selcuk Colak, Cukurova University, Department of Business, Balcali, Adana, 01330, Turkey, scolak@cu.edu.tr, Anurag Agarwal, Huseyin Guler

The Vehicle Routing Problem (VRP) consists of constructing minimum cost routes that includes a depot and customers where the vehicles leave the depot, visits each customer exactly once, and returns to the depot. In this study, the NeuroGenetic approach, hybrid of augmented neural networks and the genetic algorithms, are used to solve the VRP.

■ WB25

M - Lincoln 6A

Vehicle Routing I

Contributed Session

Chair: Stephan Meisel, Universität Braunschweig, Decision Support Group, Abt-Jerusalem-Str. 4, Braunschweig, 38106, Germany, stephan.meisel@tu-bs.de

1 - Vehicle Routing and the Value of Postponement

Gu Pang, PhD Candidate, Nottingham University Business School, Jubilee Campus, Wollaton Road, Nottingham, NG81BB, United Kingdom, lixgp5@nottingham.ac.uk, Luc Muyldermans

We study capacitated vehicle routing problems in which the client demands occur over time but the collector (or distributor) performing the service can decide when to visit the clients. It has been reported in the literature that postponement of the collection (or delivery) service decreases the overall routing cost. We investigate this issue in greater detail and report on experiments in different routing settings to uncover the impact of postponement on routing efficiency.

2 - A Combined Problem of Manpower Scheduling and Routing

Junhyuk Park, POSTECH, San31, Hyoja-Dong, Namgu, Pohang, Korea, Republic of, sacarlee@postech.ac.kr, Yeowoon Jun, Jeongin Koo, Byung-In Kim

We consider a combined problem of manpower scheduling and vehicle routing, a generalization of well-known vehicle routing problem. In the problem, a customer requires a series of staged tasks and each task should be conducted by an appropriate special team. A MIP model is developed to solve small sized problems optimally. For relatively large sized problems, a dispatching based heuristic is presented.

3 - Anticipation for Stochastic and Dynamic Vehicle Routing

Stephan Meisel, Universität Braunschweig, Decision Support Group, Abt-Jerusalem-Str. 4, Braunschweig, 38106, Germany, stephan.meisel@tu-bs.de, Dirk Mattfeld

We compare different anticipative approaches to stochastic and dynamic vehicle routing. In particular we consider a problem with one vehicle and with customer requests occuring randomly according to specified probabilities within a given time horizon. Requests must either be rejected or confirmed directly after they appear. The focus of the presentation is on the comparison of state of the art anticipative waiting strategies and an approximate dynamic programming approach to the problem.

■ WB26

M - Lincoln 5A

Joint Session CS/OPT: Applications of Mixed Integer Nonlinear Programming in the Chemical Process Industry

Sponsor: Computing Society: Mixed Integer Nonlinear Programming (Joint Cluster Optimization)

Sponsored Session

Chair: Angelo Lucia, Professor, University of Rhode Island, Dept of Chemical Engineering, Kingston, RI, 02881, United States of America, lucia@egr.uri.edu

Co-Chair: Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg

1 - Integration of Operational Planning and Medium-term Scheduling under Uncertainty

Christodoulos Floudas, Stephen C. Macaleer '63 Professor in Engineering and Applied Science, Princeton University, Department of Chemical Engineering, Princeton, NJ, 08544, United States of America, floudas@titan.princeton.edu

An integrated operational planning and medium-term scheduling framework which takes into account various forms of market and process uncertainty will be presented. The framework entails the integration of a novel and robust Planning with Production Disaggregation Model with the robust scheduling model through a forward rolling horizon scheme, and was applied to an industrial case study in order to demonstrate that it can address relevant planning and scheduling problems.

2 - Global Optimization of Algorithms Applied to Short-term Natural Gas Production Planning

Paul Barton, Professor, Chemical Engineering, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, pib@MIT.EDU, Benoit Chachuat, Ajay Selot, Mehmet Yunt

A natural gas production planning problem is formulated as a math program with computer procedures defining the objective and constraint functions, thereby eliminating internal network variables, and is solved within a branch-and-bound framework. McCormick-based convex relaxations, and the corresponding subgradients, of network calculation procedures are evaluated using operator overloading and solved with a bundle method to obtain lower bounds. Upper bounds are obtained from local solutions.

3 - Synthesis of Heat Exchanger Networks with Phase Changes

Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg, M M Faruque Hasan

We extend the heat exchanger network synthesis (HENS) to include multi-component phase changes. We model the temperature-enthalpy relation using an empirical correlation especially for the nonlinear 2-phase region and extend the superstructure concept to the level of each exchanger to model phase changes for mixtures.

4 - A MINLP Approach to Finding Non-pinched, Minimum Energy Distillation Designs

Angelo Lucia, Professor, University of Rhode Island, Dept of Chemical Engineering, Kingston, RI, 02881, United States of America, lucia@egr.uri.edu

We describe a MINLP strategy for finding non-pinched, minimum energy designs for single distillation columns and multi-unit chemical processes in which the overall strategy iterates between a nonlinear program and an integer program until no further reduction in the stripping line distance can be found.

■ WB28

M - Washington 1

Deliveries Applications in Logistics

Contributed Session

Chair: Rafay Ishfaq, The University of Alabama, 300 Alston Hall, Box 870226, Tuscaloosa, AL, 35487, United States of America, rishfaq@cba.ua.edu

1 - Analysis of Dynamic Price Bidding Mechanism for Time Slots Allocation in Attended Home Delivery

Cheng-Chieh Chen, Research Asssistant, UMCP, 4323 Rowalt Dr. Apt 101, College Park, MD, 20740, United States of America, frank542@umd.edu, Ning Yang

Offering customers the choice of delivery time slots is an emerging business strategy in home delivery services. This study proposes a dynamic price bidding mechanism (DPBM) in which customers have the opportunity to bid their preferred time slots. A bi-level optimization model is developed to optimize the price setting in order to transfer certain delivery requests to the suppliers' "preferable" time slots.

2 - Modeling a Home Delivery System in Urban Areas Using a Bilevel Programming Approach

Sutapa Samanta, Morgan State University, 1700 E. Cold Spring Lane, Baltimore, MD, 21251, United States of America, ssamant@eng.morgan.edu, Manoj Jha

The home delivery system is widely used by postal services and local businesses in urban areas. The objective is to obtain an optimal route to deliver items to a number of locations within set time windows. A bilevel approach is used to solve the problem, in which the total delay time of the delivery system is minimized in the lower level and the total distance traveled by the delivering vehicle is minimized in the upper level.

3 - Supply Chain Scheduling: Manufacturing, Batching and Delivery Based on Co-evolutionary PSO Algorithm

Wu Xuejing, School of Management in Southampton University, 69 Harefield Road, Southampton, SO17 3TG, United Kingdom, wutian585333@163.com

This paper focuses on the soft time window factor in batch delivery problems and its impact on the production scheduling in manufacturing plants. And a co-evolutionary Particle Swarm Optimization (PSO) algorithm is developed with one PSO focusing on the demand allocation while the other PSO focusing on the production scheduling and batch delivery problems. The simulation results show the effect of soft time window is critical and the efficiency and effectiveness of the new co-evolutionary PSO.

4 - Heuristics for the LNG Inventory Routing Problem

Arild Hoff, Molde University College, PO Box 2110, Molde, 6402, Norway, arild.hoff@himolde.no

The liquefied natural gas (LNG) inventory routing problem considered in this talk is the part of the supply chain between liquefaction of gas at loading terminals, shipping by LNG carriers and delivery at unloading terminals. Inventory limitations have to be obeyed. Purchase contracts with an upper and lower limit of delivery within an interval and origin-destination clauses are considered when planning routes. This talk will present the problem and suggest different heuristics for solving it.

5 - Designing an Intermodal Hub-and-spoke Transportation Network

Rafay Ishfaq, The University of Alabama, 300 Alston Hall, Box 870226, Tuscaloosa, AL, 35487, United States of America, rishfaq@cba.ua.edu, Charles Sox

In this paper we formulate a hub location-allocation problem in an intermodal transportation network using a constrained p-hub median approach. A modeling framework is developed which describes the effect of shipment consolidation at hubs, provisioning of multiple modes, shipment transfers, fixed facility location and transportation costs under a service time window. The problem structure is analyzed and a tabu-search based solution procedure is developed.

■ WB29

M - Washington 2

Data Envelopment Analysis I

Contributed Session

Chair: Brian Adams, Franklin & Marshall College, Department of Math. and Computer Science, PO Box 3003, Lancaster, PA, 17604-3003, United States of America, brian.adams@fandm.edu

1 - Solutions from Interior Point Methods for DEA

Marie-Laure Bougnol, Assistant Professor, Western Michigan University, Haworth College of Business, Kalamazoo, MI, 49008, United States of America, ml.bougnol-potter@wmich.edu, Jose Dula, Paul Rouse

Central paths and analytic centers play a special role in DEA. We report on IPM implementations to solve DEA LPs and interpret the results.

2 - Models for University Development and Efficiency Analysis

Jongwoun Youn, Graduate Student of LSOM(the doctor's course), KUBS(Korea University Business School), Anam-Dong,Seongbuk-Gu,Seoul,Korea, Seoul, Kr, 136-701, Korea, Republic of, yjw333@korea.ac.kr, Kwangtae Park

We try to establish models for university development to consider current realities required in societies and analyse performances of universities based on models derived using DEA. We have four different types of development models for further analysis and analyse efficiencies of universities based on different models using DEA. Extensive results are provided. These results will be useful as guidelines for universities to move in right directions compatible with their goals in the future.

3 - A Productivity-oriented Model for Ranking Research Groups Using Data Envelopment Analysis

Cristhian Ruiz Ramos, Universidad de los Andes, Carrera 1 No∞ 18A 10 Bogotà, Colombia, cr-ruiz@uniandes.edu.co, Diego Andrés Chavarro Bohòrquez, Juan Guillermo Villegas Ramirez, Ricardo Bonilla Jiménez, Roberto Zarama Urdaneta, José Luis Villaveces, Luis Antonio Orozco Castro

We use a Data Envelopment Analysis model to analyze science and technology policy in Colombia for ranking research groups. We compare the current production-oriented model with a productivity-oriented model for ranking groups by their disciplines. We study input variables using a Bayesian approach and hypothesis testing. This methodology could be replicable in Latin America through the Scienti network.

4 - Inputs and Outputs Selection for Generalized DEA

Hiroshi Morita, Osaka University, 2-1 Yamadaoka, Suita, Japan, morita@ist.osaka-u.ac.jp

DEA is a data oriented method based on pre-selected inputs and outputs. In some cases, the performance model is not well defined, so it is critical to select the appropriate inputs and outputs by other means. When we have many potential variables for evaluation, it is difficult to select inputs and outputs from a large number of possible combinations. We propose an input-output selection method by using meta-heuristic approach, and demonstrate the proposed method using financial statement data.

5 - Data Envelopment Analysis of Four Political Campaigns

Brian Adams, Franklin & Marshall College, Department of Math. and Computer Science, PO Box 3003, Lancaster, PA, 17604-3003, United States of America, brian.adams@fandm.edu

In this research, we apply data envelopment analysis to the campaign fundraising for four state senate candidates. We determine the relative efficiencies of the DMUs based upon the use of their campaign funds. A second aspect is to repeat the analysis to determine if the source of the funding, such as from political action committees, large individual donors, or small donors, has an impact on the relative efficiency of a campaign.

■ WB30

M - Washington 4

The Practice of OR Within the Joint IED Defeat Organization

Sponsor: Military Applications
Sponsored Session

Chair: Ronald Woodaman, Research Faculty, George Mason University, C4I Center, 4400 University Dr, Fairfax, VA, 22030, United States of America, rwoodama@gmu.edu

1 - Operations Research Challenges within the Initiative Evaluation Branch of JIEDDO ORSA

Daniel Valascho, LCDR, JIEDDO, Joint IED Defeat Organization, 5000 Army Pentagon, Washington, DC, 20310-5000, United States of America, daniel.valascho@jieddo.dod.mil, Seth Howell

The Joint IED Defeat Organization (JIEDDO) engages with industry, academia, and the national labs seeking solutions to defeat the IED as a weapon of strategic influence. Within the process of acquiring and fielding these solutions, JIEDDO's Operations Research Systems Analysis (ORSA) Division has the responsibility of evaluating solutions; ranging from theory-based evaluations - to an operational assessment of a limited deployment of a solution in theater.

2 - Tracking the Trend Line: Operations Research Challenges within the Trend Analysis Branch of JIEDDO

Matthew Santoni, MAJ, JIEDDO, Joint IED Defeat Organization, 5000 Army Pentagon, Washington, DC, 20310-5000, United States of America, matthew.santoni@jieddo.dod.mil

The Trends Analysis Branch of the Joint IED Defeat Organization is tasked with collecting and interpreting reporting on IED attacks. Providing this "common operating picture" presents three fundamental issues: managing free text fields, merging disparate data sources, and transformation into a standardized view. The author will interpret current trends and discuss potential solutions to the three data challenges listed above.

3 - Models for Unconventional Warfare: Modeling and Analysis of the IED Threat

Kathryn Laskey, Professor, George Mason University, SEOR Dept, 4400 University Dr, Fairfax, VA, 22030, United States of America, klaskey@gmu.edu, Andrew Loerch, Tod Levitt, Ronald Woodaman

Models of combat have a long tradition in analyses of conventional warfare, but research on quantitative models for unconventional warfare is still in its infancy. Modeling of IED use requires representing interactions between the Coalition Forces, insurgent groups, the population, and the operational environment. This paper describes models our integrative approach to modeling the IED threat, our results and findings, and the many challenges encountered.

■ WB31

M - Washington 5

Role Reversal: The Impact of Climate Change on Aviation

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: Norman Fujisaki, President, Metron Aviation, Inc., 45300 Catalina Ct, Suite 101, Dulles, VA, 20166, United States of America, Norm.Fujisaki@metronaviation.com

1 - Aviation and Environment: Principle Effects and Uncertainties

Terry Thompson, Director, Strategic Development, Metron Aviation, 45300 Catalina Court, Suite 101, Dulles, VA, 20166, United States of America, thompson@metronaviation.com

This talk establishes background and context for discussions of aviation and associated environmental impacts. Main topics are the generation of greenhouse gases, possible impacts associated with different phases of aircraft operation, and the interplay between climate-related effects, local air quality, and noise effects. Key uncertainties in scientific understanding and connections with research questions in multi-objective optimization are also identified.

2 - Markets for Mitigation: Financial Controls on Aviation's Environmental Impact

Peter Hullah, Proj Mgr, Strategy Unit, EUROCONTROL Exerimental Centre, Centre de Bois des Bordes, BP15, Bretigny sur Orge, 91222, France, peter.hullah@eurocontrol.int

Financial mechanisms for reducing aviation's environmental impact are assessed. Taxes, charges and cap-and-trade systems are discussed, especially the EU's Emission Trading Scheme and aviation within this scheme. The EU-funded MIME project extends tradable permits to airport noise, defining such permits and making recommendations for legislation. With Jet-A at US$1/litre, there is a search for new bio-fuels but kerosene is hard to replace. Could aviation's share of fossil CO2 rise to 100%?

3 - Strategic Intermodal Planning to Support a Low Emission Transportation System

Megan Smirti, Graduate Student Researcher, UC Berkeley, 109 McLaughlin Hall, Institute of Transportation Studies, Berkeley, CA, 94720-1720, United States of America, msmirti@berkeley.edu

This study will evaluate the impact of a large-scale Greenhouse Gas (GHG) reduction mandate for the transportation system. Policy scenarios fuel both the introduction of low emission technologies and the distribution of passengers among transportation modes to minimize GHG emissions. The ability of the system to meet a mandated GHG reduction target will be evaluated along with policies and incentives to support a low emission transportation system.

4 - Air Transport in its Energy-economy-environment Context

Thomas Fiddaman, Ventana Systems, 1070 Bridger Woods Rd, Bozeman, MT, 59715, United States of America, tom@ventanasystems.com, Dan Goldner

Air transport is a component of a global system involving demographic, macroeconomic, technical and environmental dynamics. We consider some of the key feedbacks influencing future aviation, including its dependence on and contribution to economic growth, greenhouse gas accumulations and the possible evolution of climate policy, and liquid fuel scarcity. We illustrate ramifications for the industry using simulations of US airspace strategy and a simple global climate integrated assessment model.

■ WB32

M - Washington 6

Inventory Management Under Stochastic Demand II

Contributed Session

Chair: Dean Chatfield, Assistant Professor of IT/DS, Old Dominion University, IT/DS Dept and VMASC, 2063 Constant Hall, CBPA, Norfolk, VA, 23529, United States of America, dchatfie@odu.edu

1 - Inventory Decisions for Substitutable Products with Stock-dependent Demand

Euthemia Stavrulaki, Assistant Professor, Bentley College, 175 Forest Street, Waltham, MA, 02452, United States of America, estavrulaki@bentley.edu

We derive the stocking decisions for two products in a single-period, stochastic demand setting. The products are substitutable and have inventory-level dependent demand, so a higher inventory level of one product stimulates its demand. We compare the optimal inventory policy for the two products with two heuristic policies, one that ignores substitution effects and another that ignores the demand stimulation effect of inventory.

2 - A Newsvendor's Procurement Problem when Demand is Partly Endogenous and Exogenous

Zbigniew J. Pasek, Associate Professor, University of Windsor, Room 236 - Essex Hall, 401 Sunset Avenue, Windsor, ON, N9B 3P4, Canada, zjpasek@uwindsor.ca, Foad Hassanmirzaei

In the classic news-vendor models, demand is often the generator of uncertainty and typically is assumed to be exogenous. The other extreme would be to assume that demand is endogenous, reflecting practices where marketing and sales would agree on a sales plan. Of course, reality is somewhere in between. This paper developed another extension to incorporate of this effect and investigate different strategies to determining the best advertising and sales plans for newsvendor model.

3 - Optimal Timing of Inventory Rebalancing for Fashion Products under Demand Information Update

Stefan Minner, Professor, Faculty of Business, Economics and Statistics, University of Vienna, University of Vienna, Brünnerstrafle 72, Vienna, A, 1210, Austria, stefan.minner@univie.ac.at, Gudrun P. Kiesmueller

We consider two expected profit maximizing (newsvendor) retailers selling a fashion product with an additional opportunity to redistribute inventories once during the season. The demand process at each retailer is modeled by a Poisson Process with an uncertain mean and we use a Bayesian approach to update the distribution parameter before transshipments. We derive structural properties and provide numerical insights into the initial purchasing quantities and the optimal timing of rebalancing.

4 - A Competitive Game for Joint Replenishment

Alper Sen, Assistant Professor, Bilkent University, Department of Industrial Engineering, Ankara, 06800, Turkey, alpersen@bilkent.edu.tr, Evren Korpeoglu

We consider the jointly replenishing N identical firms that operate under an EOQ like setting using a non-cooperative game. In this game, each firm bids how much it is willing to pay per unit of its replenishment and a service provider determines the frequency of the joint orders. We characterize the equilibrium under full and asymmetric information.

■ WB33

M - Johnson

Strategic Planning in Healthcare II

Contributed Session

Chair: Michelle Cowing, Associate Professor, Pacific University, 2043 College Way, Forest Grove, OR, 97116, United States of America, cowing@pacificu.edu

1 - Engaging Physicians and Clinicans in Supply Chain Improvement Initiatives

Vicki Smith-Daniels, Professor, Arizona State University, Department of Supply Chain Management, W.P. Carey School of Business, Tempe, AZ, 85287, United States of America, vicki.smith-daniels@asu.edu

Increasingly organizations are undertaking supply chain improvement initiatives that require the active participation of knowledge technicalprofessionals. This paper examines hospital strategies for engaging physicians and other hospital clinicians in supply chain improvement initiatives. Results for case studies of leading hospitals and health care systems are presented along with a conceptual model.

2 - Inventory Solutions for a Pharmacy Supply Chain

Peter Kelle, Professor, Louisiana State University, ISDS Department, Baton Rouge, LA, 70803, United States of America, qmkell@lsu.edu, Helmut Schneider, John Woosley, Sonja Wiley-Patton

We summarize the supply chain management processes and challenges unique to pharmacy providers. Next we discuss a specific case of a local hospital in Louisiana, describing the pharmacy supply chain decision structure and the different often conflicting goals in the decisions of the different entities involved. We discuss the pharmacy inventory management system of the hospital in details and provide models for improvements.

3 - Network Growth Model with Disease Propagation

Yao-Hsuan Chen, PhD Student, ISyE Georgia Tech, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, gtg636y@mail.gatech.edu, Joel Sokol

We present a simulation of HIV and HSV II spreading through a population using a network growth model with various risk group structures deduced from the NNAHRAY data. The network study considers both sexual and drug-injection partnerships, and includes HSV II's cofactor effect on HIV transmission.

4 - The Role of the Clinician-patient Relationship in Patient Satisfaction

Michelle Cowing, Associate Professor, Pacific University, 2043 College Way, Forest Grove, OR, 97116, United States of America, cowing@pacificu.edu, Joseph Szmerekovsky, Carolynn Davino, Krishnan Ramaya

As competition intensifies within the healthcare industry, appropriate quality measures are critical. Using a conceptual model of healthcare delivery quality as defined by patient satisfaction, clinical outcome, and resource stewardship, this paper examines specifically the impact of the clinician-patient relationship on patient satisfaction. Critical aspects of this relationship are tested using survey data. Research and managerial aspects including implementation are discussed.

■ WB34

M - Jefferson

Models of Chronic and Infectious Diseases

Sponsor: Health Applications Section
Sponsored Session

Chair: Elisa Long, Assistant Professor, Yale University, 135 Prospect Street, PO Box 208200, New Haven, CT, 06520, United States of America, elisa.long@yale.edu

1 - Building More Robust and Informative Cost-Effectiveness Models

Megan DeFauw, PhD Student, University of Michigan, Industrial and Operations Engineering, 1205 Beal Ave., Ann Arbor, MI, 48109-2117, United States of America, mcdefauw@umich.edu, Vijayan Nair, Joseph Norman

This presentation deals with improvements to cost-effectiveness models for chronic diseases. Instead of focusing on just the cost-effectiveness ratio, we consider the joint distributions of costs and QALYs over time and present preliminary results. These distributions present provide considerably more information to the decision-makers. In addition, we explore the limitations of the constant baseline hazard assumption and suggest more general models.

2 - Modeling Cost-effectiveness of Preventive Strategies for an Avian Influenza Pandemic

David Hutton, Stanford University, 380 Panama St, Stanford, CA, 94305, United States of America, billdave@stanford.edu, Nayer Khazeni, Alan Garber, Douglas Owens

The pandemic potential of Influenza A H5N1 virus is an international public health concern. The effectiveness and cost effectiveness of pharmaceutical prophylactic strategies to reduce mortality from pandemic influenza are not known. We developed a dynamic transmission model of pandemic Influenza A H5N1 in a large U.S. metropolitan city. We used this model to determine the drivers of cost-effectiveness for antiviral stockpiling and pre-pandemic vaccination.

3 - HIV Epidemic in Far Western Nepal: A Mathematical Model and Control

Naveen Vaidya, PhD Student, Dept of Maths and Stats, York University, 4700 Keele Street, Toronto, ON, M3J1P3, Canada, nvaidya.anyol@gmail.com

We develop a mathematical model of the dynamics of HIV epidemic in far western Nepal. For specific conditions, we calculate the basic reproduction number, disease-free equilibrium and endemic equilibrium. Our model analysis and simulation results suggest that returning-migrants group from India have to be targeted for developing preventive programs. We also formulate an optimal control problem and provide a better strategy based on the results of our model.

4 - Economic Evaluation of HIV Interventions: Expanded Screening versus Treatment

Elisa Long, Assistant Professor, Yale University, 135 Prospect Street, PO Box 208200, New Haven, CT, 06520, United States of America, elisa.long@yale.edu, Margaret Brandeau, Douglas Owens

In 2007, 2.5 million people worldwide became newly infected with HIV, more than four times the number who initiated treatment for HIV. We evaluate the cost-effectiveness of HIV intervention portfolios aimed at disease prevention, treatment, or a combination of both, using U.S. data. We discuss how the cost-effectiveness of expanded screening and treatment depends on local epidemic characteristics, including HIV prevalence and the effectiveness of counseling at reducing risky sexual behavior.

■ WB35

M - Jackson

In Memoriam: Rick Rosenthal's Influence on OR Pedagogy

Sponsor: INFORM-ED
Sponsored Session

Chair: James Cochran, Louisiana Tech University, PO Box 10318, College of Business, Ruston, LA, 71272, United States of America, jcochran@cab.latech.edu

1 - Secrets of Success with Optimization
Robert Dell, Professor, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93940, United States of America, Dell@nps.edu, Gerald Brown

Rick Rosenthal was always excited to see operations research at work in the real world and had developed a list of secrets for success with optimization. This talk will present Rick's list using a presentation Rick recently prepared.

2 - The Legacy of Richard E. Rosenthal, Distinguished Professor of OR, Naval Postgraduate School
Gerald Brown, Distinguished Professor, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93943, United States of America, GBrown@nps.edu, Robert Dell, Johannes Royset, Matthew Carlyle, Javier Salmeron, Kevin Wood, Ronald Fricker

The presenters have all been close colleagues of Rick Rosenthal. We each share and admire the passion Rick had for exposition of our OR art. Rick had a rare combination of good people skills and intellectual depth, and he employed these to the benefit of scores of colleagues and acquaintances. We will share with you the astonishing breadth, passion, and committment of Rick's contributions to OR, and to INFORMS.

3 - Lessons from a Master - The Teaching Heritage of Rick Rosenthal
Terry Harrison, Penn State University, University Park, PA, United States of America, tharrison@psu.edu

Rick Rosenthal established a lifelong heritage of excellence and passion in teaching. I reflect on the very concrete lessons that I learned from Rick over a 30 year period as a student, colleague, collaborator and friend.

4 - Teaching Out Loud
David Morton, Professor, The University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, morton@mail.utexas.edu

Rick Rosenthal advised students, and mentored young colleagues, in a fashion that sometimes resembled "thinking out loud." His effectiveness was remarkable. This presentation will attempt to illustrate some ideas for teaching in this spirit.

■ WB36

M - T. Marshall Ballroom East

Information Systems II

Contributed Session

Chair: Manpreet Dhillon, The George Washington University, 2201 G Street, NW, Suite 515, Washington, DC, 20052, United States of America, dhillonm@gwu.edu

1 - Virtual Databases for Manufacturing Innovation
Thomas Ngniatedema, PhD Candidate, Kent State University, GSM, CBA, Kent, OH, Box 5190, United States of America, tngniate@kent.edu, Alan Brandyberry

Du, Lee, and Chen (2003) proposed a virtual or federated databases framework utilizing attribute correspondence matrices (ACMs) to facilitate schema coordination in vertical relationships. It is also important to coordinate across product life-cycle stages due to differential data requirements during the various stages. This research extends Du et al by proposing a virtual database approach for manufacturing innovation that encapsulates the supply chain, to support product life cycle data.

2 - The Effect of Uncertainty on Diffusion of Mobile Data Services
Minnseok Choi, KAIST/ETRI, 2307, MSE, GSM, KAIST, 207-43 Cheongryangri-dong, Dongdaemun-gu, Seoul, 130-012, Korea, Republic of, cooldenny@business.kaist.ac.kr, Byoungsoo Kim, Jungsuk Oh, Ingoo Han

It is important to find out why mobile data service (MDS) has not been spread out as much as experts expected. In this study, we focus on MDS is an experience good, so consumers cannot easily measure the quality or the expense of the service. From this study, it is evident that the market size decrease due to uncertainty about quality or expense. Further, we investigated the alternatives that mobile service providers have tried: content quality increase, tariffs decrease, and flat pricing.

3 - Consumer Rationality in Diffusion Models for Subscription-based Services under Network Effects
Marius Niculescu, PhD Candidate, Stanford Graduate School of Business, 518 Memorial Way, Room S458, Stanford, CA, 94305, United States of America, niculescu_florin@gsb.stanford.edu, Seungjin Whang

This paper inspects whether rational consumer behavior can or cannot explain the market evolution described by a generic aggregate diffusion model for subscription-based services. Our proposed utility model explicitly captures consumer heterogeneity and micro-level network effects. We derive conditions for the two models to generate identical adoption paths and extend the results to allow for delays in consumers' decisions. We empirically apply our results to the Japanese wireless market.

4 - Individual Characteristics and Information Systems Task Performance
Manpreet Dhillon, The George Washington University, 2201 G Street, NW, Suite 515, Washington, DC, 20052, United States of America, dhillonm@gwu.edu, Subhasish Dasgupta

This study examines the impact of IS Experience, Task Experience, and Cognitive Style on Task Performance in Familiar and Unfamiliar Application Domains. Results of this study add to our understanding of individual differences on IS Task Performance.

5 - Problem Resolution in ITIL Compliant Service Provider Environment
Larisa Shwartz, T.J. Watson, IBM, 19 Skyline Dr., Hawthorne, NY, United States of America, lshwart@us.ibm.com, Genady Grabarnik, Aaron Kershenbaum

Problem management depends on an accurate and comprehensive representation of the environment. Limited access to portions of the environment or identifiable data constructs creates additional roadblocks for problem isolation and resolution. We use ontology-based unified representation of IT data, meta-data and rules in an ITIL conformant environment to isolate and determine problems in an IT environment. The ontology-based representation allows us to use inference to fill in missing information.

■ WB37

M - T. Marshall Ballroom West

OR Practice and Applications

Contributed Session

Chair: John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu

1 - Solving the Hodgkin-Huxley Inverse Problem
Dylan Shepardson, Georgia Tech ISyE, 475 Woodward Ave, Atlanta, GA, 30312, United States of America, dylan.shepardson@gatech.edu, Craig Tovey, Astrid Prinz

Biologists have used the Hodgkin-Huxley (HH) model for decades to model neuronal behavior. However, a typical HH neuron model has many differential equations whose parameters must be tailored to the neuron in question. Setting parameters to match a neuron's observed behavior is a difficult inverse problem that is generally solved by intuition and trial-and-error. We develop new techniques to automate the parameter setting process and test them on a model for the stomatogastric ganglion neuron.

2 - Bridging the Gap between Business and OR
Gertjan de Lange, VP Sales & Marketing, AIMMS (Paragon Decision Technology)), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, g.de.lange@aimms.com

Bringing OR beyond the development/analytical stage is crucial for its success beyond the OR/MS community. AIMMS has been enabling non-OR experts (business users) for almost 20 years by providing seamlessly integrated advanced modeling capabilities to OR experts (to ensure real-life models are solved) and advanced deployment & usage capabilities (to allow practical use). By two customer cases, we'll demo the power of OR for non-OR experts in their day-to-day life.

3 - Economic Implications of Safety Improvements in an Uncertain Litigation Environment
Mark Lutz, N/A, 9055 Loreleigh Way, Fairfax, VA, 22031, United States of America, mlutz@live.com

Any methodology which is used to assign values to safety improvements requires input for the maximum dollar amount to be spent per life saved. The decision to make or not make a safety improvement can be scrutinized by a judge or a jury after an accident occurs. This presentation explores methodology for determining whether to commit additional resources to safety improvements when confronted with an uncertain litigation environment.

4 - Improving RF Localization Accuracy- An Optimizing Study

Junyi Zhou, PhD candidate, North Dakota State University, 100 University Village, Fargo, ND, 58102, United States of America, junyi.zhou@ndsu.edu, Jing Shi

Multilateration is one of the most widely-applied algorithms in indoor localization using radio frequency (RF) devices such as wireless sensors and RFID tags. In our research, the effects of two main factors on the localization accuracy and precision have been studied, namely,the layout of beacons and the probability distribution of RF signal strength. The experiment shows that either factor has a significant affect on localization performance, and the optimal performance can be obtained.

5 - Optimality Conditions for Distributive Justice

John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu

I analyze optimization problems that formulate utilitarian and Rawlsian (lexmax) criteria for a just distribution of resources. I assume that some individuals are more productive than others, so that an inequitable distribution may create greater overall utility. I derive conditions under which a distribution of wealth is utility maximizing or just in a Rawlsian sense.

■ WB38

M - Tyler

Integer Programming and Applications

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Muhong Zhang,Arizona State University, Arizona State University, Tempe, AZ, United States of America, Muhong.Zhang@asu.edu

1 - A PTAS for Chance Constrained Knapsack Problem with Random Sizes

Vineet Goyal, Tepper School of Business, CMU, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, vgoyal@andrew.cmu.edu, R. Ravi

We consider a chance constrained knapsack problem where we are given a set of n items, a knapsack size B and a reliability level p. Each item has a deterministic size and a random size that is distributed normally and independent of others. The goal is to find a set of items that maximize the profit while satisfying the knapsack constraint with probability at least p. In this paper, we present a PTAS for this problem using a parametric LP approach and rounding the LP solution.

2 - Mixing Inequalities and Maximal Lattice-Free Triangles

Santanu Dey, Center for Operations Research and Ecnomometrics, Louvain-La-Neuve, Belgium, Santanu.Dey@uclouvain.be, Laurence Wolsey

In this talk, we discuss a method for using mixing inequalities to obtain cutting planes from general simplex tableau. We present a relationship between mixing inequalities and maximal lattice-free triangles and propose a method for strengthening these inequalities based on lifting of nonbasic integer variables.

3 - Stochastic Mixed-Integer Programming Approach to Asset and Liability Management

Stephen Stoyan, PhD Student, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, stoyan@mie.utoronto.ca, Roy Kwon

We present the problem of Asset and Liability Management (ALM) where the underlying portfolio contains an index-tracking fund. A general ALM model is defined whose assets meet a terminal financial obligation while upholding a number of important portfolio characteristics. The numerous sources of uncertainty are captured in a Stochastic Mixed-Integer Programming (SMIP) approach, where a Goal Programming technique is used to handle various portfolio objectives.

■ WB39

M - Truman

Algorithms for Online Advertising

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Seffi Naor, Technion, Technion City, Haifa, 32000, Israel, naor@cs.technion.ac.il

1 - Online Primal-dual Algorithms for Maximizing Ad-auctions Revenue

Niv Buchbinder, Technion, Computer Science Department, Technion, Haifa, - 32000, Israel, nivb@cs.technion.ac.il, Kamal Jain, Seffi Naor

We study the online ad-auctions problem introduced by Mehta et. al. We design a (1-1/e)-competitive algorithm for the problem, which is based on a clean primal-dual approach. Our basic algorithm along with its analysis are very simple. Our results are based on a unified approach developed earlier for the design of online algorithms. We show that this approach is useful for analyzing other classical online algorithms such as ski rental and the TCP-acknowledgement problem.

2 - Dynamic Cost-Per-Action Mechanisms and Applications to Online Advertising

Amin Saberi, Stanford University, Terman Engineering Building, Room 317, Stanford, CA, 94305, United States of America, saberi@stanford.edu, Hamid Nazerzadeh, Rakesh Vohra

We study the Cost-Per-Action or Cost-Per-Acquisition (CPA) charging scheme in online advertising. In this scheme, instead of paying per click, the advertisers pay only when a user takes a specific action(e.g. fills out a form) or completes a transaction on their websites. We focus on designing efficient and incentive compatible mechanisms that use this charging scheme.

3 - Maximizing Sequence-submodular Functions and Its Application to Adwords Auctions

Azarakhsh Malekian, student, University of Maryland, 4322 Rowalt Dr., apt 101, College Park, MD, 20740, United States of America, azarakhshm@gmail.com, Saeed Alaei

We extend the notion of submodularity to sequence functions and analyze the greedy algorithm for maximizing such functions subject to a maximum length constraint on the solution sequence. Many combinatorial problems involving time fall in this category. We model the online ad allocation problem in this framework implying that the greedy gives a (1-1/e) approximation assuming that the distribution of queries over keywords do not change over time.

4 - Structural Approximations with Applications to Banner Advertising

Hamid Nazerzadeh, Stanford University, Palo Alto, CA, Palo Alto, CA, United States of America, hamidnz@stanford.edu, Uri Feige, Vahab Mirrokni, Nicole Immorlica

We introduce a new framework for designing and analyzing algorithms. Our framework applies best to problems that are inapproximable according to the standard worst-case analysis. We circumvent such negative results by designing guarantees for classes of instances, parameterized according to properties of the optimal solution. We apply our framework to the problem of allocating banner ads when advertisers have combinatorial preferences and require at least a minimum number of impressions.

■ WB40

M - Taylor

Methods for Mathematical Programs with Complementarity Constraints, and for Related Problems

Sponsor: Optimization/ Linear Programming & Complementarity
Sponsored Session

Chair: John Mitchell, Professor, Rensselaer Polytechnic Institute, Math Sciences, Troy, NY, 12180, United States of America, mitchj@rpi.edu

1 - A Second-order Method for Mathematical Programs with Complementarity Constraints

Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Walter Murray, Michael Saunders

We consider the solution of mathematical programs with complementarity constraints. We present a primal-dual method reliant on both negative curvature and Newton directions. A curvilinear search over a combination of these directions is employed for purposes of globalization. We prove that the iterates converge to a second-order KKT point. We conclude by discussing the performance of the algorithm on a test problem set of quadratic programs with equilibrium constraints.

2 - An Algorithm for the Bilevel Approach to SVM Problems

Greg Moore, Rensselaer Polytechnic Institute, Amons Eaton 301, 110 8th Street, Troy, NY, 12180, United States of America, mooreg5@rpi.edu, Kristin Bennett

We develop an efficient algorithm for solving the the SVM problem of T-fold cross validation which incorporates continuous parameter selection. The algorithm uses a cutting plane technique combined with proximity control to find (local) optimal solutions. The algorithm can handle many parameters and is also scalable and generalizes well.

3 - LPCC approach to Nonconvex Quadratic Programs

Jing Hu, Rensselaer Polytechnic Institute, Amons Eaton 301, 110 8th street, Troy, NY, 12180, United States of America, huj@rpi.edu, John Mitchell, Jong-Shi Pang

This talk presents a novel approach to general nonconvex quadratic programs. The global resolution of a feasible QP, which is not known a priori to be bounded or unbounded below, can be accomplished by resolving two linear programs with linear complementarity constraints (LPCC). The first LPCC confirms whether the QP is bounded below or not; and the second one computes a globally optimal solution if such a solution exists.

4 - Mathematical Programming Applications of LPECs

John Mitchell, Professor, Rensselaer Polytechnic Institute, Math Sciences, Troy, NY, 12180, United States of America, mitchj@rpi.edu, Jing Hu, Jong-Shi Pang

Linear programs with complementarity constraints have many applications in practice. Perhaps the best known are formulations of bilevel linear programming problems and of nonconvex quadratic programming problems. We discuss other applications, including inverse convex quadratic programming, testing copositivity of matrices on polyhedral cones, and verification of B-stationarity in mathematical programs with complementarity constraints.

■ WB41

M - Taft

Innovation and Entrepreneurship II

Contributed Session

Chair: Ozan Ozcan, Research Assistant, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, Tampa, 33620, United States of America, oozcan@mail.usf.edu

1 - How Technology Intermediators Work?

Yutaka Hamaoka, Professor, Keio University, 2-15-45 Minato-ku, Mita, Tokyo, ja, 103-8345, Japan, hamaoka@fbc.keio.ac.jp

Under open innovation paradigm, technology intermediators, such as InnoCentive and NineSigma, have important role that intermediate solution seekers and solution providers. However, how this system works is not well investigated. This study empirically examine effectiveness of technology intermediators using publicly available data. Whether problem was solved is related with the amount of prize, duration until deadline, problem domain, explicitness of the problem, and other variables.

2 - Contracting R&D and the Role of Incentives

Shantanu Bhattacharya, Associate Professor of Operations Management, INSEAD, 1 Ayer Rajah Avenue, Singapore, 138676, Singapore, shantanu.bhattacharya@insead.edu, Vibha Gaba

We model the outsourcing of specific R&D activities to partnering firms, and find that when the outcome of investments made in R&D by partnering firms is stochastic, the optimal contract is always a mix of a cost and revenue sharing contract, where the degree of each is a function of the stochasticity in the outcome of the R&D activities conducted by each firm and the expected reward from successful development.

3 - Enhancing Cumulative Innovation by Creating Social Ties within Collaborative Networks

Ozan Ozcan, Research Assistant, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, Tampa, 33620, United States of America, oozcan@mail.usf.edu, Fethullah Caliskan, Kingsley Reeves

This study will: 1) identify measures of social capital and the factors that enable or impede its impact on interorganizational cumulative innovation, 2) generate physical, human, and social capital and determine the implications for the role of universities and the implications for public policy, and 3) add to our knowledge of how the physical and virtual aspects of social networks co-evolve in the presence of a viable cyberinfrastructure.

■ WB42

M - McKinley

Supply Chain Management II

Contributed Session

Chair: Navid Sabbaghi, MIT, 77 Massachusetts Ave. #32-D712, Cambridge, MA, 02139, United States of America, sabbaghi@mit.edu

1 - Coordinating Buy-back Contracts under Asymmetric Information

Eli Snir, Asst. Professor, Southern Methodist University, Cox School of Business, PO Box 750333, Dallas, TX, 75275, United States of America, esnir@cox.smu.edu, Chester Chambers

We consider a monopolist supplier and single buyer in which buy-back or revenue sharing contracts are written in anticipation of demand. The buyer's order is based on a privately held forecast which evolves according to a Brownian motion process. We find that it is optimal to offer a single, coordinating contract regardless of the distribution of buyer types. The terms of this contract are developed which optimally manages the risk that the buyer will not order if his forecast becomes too low.

2 - Who Should Offer Supply Chain Finance? A Comparison of Manufacturer-Led vs. Bank-Led Financing

Jianer Zhou, Simon School, University of Rochester, 4-341 Carol G Simon Hall, University of Rochester, Rochester, NY, 14627, United States of America, zhouj2@simon.rochester.edu, Harry Groenevelt

We consider a supply chain involving 3 parties: retailer, manufacturer, and bank. The mfr sells through the retailer whose ability to finance inventory is limited, so either the mfr or the bank may offer supply chain finance. We formulate the interaction between the retailer and the lender in a Stackelberg game in each period, and the lender's financing choices in a Markov decision process. Numerical comparisons show that mfr-led financing has advantages in improving chain performance.

3 - Coordinating a Constrained Channel

Navid Sabbaghi, MIT, 77 Massachusetts Ave. #32-D712, Cambridge, MA, 02139, United States of America, sabbaghi@mit.edu, Yossi Sheffi, John Tsitsiklis

Linear wholesale-price contracts are considered incapable of coordinating a retailer's procurement decision for a 1 supplier/1 retailer supply channel. Consequently, more complex contracts have been studied. We show that when a retailer is capacity constrained there is a set of wholesale prices that coordinate his ordering decision. We extend our results to multiple-supplier channels operating in push-mode, multiple-retailer channels operating in pull-mode, equilibrium settings, & buyback.

4 - Effects of Stock-dependent Shipments on the Bullwhip Effect

Yanfeng Ouyang, Assistant Professor, University of Illinois at Urbana-Champaign, 1209 Newmark Laboratory, MC 250, Urbana, IL, 61801, United States of America, yfouyang@uiuc.edu

Past studies on the bullwhip effect often assume that the goods ordered by a supplier always arrive after an exogenous lead time. In reality, the shipment quantities depend dynamically on stock conditions upstream. This paper analyzes the effects of stock-dependent shipments and presents robust analytical conditions to bound the bullwhip effect magnitude. Numerical examples verify that stock dependent lead times do not significantly exaggerate the bullwhip effect.

■ WB43

M - Balcony D

Operations Management II

Contributed Session

Chair: Zhenying Zhao, Intel, 2126 E. Aloe Pl, Chandler, AZ, 85249, United States of America, zhenying.zhao@intel.com

1 - Strategic Capacity Deterrence: What Really Matters?

Shu-Jung Sunny Yang, Lecturer in Management, The University of Melbourne, 5th Floor Babel Building, Victoria 3010, Melbourne, Australia, sunnyy@unimelb.edu.au, Eddie Anderson

We study the impact of industrial characteristics on a firm's investment decisions. In our model, each firm faces both fixed and variable costs to purchase capacities. First, the firms simultaneously/sequentially make their investment decisions and then simultaneously decide their outputs. We characterize the firms' decisions in equilibrium and demonstrate that the industrial characteristics play a crucial role in determining the effectiveness of preemptive investment.

2 - Definition and Determinant Theorem of No-Arbitrage in Fuzzy Financial Market

Xin Gao, PhD Candidate, Tsinghua University, Zijing Building 16#104A, Tsinghua University, Beijing, 100084, China, cooeegao@gmail.com

In this paper, a rigorous mathematical model of finance based on fuzzy processes is given. Most fundamental issues and the mathematical definitions of some fundamental finance concepts are given. Then a multidimensional model describing the fuzzy financial market is presented. At the end, mathematical definition and determinant theorem of no-arbitrage are investigated.

3 - Handling Nonlinearity with Sequential Solve for Intel Supply Chain Optimization

Zhenying Zhao, Intel, 2126 E. Aloe Pl, Chandler, AZ, 85249, United States of America, zhenying.zhao@intel.com

Various nonlinearity business rules/requiremtns will be introduced in managing Intel supply chain. Linear approximation of these nonlinear business rules/requirements with sequential solve and iterative serach will be discussed. The algorithm accuracy will be analyzed and real-life case studies will be presented.

■ WB44

M - Balcony C

Design of Assembly Supply-Chain Configurations for Product Variety Management

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Jeonghan Ko, University of Nebraska-Lincoln, 175 Nebraska Hall, Industrial and Management Systems Eng., Lincoln, NE, 68588, United States of America, jko2@unl.edu

Co-Chair: Hui Wang, University of Michigan, 2350 Hayward Street, 2250 GGBL, Ann Arbor, MI, 48109, United States of America, johnwang@umich.edu

1 - Handling Variety in Mixed-Model Assembly Supply Chain by Order Decoupling

Xiaowei Zhu, University of Michigan, Ann Arbor, 2350 Hayward Street, RM 2250, Ann Arbor, MI, 48109, United States of America, xwzhu@umich.edu, S. Jack Hu, Jin Feng

A mixed-model assembly process is considered as a supply process in which customized parts are added to partially completed assemblages. As product variety increases, the part supply process can become quite challenging. We propose using order decoupling to minimize part variation rate, which improves the process to handle variety without mechanically moving the physical assemblages. Procedures are developed in deterministic and stochastic settings to accommodate possible sequence disruptions.

2 - Multi-objective Supply Chain Scheduling

Tadeusz Sawik, Professor, AGH University of Science & Technology, Dept of Oper. Res. & Inform. Techn., Al.Mickiewicza 30, Krakow, PL, 30059, Poland, ghsawik@cyf-kr.edu.pl

A hierarchy of mixed integer programs is proposed for a multi-objective supply chain scheduling. The supply chain consists of multiple suppliers of parts and one producer. Given a set of orders, the objective is to select supplier of parts for each order, determine manufacturing and supply schedules for suppliers and assembly schedule for producer to reach a high customer service level at low cost.

3 - A Model of Assembly Supply Chain Complexity and its Relationship to Cost

Hui Wang, University of Michigan, 2350 Hayward Street, 2250 GGBL, Ann Arbor, MI, 48109, United States of America, johnwang@umich.edu, S. Jack Hu, Goker Aydin

We propose a complexity measure for an assembly supply chain, based on the information entropy. Using two potential applications (choosing the product variety to be offered by the supply chain and choosing between two given supply chain configurations), we study the degree of consistency between decisions made according to the complexity and decisions made according to the cost. The complexity measure is found to be particularly useful when choosing the level of product variety.

4 - Re-configurations of an Assembly Supply-chain and Subassemblies to Manage Supply-chain Disruptions

Jeonghan Ko, University of Nebraska-Lincoln, 175 Nebraska Hall, Industrial and Management Systems Eng., Lincoln, NE, 68588, United States of America, jko2@unl.edu, Hans Boeschen

In the assembly supply chain, supplier or logistics disruptions usually lead to the delay in the assembly of products, often requiring supply chain re-design. This paper presents a mathematical model for the optimized re-configurations of subassemblies and re-assignment of these subassemblies to suppliers for the supply chain re-design.

■ WB45

M - Balcony B

Procurement and Supplier Selection

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Fuqiang Zhang, Assistant Professor, Washington University, Olin Business School, St. Louis, MO, United States of America, FZhang22@wustl.edu

Co-Chair: Hui Zhao, Assistant Professor, Purdue University, 403 W. State Street, West Lafayette, IN, 47906, United States of America, zhaoh@purdue.edu

1 - When Should Firms Pool Purchases from a Sole-source Supplier?

Bin Hu, PhD Student, University of Michigan, Ross School of Business, Ann Arbor, United States of America, hub@umich.edu, Izak Duenyas, Damian Beil

We consider the strategic question of whether firms (or divisions of a firm) should or should not pool their purchases when facing a sole source monopolistic supplier. We develop a principal-agent model and develop insights that are surprisingly different than those in classical inventory pooling.

2 - Procurement Strategies in a Three-tier Supply Chain with Private Demand Information

Dimitris Kostamis, University of North Carolina, Kenan-Flagler Business School, CB #3490, McColl Bldg., Chapel Hill, NC, United States of America, Dimitris_Kostamis@unc.edu, Izak Duenyas

We consider a supply chain with an OEM, a tier-1 and a tier-2 supplier. The OEM has private demand information but no market power over the suppliers, and can choose to contract with both suppliers or with the tier-1 supplier only. While we show that the OEM is better off contracting only with the tier-1 supplier if suppliers employ full price-quantity schedules, the OEM might be better off contracting with both if they offer just as many contracts as the number of possible demand types.

3 - Quality-based Supplier Selection with Asymmetric Information

Hui Zhao, Assistant Professor, Purdue University, 403 W. State Street, West Lafayette, IN, 47906, United States of America, zhaoh@purdue.edu, Xinghao Yan, Kwei Tang

We explore quality-based supplier selection when product quality is suppliers' private information, quality itself exhibits uncertainty, and quality can be improved by efforts from the suppliers and/or the buyer.In selecting the supplier,the buyer can choose two different strategies, a promise strategy or a requirement strategy. We investigate how these two different strategies affect the efforts in quality improvement and the supply chain profits under different quality improvement scenarios.

4 - Procurement Mechanism Design in a Two-echelon Inventory System with Price-dependent Demand

Fuqiang Zhang, Assistant Professor, Washington University, Olin Business School, St. Louis, MO, United States of America, FZhang22@wustl.edu

A buyer procures a product from an upstream supplier and in turn sells to customers. Both firms can hold inventory to improve service. The buyer takes two attributes into consideration when designing the procurement contract: price attribute and service-level attribute. We derive the optimal contract for the buyer and investigate the implications of the two attributes on procurement mechanism design.

■ WB46

M - Balcony A

Optimization Models for Operations Planning

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Joseph Geunes, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, geunes@ise.ufl.edu

1 - Analysis of Energy Bridge Technology in the Liquefied-natural-gas Industry

Erkut Sonmez, PhD Candidate, Carnegie Mellon University Tepper School of Business, 5837 Hobart st apt 2, Pittsburgh, PA, 15217, United States of America, esonmez@andrew.cmu.edu, Nicola Secomandi, Alan Scheller-Wolf, Sunder Kekre

According to forecasts, local natural gas production will be soon unable to meet the demand in industrialized countries; imported liquefied natural gas (LNG) will play an imported role to close this gap. Increasing LNG imports will require additional regasification capacity. Energy-Bridge (EB) is a new offshore LNG regasification technology. In this paper, we analyze and compare conventional onshore, EB and transshipment based EB systems in terms of LNG throughput and capacity investment.

2 - Dynamic Lot Sizing Models for Managing Retailer Inventory Using Case Packs

Ajay Mishra, Visiting Associate Professor, SUNY Binghamton, School of Management, Binghamton, NY, 13902, United States of America, amishra@binghamton.edu

Often distribution centers procure case packs from vendors and then send multiples of these to individual stores. E.g., a case pack of shirts may contain a mix of small, medium, and large shirts. This saves on handling costs at the distribution center and reduces lead time. Even though products come in a variety of case packs, they sell individually and a store must order an optimal number of case packs to avoid excess units. We study replenishment decisions for a family of products at a store.

3 - A Facility Location Model with Safety Stock Costs: Analysis of the Cost of Single-sourcing Requirements

Semra Agrali, University of Florida, 303 Weil Hall PO Box 116595, Gainesville, FL, 32611, United States of America, sagrali@ufl.edu, Zeki Caner Taskin, Joseph Geunes

We consider a supply chain setting in which multiple facilities serve a set of customers with uncertain demands. Each facility has an associated fixed cost, and incurs safety stock and variable supply costs. We propose a MINLP model and provide a Benders' decomposition algorithm for the case in which a customer's demand may be split among an arbitrary number of facilities. We provide computational results that permit characterizing the costs that arise from a single-sourcing strategy.

■ WB47

M - Hoover

Treatment Optimization Models for Disease Management

Sponsor: Health Applications Section
Sponsored Session

Chair: S. Ayca Erdogan, North Carolina State University, Graduate Program in Operations Research, 375 Daniels Hall, Campus Box 7906, Raleigh, NC, 27695, United States of America, saerdoga@ncsu.edu

1 - An Economic Sequential Probability Ratio Test (ESPRT) Model to Detect Epidemic Outbreaks

Dayna Martinez-Torres, Graduate Student, University of South Florida, 4401 St Lucia Court, Apartment 8, Tampa, Fl, 33613, United States of America, dlmartin@mail.usf.edu, Jose Zayas-Castro, Tapas Das

We present an Economic Sequential Probability Ratio Test model designed to enhance surveillance ability of early warning systems for epidemic outbreaks. The model considers the costs of false alarm, detection delay, and cost to society. Epidemiological models are developed for each cost and the total cost is optimized to obtain the surveillance parameters.

2 - Evaluation of HIV Treatment Policies in Resource Poor Environments

Robert Koppenhaver, PhD Student, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, rzk9@pitt.edu, Andrew Schaefer, R. Scott Braithwaite, Mark Roberts

We consider a closed population of HIV infected patients. In resource poor environments, decision makers must allocate antiretroviral drugs (ARVs) to patients in need of them the most. Further complicating matters is that once a patient is given ARVs, the decision maker must decide when to deny further access to ARVs. We compare various methods for determining which patients should receive ARVs and when to switch a patient off of ARVs.

3 - Modeling Comorbidity as a Function of Age, Race and Gender

Julie Simmons Ivy, North Carolina State University, ISE Department, Campus Box 7906, Raleigh, NC, 27695, United States of America, jsivy@ncsu.edu, Fay Cobb Payton

Our goal is understand and model the impact of comorbid conditions (concurrent chronic diseases) on patient outcomes. We develop path analyses to describe relationships between comorbid conditions, charges, procedures, length of stay, and disposition as a function of age, race, and gender for patients at a large urban academic hospital.

4 - Designing an Effective Mass Prophylaxis Response System

Cindie Wu, Cornell University, c/o Professor Jack Muckstadt, 286 Rhodes Hall, Ithaca, NY, 14853, United States of America, cindiewu@gmail.com, Caitlin Hawkins

Prophylaxing a population within 48 hours of infection is key to ensuring survival during an outbreak of smallpox, anthrax, or influenza. To prophylaxis a large population quickly, moving people to a point of dispensing (PoD) and serving them efficiently within a PoD is imperative. We present an analytic and simulation PoD model that will assist public health officials in determining staffing and service levels throughout a prophylaxis campaign for a system of PoDs.

■ WB48

M - Coolidge

Technology, Innovation and Entrepreneurship: Managing Knowledge and IT

Sponsor: Technology Management
Sponsored Session

Chair: Kenneth Huang, Assistant Professor of Management, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Road #05-01, Singapore, SG, 178899, Singapore, kennethhuang@smu.edu.sg

1 - Intra-firm Markets for Information

John Popham, Information Architect, IBM, 4341 Chesapeake Street NW, Washington, DC, 20016, United States of America, pophamj@us.ibm.com

Entrepreneurial organizations within firms often hide information and knowledge assets in order to maintain a competitive advantage and/or avoid perceived costs associated with enterprise-level IT regulation. Intra-firm markets for information can support mechanisms that promote knowledge sharing among firm organizations, provide meaningful measurements of firm information asset value, and identify firm organizations that act as centers of competency in high-value knowledge generation.

2 - Strategic Pacing and the Progress Trap of IT Innovations

Dr. Pratim Datta, Kent State University, A408 M&IS, Kent, OH, 44236, United States of America, pdatta@kent.edu, Sergei Anokhin

Is the current pace of IT innovations "too much of a good thing"? The paper argues that there is a progress trap of IT innovations where too many innovations too fast may lead to diminishing returns on R&D efforts. Unless firms strategically "pace" their IT innovations (both incremental & radical) by controlling timeliness & diversity of IT innovations, firms will fall prey to a progress trap through execution shortfalls, cannibalization, low shelf life, & competence rigidity.

■ WB49

M - Harding

Simulation-based Decision Making

Contributed Session

Chair: Duraikannan Sundaramoorthi, Assistant Professor, Missouri Western State University, 4525 Downs Drive, Popplewell Hall 309G, Saint Joseph, MO, 64507, United States of America, dsundaramoorthi@missouriwestern.edu

1 - Generation of Vessel Sequences for Relieving Congestion at Locks in a River Transportation System

Dirk Mattfeld, Professor, Universität Braunschweig, Decision Support Group, Abt-Jerusalem-Str. 4, Braunschweig, 38106, Germany, d.mattfeld@tu-bs.de, Matthias Reindl, Jan Ehmke, L. Douglas Smith

We generate locking sequences for efficient elimination of all queues in a series of river locks based on expected times for each activity, while limiting the displacement from a vessel's expected departure time under a FIFO regime. We regenerate the sequence with each new arrival and use discrete-event simulation to test the efficacy of employing this process for scheduling locking operations against simpler decision rules designed for efficient clearing of queues at individual locks.

2 - Modeling Unit Loading Device Inventory in Airline Operations

Chatabush Roongrat, PhD Student, University of Texas at Arlington, PO Box 19017, The University of Texas at Arlington, Arlington, TX, 76019, United States of America, cxr7865@exchange.uta.edu, Jay Rosenberger, Brain Huff

Maintaining sufficient inventory of Unit Loading Devices (ULDs) is challenging in airline operations, because ULD network flow is typically imbalanced. In this paper, we develop a stochastic model of ULD inventory, and we describe how we implemented the model in a WITNESS simulation. We then develop a minimum ULD loading configuration policy to help balance the network. Using the simulation, we evaluate this policy and demonstrate how the policy reduces ULD shortages.

3 - SD Modeling of Left Alone Bicycles in a Japanese City

Toshiharu Hasegawa, Professor, The Kyoto College of Graduate Studies for Informatics, 7 Tanaka Monzen-cho, Sakyo, Kyoto, 606-8225, Japan, t_hasegawa@kcg.ac.jp, Yu Inoue

Left alone bicycles near mass transit stations have been causing various social problems in many Japanese cities. Yet, many Japanese do not pay attention to the traffic regulations for bicycles Â@Utilizing Systems Dynamics techniques, the authors try to have an accurate decision making model of people to let their bicycles alone in a Japanese city. They try to find a set of feasible optimal policies to reduce the number of left alone bicycles in the proposed area.

4 - A Data-integrated Simulation Approach to Optimize Patient Care

Duraikannan Sundaramoorthi, Assistant Professor, Missouri Western State University, 4525 Downs Drive, Popplewell Hall 309G, Saint Joseph, MO, 64507, United States of America, dsundaramoorthi@missouriwestern.edu, Jay Rosenberger, Victoria Chen, Seoung Bum Kim

This research develops a novel data-integrated simulation model to evaluate and optimize nurse-to-patient assignments to improve the amount of care received by patients from the nurses assigned to them. The simulation model can aid hospital management to predict the workforce requirement by quantifying the expected patient care for a shift under consideration.

■ WB50

M - Wilson C

Nonlinear Programming: Theory and Applications

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Thomas Sharkey, Assistant Professor, Rensselaer Polytechnic Institute, Troy, NY, 12180, sharkt@rpi.edu

1 - A Shadow Simplex Method for Infinite Linear Programs

Archis Ghate, Assistant Professor, University of Washington, Industrial Engineering,, Box 352650, Seattle, WA, 98115, United States of America, archis@u.washington.edu, Robert Smith, Dushyant Sharma

We present a Simplex-type algorithm, i. e., an algorithm that moves from one extreme point of the infinite-dimensional feasible region to another not necessarily adjacent extreme point, for solving a class of linear programs with countably infinite variables and constraints. Application to non-stationary infinite horizon Markov decision processes will be discussed.

2 - A Novel Approach for Solving Disjoint Bilinear Programming Problems

Churlzu Lim, UNC Charlotte, 9201 University City Blvd, Charlotte, NC, United States of America, clim2@uncc.edu

We present a new solution approach for solving disjoint bilinear programming problems having two distinctive sets of constraints. The method exploits optimality conditions at a vertex of the polytope defined by one set of constraints, and can be implemented as a stand-alone procedure while potentially enhanced by conventional cutting planes. We report preliminary computational results for solving test instances generated from different applications of disjoint bilinear programming.

3 - Optimal Clustering Approach via Quadratic Programming with Biological Application

Chun-An Chou, Rutgers University, 96 Frelinghuysen Rd., Piscataway, NJ, 08854, United States of America, joechou@rci.rutgers.edu, Art Chaovaitwongse, Tanya Berger-Wolf, Bhaskar DasGupta, Mary Ashley, Saad Sheikh, Isabel Caballero

We present a new clustering optimization model based on likelihood measures, which is formulated as a quadratic 0-1 program to maximize the likelihood of individuals in each cluster. A linearization technique is used to reformulate this problem as a mixed integer program. The approach is used to reconstruct sibling relationships from genetic markers by grouping individuals with maximum likelihood in the same sibling set. Empirical studies on real life datasets will be presented.

4 - A Quadratic-model-based Convergent Deterministic Black-box Optimization Algorithm

Luis Rios, Graduate Student, University of Illinois at Urbana-Champaign, 537 W Melrose St Apt 133, Chicago, IL, 60657, United States of America, luisrios@uiuc.edu, Nick Sahinidis

We propose an algorithm for optimizing a deterministic function using no derivative information. Function evaluations are assumed expensive, limiting the total number of trials. Linear models are interpolated using points in a neighborhood, reusing as many evaluated points as possible. If more points are available, quadratic terms are included in the model, with priority to coordinates with greater values in the gradient. Computational comparison with other solvers is presented.

■ WB51

M - Wilson B

Semantic Web Technologies, Electronic Mediated Environment and Services

Sponsor: Information Systems
Sponsored Session

Chair: A. F. Salam, Associate Professor of Information Systems, UNCG, 479 Bryan School of Business and Econom, Greensboro, NC, 27402, United States of America, A_F_Salam@uncg.edu

1 - The Web Services Marketplace: Examining Advertising Effectiveness

Sandra Vannoy, Doctoral Student, UNCG, 479 Bryan School of Business and Econ, Greensboro, NC, 27402, United States of America, SAVANNOY@uncg.edu

An electronic marketplace has emerged as a trading ground for buyers and sellers of business services delivered via Web Services technologies. In question is whether a mechanism is in place to enable buyers of business services to make effective choices among the services. In this research we develop the tools necessary to understand and conduct an examination of the effectiveness of advertising within a Web Services Marketplace, and we utilize those tools in conducting such an examination.

2 - Service Convenience and Relational Exchange in Electronic Mediated Environment

Hua Dai, Doctoral Student, UNCG, 479 Bryan School of Business and Econ, Greensboro, NC, 27402, United States of America, H_DAI@uncg.edu, Ruth King

The focus of this study is to examine how service convenience affects long term relational exchange in electronic mediated environment (EME). Service convenience has been conceptualized as a second order construct with six convenience dimensions reflecting online service consumption process. An analytical framework has been developed and tested to validate the comprehensive framework of service convenience and its antecedents and consequences in EME leading to long-term exchange relationship.

3 - Semantic Service Contracts and Extended Enterprise

A Salam, Associate Professor, UNCG, 479 Bryan School, Greensboro, NC, 27402, United States of America, amsalam@uncg.edu

Communication, coordination and other problems arise due to the use of different terms and concepts (and their underlying lack of common semantics or meaning) used in the description of service contracts. This research is motivated by this critical problem of stark incompatibility between the contractual clauses (typically buried in legal documents) and the myriad of service performance measures for participants in the extended enterprise.

■ WB52

M - Wilson A

Disaster Preparedness and Response

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Pinar Keskinocak, Associate Professor, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, pinar@isye.gatech.edu

1 - Building a Regional Earthquake Emergency Response Exercise from Scientific Foundations

Anne Wein, Operations Research Analyst, US Geological Survey, Western Geographic Science Center, 345 Middlefield Rd., MS 531, Menlo Park, CA, 94025, United States of America, awein@usgs.gov

An emergency response exercise planned in So. California is based on an earthquake scenario produced by the United States Geological Survey and partners. The Multiple Hazards Demonstration Project integrated models and expert opinion to transform geophysical outputs into estimates of lifeline and building damages, and their consequences. The talk will provide an overview of the models, processes, and products, and highlight lessons learned, innovative features, results, and stakeholder benefits.

2 - Modeling and Solving the Problem of Evacuating Transit-dependent Citizens During No-notice Disasters

Sandra Eksioglu, Assistant Professor, Mississippi State University, PO Box 9542, Mississippi State, MS, 39762, United States of America, sde47@ise.msstate.edu

Public transit system can be used during no-notice disasters to evacuate transit-dependent citizens to safety. This paper describes a framework to model the problem, and presents a Tabu search approach to identify routes for transit vehicles. The objective is to maximize the number of transit dependent citizens evacuated within a short time-frame. The traffic network of the city of Fort Worth, TX is used to demonstrate the validity of the proposed framework.

3 - Solution Framework for Hurricane Evacuation Planning and Management

Tiravat Assavapokee, Assistant Professor, University of Houston, 4800 Calhoun Street, Houston, TX, 77204, United States of America, Tiravat.Assavapokee@mail.uh.edu, Shabnam Zangeneh, MohammadReza Baharnemati, Gino Lim

This work presents the solution framework for emergency evacuation planning by utilizing mathematical models and heuristics algorithms. The framework utilizes network optimization techniques and efficiently generates evacuation routes and schedules based on the forecast information. This framework is expected to provide an intelligent systematic methodology that can be used by transportation planners and emergency management agencies to improve traffic management during hurricane evacuation.

4 - Analysis of Local Impacts of the Regional ShakeOut Earthquake Scenario in Southern California

Laura Dinitz, Operations Research Analyst, US Geological Survey, Western Geographic Science Center, 345 Middlefield Rd., MS 531, Menlo Park, CA, 94025, United States of America, ldinitz@usgs.gov, Anne Wein, Pauline Cotelle

A focus study for the USGS Multiple Hazards Demonstration Project analyzes the local impacts of a regional earthquake disaster scenario including lifeline and building damages and economic and social consequences for a Coachella Valley community in Southern California. We will present results on the vulnerability of mobile homes, importance of air transportation, short- and long-term tourism industry concerns, and feedback from community-leader workshop participants who received the information.

■ WB53

M - Nathan Hale- Wardman Tower

Modeling and Computation in Financial Engineering

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Steven Kou, Columbia University, 312 Mudd, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States of America, sk75@columbia.edu

1 - Discrete Barrier and Lookback Options under Stochastic Volatility Model

Nan Chen, Assistant Professor, Chinese University of Hong Kong, 709A, William Mong Engineering Building, Chinese University of Hong Kong, Hong Kong, China, nchen@se.cuhk.edu.hk

The stochastic volatility model suggested by Heston (1993) receives much attention in the community of quantitative finance. However, there is little progress in the direction of path-dependent option pricing beyond the close form Fourier transforms of vanilla European options. In this article, we develop a recursion algorithm to price discretely monitored barrier and lookback options based on the Heston stochastic volatility model.

2 - Option Pricing under a Hyper-exponential Jump Diffusion Model

Ning Cai, Department of IEOR, Columbia University, New York, NY, 10027, United States of America, nc2118@columbia.edu, Steven Kou

We propose a jump diffusion model with jump sizes having a hyper-exponential distribution. This model provides a link between asset pricing models with exponential tails and power tails, and leads to analytical solutions for lookback, barrier and perpetual American options. This is made possible by using martingale methods to study some multi-dimensional integro-differential equations, and by solving related first passage time problems and optimal stopping problems.

3 - Inflation, Incomplete Information and Optimal Portfolio

Jussi Keppo, University of Michigan, keppo@umich.edu, Alain Bensoussan, Suresh Sethi

We consider an optimal consumption and portfolio investment problem of an investor who is interested in maximizing his utility from terminal wealth subject to a random inflation in the consumption basket price. The investor receives noisy observations on the basket price from inflation measures and salary income. We test the model empirically.

4 - Hedging Longevity Risk Via Issuing of Mortality Bonds

Xianhua Peng, Columbia University, 313A Mudd, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States of America, xp2102@columbia.edu, Steven Kou

The U.S. government faces substantial longevity risk, i.e. the improvement of longevity in the U.S. population leads to increase in the government's social security and medicare liability. We propose that the government may hedge longevity risk significantly by issuing mortality bonds, which are financial instruments with coupon payments depending on the mortality rates of the U.S. population. The stochastic modeling of the mortality rates and the valuation of mortality bonds are also studied.

■ WB54

M - Congressional - Wardman Tower

Production Scheduling I

Contributed Session

Chair: Henny van Ooijen, Assistant Professor, TU/e Technology Management Faculty, Postbus 513, Eindhoven, - 5600 MB, Netherlands, H.P.G.v.Ooijen@tm.tue.nl

1 - Timely Manufacturing of Outsourced Operations: Coordination Issues

Tolga Aydinliyim, Assistant Professor, University of Oregon, Decision Sciences Department, Lundquist College of Business, Eugene, OR, 97403-1208, United States of America, tolga@uoregon.edu, George Vairaktarakis

We consider coordination issues which arise when multiple manufacturers outsource operations to the same third-party, using online capacity booking systems that are implemented by many contract manufacturers. When compared to the current practice of the FCFS booking of the available capacity, centralized scheduling generates significant savings, but may result to inferior performance individually. We present savings sharing schemes that promote full cooperation among the manufacturers.

2 - Lead Time Performance under Periodic Capacity Adjustment Policies

Nasuh Cagdas Buyukkaramikli, PhD Student, TU/e Technology Management Faculty, Postbus 513, Eindhoven, - 5600 MB, Netherlands, n.c.buyukkaramikli@tue.nl, Will Bertrand, Henny van Ooijen

We develop analytical expressions to find cost-optimal periodic capacity adjustment polices for production systems that operate under a lead time performance constraint and can periodically adjust their capacity at a cost.Production system is modelled as a queuing system.We use numerical techniques to find the operating characteristics of the capacity policies and show that these policies can lead to up to 24% savings,compared to the optimal costs under constant capacity.

3 - Multi-shift Production and Labor Capacity Scheduling

Babak Zafari, Bowling Green State University, Applied Statistics & Operations Research, Bowling Green, OH, 43403, United States of America, babakz@bgsu.edu, Christopher M Rump, Daniel J Bragg

We consider the joint scheduling of labor resources and production tasks in a job shop, incorporating capacity requirement planning (CRP) within the material requirements planning (MRP) process. We compare heuristic strategies to optimal decisions under a variety of performance metrics.

4 - Lead Time Performance of a Mass Production Unit with Periodic Capacity Adjustment Policies

Henny van Ooijen, Assistant Professor, TU/e PO Box 513, EINDHOVEN, 5600 MB, Netherlands, h.p.g.v.ooijen@tue.nl, Nasuh Cagdas Buyukkaramikli, Will Bertrand

In this study,we analyze a mass production unit that operates under a periodic capacity adjustment policy.Due to the material coordination,demands for new products arrive as a batch,which is a discrete random variable,at the beginning of each period.Each job has to be finished within L units of time.We are interested in savings from the expected capacity usage costs under a lead time service level.Numerical tests reveal that capacity flexibility can yield to substantial savings.

■ WB55

M - Room 8217

Flight Scheduling

Contributed Session

Chair: Stefan Friederichs, University of Cologne, Pohligstr. 1, Cologne, 50969, Germany, stefan.friederichs@uni-koeln.de

1 - Real-time Inter-modal Diversion: A Strategy for Recovery from Severe Airport Capacity Shortfall

Yu Zhang, Assistant Professor, University of South Florida, 1023 Foster City Blvd,, Apt.C, Foster City, CA, 94404, United States of America, zhangyu@berkeley.edu, Mark Hansen

We propose an inter-modal strategy to divert flights affected by capacity shortfall at a hub airport to regional airports (called alternative hubs) and suggests passenger relocation instead of aircraft relocation with ground connections. In this strategy, short-haul flights can be substituted by ground transportation as well. A mathematical programming model and an approximation algorithm are introduced to help airlines make decisions on how to delay, cancel, substitute, and divert flights.

2 - Algorithms for a Departure Scheduling Problem at the Dallas-Fort Worth International Airport

Sivakumar Rathinam, UARC, Building 210, Ames Research Center, Moffett Field, CA, United States of America, srathina@ucsc.edu, Yoon Jung

All arrival aircraft at the Dallas Fort Worth (DFW) airport are required to cross a departure runway before reaching their gates. This work addresses a scheduling problem where the aim is to determine when a departure runway must be used for departures or arrivals given all the aircraft waiting to use the runway and the operational constraints. In this work, an integer-programming formulation and heuristics with computational results are presented for the proposed scheduling problem.

3 - Optimization of Gate Assignment Problem (GAP) through the Minimization of Ground Delays (GDs)

Binod Maharjan, Texas Tech University, 2500 Broadway, Lubbock, TX, 79415, United States of America, b.maharjan@ttu.edu, Timothy Matis

About 84% of the total delays at an airport are due to GDs such as taxi-in, taxi-out, and gate delays which are mainly due to airline operating procedures, capacity constraints, maintenance, weather conditions and runway config. These delays causing more jet fuel burn taking away profit from airlines. It will be shown that the GAP taking above mentioned factors into consideration is an NP hard. The variability concept between the routes for designated flight will be analyzed & present solution to the problem by using traditional and other heuristic approaches.

4 - Scheduling Aircraft Landing at Airport with Multiple Runways Considering Airline Preferences

Peng Cheng, Associate Professor, Department of Automation, Tsinghua University, Main Building, Room 614, Beijing, BJ, 100084, China, chengp@tsinghua.edu.cn

Taxi time is usually not negligible after aircrafts landing at a major airport with multiple runways and terminal buildings scattered over a large area. We propose a 0-1 Integer Program model of scheduling of aircraft landing to make an optimal runway allocation and landing sequence, considering airline's preference for the nearest runway to its terminal. Primary results will be applied to Beijing International airport, where the third runway and new terminal are just put into operation.

■ WB56

O - Blue Room

Joint Session TSL/AAS: Topics in Aviation OR

Sponsor: Transportation Science & Logistics, Aviation Applications Sponsored Session

Chair: Chunhua Tian, Advisory R&D Engineer, IBM China Research Lab, Diamond Building, ZGC Software Park 19#, ShangDi, Beijing BJ 100193, China, chtian@cn.ibm.com

1 - An Improved Tabu Search for Airport Gate Assignment

Cheuk Lam Kwan, Graduate Student, The Chinese University of Hong Kong, Dept of Syst Engg & Engg Mgmt, The Chinese Univ. of Hong Kong, Shatin, NT, Hong Kong - China, clkwan@se.cuhk.edu.hk, C.H. Cheng

We examine the use of tabu search for airport gate assignment. Features such as path relinking will be used to improve its performance. Computational study will also be presented.

2 - Air Cargo Load Planning: A Rule-based Optimization Approach

Chunhua Tian, Advisory R&D Engineer, IBM China Research Lab, Diamond Building, ZGC Software Park 19#, ShangDi, Beijing, BJ, 100193, China, chtian@cn.ibm.com, Feng Li, Hao Zhang, Wade Kelley

To provide the flexibility to change business logic a rule based optimization approach is proposed. High-level business logic is captured as a rule flow. Optimization algorithms (such as bin assign) are embedded as the action of the rule flow. With this approach, a loading plan can be adaptive to business changes without changing the application code. Our implementation includes a visual rule editor and rule engine. The system has successfully been applied at a North American airline company.

■ WB57

O - Blue Room Prefunction

Joint Session AAS/TSL: Autonomous Reconfigurability

Sponsor: Aviation Applications, Transportation Science & Logistics Sponsored Session

Chair: Constantine Caramanis, Assistant Professor, The University of Texas at Austin, Electrical and Computer Engineering Dept, Austin, TX, United States of America, cmcaram@ece.utexas.edu

1 - Event-driven Sensing for Enterprise Reconfigurability and Optimization

Christos Cassandras, Professor, Boston University, Department of Manuf. Engineering, 15 St. Mary's St., Brookline, MA, 02446, United States of America, cgc@bu.edu, Weibo Gong, Robert Gao, Yannis Paschalidis, Azer Bestavros

We propose a systematic reconfigurability framework for an enterprise viewed as a large-scale dynamic system. A key element is the replacement of traditional fixed-interval, time-driven systems by reconfigurable event-driven systems better suited for asynchronous distributed environments. To achieve this, we develop event-driven mechanisms for data acquisition, sensor networking with node localization, and system level optimization that includes mobility coordination for delay tolerant networks.

2 - Controlling the Autonomously Reconfiguring Stochastic Factory

Mark Yim, Associate Professor, University of Pennsylvania, 297 Towne Bldg, 220 S. 33rd Street, Philadelphia, PA, 19104, United States of America, yim@grasp.upenn.edu, Hod Lipson, Eric Klavin, Daniela Rus

Natural systems create deterministic structures from a variable materials. Robustness and adaptability result from this stochastic nature. We will demonstrate a novel paradigm for robust construction and adaptive reconﬁguration of physical systems, under uncertainty and variable resources. We envision processes with resources and targets subject to stochastic ﬂuctuations. Attributes: autonomy, stochastic behavior, adaptation, distribution of sensing, control, and actuation.

3 - Information Theoretic Bounds for Distributed Computation

Munther Dahleh, Professor, Massachusetts Institute of Technology, 77 Massachusetts Ave, Cambridge, MA, 02139, United States of America, dahleh@mit.edu

We consider a network of nodes, each having an initial value, and seeking to acquire an estimate of a given function of all the nodes' values in the network. Each node may exchange with its neighbors a finite number of bits. We present an order optimal algorithm for computation of separable functions under such constraints in terms of the "conductance" of the graph representing this topology.

4 - Autonomous Reconfigurability of the National Air Transportation System

Constantine Caramanis, Assistant Professor, The University of Texas at Austin, Electrical and Computer Engineering Dept, Austin, TX, United States of America, cmcaram@ece.utexas.edu, Cynthia Barnhart, Georgia Perakis, Dimitris Bertsimas

This talk describes a vision for the autonomous Reconfigurability of the National Air Transportation System in response to the prevailing demand-to-capacity relationship at any given time. We focus on recent optimization-based results whose salient features include: (a) equity models mirroring industry standards, (b) national-scale computations, and (c) models and results for multiple-agent interactions, in particular the FAA's slot allocation and subsequent airline recovery operations.

■ WB58

O - Capital

Advanced Vehicle Systems and NextGen

Sponsor: Aviation Applications
Sponsored Session

Chair: Dr. Frederick Wieland, Senior Research Engineer—ATM Systems, Sensis Corporation, 600 Maryland Ave SW, Washington, DC, 20024, United States of America, fwieland@sensis.com

1 - Assessing the Impact of New Vehicle Concepts in NextGen

Michelle Kirby, Research Engineer II, ASDL/Georgia Tech, 270 Ferst Drive, Mail Stop 0150, Atlanta, GA, 30332, United States of America, Michelle.kirby@ae.gatech.edu

This presentation will focus on the impact of various new vehicle concepts within NextGen utilizing a physics based analysis being developed by the FAA called the Environmental Design Space,EDS. EDS can provide a capability to estimate source noise, exhaust emissions, performance, and operational parameters for future aircraft designs under different technological scenarios. The capability will allow for assessments of interdependencies and trade-offs that occur within the NextGen setting.

2 - A Framework for Assessing the Impact to Safety of Deploying New Aircraft Concepts into NextGen

Alfredo Colon, CSSI Inc., 400 Virginia Avenue, SW, Suite 710, Washington, DC, 20024, United States of America, acolon@cssiinc.com

This paper presents a framework being developed to facilitate assessing the safety and associated tradeoffs of introducing new aircraft concepts into the Next Generation Air Transportation System. It aims to understand: the safety constraints imposed by NextGen on vehicle operations; the impact of new vehicle operations on safety; and the tradeoffs involved between the new vehicles and the ATM system for improving safety while maintaining operational flexibility and efficiency.

3 - Impact Assessment of the Integration of Advanced Concepts and Vehicles into the NextGen

Almira Ramadani Williams, Associate Fellow, CSSI, Inc., 400 Virginia Ave, SW, Washington, DC, 20024, United States of America, awilliams@cssiinc.com

A metric set and performance evaluation framework were developed to enable understanding the impact of integration of advanced concepts and vehicles into the NextGen. The performance metrics and framework support analyses of procedures, safety assurance and system-level performance, and enable understanding of trade-offs between safety assurance, system performance and environmental constraints.

4 - Analysis of NextGen and New Vehicle Types

Dr. Frederick Wieland, Senior Research Engineer—ATM Systems, Sensis Corporation, 600 Maryland Ave SW, Washington, DC, 20024, United States of America, fwieland@sensis.com

This talk (and the rest of the papers in this session) will focus on the impact of new vehicle types on the NextGen air transportation system, focusing on the 2025-2040 time frame. The new vehicle types to be discussed include commercial supersonic transports, very low-cost jets, cruise efficient short takeoff and landing vehicles, rotorcraft, and unmanned aerial systems. Impacts in the performance, environment, and safety areas will be discussed.

■ WB59

O - Embassy Room

Retail Revenue Management and Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Juan Carlos Ferrer, Associate Professor, P. Universidad Católica de Chile, Casilla 306 Correo 22, Santiago, Santiago, RM, Chile, jferrer@ing.puc.cl

1 - Joint Inventory and Pricing in Product Bundling

Ek Peng Chew, National University of Singapore, 10 kent Ridge Crescent, Singapore, Singapore, isecep@nus.edu.sg, Qiang Wang, Loo Hay Lee

This research aims to study how product bundling performs for a retailer in terms of effects on expected profit in a supply chain who orders products from his supplier and sells them to customers. Separate products as well as bundled form of them can be provided by the supplier. Hence, the retailer needs to design its selling strategy and decide the order quantities simultaneously.

2 - Multiproduct Dynamic Pricing with Time-dependent Customer Arrival Rates

Jr-Shin Li, Assistant Professor, Washington University in St. Louis, One Brookings Drive, Box 1127, St. Louis, MO, 63130, United States of America, jsli@ese.wustl.edu

We study multiproduct dynamic pricing problems with time-dependent customer arrival rates in the retail industry using the Multinomial Logit (MNL) model. An integral transformation is employed to translate the time-dependent customer arrival rate model to the well-studied time-homogeneous one. A computational optimal control algorithm is proposed to produce the real-time optimal pricing, which is only based on the total customer arrivals without knowing the actual distribution of arrival rates.

3 - Retail Pricing with Bayesian Demand Learning

Juan Carlos Ferrer, Associate Professor, P. Universidad Católica de Chile, Casilla 306 Correo 22, Santiago, Santiago, RM, Chile, jferrer@ing.puc.cl, Eduardo Flores

We consider the retail problem of maximizing expected profits when the demand arrival rate parameter is unknown. We provide a bound for which the model cannot learn more about the unknown parameter. Computational experiments show the benefits of learning, between 2% and 5% above the non-learning scenarios. Finally, we performed an empirical study in a Chilean retail chain, where our model worked very well.

■ WB60

O - Hampton Room

Transportation

Contributed Session

Chair: Eddie Yon Sim Chan, Mr., The Chinese University of Hong Kong, Systems Engineering & Eng. Mgt. Department, Shatin, Hong Kong - China, yschan@se.cuhk.edu.hk

1 - Models for Classifying Commodities into Logistical Families

Manjunath Kamath, Professor, Oklahoma State University, School of IE&M, 322 EN, Stillwater, OK, 74078, United States of America, m.kamath@okstate.edu, Peerapol Sittivijan

Conventionally, the classification of commodities for freight transport modeling is based on industrial sectors. However, commodities in the same industrial sector may have different characteristics and logistical requirements. We present network clustering based formulations for classifying commodities into logistical families for transport analysis purposes. Dissimilarity coefficient is used as the main criterion for classification. Results using a sample set of commodities are presented.

2 - Transportation Freight Multi-objective Planning and Scheduling

Carlos Paternina-Arboleda, Chairman, Universidad del Norte, Km. 5 Via a Puerto Colombia, Barranquilla, AT, Colombia, cpaterni@uninorte.edu.co, Ivan Saavedra-Antolinez

This paper presents SINMAF CARGO PLANNER, a DSS for optimal transportation operational planning with multiple objectives. The system takes into account the effect of maintenance policies, crew and practical constraints on road availability and security issues. It uses SPEA genetic algorithms for large-scale long term planning to obtain Pareto optimal solutions on various transportation objectives. It also deploys rapid heuristics for contingency planning due to uncertain events.

3 - Chaos Characterization of Traffic Through a Sequence of Traffic Lights

Jorge Villalobos, PhD Student, Universidad de los Andes, Calle 18 #2-68, Bogotà, DC, Colombia, jovillal@uniandes.edu.co, Roberto Zarama Urdaneta, Juan Alejandro Valdivia, Bejamìn Toledo

We explore in more detail the traffic model proposed in Toledo et. al. (Phys. Rev. E 70 016107, 2004) due to its minimalistic representation of basic city traffic dynamics. The chaotic behavior shown for a given lower bound in acceleration/brake ratio, is examined more carefully and indeed is found a whole region in parameter space for which we observe chaotic behavior. This parameter region may be related to high sensitivity of traffic flow that eventually leads to traffic jams.

4 - Game Theoretic Models for Competition in Public Transit Services

Eddie Yon Sim Chan, Mr., The Chinese University of Hong Kong, Systems Engineering & Eng. Mgt. Department, Shatin, Hong Kong - China, yschan@se.cuhk.edu.hk, Janny Leung

We investigate the competition among public transit service providers, modelled by a class of games called potential games. We discuss mathematical programmes for finding Nash equilibria for these games. By examining the equilibrium solutions, we can examine the relative merits and tradeoffs for different competitive frameworks.

■ WB61

O - Calvert Room

Hazardous Materials Transportation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Vedat Verter, Associate Professor, McGill University, 1001 Sherbrooke Street W., Montreal, QC, H3A 1G5, Canada, vedat.verter@mcgill.ca

1 - Mixed Route Strategies for Transporting Hazardous Materials
Michael Bell, Professor, Imperial College, Exhibition Road, London, UK, SW7 2BU, United Kingdom, m.g.h.bell@imperial.ac.uk, Urszula Kanturska

The shipment of hazardous materials commonly focuses on identifying a single safest route between a pair of points. We demonstrate that for repeated shipments, where there is uncertainty about link incident probabilities, the safest strategy is to use a mix of routes. The optimality conditions are explored and a solution algorithm suitable for use with standard traffic assignment software is presented.

2 - Considering Hazardous Materials Vehicles as a Terrorist Weapon: A Geographically Motivated Model
Justin Yates, Assistant Professor, Texas A&M University, Dept of Industrial & Systems Engineering, College Station, TX, United States of America, jtyates@buffalo.edu, Rajan Batta, Chase Murray, Irene Casas

Modeling various sensor parameters, detection capability within a geographic region is formulated as a bi-level integer program and integrated with a queuing schema that allocates limited interception resources responsible for alarm response. A geographic information system is used to store, manipulate and display geographic and network data. The presentation culminates with a case study examining the geographic region of Los Angeles County, California.

3 - Malicious Entities and Hazmat: A Methodology to Identify Potential Hijack Points and Routes
Rodrigo Garrido, Pontificia Universidad Catolica de Chile, Vicuna Mackenna 4860, Macul, Department Ingenieria de Transporte y Logist, Santiago, RM, 6904411, Chile, rgarrido@ing.puc.cl

Malicious entities may use hazmat as a weapon. This is a methodology to identify possible hijack points and routes to vulnerable targets. Probabilities of interception by law enforcement agents depend on the deployment of their resources. Choice of hijack points depends on the location of possible targets and the probabilities of reaching them. Route choice aims to minimizing distance to a target and maximizing consequences if the vehicle is intercepted before reaching the target.

4 - Railroad Transportation of Hazardous Materials: A Tactical Planning Model
Vedat Verter, Associate Professor, McGill University, 1001 Sherbrooke Street W., Montreal, QC, H3A 1G5, Canada, vedat.verter@mcgill.ca, Manish Verma, Michel Gendreau

We will present an optimization model with risk and cost objectives, wherein the assessment of rail transport risk is focused on airborne hazardous materials. The model aims at identifying the most appropriate routing of railcars, yard activities, and number of trains of different types needed for each service. We developed a memetic algorithm for this problem and will illustrate the its use on a large-scale real life problem instance.

5 - Flexible Routing of a Hazmat Vehicle in a Weather System
Xiao Wang, PhD, University at Buffalo, 423 Bell Hall, University at Buffalo, Buffalo, NY, 14260, United States of America, xw27@buffalo.edu, Mark Karwan, Rajan Batta

We propose a new model to measuring risk for the single hazmat vehicle routing problem under the effects of a weather system in a more generalized and natural setting then proposed in earlier work. In addition, the new risk measure is used within a routing algorithm which allows a dynamic parking strategy and offers greater flexibility to consider one or more objectives.

■ WB62

O - Governor's Boardroom

Modeling Competition in Pricing Optimization

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Darius Walczak, dwalczak@prospricing.com

1 - A Game Theoretic Model for Airline Revenue Management and Competitive Pricing
Karl Isler, Head of RM Strategy and Operations Research, Swiss International Air Lines Ltd, ZRHLX/NYS/ISKA, PO Box, Zuerich-Airport, CH, 8058, Switzerland, karl.isler@swiss.com, Henrik Imhof

We consider two airlines with one flight leg each and fenceless fare structures. We simulate the competitive dynamics when both airlines use an elasticity forecast derived from the observation of their own bookings and an exact optimization algorithm disregarding competition. We show that for continuous fares the game theoretic model has a unique, pure strategy, sub game-perfect Nash equilibrium. Both the simulation and the equilibrium show that for larger capacities prices will spiral down.

2 - Algorithmic Game Theory: Artificial Agents Play, Learn, and Produce Surprising, Instructive Results
Steven Kimbrough, Professor, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, kimbrough@wharton.upenn.edu, Frederic Murphy

We report results from recent work in algorithmic studies of strategic interaction. When games are indefinitely repeated the predictions of classical game theory become much less specific. Robust, more concrete predictions can be made if we assume that agents engage in simple, plausible learning regimes. We report and discuss the significance of results from standard 2x2 games, from oligopoly models involving 2 and more than 2 agents, and from bargaining and coalition formation models.

3 - Mapping Competitive Intelligence in Pricing Applications
Aihong Wen, Scientist, PROS Revenue Management, 3100 Main St. Suite 900, HOuston, TX, 77025, United States of America, awen@prospricing.com, Tony Ruggiero

Leveraging the competitive intelligence in a pricing system could gain significant improvement on pricing solutions. However the competitive intelligence data may not, or most likely, will not have the same attributes and same values for attributes as a company's own data. We developed a methodology to map the elements in these two data sets utilizing similarity indices. The methodology is robust in the sense that if an exact mapping is not available then the most similar match is identified.

4 - Dynamic Models with Two Competitors
Darius Walczak, PROS Revenue Managment, 3100 Main Street, Suite 900, Houston, TX, 77382, United States of America, dwalczak@prosrm.com

We present a review of dynamic programming-based methods for a problem with two expected-revenue maximizers competing in a single market. We contrast a game theory-based model with other alternatives. The former model is closely related to Dudey (1992, 2006), Talluri (2003), and Isler (2007). We further investigate some of its properties.

■ WB63

O - Congressional B

Joint Session TSL/CS: Advances in Computing Network Equlibrium

Sponsor: Transportation Science & Logistics, Computing Society
Sponsored Session

Chair: Michael Florian, Professor, University of Montreal, PO Box 6128, Station, Montreal, QC, H3C3J7, Canada, mike@crt.umontreal.ca

1 - Computing Challenges in Static Traffic Assignment: Past, Present and Future
Hillel Bar-Gera, Dr., Ben-Gurion University, 5038 S. Hardy Dr., #2095, Tempe, AZ, 85282, United States of America, bargera@bgu.ac.il, David Boyce

Traffic assignments continuously pose computing challenges, from the 1950's, as the main civilian application of the first computers, until today, when larger complex models fully utilize available computing capacities. Recently, improved convergence needed for refined scenario analyses became available. The future challenge of plausible route flows will also be discussed.

2 - An Integrated Electric Power Supply Chain and Fuel Market Network Framework
Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, nagurney@gbfin.umass.edu, Zugang Liu

In this paper, we develop a novel electric power supply chain network model using the theory of variational inequalities. The model is then applied to an empirical application for New England with 6 states, 82 power generators, 573 generating units, and 10 demand market regions. The computational procedure exploits the connections between transportation network equilibria and electric power supply chains.

3 - A Projected Gradient Algorithm for Network Equlibrium
Michael Florian, Professor, University of Montreal, PO Box 6128, Station, Montreal, QC, H3C3J7, Canada, mike@crt.umontreal.ca, Isabelle Constantin

An efficient adaptation of the projected gradient algorithm for solving network equilibrium problems is presented. Comparison with the OBA method of Bar-

Gera and other algorithms demonstrate the computational efficiency of the method on large scale problems.

■ WB64

O - Congressional A

Queuing Models in Warehousing Systems

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Ananth Krishnamurthy, Associate Professor, University of Wisconsin-Madison, Department of Industrial and Systems Eng, ME 3258, 1513 University Avenue, Madison, WI, 53706, United States of America, ananth@cae.wisc.edu

1 - Semi-open Queuing Network Analysis of Autonomous Vehicle Storage and Retrieval Systems

Sunderesh Heragu, Professor, University of Louisville, 309, JB Speed Bldg, Industrial Engineering department, Louisville, KY, 40292, United States of America, s.heragu@louisville.edu, Ananth Krishnamurthy, Charles Malmborg, Xiao Cai

The autonomous vehicle storage and retrieval system (AVS/RS) is a relatively new automated material handling technology. There are very few analytical performance evaluation models available in the literature for an AVS/RS. The semi-open queuing network (SOQN) methodology is used to model the AVS/RS, and solved via a heuristic algorithm. The heuristic results are compared with those of simulation.

2 - Approximate Mean Value Analysis of Closed Queueing Networks with Bulk Servers

Liqiang Liu, Postdoctoral Researcher, EURANDOM, Eindhoven University of Technology, 1.03 Laplace Gebouw, Den Dolech 2, Eindhoven, 5612 AZ, Netherlands, liu@eurandom.tue.nl, Ivo Adan

Motivated by the performance analysis of the picking operations in automated distribution centers, we study a closed multichain queueing network with standard bulk servers and develop several approximations based on the mean value analysis method. We study the goodness of the approximations by numerical experiments.

3 - Queuing Network Models for Cycle Times of Autonomous Vehicle based Storage and Retrieval Systems

Ananth Krishnamurthy, University of Wisconsin-Madison, ME 3258 Department of ISyE, 1513 University Avenue, Madison, WI, 53706, United States of America, ananth@engr.wisc.edu, Li Zhang, Charles Malmborg, Sunderesh Heragu

Autonomous vehicle storage and retrieval System (AVSRS) are a relatively new technology. AVSR systems use vehicles and lifts for horizontal and vertical movements respectively. We propose a new class of queuing network models for AVSR systems that uses fork/join synchronization stations to precisely model transaction, vehicles and lift interactions.

■ WB65

M - Virginia A

Inventory Policy I

Contributed Session

Chair: Yih-Long Chang, Professor, Georgia Institute of Technology, 800 West Peachtree Street, Atlanta, GA, 30308-0520, United States of America, yihlong.chang@mgt.gatech.edu

1 - Analysis of a New Dynamic Rationing Policy: Rationing with Exponential Replenishment Flow

Önder Bulut, PhD Student, Bilkent University, Bilkent University, Industrial Engineering Department, Ankara, 06800, Turkey, onderb@bilkent.edu.tr, Murat Fadyloolu

We propose a new dynamic rationing policy for continuous-review inventory systems. We conduct a simulation study to compare the performance of the dynamic policy with the static critical level and the common stock policies. We also provide an analytical analysis of the proposed policy under constant lead-time, and unit Poisson demands for two demand classes using at-most-one-outstanding-order assumption and derive service levels for both demand classes.

2 - Life Cycle Inventory Policy Characterizations for a Single-product Recoverable System

S. Sebnem Ahiska, Research Assistant, Galatasaray University, Industrial Engineering Department, Ortakoy, Istanbul, 34357, Turkey, ssahiska@ncsu.edu, Russell E. King

We investigate the optimal inventory control policies over the entire life cycle of a remanufacturable product. Benefiting from the long-run optimal policies found through Markov Decision Analysis, the optimal or near-optimal policy characterizations with practical structure are determined for every life cycle stage under several set up cost configurations. The performance of these long-run policy characterizations is also evaluated in a finite-horizon setting.

3 - The Classical Square Root Formula for Inventory Lot Sizing

Kaj Rosling, Professor, Växjö University, SE 351 95, Växjö, Sweden, Kaj.Rosling@vxu.se

Formulas for (r,Q) inventory policies always rely on approximations. We demonstrate that this classical problem in fact is pseudo-convex, so that it can be exactly optimized by a (new) square-root formula, and an equation for r. So, no approximations are required. The result assumes a quasi-convex inventory cost function - typically assured for log-concave demand distributions. A new more precise theory on how to use (r,Q) policy parameters to approximate (s,S) policies is also presented.

4 - Coordination of a Two-tier Serial Supply Chain with Demand Information Updating

Yih-Long Chang, Professor, Georgia Institute of Technology, 800 West Peachtree Street, Atlanta, GA, 30308-0520, United States of America, yihlong.chang@mgt.gatech.edu, Andrew Manikas, Srinagesh Gavirneni

We analyze a two-stage supply chain with one retailer and a single supplier. Customer pre-orders during the supplier's production lead-time allow the retailer to resolve some demand uncertainty prior to making her quantity decision. We utilize a subsidy mechanism to coordinates this supply chain. Our research contributes by (i) demonstrating a single parameter that coordinates the supply chain, and (ii) showing the parameter effects on supply chain profit loss under myopic decision making.

■ WB66

M - Delaware A

Advanced Spreadsheet Applications & Techniques

Cluster: Spreadsheet Productivity Research
Invited Session

Chair: Joel Oberstone, Professor, University of San Francisco, SOBAM, 2130 Fulton Street, San Francisco, 94117, United States of America, qba.teechur@gmail.com

1 - Excel-based Decision Support Systems for Primary Care Vaccinations

John Fontanesi, Director, Center for Management Science in Health, University of California, San Diego, 9500 Gilman Drive, #0821, La Jolla, Ca, 92093, United States of America, jfontanesi@ucsd.edu, Debra Bowers

Provider Offices are presented with difficult optimization issues in deciding what combination of strategies to employ in providing influenza vaccinations. We will describe and demonstrate an Excel-based Decision Support System presently used in a number of provider offices to balance costs, number of individuals vaccinated and customer satisfaction. The DSS has embedded optimization routines that permit "as is" and "what if' analysis as well as planning and staff training guidelines.

2 - Lockheed Martin Space Systems Company Optimizes Infrastructure Project-portfolio Selection

Cigdem Gurgur, Professor, Division of Economics and Business, 1500 ILLINOIS STREET, Golden, CO, 80401, United States of America, cgurgur@mines.edu, Tom Morley

Our solution, by multi-attribute utility theory and chance-constrained programming, ensures that high-value projects are selected to maximize the financial performance and that the portfolio does not exceed the available budget and that the carryover of the unspent funds to the next fiscal year does not exceed predetermined limits. We used Microsoft Excel to ensure broad accessibility, transparency, user interaction, improved data collection and asset management, and ease-of-use by managers.

3 - Tutorial: Building a Stochastic Simulation from Scratch

H. Ric Blacksten, Senior Analyst, ANSER/Homeland Security Institute, 2900 S. Quincy St., Suite 800, Arlington, VA, 22206, United States of America, Harry.Blacksten@hsi.dhs.gov

We demonstrate the basics of constructing a simple stochastic simulation "from scratch," using a two-player duel as the illustrative problem. "From scratch" means without special-purpose simulation add-ins or template simulations. We show how to construct a real time simulation, sampling from Bernoulli, Poisson, Gaussian and general piecewise-linear user-input distributions. We show that, for some problems, simpler expected value models give incorrect results.

4 - Inventory Management Spreadsheet Tradeoffs between Supplier Shipping Costs and Lead Times

Joel Oberstone, Professor, University of San Francisco, SOBAM, 2130 Fulton Street, San Francisco, 94117, United States of America, qba.teechur@gmail.com

An inventory spreadsheet simulation is presented for an introductory undergraduate course in quantitative business analysis. Although the template is a stand alone design, it does not employ add-ins, it still allows the student to manipulate key input parameters such as multiple order quantity-reorder point combinations along with uncertain consumer demand, supplier lead times and multiple price-break points.

■ WB67

O - Forum Room

Continuous Optimization

Contributed Session

Chair: Michael Zabarankin, Assistant Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, Michael.Zabarankin@stevens.edu

1 - A Quasi-multistart Global Optimization Approach Using Radial Basis Functions

Rommel Regis, Assistant Professor, Saint Joseph's University, Mathematics & Computer Science Department, 5600 City Avenue, Philadelphia, PA, 19131, United States of America, rregis@sju.edu, Christine Shoemaker

We present a quasi-multistart radial basis function (RBF) method for the global optimization of computationally expensive functions. In each iteration, the method uses previously evaluated points to build an RBF model of the expensive function, which is then used to initiate and guide local searches and help them avoid previously found local minima. We also present numerical results.

2 - A Global Optimization Approach for Solving Generalized Nash Equilibrium Problem

MendAmar Majig, PhD Student, Department of Applied Mathematics and Physics, Graduate School of Informatics, Kyoto University, Kyoto University, T606-8501, Kyoto, Japan, mend@amp.i.kyoto-u.ac.jp, Masao Fukushima

This work considers a method for finding multiple, hopefully all, solutions of the generalized Nash equilibrium problem (GNEP). Based on a merit function of the quasi-variational inequality problem to GNEP, we reformulated GNEP as an unconstrained global optimization problem. To deal with the latter problem, we employ the evolutionary algorithm with adaptive fitness functions. Numerical experiments for some test problems show the practical effectiveness of the method.

3 - Continuous Approximation Procedures for Inventory Distribution with Asynchronous Shipping Patterns

Trevor Hale, University of Houston - Downtown, One Main Street, Houston, TX, 77002, United States of America, halet@uhd.edu, Nikhil Pujari, Faizul Huq

The research objective herein is to determine the optimal number and size of shipments under a generalized variety of production and shipping rate scenarios. Prior research in this area presented a continuous approximation procedure for inventory models in which shipping was presumed to be instantaneous and production was assumed to be continuous. Herein, this prior research is generalized to include non-instantaneous and staggered shipping patterns.

4 - Semi-analytical Approach to Three-dimensional Shape Optimization Problems

Michael Zabarankin, Assistant Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, Michael.Zabarankin@stevens.edu

A semi-analytical approach to 3-D shape optimization problems for a viscous incompressible fluid under the assumption of low Reynolds number is suggested. It couples the theory of generalized analytic functions with the adjoint equation-based methodology. The approach is illustrated for the drag minimization problem for motion of a solid body of revolution in the fluid, in which the fluid velocity and boundary shape are considered to be the state and design variables, respectively.

■ WB68

O - Senate Room

Marketing II

Contributed Session

Chair: Salma Karray, Assistant Professor, University of Ontario Institute of Technology, 2000, Simcoe St North, Oshawa, ON, Canada, salma.karray@uoit.ca

1 - Understanding Voter Response to Political Advertising through Election Cycles with Limited Information

Hai Che, Assistant Professor, University of California at Berkeley, 545 Student Services Building, #1900, Walter A. Haas School of Business, Berkeley, CA, 94705, United States of America, cheh@haas.berkeley.edu, P.B. (Seethu) Seetharaman

Voter response to political advertising has been studied extensively. With campaign advertising data from 3 election cycles (1996-2004), we study voter response to political advertising in terms of not only voter turnout (vote or not) but also candidate choice (whom to voter). Our proposed model uses aggregate-level voter data, augmented with voter survey data such as political interests and candidate goodwill, to draw inferences.

2 - The Influence of Diffusion Factors on Competitive Structure

Abhik Roy, Professor, Quinnipac University, School of Business, 275 MT. CARMEL AVENUE, Hamden, CT, 06518-1908, United States of America, Abhik.Roy@quinnipiac.edu

The impact of demand factors such as diffusion rates, substitution effects and market potential on patterns of competition between rival firms is studied in the context of the linked markets of microprocessors and personal computers. The upstream structure of price competition between microprocessor manufacturers is explained in terms of the demand conditions in the downstream markets for computers, using a combination of differential game theory and simultaneous equation regression.

3 - The Duration of Recency, Short-term and Direct Advertising Effects on Sales

Hiroshi Kumakura, Professor, Senshu University, 2-1-1, Higashi-Mita, Tama-ku, Kawasaki, 214-8580, Japan, kumakura@isc.senshu-u.ac.jp

It has been considered that advertisement (ad) has long-term and indirect effects on sales. Recently its short-term and direct effects are noticed. Such effects (recency) work directly consumers' brand buying, because ad recalls consumers to a brands name at their category buying, if that brands ad has reached consumers immediately before their category buying. We measure the duration of recency, short-term and direct ad effects on sales, by using single-source panel data.

4 - Double Couponing as Commitment to Gain Bargaining Power within a Distribution Channel

Shan-Yu Chou, National Taiwan University, No. 50, Lane 144,Section 4,Kee-Lung Road, Taipei, Taiwan - ROC, chousy@management.ntu.edu.tw, Chi-Cheng Wu, Chyi-Mei Chen

This paper develops a theory of double couponing. We show that (i)multiple couponing tends to be accompanied by deep trade promotions;(ii)multiple couponing enhances retailers' profits;(iii)ceteris, paribus, it is more likely for retail chains than independent retailers to adopt a multiple-coupon policy; and (iv)multiple couponing dominates a retail coupon commitment for the retailer when demand uncertainty takes a multiplicative form. These results are mostly consistent with empirical evidence.

5 - Could Market Coverage be Source of Conflict in Distribution Channels?

Salma Karray, Assistant Professor, University of Ontario Institute of Technology, 2000, Simcoe St North, Oshawa, ON, Canada, salma.karray@uoit.ca

We study optimal market coverage choices in a bilateral monopoly serving heterogeneous consumers. We develop a game theoretic model and obtain equilibrium pricing and quality strategies for six coverage scenarios. Results show that, at equilibrium, the coverage scenarios that both channel members would choose depend on the importance of brand image, quality costs and consumer segments' sizes. Finally, we present numerical examples that demonstrate conflictual coverage choices within the channel.

Wednesday, 1:30pm - 3:00pm

■ WC01

M - Marriott Ballroom 3

E-Business

Contributed Session

Chair: Martin Bariff, Associate Professor of Information Management, Illinois Institute of Technology, Stuart School of Business, 565 W Adams St, Chicago, IL, 60661, United States of America, bariff@stuart.iit.edu

1 - Visual Attention based Study on Online Banner Ad Effect and its Implications on Ad Avoidance

Joowon Lee, PhD Candidate, KAIST, ME, 207-43 Chungryangri-dong, Dongl daemoon-gu, SUPEX #291, Seoul, Korea, Republic of, jwlee12@hotmail.com, Sang Pil Han, Jae Hyun Ahn

CPM, the most popular banner ad pricing model, is considered neither accurate nor accountable, because exposed visitors to a banner ad doesn't mean they have paid attention to it. Considering consumer's ad avoidance, analyzing visual attention by tracking eye movement could provide a better way to understand ad effectiveness. This paper investigates the effect of banner ads in terms of visual attention while considering consumers' motivation for internet usage and creative factors of the ads.

2 - The Online Socialization of Internet Users in the Context of UCC

Sungwook Lee, KAIST Business School, 87 Hwegi-ro, Dongdaemoon-gu, Seoul, Korea, Republic of, swlee@business.kaist.ac.kr

This research examined that how perceived UCC quality gap and feedback type affect UCC sharing intention. As hypothesized, site newcomers showed the highest sharing intention when the UCC quality level of site insiders was similar to theirs. But this has changed along with the feedback type to the opposite way, superior UCC quality site were preferred when information-based feedbacks were provided and inferior UCC quality site were preferred when friendship-based feedbacks were provided.

3 - Digital Enterprise 2.0: Moving Toward Optimal Performance or Chaos?

Martin Bariff, Associate Professor of Information Management, Illinois Institute of Technology, Stuart School of Business, 565 W Adams St, Chicago, IL, 60661, United States of America, bariff@stuart.iit.edu

Web 2.0 has transformed many organization workplaces into multiple networked workspaces. A highly collaborative Digital Enterprise 2.0 presents new challenges and opportunities. Individuals and groups are expected to demonstrate continuous improvement for both outcomes and business processes. Yet, behavioral factors, e.g., information overload and decisions under stress and time pressure, may limit improvement. A proposed behavioral model proposes a solution to this dilemma.

■ WC03

M - Marriott Ballroom 1

Forecasting I

Contributed Session

Chair: Hiroshi Ochiumi, Marshall School of Business, University of Southern California, Los Angeles, CA, 90089, United States of America, ochiumi@marshall.usc.edu

1 - Structure of Collaborative Forecasting: Insights from Six Case Studies

Vish Hegde, Assistant Professor, California State University East Bay, 25800 Carlos Bee Blvd, College of Business and Economics, Hayward, CA, 94542, United States of America, vish.hegde@csueastbay.edu, Kaushik Sengupta

Supply chain collaboration literature indicates that intra-firm forecasting related factors impact the value and success of forecast collaboration. However, there is lack of theoretical understanding of inter-firm collaboration and intra-firm forecasting linkages. We initiate the theory development on the structure of collaborative forecasting that unites these two desperate areas of research. We develop this structure through an exploratory research involving six forecasting implementations.

2 - Modeling Terminal Airspace Capacity under Uncertain Weather

Diana Michalek, PhD Student, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Building E40-149, Cambridge, 02139, United States of America, dianam@mit.edu, Hamsa Balakrishnan

Convective weather causes a significant fraction of flight delays. Air Traffic Flow Management models for mitigating such delays require capacity forecasts as input. However, reliable capacity forecasts do not currently exist. We bridge this gap by developing a stochastic model of airspace capacity. We synthesize dynamic routes using state-of-the-art forecasts and correlate features of these routes with the probability of being blocked, yielding models of route robustness and airspace capacity.

■ WC04

M - Delaware B

Joint Session PPP/Voting: Predicting and Winning Elections in the 21st Century

Sponsor: Public Programs and Processes, Voting, Elections, and Political Institutions

Sponsored Session

Chair: Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

1 - Political Engineering and Predicting the Outcome of the U.S. Presidential Election

James Cochran, Louisiana Tech University, PO Box 10318, College of Business, Ruston, LA, 71272, United States of America, jcochran@cab.latech.edu

We treat determination of the optimal US Presidential platform as a share of choices problem. We utilize a maximal covering formulation with special ordered sets representing positions candidates on the issues. We project the winner by state, estimate variance and bias of projected Electoral College votes for each candidate, and assess sensitivity of each candidate's support to changes in position on the issues. We also identify key issues and assess potential impact of a 3rd party candidate.

2 - Election Projections: A Retrospective

Jack Moshman, Moshman Associates

The art of projecting elections has come a long way since 1960. We had a paper-bound, limited memory technology that estimated a probability that one designated political party would capture the White House. Inputs were past statistical relationships, informed opinion and actual voting behavior as reported on Election Night. We now have no paper, a procedure of tallying electoral vote state by state, and a major reliance on exit polling. The author, who was in charge of election-night projections for NBC and then ABC from 1960 through 2000, recounts how the process has evolved.

3 - It's All Markov's Fault: Secrets of Targeting

Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

Where to appear, what issues to emphasize, how and where to get out the vote, what kinds of ads to run, how to raise funds, and other key campaign decisions all depend on analyses of which voters and contributors are open to persuasion. Markov Chain based targeting, similar to marketing segmentation, is one of the most important and widely used methods to answer these questions. The speaker, a former campaign professional, will discuss how campaigns do targeting and some of its implications.

■ WC05

M - Virginia B

Game Theory II

Contributed Session

Chair: Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu

1 - Temporal Scales in Multi-Scale Decision-Making

Christian Wernz, Assistant Professor, Virginia Tech, Department of Industrial and Systems Eng., 250 Durham Hall, Blacksburg, VA, 24061, United States of America, wernz@vt.edu, Abhijit Deshmukh

In organizations and other complex systems, an agent's decision influences other agents and their decisions across organizational hierarchies and time. Our model captures and analyzes organizational and temporal multiscale effects occurring in hierarchical systems. The agents' interaction is modeled and analyzed using Markov decision processes and Nash equilibria. Results show how the decision-making capabilities of agents are affected by multiple temporal scales.

2 - Progress on Using Computational Hardness to Prevent Manipulation

Vincent Conitzer, Assistant Professor, Duke University, LSRC, Box 90129, Durham, NC, 27708, United States of America, conitzer@cs.duke.edu, Jeff Rosenschein, Tuomas Sandholm, Lirong Xia, Ariel Procaccia

It has been suggested that if a voting rule is computationally hard to manipulate, then manipulation may not occur. I will talk about some recent progress on this topic, in particular the issue of hardness in the worst case vs. in the typical case.

3 - A Signaling Explanation for Humanitarian Relief

Clarence Wardell III, Georgia Institute of Technology, 238 Walker St. #26, Atlanta, GA, 30313, United States of America, cwardell@isye.gatech.edu, Marco Castillo

We show that humanitarian relief organizations might use participation in high attention areas as a signal to donors of quality and credibility. We propose a game theoretic model in which the relationship between fundraising and relief work is explicitly modeled. The characterization of pooling and separating equilibrium demonstrate that significant inefficiencies arise in the absence of verifiable signals of quality. This advances the literature on the supply side of public goods.

4 - A Queueing Control Application Using Discounted Robust Stochastic Games

Erim Kardes, Postdoctoral Researcher, University of Southern California, 3710 McClintock Ave., RTH 322, Los Angeles, CA, United States of America, kardes@usc.edu, Fernando Ordonez, Randolph W Hall

This paper presents a robust optimization model for n-person finite discounted stochastic games with incomplete information. Our focus is then on using this approach in a single server queueing control problem, where a server and a router are the two players.

5 - An Analysis of Fundraising Problems in Humanitarian Operations

Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu, Fuminori Toyasaki

We address the fundraising problem in humanitarian operations. Specifically, we analyze the question if humanitarian organizations should allow donors to earmark donations. While earmarking donations provides multiple positive effects for donors and might lead to increased total donation amounts, it poses multiple problems for humanitarian organizations and often reduces their efficiency. We analyze under which conditions earmarking should be allowed and explore its impact on the stakeholders.

■ WC06

M - Virginia C

Auctions

Contributed Session

Chair: Hannele Wallenius, Professor, Helsinki University of Technology, Otaniementie 17, Espoo, 02150, Finland, hannele.wallenius@tkk.fi

1 - Improving Efficiency in Multiple-Unit Combinatorial Auctions: Bundling Bids from Multiple Bidders

Riikka-Leena Leskelä, Helsinki University of Technology, Otaniementie 17, Espoo, 02150, Finland, rleskela@cc.hut.fi, Hannele Wallenius, Murat Köksalan, Jyrki Wallenius

We present a support tool called Group Support Mechanism, which suggests bundles of bids to groups of bidders not among the provisional winners in an iterative, multiple-unit combinatorial auction. Accepting the suggestions makes the bidders provisional winners. We argue that the efficiency of the final allocation is better when bids are suggested to a group of bidders instead of one bidder at a time. The more bids there are in the efficient allocation, the bigger the difference in efficiency.

2 - The Dynamic Bidding Strategy for Supply Chain Procurement Problem

Sung Hoon Chung, PhD Student, The Pennsylvania State University, 244 Leonhard Bldg.,, University Park, PA, 16802, United States of America, shchung@psu.edu, Ufuk Bilsel, Tae Il Kim, Terry Friesz

In this paper, we extend the Tang (2005) supply chain procurement model by introducing reinforcement learning and fictitious play. We discuss implementation details and provide a numerical example.

3 - Developing Decision Support for Real-life Prosper.com Small Loan Auctions

Hannele Wallenius, Professor, Helsinki University of Technology, Otaniementie 17, Espoo, 02150, Finland, hannele.wallenius@tkk.fi, Lauri Puro, Jeffrey Teich, Jyrki Wallenius

We discuss the P2P banking website, Prosper.com. Firstly, we develop bidding strategies of the lenders in the reverse auction. Secondly, we develop a decision support system for borrowers, helping them to decide on the starting interest rate for their auction. We use a regression model to calculate probabilities of success for various starting rates.

■ WC07

M - Maryland A

Supply Chain Models and Analysis

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Ananth Iyer, Professor, Purdue University, Rawls Hall, Room 4001, 100 S Grant Street, West Lafayette, IN, 47907, United States of America, aiyer@purdue.edu

1 - First Mover (Dis)advantage with Private Information and Dynamic Supply Condition

Sridhar Seshadri, Professor, NYU, sseshadr@stern.nyu.edu, Milind Sohoni, Aditya Jain, Jiri Chod

We consider 2 competing retailers ordering sequentially, based on private forecasts. Most papers on first mover advantage ignore changes in supply conditions resulting from information dissemination due to decisions of first mover. Our model incorporates a common supplier who sets the wholesale prices. We characterize conditions that result in first mover advantage under various information disclosure scenarios, and examine the supplier's incentive to disseminate the first mover's information.

2 - Global Supply Chain Management with Unknown Demand Distribution

Arnab Bisi, Assistant Professor of Management, Purdue University, 403 W. State Street, West Lafayette, IN, 47907, United States of America, abisi@purdue.edu, Maqbool Dada

We address the optimal procurement and distribution policies for managing global supply chains of both seasonal and non-seasonal products. When a global company introduces a new product to the market, there is no past data to accurately calibrate the demand distribution. We use a Bayesian scheme to learn about the demand distribution based on historical demand/sales data and make operational decisions dynamically that optimize the performance of a global supply chain in a multi-period problem.

3 - Optimal Replenishment Policies for Multi-product Stochastic Inventory Systems

Vinayak Deshpande, Purdue University, 4024 Rawls Hall, West Lafayette, IN, United States of America, vinayak@exchange.purdue.edu, Kumar Muthuraman, Haolin Feng

We analyze optimal replenishment policies for multi-product inventory systems with joint-replenishment costs and correlated demand. Our focus is on computing and finding the structure of the optimal policies. An efficient method to compute the optimal policy that uses a moving boundary based policy improvement scheme is analyzed. A new heuristic, called an (s, c, d, S) policy is proposed, and is shown to closely approximate the optimal policy.

4 - Optimal Bulk to Case Product Mix in a Supply Chain

Ananth Iyer, Professor, Purdue University, Rawls Hall, Room 4001, 100 S Grant Street, West Lafayette, IN, 47907, United States of America, aiyer@purdue.edu, Joo Yol Maeng

We model the optimal choice of production in bulk or in individual product in the presence of demand forecast errors, production cost differences and inventory control choices. The model suggests that demand correlation with forecast, inventory turns and production variation may determine the benefit to product postponement. Data from a bottling company is used to estimate the impact of such strategies.

■ WC08

M - Maryland B

Information Economics in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Wenqiang Xiao, Assistant Professor, New York University, 44 W 4 St, KMC 8-72,, New York, NY, 10012, United States of America, wxiao@stern.nyu.edu

1 - Implementing High-powered Contracts to Motivate Intertemporal Effort Supply

Leon Yang Chu, Department of Information and Operations Management, University of Southern California, CA, United States of America, leonyzhu@usc.edu, David Sappington

We characterize the optimal contract between a principal and a risk-neutral, wealth-constrained agent whose information about the operating environment improves over time. The optimal contract in this setting often is more steeply-sloped for the largest output levels compared to the classic models. The large incremental rewards for exceptional performance motivate the agent to deliver substantial effort both and after he acquires privileged information about the production environment.

2 - Strategic Decentralization in Supply Chains

Harish Krishnan, Assistant Professor, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, Harish.Krishnan@sauder.ubc.ca, Sudheer Gupta

Price competition can be mitigated if competing firms sell through independent retailers. This argument (strategic decentralization) is usually made assuming deterministic demand. We assume stochastic demand, i.e. firms compete on price and inventory. We show that decentralization may still provide strategic benefits, but can also leave firms worse off. We also show that firms may benefit by delegating only the price decision; this provides a strategic explanation for vendor-managed-inventory.

3 - On the Selection of Supply Chain Coordinating Contracts: The Role of Capital Constraints

Yi Xu, Assistant Professor, Robert H. Smith School of Business, University of Maryland, College Park, MD, United States of America, yxu@exchange.sba.miami.edu, Jun Zhang

We consider a supply chain with a financially constrained retailer, and examine the implications of the retailer's capital constraint on the selection of supply chain coordinating contracts. We demonstrate that several well-accepted results on supply chain coordinating contracts need to be reexamined. We then propose and study a new coordinating contract form: manufacturer financing contract in which the manufacturer provides financing for the retailer's purchase.

4 - Dynamic Supplier Contracts under Asymmetric Inventory Information

Hao Zhang, University of Southern California, 3670 Trousdale Pkwy, Bridge Hall 401, Los Angeles, CA, 90089, United States of America, zhanghao@marshall.usc.edu, Mahesh Nagarajan, Greys Sosic

We study a supplier-retailer chain with multiple periods. The supplier offers a single-period contract at the beginning of each period and the retailer places the order before demand realization. Inventory is carried over and unmet demand is lost. Inventory and realized demand can only be observed by the retailer. With certain assumptions, we show that selling in batches is optimal or near optimal for the supplier in order to reduce the retailer's information rent.

5 - Information Sharing in Competing Supply Chains with Imperfect Demand Signals

Hongtao Zhang, Associate Professor, Hong Kong Univ. of Sci & Tech, Clear Water Bay, Kowloon, Hong Kong, China, imhzhang@ust.hk

We consider vertical information sharing in two competing supply chains, each consisting of one manufacturer selling to one retailer. A retailer observes an imperfect demand signal and decides whether to share it with his manufacturer. Both manufacturers face diseconomies of scale in production. We analyze how firms make information sharing, contracting and retail decisions, and how signal precision and competition intensity affect the direct and competitive effect of information sharing.

■ WC09

M - Maryland C

Optimization Methods in Quality, Reliability and Statistics

Sponsor: Quality, Statistics and Reliability Sponsored Session

Chair: Abhishek Shrivatsava, Texas A&M University, Industrial and Systems Engineering, 3131 TAMU, College Station, TX, 77843, United States of America, akshriv@tamu.edu

Co-Chair: Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

1 - Optimization of Noisy Functions

Michael Ferris, Computer Sciences Department, University of Wisconsin, 1210 West Dayton Street, Madison, WI, 53706, United States of America, ferris@cs.wisc.edu

We investigate the use of Bayesian methods combined with existing (derivative-free) optimization procedures to effect the optimization of simulation codes. Key ideas relate to Monte Carlo validation of optimization steps, coupled with nonparametric tests to determine promising regions. The methods are tested on a number of important applications.

2 - Gradient based Methods for Large-scale Statistical Computing

Zhaosong Lu, Assistant Professor, Simon Fraser University, 250 - 13450 102nd Avenue, Surrey, BC, V3T 0A3, Canada, zhaosong@sfu.ca

In this talk, we first discuss two simple gradient methods, namely, Nestero's optimal method and two-point projected gradient method for a class of smooth and nonsmooth convex optimization problems. We then discuss their application to sparse covariance selection and principle component analysis. Finally, we compare their performance based on some randomly generated instances.

3 - Annealing Evolutionary Stochastic Approximation Monte Carlo for Global Optimization

Faming Liang, Associate Professor, Texas A&M University, Department of Statistics, College Station, TX, United States of America, fliang@stat.tamu.edu

We present a new algorithm, the so-called annealing evolutionary stochastic approximation Monte Carlo (AESAMC) algorithm as a general optimization technique, and study its convergence. A remarkable feature of AESAMC is that it possesses the self-adjusting mechanism and is thus not trapped by local energy minima. The numerical results indicate that AESAMC can potentially outperform simulated annealing and the genetic algorithm in function optimization.

4 - Empowering Optimization under Uncertainty Methods with Space-filling Designs

Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

Space-filling designs, designs where the points are uniformly distributed, are invented in computer experiments. This talk will report some recent advances in using these designs in solving optimization under uncertainty methods. Both theoretical and numerical results will be given. Also will be discussed are statisitcal enchancements of validation methods for such optimization methods. Joint work with Qi Tang at U of Wisconsin.

■ WC10

M - Room 8206

Expansion Planning of Electricity Transmission in the New Environmental Era

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Enzo Sauma, Dr., Pontificia Universidad Catolica de Chile, Vicuña Mackenna 4860, Santiago, RM, Chile, esauma@ing.puc.cl

1 - The Power of Green- EPRI's Green Circuits Distribution Losses Program

Karen Forsten, Manager, Engineering Operations, EPRI, 942 Corridor Park Boulevard, Knoxville, TN, 37923, United States of America, KForsten@epri.com

Meeting the need for growing power demand and decreasing carbon emissions are two challenges utilities face in today's business climate. One strategy that can simultaneously satisfy these challenges is to minimize existing system losses. Upgrading existing distribution circuits or changing operating procedures are actions any utility can consider. EPRI will discuss its effort to demonstrate the application of loss reduction technologies and measures and quantify potential loss reduction effects.

2 - A Bilevel Approach to Transmission Expansion Planning

Antonio J. Conejo, Professor, University of Castilla - La Mancha, Department of Electrical Engineering, Campus Universitario s/n, Ciudad Real, 13071, Spain, Antonio.Conejo@uclm.es, Lina Garces, Ruben Romero, Raquel Garcia-Bertrand

We present a bilevel model for transmission expansion planning. A market environment is considered where producers and consumers trade freely electric energy through a pool. The target of the transmission planner, modeled through the upper problem, is both to maximize global social welfare and to minimize network investment cost. This upper problem is constrained by a collection of market clearing problems representing pool trading, and whose objective functions correspond to social welfare.

3 - Optimal Transmission Switching – Sensitivity Analysis and Extensions

Kory Hedman, PhD Student, University of California, Berkeley, Etcheverry Hall, Berkeley, CA, 94709, United States of America, kwh@berkeley.edu, Shmuel Oren, Emily Bartholomew Fisher, Richard O'Neill

Optimal transmission switching determines the optimal state, open or closed, for all branches in the electricity network flow problem as well as the optimal generator dispatch levels in order to minimize total cost. We formulate the problem as a mixed-integer program (MIP), based on the traditional DC optimal power flow (DCOPF). We then use this formulation to examine the potential for improving generation dispatches by optimizing transmission topology for well-known IEEE test cases.

4 - Who Have Incentives to Expand the Power Transmission Systems?

Enzo Sauma, Dr., Pontificia Universidad Catolica de Chile, Vicuña Mackenna 4860, Santiago, RM, Chile, esauma@ing.puc.cl, Shmuel Oren

In this paper, we study the economic-incentive structures for long-term transmission investment that currently exist in the United States. In particular, we analyze the incentives/disincentives that some specific market participants (holders of transmission rights, merchant investors, and generation firms) have to make socially efficient transmission expansions. We also propose some variations to the actual incentive structures that could improve efficiency from a social-welfare perspective.

■ WC11

M - Room 8209

Facilities Planning and Design

Contributed Session

Chair: Mihiro Sasaki, Associate Professor, Nanzan University, 27 Seirei, Seto, Japan, mihiro@nanzan-u.ac.jp

1 - Retail Store Layout with Variable Area Departments and a Racetrack Aisle

Haluk Yapicioglu, PhD Candidate, Auburn University, 3301 Shelby Center, Auburn, AL, 36849, United States of America, yapicha@auburn.edu, Alice E. Smith

We undertake the optimization of the layout of a retail store with a racetrack aisle network where areas of departments and the aisle are variable. The quality of the layout is evaluated with respect to expected revenue and the degree of adjacency satisfaction among departments. In our optimization procedure, the department and aisle areas are determined first and then by modifying the aisle width, different block layouts are generated through a tabu search framework.

2 - A Heuristic for Multi-load Vehicle Dispatching in Material-handling Systems

Moonsu Lee, Korea Unversity of Technology & Education, 307 Gajeon-Ri, Byungcheon-Meon, Cheonan-City, 330-708, Korea, Republic of, mslee@kut.ac.kr, Junjae Chae, Pansoo Kim

The vehicles with multiple loadcarrying capacities can improve their availability for material transport requests in material handling systems(MHS) because a multi-load transporter can pick up additional loads while transporting a previously assigned job. We can reduce the vehicles' empty trip as well as the total distance traveled with multi-load vehicles. Using a simulation approach, a heuristic dispatching policy for multi-load transporters is developed and tested for a fixed-route MHS.

3 - Uncapacitated Facility Location under Stochastic Demands: A Fuzzy Approach

Saroj Koul, Assistant Professor, Acadia University, 307, Rhodes Hall, Wolfville, NS, B4P2R6, Canada, saroj.koul@acadiau.ca, Dr. Rakesh Verma

We consider a location problem where the classical uncapacitated facility location model is recast in a stochastic environment that makes demand at each customer site probabilistic; random and follow the Normal and Gamma probability distribution with known mean and variance.. We proposed a fuzzy programming approach with non-linear membership function to solve a non-linear integer program whose solution gives the optimal locations for p facilities at risk. A case study shows the methodology.

4 - Link Scheduling Problem in Wireless Sensor Network

Mihiro Sasaki, Associate Professor, Nanzan University, 27 Seirei, Seto, Japan, mihiro@nanzan-u.ac.jp, Atsuo Suzuki, Hajime Miyazawa, Fumio Ishizaki, Takehiro Furuta

We consider a link scheduling problem in a multi-hop wireless sensor network. Sensors attempt to send the monitored event to a base station through a given network. Since the sensors have limited battery power, we need an efficient link schedule to avoid data collisions which may cause unnecessary power consumption. We propose a mathematical formulation of link scheduling problem taking into account both the hidden terminal and the exposed terminal problems.

■ WC12

M - Room 8212

Data Mining II

Contributed Session

Chair: Tie Liu, IBM CRL, IBM, Diamond Building, Beijing, BJ, China, liultie@cn.ibm.com

1 - Recommender Systems Based on Social Drivers

Yun Huang, Postdoctoral Fellow, Northwestern University, 2145 Sheridan rd, TECH C210, Evanston, IL, 60208, United States of America, yun@northwestern.edu, Noshir Contractor

Recommender systems are essential tools to identify right expertise or knowledge resources in large knowledge repositories. Using Multi-Theoretical Multilevel (MTML) Models and Exponential Random Graph Models (ERGM), we estimate people's social drivers to create, maintain, and dissolve social and knowledge ties in a multidimensional network. Based individual's social drivers, we design CI-KNOW recommenders to predict their connections in knowledge networks and make personalized recommendations.

2 - Bridge Regression and Its Application in Variable Selection

Qiuying Lin, Graduate Student (PhD Candidate), University of Washington, Department of Mathematics, PO Box 354350, University of Washington, Seattle, WA, 98195, United States of America, qiuying@u.washington.edu, James V. Burke

Bridge regression searches a family of peneralized regressions of a l_p "norm" penalty function. Lasso($p=1) is known a method of variable selection because it reduces the number of nonzero coefficients. In this talk, we consider p smaller than 1,even more coefficients are forced to the value zero enhancing the variable selection properties of the method. In this talk we propose methods for solving this nonsmooth nonconvex optimization problem. Some properties are discussed as well.

3 - Kernel Fusion and Optimization in Machine Learning

Changjian Huang, PhD Student, Rensselaer Polytechnic Institute, 11 08th Street, Troy, NY, 12180, United States of America, huangc@rpi.edu, Mark Embrechts, Li Zhang, Curt Breneman

In this presentation, the kernel partial least squares ensemble with bagging and boosting in combination with kernel fusion are developed to improve modeling accuracy. The kernel fusion method can be applied to multi-source feature sets. With Hessian-free and self-correction properties, the BFGS quasi-Newton method is employed for parameter tuning of kernel fusion. At the end, this method is applied to multi-source datasets of human serum albumin, and their performance is compared and evaluated.

4 - Automated Segmentation of Mouse Brain Images Using Extended MRF

Min Hyeok Bae, Research Assistant, Departmentof IE at ASU, Arizona State University, Tempe, 85287-5906, United States of America, minhyeok.bae@asu.edu, Teresa Wu

We introduce an automated method of mouse brain segmentation using a novel method called extended Markov Random Field. It integrates MR intensity information, location information of a neuroanatomical structure within a mouse brain and contextual information between the structures to predict the probability of labeling of a given voxel. Support Vector Machine which has strong discriminative power is used to model the potential function of MR intensity.

5 - A Distance Measurement for Unstructure Information Learning from Joint Probability

Tie Liu, IBM CRL, IBM, Diamond Building, Beijing, BJ, China, liultie@cn.ibm.com, Chunhua Tian, Wei Ding, Feng Li

This paper present a novel distance measurement criteria learning from the joint probability for un-structure information. We suppose that information occurring at the same place or paragraph prefer to have a close distance, such as "earthquake" and "SiChuan in China". We learn the joint probability from a large set of dataset, which are collected from internet news. The distance is inverse proportional to the joint probability, with the normalized parameters also learning from the dataset.

■ WC13

M - Room 8216

Do You Have The Right Features and How Much Do You Trust Them?

Sponsor: Data Mining
Sponsored Session

Chair: Claudia Perlich, T.J. Watson IBM Research, 1101 Kitchawan Rd, RTE 134, Yorktown Heights, United States of America, perlich@us.ibm.com

1 - Auction Forecasting via Functional KNN

Shu Zhang, PhD Student, Applied Mathematics and Scientific Computation Program, University of Maryland, Mathematics Department, Univ. of Maryland, College Park, MD, 20742, United States of America, zhangshu01@gmail.com, Wolfgang Jank, Galit Shmueli

We develop a functional K-nearest-neighbor (KNN) method to predict prices in online auctions. We first capture the price path of auctions via a novel parametric Beta model and then measure the distance between neighboring price paths using the Kullback-Leibler distance. Our KNN methods incorporates a mixture of functional and non-functional and improves the prediction accuracy compared to a series of competitor models.

2 - Methods and Their Implications For Inference with Incomplete Information

Maytal Saar-Tsechansky, Assistant Professor, University of Texas at Austin, Austin, TX, 78712, United States of America, Maytal.Saar-Tsechansky@mccombs.utexas.edu, Foster Provost

What is the best inference policy in the presence of incomplete information? We compare different popular policies for applying classification models to instances with missing values. We show that the two most popular approaches each is preferable under different conditions. Strikingly the approach most seldom mentioned or used consistently outperforms the others, often by large margins. We also discuss the impact of our findings on intelligent information acquisition.

■ WC14

M - Room 8218

Multicriteria Decision Making I

Contributed Session

Chair: Ozay Ozaydin, Research Assistant, Dogus University, Mine S. No:15/8 Kucukyali, Istanbul, 34840, Turkey, oozaydin@dogus.edu.tr

1 - Multi-criteria Decision Model for Project Portfolio Selection Considering Synergies

Marina Duarte, PhD Student, Federal University of Pernambuco, Cx. Postal 7462, Recife, PE, 50.630-970, Brazil, marina@ufpe.br, Adiel Teixeira Almeida

A Project Portfolio Selection multi-criteria decision model is proposed taking into account synergy effects. These effects are evaluated by means of judgment taken from experts and decision-makers on the relative gain proportionate due to the jointly presence of projects in the portfolio. In addition, a multi-criteria methodology will be used to compile the objective function of the developed optimization model, which allows the decision maker's preferences to be incorporated.

2 - A Multiple Criteria Sorting Approach with Tchebycheff Utility Function

Banu Soylu, Erciyes University, Department of Industrial Eng., Talas Street, Kayseri, 38039, Turkey, bsoylu@erciyes.edu.tr

We present a Tchebycheff utility function based approach for multiple criteria sorting problems. This approach classifies the alternatives into ordered categories. Favorable weights constitutes the important part of the method. Each alternative selects its own favorable weights for a weighted Tchebycheff distance function. Then, each alternative is compared with some references to compute its strength over them. We compare the performance of the method with UTADIS algorithm on some data sets.

3 - Country Credit-risk Rating Aggregation via the Separation-deviation Model

Erick Moreno Centeno, PhD Student, UC Berkeley, Department of IEOR, 4141 Etcheverry Hall, Mail Code 1777, Berkeley, CA, 94720, United States of America, erick_moreno@berkeley.edu, Dorit Hochbaum

Separation-deviation (SD) is a novel model in multi-criteria decision making that captures pairwise relative ranking as well as pointwise priors. We use it to aggregate country credit-risk ratings given by several agencies. Hochbaum's SD model provides an improved aggregate rating with respect to several criteria. We demonstrate properties of the model, including that the aggregate rating obtained via the SD model agrees with the majority of agencies or reviewers, regardless of the scale used.

4 - Evaluating the Impact of Additional Information in the Context of MCDA with Information Imperfection

Sarah Ben Amor, Assistant Professor, University of Ottawa, 55 Laurier E. (7123), Ottawa, ON, K1N6N5, Canada, benamor@telfer.uottawa.ca, Jean-Marc Martel

In the context of multicriteria decision analysis (MCDA) facing different kinds of information imperfections (uncertainty, imprecision, Ö), it is natural to seek additional information to reduce the imperfection. A procedure for processing additional information in such a context is proposed. This procedure is based on the Bayesian model and the adaptation of information revision rules from the uniattribute to the multiattribute context. Related issues for future work will also be discussed.

5 - A Multi-criteria Decision Model for Prioritization of Critical Road Structures

Ozay Ozaydin, Research Assistant, Dogus University, Mine S. No: 15/8 Kucukyali, Istanbul, 34840, Turkey, oozaydin@dogus.edu.tr, Ilker Topcu

Disasters, not only cause loss of human life, but also environmental damage, disruption of the working infrastructure, and economic loss. In mitigation phase of a well-constructed emergency management, prioritization of bridges, viaducts and tunnels that play a critical role in response and recovery phases, stays on top of the to-do list. In this context, this study first develops a multi-criteria decision model, and implements the proposed model on a critical zone under high seismic activity.

■ WC15

M - Room 8219

Productivity in Service Operations

Sponsor: Service Science
Sponsored Session

Chair: Sheneeta White, PhD Candidate, Virginia Tech, 1007 Pamplin Hall (0235), Blacksburg, VA, 24061, United States of America, sheneeta@vt.edu

1 - Productivity Measurement for Local Public Services

John Ruggiero, Associate Professor of Economics, University of Dayton, John.Ruggiero@notes.udayton.edu

The measurement of efficiency and productivity in local public services like education require controls for nondiscretionary inputs. These factors of production are beyond the control of decision makers and hence, must be treated as exogenous. In this presentation, we provide a method that simulataneously controls for these factors while measuring productivity and efficiency.

2 - Estimating Technology Functions in Service Operations

Sheneeta White, PhD Candidate, Virginia Tech, 1007 Pamplin Hall (0235), Blacksburg, VA, 24061, United States of America, sheneeta@vt.edu, Ralph Badinelli

The way in which professional services transform inputs into outputs is typically unknown. Consequently decision makers, at best, can only make estimates of the underlying technology function from measures of overall efficiency. The objective of this research is to examine the breadth of technology functions which can be consistent with DEA results and the sensitivity of estimates of technology functions to aggregate data analysis.

3 - Service Scorecard- An Implementation Strategy

Rajesh Tyagi, Assistant Professor, HEC Montreal, 3000 Chemin de la Côte-Sainte-Catherine, Montreal, PQ, 60604, Canada, rtyagi@depaul.edu, Marie-Helene Jobin

The Service Scorecard, a newly designed PMS, is aimed specifically at service business context capturing the intricacies of services. The seven elements of Service Scorecard are Growth, Leadership, Acceleration, Collaboration, Innovation, Execution, and Retention. Several companies have implemented aspects of the Service Scorecard well and have realized the benefits. This paper presents lessons from these experiences and best practices in business service performance measurement.

4 - Scheduling Email Processing: An SPR Formulation

Narges Kasiri, PhD Student, Oklahoma State University, Spears School of Business, Stillwater, OK, 74078-4011, United States of America, narges.kasiri@okstate.edu, Ramesh Sharda

Email management/scheduling is a major part of knowledge workers' tasks today. We consider email scheduling as a lot sizing problem in which knowledge workers' time is the resource to be allocated to process emails and other daily tasks. Processing emails has some cost similar to production costs, postponing emails incurs some costs similar to penalty costs, and incoming emails are the uncertain demand in the model. We use stochastic linear programming with recourse to solve this problem.

■ WC16

M - Room 8222

Supply Chain Practice and Empirics

Contributed Session

Chair: Pawan Joshi, Director, Solution Architecture, E2open, Inc., Two Lincoln Centre, Suite 700, 5420 LBJ Freeway, Dallas, TX, 75240, United States of America, pawan.joshi@e2open.com

1 - A Structural Equation Model of Supply Chain Implementation and Performance

Pietro De Giovanni, Essec Business School, Avenue Bernard Hirsch, B.P. 105, 95021, Paris, France, pietro.degiovanni@essec.fr, Fouad El Ouardighi

Inspired by theoretical gaps and practical implications, this research examines the relationships between Supply Chain implementation and performance. Three major areas of performance are investigated: operational, financial and customer performance.Using a large sample of French firms, this study develops a confirmatory analysis by testing model invariance after measurement and structural model specification.

2 - Key Metrics and Current Industry Practices in Supply Chain Measurement

Ramesh Bollapragada, Associate Professor, San Francisco State University, BUS 206A, College of Business,, 1600 Holloway Avenue,, San Francisco, CA, 94132, United States of America, rameshb@sfsu.edu, Tuna Cencki, Calvin Lee

The purpose of this paper is to identify current business practices and key measurements in supply chain performance management. This survey based research indicates that supply chain professionals give high importance to "quality and reliability factors", "increasing company's competitiveness", and not just to cost factors, to create more effective supply chains for their companies.

3 - The Journey Towards Demand Driven Resilient Supply Chains

Pawan Joshi, Director, Solution Architecture, E2open, Inc., Two Lincoln Centre, Suite 700, 5420 LBJ Freeway, Dallas, TX, 75240, United States of America, pawan.joshi@e2open.com

In an ever-increasing outsourced world companies are evolving as brand managers with majority value delivered by partners. Ensuring resiliency in supply while managing/shaping demand is critical for survival, not just success. Existing business models, processes and systems are often inadequate and need revamping. During this process ensuring continued value for stakeholders is paramount. This paper addresses aforementioned issues and discusses approaches for thriving in this evolving landscape.

■ WC17

M - Room 8226

Joint Session QSR/HAS: Quality and Statistical Decision Making in Healthcare Applications II

Sponsor: Quality, Statistics and Reliability, Health Applications Section

Sponsored Session

Chair: Jing Li, Assistant Professor, Department of Industrial Engineering, Arizona State University, Tempe, AZ, United States of America, jinglz@asu.edu

1 - A Bayesian Network for Predicting Invasive and In-situ Breast Cancer Using Mammographic Findings

Jagpreet Chhatwal, Health Economist, Merck Research Laboratories, North Wales, PA, 19454, United States of America, jchhatwal@wisc.edu, Nassif Houssam, Edward Sickles, Oguzhan Alagoz, Elizabeth Burnside

We developed a Bayesian Network (BN) to predict the risk of invasive and in-situ breast cancer based on patient's prospectively collected mammographic findings and demographic factors. The structure and parameters of the BN were trained and tested on a large clinical dataset. Understanding the risk of invasive and in-situ cancer prior to biopsy can improve the clinical management of breast cancer patients.

2 - Dynamic Vectorcardiogram (VCG) Signal Representation and Diagnostic Applications

Hui Yang, Industrial Engineering and Management, 322 Engineering North, Oklahoma State University, Stillwater, OK, 74078, United States of America, hui.yang@okstate.edu, Satish Bukkapatnam

Vectorcardiogram (VCG) signals monitor the spatiotemporal cardiac electrical activity along three orthogonal planes. Contrary to the loss of temporal resolution in the conventional static VCG representation, this paper presents an approach to capture the critical spatiotemporal heart dynamics by displaying the real time motion of a cardiac vector. The dynamic VCG representation is shown to significantly promote the interpretability and diagnosibility of VCG.

3 - Using Simulation to Evaluate Colonoscopy Screening Protocols for Secondary CRC Prevention

Fatih Safa Erenay, University of Wisconsin-Madison, Madison, WI, United States of America, erenay@wisc.edu, Ritesh Banerjee, Oguzhan Alagoz

In order to prevent a second occurrence of colorectal cancer (secondary CRC), patients periodically undergo colonoscopy screenings after the treatment of their first CRC. We build a simulation model that mimics the progression of secondary CRC under a given screening protocol. We use this model to estimate unknown parameters governing the progression of secondary CRC, and evaluate the performance of reasonable screening protocols based on the risk of secondary CRC and total treatment cost.

4 - A Bayesian Approach for Risk-adjusted Quality Monitoring in Healthcare

Li Zeng, University of Wisconsin - Madison, 1513 University Ave., Madison, WI, 53706, United States of America, lzeng1@wisc.edu, Shiyu Zhou

One challenge in healthcare outcome monitoring is the need of adjustment for patient case mix, i.e., taking the heterogeneity of base-line patient risk into account. This paper proposes a Bayesian approach which can not only implement risk-adjusted monitoring, but also can estimate the change point once a change is detected.

■ WC18

M - Room 8228

Novel Optimization Techniques I

Contributed Session

Chair: Marcia Fampa, Dr., UFRJ, DCC, IM, UFRJ, Caixa Postal 68.530, Rio de Janeiro, RJ, 21941-590, Brazil, fampa@cos.ufrj.br

1 - A Global Optimization Approach to Rule-based Systems

Huseyin Mete, PhD Student / Research Assistant, University of Washington, Industrial Engineering 352650, Seattle, WA, 98115, United States of America, mete@u.washington.edu, Zelda Zabinsky

Rule-based systems provide a natural way to describe business problems. We solve a generic multiobjective optimization problem defined by rules in a global optimization setting. The rules are transformed into a mixed (continuous and discrete) space for generating candidate points. The generated point is mapped back to the rule space where the hard rules are evaluated for feasibility and the soft rules are evaluated to direct the adaptive search algorithm.

2 - Branch and Bound Algorithm for Lennard-Jones Cluster Optimization

George Popescu, Research, DIMACS, 274 Church Street, Apt 6F, Guilford, CT, 06437, United States of America, george.popescu@acm.org

Given two populations of atoms with known Lennard-Jones parameterizations, find the minimum energy configuration. We propose a branch and bound algorithm where at each iteration all possible combinations of atom types and positions on the boundary are evaluated; for each set of nodes on the boundary the position and type of the added atom is selected such that to minimize local energy. We provide cost and algorithm performance analysis.

3 - Optimizing De-icing/ Anti-icing Fluids under Constraints Using a MILP

Scott Ornitz, Student, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, 33431, United States of America, Sornitz@fau.edu, Evangelos Kaisar

The concerns with deicing of planes stem from the deleterious affects on the environment. The problem arises when harmful effects of chemicals play a role. Effects vary because all airports are different and serve according to their specific city's needs. It is proposed that an operational research method be implemented in order to effectively make an effort to address problems with scheduling, transport, collection, and treatment. A MILP is proposed because considers many variables.

4 - On the Resolution and Optimization of a System of Fuzzy Relational Equations with Sup-T Composition

Pingke Li, Mr., NC State University, 443 Daniels Hall, North Carolina State Univ., Raleigh, NC, 27695, United States of America, pli@ncsu.edu, Shi-Cherng Fang

This work provides a unified framework to deal with the problem of resolution and optimization of a system of sup-T equations. We show that systems of sup-T equations can be divided into two categories and the resolution of a system of sup-T equations is closely related to the set covering problem. We then show that the problem of minimizing a linear objective function subject to a system of sup-T equations can be reduced into a 0-1 integer programming problem in polynomial time.

5 - A Branch-and-bound Algorithm for LPECs

Marcia Fampa, Dr., UFRJ, DCC, IM, UFRJ, Caixa Postal 68.530, Rio de Janeiro, RJ, 21941-590, Brazil, fampa@cos.ufrj.br, Nelson Maculan, Wendel Melo

We propose a branch-and-bound (B&B) algorithm to solve linear programs with complementarity constraints (LPECs). Burer e Vandenbusshe recently proposed a semidefinite (SDP) relaxation for the nonconvex quadratic programming problem. We extend the Burer-Vandenbusshe approach for LPECs, and propose the use of SDP relaxations to generate bounds at the nodes of the B&B tree. Numerical results are presented.

■ WC19

M - Lincoln 4

DA Arcade III

Sponsor: Decision Analysis
Sponsored Session

Chair: Leon Lasdon, University of Texas, Austin, TX, Leon.Lasdon@mccombs.utexas.edu

1 - Accelerating Decision Concensus on Complex Problems in Large Enterprises- An Experiential Approach

Mike Cramer, Director, Operations Research, McDonald's Corporation, 1253 North Schmidt Rd, Romeoville, IL, 60446, United States of America, mike.cramer@us.mcd.com

McDonald's operates over 34,000 restaurants in 118 nations. The pursuit of continued growth in markets where outlet expansion is mature, creates conflicting growth strategies. The problem is aggrevated by the time to market, fragmentation and lost opportunity cost inherent in large enterprises. This session adresses the use of a combination of behavorial and decision analysis science to accelerate of "Time to Concensus" of complex and conflicting growth strategies.

2 - Development of a Tool for Environmentally Sustainable Decision Making

Ben Ewing, UMass Amherst, 15 Cedar St., Northampton, MA, United States of America, ben.r.ewing@gmail.com

We discuss the development of a decision tool for use in selecting green energy technologies in which to invest. Our tool was developed specifically for the Hitchcock Center for the Environment (HC) in Amherst, MA. Our Excel tool allows users to select various technologies (solar, daylighting, heating) and see the financial and environmental impacts of their choice. We found that the optimal choice for the HC is to install a biomass heating system and avoid investment in other technologies.

3 - Optimal Multiperiod Portfolios of Hydrocarbon Exploration and Production Projects under Uncertainty

Leon Lasdon, University of Texas, Austin, TX, Leon.Lasdon@mccombs.utexas.edu, James Dyer, Wei Chen

We model a single project as a decision tree, and consider sets of projects linked by budget constraints. Chance nodes model geologic uncertainties, while decision nodes include acquisition, exploration, and development stages. We describe some realistic problem instances, and show their CPLEX behaviors when posed as MILP's using GAMS. Plans for future work are discussed. For more information see http://www.cparm.utexas.edu/.

4 - When Users Pledge to Take Green™ Actions, Are They Solving a Decision Problem?

Michael Johnson, PhD, Associate Professor, University of Massachusetts Boston, 100 Morrissey Blvd., Dept of Public Policy and Public Affairs, Boston, MA, 02124, United States of America, michael.johnson@umb.edu, Susan Fussell, Deanna Matthews, Jennifer Mankoff

A Web-based system provides users with alternative choices of actions to reduce energy consumption. While users in the field have consistently chosen from 60 actions to pursue, laboratory experiments have not indicated any impact of verbal descriptions or graphical representations on decision quality and speed. We examine user actions and descriptions of their actions to determine the extent to which users optimize utility in making action choices and make recommendations for system redesign.

■ WC20

M - Lincoln 3

DA Arcade IV

Sponsor: Decision Analysis
Sponsored Session

Chair: Asim Roy, Department of Information Systems, Arizona State University, PO Box 874606, AZ, 85287-4606, ASIM.ROY@asu.edu

1 - Incorporating Incomplete Information in the SMART and SWING Methods

Ahti Salo, Professor, Helsinki University of Technology, PO Box 1100, TKK, 02015, Finland, ahti.salo@tkk.fi, Raimo P Hämäläinen, Jyri Mustajoki

We introduce a preference programming approach based on interval-valued statements in order to accommodate preferential and informational imprecision in SMART and SWING weighting methods. In the proposed generalization, the reference attribute can be any one of the attributes and the decision maker can reply to weight ratio questions with intervals. We also present the related WINPRE software which is available for academic use at http://www.sal.hut.fi/Downloadables/winpre.html .

2 - Analysis of Multi-criteria Decision-making Methodologies for the Petroleum Industry

Lev Virine, Schlumberger Ltd., 600, 322 - 11Ave S.W., Calgary, AB, Canada, lvirine@calgary.oilfield.slb.com

Oil companies use multi-criteria decision making to balance financial performance and production with quality, safety, reserve maturation and environmental protection and other objectives. The paper provides recommendations how different multi-criteria decision-making methodologies and techniques of eliciting judgment can be applied for different types of decisions related to petroleum exploration and production.

3 - The Tradeoff between Investments in Infrastructure and Forecasting in the Face of Hurricane Risk

Seong Dae Kim, PhD Candidate, Texas A&M University, 340D Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843, United States of America, sdkim@tamu.edu, Eric Bickel

Given limited funding, one must decide whether to invest in infrastructure to speed evacuation in an emergency, or in forecasting technology to predict more accurately the timing and intensity of the event. We use dynamic programming and Markov processes to quantify the benefits of investing in infrastructure or investing in forecasting technologies. By integrating the emergency management and forecasting systems into a single dynamic model, we are able to find an optimal mix of the investments.

4 - The Ethanol-Gas Flex Fuel Car: What is the Option Value of Choosing Your Own Fuel?

Luiz Brandão, IAG Business School - PUC-Rio, Pontificia Universidade Catòlica do Rio de Janeiro, Rua Marqu's de São Vicente, 225, Gàvea, Rio de Janeiro, RJ, 22451-900, Brazil, brandao@iag.puc-rio.br

Renewable energy sources are becoming more important as the world's supply of fossil fuels decrease and also due to environmental concerns. In 2003, the ethanol-gasoline flex fuel car (runs on ethanol, gasoline, or combination) became commercially available in Brazil. Now 40% of the fuel consumption in Brazil is from renewable energy sources. Flex fuel cars also provide the owner with the flexibility to choose fuels at each refueling stop. Given the uncertainty on future prices of ethanol and gas, this option adds value to the owner since he can always opt for the cheaper fuel whenever he fills up his car. We use the Real Options method to analyze the value of the flex fuel option assuming both a Geometric Brownian Motion and Mean Reverting diffusion processes and compare the results.

■ WC21

M - Lincoln 2

Technology Impacts in Healthcare

Cluster: Health Care Informatics and Operations
Invited Session

Chair: Sarv Devaraj, University of Notre Dame, Mendoza College of Business, Notre Dame, IN, 46556, United States of America, sdevaraj@nd.edu

1 - Information Technology, Risk, and Quality in Hospitals

Nirup Menon, Associate Professor, George Mason University, School of Management, Faifax, VA, 22032, United States of America, Nirup.Menon@gmail.com, Rajiv Kohli

IT helps managers take appropriate risks, and improve organizational outcomes. Administrative IT and clinical IT impact risk and quality directly and by moderating non-IT production inputs and outcomes links. The risk of a hospital is measured by the expected rates of mortality and complications, malpractice insurance premiums, and the financial liability incurred. The quality of hospital service is measured as the actual rates of mortality and complications. This study uses data on hospitals in the State of Washington from 1998 to 2001. Results highlight differences in IT types.

2 - Automatic Medication Reconciliation

Sharique Hasan, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, United States of America, shasanx@cmu.edu, George Duncan, Rema Padman, Daniel Neill

To reduce medication errors, JCAHO recommends medication reconciliation for creating a more accurate list of a patient's medications. We develop automatic techniques for medication reconciliation, particularly detection of omissions in medication lists, identifying drugs that the patient may be taking but are not on the patient's medication list. Our key insight is that this problem is analogous to the collaborative filtering framework used by online retailers to recommend relevant products.

3 - An Empirical Investigation of Technology Adoption Sequences in Hospitals

Carrie Queenan, Assistant Professor, University of Notre Dame, 379 Mendoza College of Business, University of Notre Dame, Notre Dame, IN, 46556, United States of America, c_queenan@nd.edu, Corey Angst, Sarv Devaraj, Brad Greenwood

In this hospital-level study, we examine implementation characteristics of technology applications within a department and explore their relationship to performance. Questions answered include: 1) what is the sequence in which technology applications are adopted, 2) do these sequences affect performance? This essay contributes to academic literature by suggesting that the order of adoption must be considered in the measurement of technology value.

■ WC22

M - Lincoln 1

Queueing Models IV

Contributed Session

Chair: Ira Gerhardt, Northwestern University IE/MS, 2145 Sheridan Rd, Room C210, Evanston, IL, 60208, United States of America, i-gerhardt@northwestern.edu

1 - Theoretical Issues of Applying Queueing Theory to a Single Machine System

Kan Wu, PhD Student, Georgia Tech, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, kan626@gmail.com, McGinnis Leon, Bert Zwart

In analyzing the performance of a single machine, M/M/1 or G/G/1 models usually are considered appropriate. Hopp and Spearman argue for adjustments to parameter values to account for interruptions. Because of the complex nature of interruptions in practical, these simple approximations may not be adequate. We proposed a systematic way to classify all interruptions seen in a single machine system. Suitable queueing models for each category are proposed, and an integrated model is derived.

2 - Queuing Network Approximations for Server Assembly

Maria Hulett, Florida International University, 10555 W Flagler Street, Miami, FL, 33174, United States of America, maluhulett@yahoo.com, Purushothaman Damodaran

The nature of the server assembly process is complex. Analytical models based on queuing network theory were developed to estimate system performance measures with job/product/server circulation due to random part failures.

3 - Using a Queuing Model to Solve an Inventory Problem

Fernando Chiyoshi, Associate Professor, COPPE/UFRJ, Rua Prof Gastao Bahiana 399/404, Rio de Janeiro, RJ, 22071-030, Brazil, chiyoshi@pobox.com

This study concerns a maintenance unit serving a number of equipments, say, cable modems. The policy is to keep spare units locally to replace the defective unit which enters a repair cycle. The objective is to determine the size of spares in stock for the system to provide 99.9% reliable service.

4 - Analysis of a Priority Queueing System with Two Types of Customers and Customer Transfers

Jingui Xie, PhD Candidate, IE Departments, Tsinghua University, Beijing, China, xiejingui@gmail.com, Xiaobo Zhao, Qi-Ming He

In many service systems (including healthcare service, call centers), we observe that there are customer transfers from low priority queue to high priority queue. This paper is concerned with the performance analysis of a preemptive priority queue with two types of customers and customer transfers between queues. Performance analysis shows that the average length of high priority queue depends on the transfer rate and service rate for the low priority queue.

5 - Analysis of Queueing Networks by Approximating Departure Count Processes

Ira Gerhardt, Northwestern University IE/MS, 2145 Sheridan Rd, Room C210, Evanston, IL, 60208, United States of America, i-gerhardt@northwestern.edu, Barry L Nelson

We analyze networks of queues with Phase-type renewal (Ph) or Markovian Arrival Process (MAP) arrivals and Ph service distributions. To do so we approximate the inter-queue flows by fitting Ph and MAP processes to moments of departure counts obtained via departure moment differential equations.

■ WC23

M - Lincoln 5

Stochastic Models and Methods for Networks

Sponsor: Applied Probability

Sponsored Session

Chair: Ramesh Johari, Stanford University, Terman Engineering Center, Room 319, 380 Panama Mall, Stanford, CA, 94305-4026, United States of America, ramesh.johari@stanford.edu

1 - Scheduling in Wireless Networks in the Presence of State-feedback Delay

Sanjay Shakkottai, Associate Professor, The University of Texas at Austin, ECE Dept, ENS 437, Austin, TX, 78712, United States of America, shakkott@ece.utexas.edu, Lei Ying

In this talk, we present recent results on scheduling and routing over wireless networks with time-varying channels in the scenario where only delayed channel and queue state is available. Specifically, we develop distributed algorithms that are throughput-optimal.

2 - Convergence to Equilibrium in Local Interaction Games and Using Models

Amin Saberi, Stanford University, Terman Engineering Building, Room 317, Stanford, CA, 94305, United States of America, saberi@stanford.edu, Andrea Montanari

We consider a two-strategies coordination game played asynchronously between the nodes of a network. Agents behave according to a noisy best-response dynamics. It is known that noise removes the degeneracy among equilibria: In the long run, the "risk-dominant" behavior spreads throughout the network. Here we consider the problem of computing the typical time scale for the spread of this behavior.

3 - A Semidefinite Optimization-based Approach to Systems of Coupled Queues

Constantine Caramanis, Assistant Professor, The University of Texas at Austin, Electrical and Computer Engineering Dept, Austin, TX, United States of America, cmcaram@ece.utexas.edu, Balaji Rengarajan, Gustavo de Veciana

We consider systems of non-work conserving coupled queues, where the service rates depend on all the queue lengths. Such models arise naturally in systems with shared resources. Coupled queuing systems are notoriously difficult to analyze and steady state queue length distributions are known only in some special cases. We consider a semi-definite optimization-based moment approach that provides tight bounds on the steady-state mean sum queue-length, and we use this for optimal system design.

4 - On the Flow-level Dynamics of a Packet-switched Network

Ciamac Moallemi, Assistant Professor, Columbia Business School, Uris 416, 3022 Broadway, New York, NY, 10027, United States of America, ciamac@gsb.columbia.edu, Devavrat Shah

We study the dynamics of a network that employs congestion control at both at the level of flows injecting packets into the network and at the level of packets being scheduled within the network. We investigate how dynamics at these two levels interact without any assumption of time scale separation, and propose algorithms that trade-off the maximization of utility with the minimization of delay.

■ WC24

M - Lincoln 6

Genetic Algorithm Approaches to Scheduling

Sponsor: Computing Society

Sponsored Session

Chair: Mihalis Golias, Rutgers University, 623 Bowser Road, Piscataway, NJ, 08854, United States of America, golias@rci.rutgers.edu

1 - Genetic Algorithm for Scheduling with Sequence Dependent Setup Time

Javier Parra Peña, Industrial Engineer, Universidad Distrital Francisco José de Caldas, Cra 64B Numero 45A 61 Sur Int 12 Apt 502, Carrera 7 No. 40-53, Bogotà, DC, 57, Colombia, javparrap@gmail.com, Lindsay Àlvarez

We use a genetic algorithm to do the scheduling with any restrictions as setup time dependent of the sequence and some other that we find typically in medium and small factories. The problem analyzed implies a flow shop system with working centers in parallel and the requirement of manage capacities and turns. In a Brick factory they use generally intuition and experience for make decisions, but they found this genetic algorithm so good, easy and efficient to do it.

2 - Genetic Job-shop Scheduling Integrated with Preventive Maintenance Plan

Baha Guney, Ass. Professor, Sakarya University, Muh. Fak. Esentepe Kampus, Serdivan, Adapazari, SA, 54187, Turkey, bguney@sakarya.edu.tr, Kemal Cakir, Ahmet Erdem, Emin Gundogar

Generally job-shop scheduling problem focuses on minimizing the total completion time of all jobs. Maintenance is not considered. However machines require maintenance which must be planned on production schedule. The objective of this paper is to minimize jobs completion time and also schedule preventive maintenance by using genetic algorithms. An application is demonstrated for a case study in electro-mechanic industry for press shop weekly scheduling under a strict maintenance plan.

3 - A Genetic Algorithm for Scheduling Groups of Jobs on Parallel Machines to Minimize Total Tardiness

Jeffrey Schaller, Professor, Eastern Connecticut State University, Department of Business Administration, 83 Windham Streeet, Willimantic, CT, 06226, United States of America, schallerj@easternct.edu

This paper considers the problem of scheduling on parallel machines with family setup times to minimize total tardiness. A new genetic algorith proposed. This algorithm is compared to tabu search procedures by testing them on randomly generated problems. The results of the test reveal that improved solutions can be obtained by using the genetic algorithm.

4 - A 2-opt Based Heuristic for the Machine Scheduling Problem

Mihalis Golias, Rutgers University, 623 Bowser Road, Piscataway, NJ, 08854, United States of America, golias@rci.rutgers.edu, Maria Boile, Sotiris Theofanis

In this paper we present two 2-opt based heuristic for the unrelated parallel machine scheduling problem that guarantees optimality in two defined neighborhoods. A genetic algorithms based heuristic is also proposed to improve the speed of the heuristics. The behavior and efficiency of the heuristics is illustrated using the discrete berth allocation problem.

■ WC25

M - Lincoln 6A

Vehicle Routing II

Contributed Session

Chair: Joseph Wilck, The University of Tennessee, 411 East Stadium Hall, Knoxville, TN, 37996, United States of America, joe.wilck@gmail.com

1 - Elevator Group Dispatching as Stochastic Bilevel Optimization Problem

Janne Sorsa, Manager, Kone Elevators Ltd., PO Box 7, Espoo, 02151, Finland, janne.sorsa@kone.com, Marja-Liisa Siikonen, Harri Ehtamo

We formulate elevator group dispatching as bilevel optimization problem. In the upper level, we assign elevators to landing calls. The visiting order of the landing calls is solved in the lower level, where we forecast uncertain passenger demands. To solve the problem, we use the certainty equivalent control principle, which allows us to derive its optimal solution analytically. The applicability of our new method to online elevator optimization has been verified by extensive simulations.

2 - Some Recent Results on Neighborhood Search Strategies for Rich Vehicle Routing Problems

Ulrich Vogel, University of Cologne, Pohligstr. 1, Cologne, 50969, Germany, ulrich.vogel@uni-koeln.de, Ulrich Derigs

Many extensions to the classical vehicle routing problem (VRP) have been introduced, as for instance delivery time windows, split deliveries, open tours and vehicle compartments for the transportation of inhomogeneous products. We have implemented different neighborhood search approaches to solve such rich vehicle routing problems. We present computational experience and new results obtained for standard instances from the literature.

3 - A Genetic Algorithm for the Split Delivery Vehicle Routing Problem

Joseph Wilck, The University of Tennessee, 411 East Stadium Hall, Knoxville, TN, 37996, United States of America, joe.wilck@gmail.com, Tom Cavalier

The Split Delivery Vehicle Routing Problem (SDVRP) allows customers to be assigned to multiple routes. A new genetic algorithm is developed for the SDVRP and computational results are given for thirty-two data sets from previous literature. With respect to the total travel distance and computer time, the genetic algorithm compares favorably versus a column generation method and a two-phase method.

■ WC26

M - Lincoln 5A

Joint Session CS/OPT: Applications of Mixed Integer Nonlinear Programming in the Chemical Process Industry - II

Sponsor: Computing Society: Mixed Integer Nonlinear Programming (Joint Cluster Optimization)

Sponsored Session

Chair: Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg

Co-Chair: Angelo Lucia, Professor, University of Rhode Island, Dept of Chemical Engineering, Kingston, RI, 02881, United States of America, lucia@egr.uri.edu

1 - Decomposition Methods Applied in Refinery Scheduling

Marianthi Ierapetritou, Associate Professor, Rutgers University, 98 Brett Rd, Piscataway, NJ, 08854, United States of America, marianth@soemail.rutgers.edu, George Saharidis

Scheduling in refineries is a difficult task. In general the developed models are large scale mixed integer models. The application of decomposition methods seems to be a good approach for the resolution of this type of problems. The question is which decomposition method gives the faster convergence in each case. We present a comparison of classical decomposition methods and some extension of them applied in two case studies of scheduling in refineries.

2 - Structural and Parametric Optimization of Separation Networks

Libin Zhang, University of Illinois at Chicago, 851 S. Morgan Street, SEO218, MC063, Chicago, IL, 60607, United States of America, lzhang10@uic.edu, Jeonghwa Moon, Andreas Linninger, Benyamin Grosman

Synthesis of separation networks involves structural decisions representing the configuration of the network and continuous parameters such as the operating conditions. MINLP formulations are a common method of representation for the problems. We propose a hybrid algorithm for the solution of this MINLP separation problem combining stochastic search techniques with deterministic method. The proposed approach builds and optimizes complex column network and operating conditions simultaneously.

3 - Optimal Synthesis of Fuel Gas Networks

Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg, M M Faruque Hasan

We identify the numerous fuel sources and sinks for LNG and refinery systems, and pose the network problem as a generalized pooling problem with the additional complexity of product quality constraints (e.g. Wobbe Index), compression costs, and pressure variations among sources and sinks. The concept of superstructure has been used.

4 - Dynamic Optimization of FOPTD, SOPTD and SOPTD with Lead Systems

Ali Elkamel, Associate Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, aelkamel@cape.uwaterloo.ca, Chandramouli Madhuranthakam

The optimal PID controller parameters for first order plus dead time (FOPTD), second order plus dead time (SOPTD) and SOPTD with lead process are obtained by performing dynamic optimization. The objective function was to minimize the integral of absolute errors for servo and regulatory changes.It shows that the PID controller parameters thus obtained from dynamic optimization improves the responses compared to those obtained from conventional methods.

■ WC28

M - Washington 1

Logistics in Supply Chain

Contributed Session

Chair: Iqbal Agha, Chairman, Dept of Finance and Operations Management, UMASS Amherst, Isenberg School, Amherst, MA, 01003, United States of America, aiali@som.umass.edu

1 - Warehouse Location Model for Third Party Dairy Logistics

Alp Avni Yelkenbicer, Izmir University of Economics, Sakarya Caddesi, No: 156, Balçova, Izmir, 35330, Turkey, alpavni@gmail.com, Burcu Ozcam

We consider a strategic warehouse location problem for a dairy producer which is in the process of transferring warehouse activities to a third party logistics provider. Highly perishable dairy products requires all supply chain functions to be fast as well as responsive. Due to low profit margins and low volume of goods, supply chain has to be efficient. Therefore, the trade off between responsiveness and efficiency is studied in detail. We build an optimization model based on the real data.

2 - Improving Logistics Operation through Acquisition of Necessary Management Skills

Obinna Muogboh, Assistant Professor, Lagos Business School, Pan-African University, 2 Ahmed Onibudo Street, Victoria Island, Lagos, Nigeria, omuogboh@lbs.edu.ng

Efficient logistics management is critical to the success of business organisations. In this paper, we present the result of an empirical study on the relationship between organisational logistics skills and corporate logistics performance. The result emphasizes the importance of specific logistics skills; and provides managers with an approach in prioritizing their logistics skills development plan.

3 - A Decomposition Heuristic for the Location Routing Problem with Intermediate Storage Facilities

Stephen Hill, Assistant Professor, Weber State University, Department of Business Administration, 3802 University Circle, Ogden, UT, 84408, United States of America, shill@cba.ua.edu, John Mittenthal

In this work we present the development of a decomposition-based heuristic approach for the Location Routing Problem with Intermediate Storage Facilities. A simulated annealing improvement procedure is proposed and computational experimentation conducted. Also, an application of the heuristic approach and improvement procedure to a real-world problem instance is discussed.

4 - Coordination of Material Purchasing for Neighboring Factories

Ben Peterson, Student, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, benp@cmu.edu, Laurens Debo, Willem-Jan van Hoeve, Sunder Kekre, Sham Kekre

Many companies have different production plants at a single site. Often they do not coordinate their inbound logistics because of organizational barriers. As a result, opportunities exist to reduce total logistics costs by consolidating orders, sharing trucks or combining inventories. In this project we study how to design and implement such coordination while ensuring each individual plant's flexibility with respect to changes in sourcing volumes.

5 - The Impact of Vehicle Characteristics on Multi-modal Distribution Systems

Iqbal Agha, Chairman, Dept of Finance and Operations Management, UMASS Amherst, Isenberg School, Amherst, MA, 01003, United States of America, aiali@som.umass.edu, Debra O'Connor

We examine a two echelon distribution system in which two fleets of vehicles are used on transportation lanes of the second echelon. We analyze the manner in which the defining characteristics of the two types of employed vehicles determine the number of the each type of vehicle that is deployed in an optimal distribution plan.

■ WC29

M - Washington 2

Data Envelopment Analysis II

Contributed Session

Chair: N.K. Kwak, Professor, Saint Louis University, Cook School of Business, St. Louis, MO, 63108, United States of America, kwakn@slu.edu

1 - Social Banking, Deregulation, and Profitability of Banks: The Indian Case

Hwan Lim,Manager, Korea Institute of Science and Technology, 39-1, Hawallgokdong Sungbookgu, Seoul, Korea, Republic of, hwanlim@kist.re.kr, Hosun Rhim

In this study, we explicitly recognize the dual role of Indian banks as a profit maximizing financial institution on the one hand and as an agent of social and economic development on the other. We construct DEA models to obtain the opportunity cost of pursuing various social banking objectives in the form of foregone potential profits for the period 1997-2005. Our results indicate that the lost potential return on equity for Indian banks due to the social banking restrictions is significant.

2 - Measuring Production Frontier Performance of R&D Activities: An Application to Chinese Regional R&D

Jiancheng Guan, Professor, School of Management, Fudan University, Guoshun Road 670, Shanghai, China, guanjianch@buaa.edu.cn

This paper proposes a comprehensive framework of production frontier analysis to measure performances of the R&D activities, mainly associated with a non-radial data envelopment analysis (DEA) model and an improved Malmquist type index. The empirical findings are acquired from Chinese regional innovation systems (RIS) and reveal that the production frontier performance of R&D activities of Chinese RIS is in an unbalanced and unstable state.

3 - A DEA Model to Evaluate the Performance of BSC with Unique and Common Performance Measures

Hwan Lim,Manager, Korea Institute of Science and Technology, 39-1, Hawallgokdong Sungbookgu, Seoul, Korea, Republic of, hwanlim@kist.re.kr, Hosun Rhim

We proposed a modified DEA model to evaluate balanced scorecards of heterogeneous groups with common and unique performance measures. In this progress we made up for the model including weight range of perspective to sustain balanced perspective, one of the most important characteristics in BSC. The model is tested using a real data set. The data set has been obtained from a representative public-sector R&D institute, the K-institute in Korea. they introduced BSC from 2005.

4 - A Use of DEA-discriminant Analysis to Measure Corporate Performance of Manufacturing Industries

Mika Goto, Research Economist, Central Research Institute of Electric Power Industry, 2-11-1, Iwado Kita, Komae, Tokyo, 201-8511, Japan, mika@criepi.denken.or.jp, Yusuke Omi, Toshiyuki Sueyoshi

This study investigates the influence of R&D expenditure on the corporate value of Japanese manufacturing industry. DEA-DA is the methodology for the study. This research finds that the R&D expenditure is important for the Japanese manufacturing industries to be competitive in a global market. However, the importance of R&D expenditure depends upon the type of industry. Empirical findings identified in this study are useful to other industries (not only manufacturing) and other nations.

5 - Research Library Operational Efficiency Evaluation Using Data Envelopment Analysis

N.K. Kwak, Professor, Saint Louis University, Cook School of Business, St. Louis, MO, 63108, United States of America, kwakn@slu.edu, Chang Won Lee

This paper presents an efficiency evaluation of research library using data envelopment analysis (DEA). DEA model is developed based on the collected data from the USA libraries statistics. Model results are analyzed and discussed in terms of a resource management perspective. This study provides the management with a managerial insight for achieving operational excellence.

■ WC30

M - Washington 4

Military and Homeland Security Applications of Portfolio Analysis

Sponsor: Military Applications

Sponsored Session

Chair: Daniel Wilson, Lead Systems Engineer, MITRE Economic & Decision Analysis Center, 202 Burlington Road, Bedford, MA, 01730, United States of America, danwilson@mitre.org

1 - Risk Analysis and Game Theory: Two Policy Examples

Elisabeth Paté-Cornell, Professor and chair, Stanford University, Terman Building Room 340, Stanford, CA, 94305, United States of America, mep@stanford.edu, Paul Kucik

We show two examples of modeling and simulation of a game between a government and an opponent to assess the risk of some public policies given the response of the other side. In one case, the US government faces one or more terrorist groups and needs to collect intelligence information in time to take action; in the other, a government is trying to balance the immediate need for security and the long-term goal of solving fundamental problems that fuel an insurgency.

2 - Using Revealed Preference for Portfolio Management

Richard Tepel, Lead Operations Research Analyst, MITRE Economic and Decision Analysis Center, FOB2 Navy Annex, Arlington, VA, United States of America, rtepel@mitre.org

Once investments are actually selected we may know their relative priority compared to other potential investments and their funding levels. But, can the actual priority of investments and the levels of investment reveal the preferences embedded in the value structure? The paper explores ways to determine which values of the parameters in the value structure would be needed to generate the actual funded investment structure.

3 - Enterprise Scale Portfolio Analysis at the National Oceanic and Atmospheric Administration

Richard Moynihan, Principal Operations Research Analyst, MITRE Economic and Decision Analysis Center, 202 Burlington Road, M/S M230, Bedford, MA, 01730, United States of America, moynihan@mitre.org, Robert Reining, Patricia Salamone, Brian Schmidt

We describe a portfolio analysis approach to modeling the value of the National Oceanic and Atmospheric Administration's investment options that was used to select portfolios of environmental observing systems that best satisfy NOAA's

mission-critical observing requirements at target budget constraints. The approach is based on capability-based performance measures that satisfy recent Government acquisition and planning regulations.

4 - How Portfolio Analysis Helped the UK's Royal Navy Design the Type 45 Destroyer

Lawrence Phillips, Visiting Professor of Decision Sciences, London School of Economics, Houghton Street, London, WC2A 2AE, United Kingdom, larry_phillips@msn.com

Decision conferences and multi-criteria portfolio analysis enabled the United Kingdom's Royal Navy to generate an affordable configuration for the ship. This approach aligned the key players and shortened the concept development stage to a record 18 months, saving BAE Systems two years of work. The project showed how the MoD and main contractor can work collaboratively to reduce risk, keep costs under control, maintain steady progress and attain the desired capability.

■ WC31

M - Washington 5

Project Management

Contributed Session

Chair: Dwight Smith-Daniels, Professor, Wright State University, Department of IS & OM, Raj Soin College of Business, Dayton, OH, 45435, United States of America, dwight.smith-daniels@asu.edu

1 - A New Approach to Measuring Slack in Stochastic Project Networks

Ted Klastorin, Professor, University of Washington, ISOM Dept, Box 353200, Foster School of Business, Seattle, WA, 989195-320, United States of America, tedk@u.washington.edu, Gary Mitchell

The concept of slack in deterministic activity networks is well developed in the project management literature. However, there has been little discussion of slack measures in stochastic activity networks. How should stochastic slack measures be calculated? How can practitioners use stochastic slack and related concepts to better manage projects? In this paper, we propose a new definition for stochastic slack that addresses these questions.

2 - Capacity Allocation and Downsizing Decisions in Project Portfolio Management

Jade Herbots, PhD Student, KULeuven, Naamsestraat 69, Leuven, 3000, Belgium, jade.herbots@econ.kuleuven.be, Willy Herroelen, Roel Leus

Project portfolio management deals with the continuous flow of projects; it entails choosing the right projects and allotting resources to these projects or capacity allocation. By downsizing, we refer to a reduction of the scale or size of a project so that its content is changed and the project's capacity requirements comply with the allocated capacity. We investigate how the scarcity of resources affects the value of projects in environments where additional resources cannot be found.

3 - Resource Planning and Job Scheduling for Project Management

Gang Li, University of Texas at Austin, 1 University Station, B6500, Austin, TX, 78759, United States of America, gang.li@mail.utexas.edu, Anant Balakrishnan

We address a project planning problem that entails selecting resource types among alternative types with varying costs and capabilities, assigning chosen resources to jobs of the project, and scheduling the jobs to complete the project. The objective is to minimize total cost including the costs for resource acquisition, job processing, and changeovers. We develop modeling enhancements, and propose a cutting plane procedure with heuristics that vastly outperforms standard solution methods.

4 - Effects of Forward Agility in Projects with Stochastic Durations

Karolina Glowacka, McGill University, Desautels Faculty of Management, Montreal, QC, H3A 1G5, Canada, karolina.glowacka@mail.mcgill.ca, Timothy Lowe, Richard Wendell

We consider an issue of forward agility and its impact on project delays. If an activity can reschedule its start time to take advantage of an earlier finish of its predecessors, then we say that it is forward agile. We show how the impact of this agility varies with respect to the project structure and the due date. Our results can serve as a guideline for project managers negotiating contracts with subcontractors and setting project target completion dates.

5 - The Roles of Clear Goals and Uncertainty in Project Performance

Dwight Smith-Daniels, Professor, Wright State University, Department of IS & OM, Raj Soin College of Business, Dayton, OH, 45435, United States of America, dwight.smith-daniels@asu.edu, Vicki Smith-Daniels

We present results for a team simulation involving the planning and excution of a project where a group was provided with a realistic project goal as compared to a control group that was instructed to do their best. We provide analysis of the moderating effects of variance, uncertainty and complexity on project performance.

■ WC32

M - Washington 6

Inventory Control I

Contributed Session

Rob Broekmeulen, TU Eindhoven, PO Box 513, Pav. E10, Eindhoven, Netherlands, r.a.c.m.broekmeulen@tue.nl

1 - Critical Path for Inventory Control Method in an Assemble-to-order Environment

Roberto Seijo, PhD Student, Texas A&M, PO Box 11181, College Station, TX, 77842-1181, United States of America, rlseijo@tamu.edu, Cesar Malave, Gary Gaukler

In an assemble-to-order (ATO) scenario there is usually safety time built in the delivery date and as such, assembly components needed for the final product are not required to be available at time of order entry. The main objective of this research is to incorporate this safety time into the (Q, r) inventory model in order to obtain lower inventories without affecting the ability to meet the delivery date. The safety time is characterized by means of the assembly critical path.

2 - Perishable Inventory Control under Handling and Storage Constraints

Rob Broekmeulen, TU Eindhoven, PO Box 513, Pav. E10, Eindhoven, Netherlands, r.a.c.m.broekmeulen@tue.nl

We consider a retailer that sells perishable inventory from a capacitated storage space in the store. The customers prefer to withdraw the products Last In First Out. The supplier delivers the products to the backroom from where the products are replenished to the sales area. We investigate control policies that reduce the effects of the withdrawal behavior and the handling costs for the retailer.

■ WC33

M - Johnson

Operations Research in Medicine and Bioinformatics

Contributed Session

Chair: Enrique Campos-Nanez, Assistant Professor, George Washington University, 1776 G Street, Washington DC, DC, 20052, United States of America, ecamposn@gwu.edu

1 - Using the Mann-Whitney Test in Microarray Data for Cancer Diagnosis

Mauricio Cabrera Rìos, Assistant Professor, University of Puerto Rico - Mayaguez, PO Box 9043, Mayaguez, PR, 00681, Puerto Rico, mauricio.cabrera@gmail.com, Lyzett Uribe, Hugo Perez, Clara Isaza

The use of microarrays for cancer diagnosis implies the complex task of analyzing tens of thousands of genomic expression data. In this work a microarray analysis strategy based on the Mann-Whitney test is presented. The aim is to develop a straight-forward and effective procedure that allows a convenient implementation in cancer diagnostic centers. The results of the application of the proposed strategy to cervix cancer and pancreatic cancer microarray data are presented.

2 - Microarray Data Envelopment Analysis: Preliminary Results

Clara Isaza, Assistant Professor, Universidad Autonoma de Nuevo Leon, Av. Universidad S/N, San Nicolas de los Garza, NL, 66450, Mexico, isaza.clara@gmail.com, Matilde Sanchez, Lyzett Uribe, Hugo Perez, Mauricio Cabrera Rìos

Use of microarray data to diagnose cancer has been an active area of study in recent years. In this work, the use of Data Envelopment Analysis is proposed to elucidate insight into the potential presence of cancer. The preliminary ideas and results are discussed.

3 - Stochastic Synchrony, Application to Neural Signals and Early Prediction of Alzheimer's Disease

Théophane Weber, MIT, 109 Windsor Street #1, Cambridge, MA, 02319, United States of America, theo_w@mit.edu, Andrzej Cichocki, Justin Dauwels, Francois Vialatte

We propose a new measure of statistical interdependence of time series, referred to as "Stochastic Event Synchrony" (SES). The statistical estimation of SES can be cast as a combinatorial optimization problem on sparse graphs. As an application, we consider the problem of detecting anomalies in electroencephalograms of pre-Alzheimer's patients. Numerical results suggest that SES is significantly more sensitive to perturbations in EEG synchrony than a large variety of other measures.

4 - Treatment Planning for Radiofrequency Ablation of Liver Tumors

Enrique Campos-Nanez, Assistant Professor, George Washington University, 1776 G Street, Washington DC, DC, 20052, United States of America, ecamposn@gwu.edu, Kevin Cleary, Hernan Abeledo, Fil Banovac

Radiofrequency ablation (RFA) is a minimally invasive clinical technique used to treat liver cancer tumors. In this procedure, needles are guided into the tumor and a radiofrequency current is used to produce frictional heat that kills cells. This work concerns the development of optimal RFA treatment plans for large or irregularly shaped tumors that determine the placement of multiple burn regions so the tumor can be completely destroyed with a minimally invasive sequence of burns.

■ WC34

M - Jefferson

Novel Applications in OR I

Contributed Session

Chair: Ronald Tibben-Lembke, Associate Professor, Supply Chain Management, University of Nevada, MGRS / 0028, Reno, NV, 89557, United States of America, rtl@unr.edu

1 - A Robust Algorithm for Cost-effective Operation of Distributed Sensor Systems

Thomas Wettergren, Naval Undersea Warfare Center, 1176 Howell Street, Newport, RI, 02841, United States of America, t.a.wettergren@ieee.org, Sandie Grage

We describe a method to manage the deployment of a fixed number of distributed sensors. These sensors function collaboratively, but they must be judiciously deployed over time. We illustrate the operation of our approach to solving this optimization problem for cases of maximizing either the expected performance or the worst-case performance. We also show how the optimization method may be used in an adaptive setting. Computer simulations support the optimization results.

2 - Mother Nature's Design: E-mail Communication as a Paradigm for Complex Network Evolution

Dean Malmgren, PhD Candidate, Northwestern University, 2145 Sheridan Rd., Evanston, IL, 60208, United States of America, r-malmgren@northwestern.edu, Julio Ottino, Luis Amaral

The existence of ubiquitous properties of complex networks across sociological, technological, and biological disciplines raises an important question: what can we learn from Mother Nature's design of these systems? We investigate this question with data from three anonymous universities that not only records their e-mail communication patterns, but also records their social affiliations. This data enables us to quantitatively investigate plausible mechanisms for social network evolution.

3 - Local Search Algorithms for the Maximum k-plex Problem

Erika Short, University of Pittsburgh, PO Box 1347, Crystal River, 34423, United States of America, erika.short@gmail.com

The maximum k-plex problem is one of many ways to classify a cohesive subgroup in social network analysis. Considered to be a type of relaxed clique, the maximum k-plex problem is a degree based approach to identifying closely related vertices in a graph. Local search algorithms are discussed and applied to benchmark problems for the maximum k-plex problem. Computational experiments are performed, and new lower bounds are successfully attained.

4 - Intelligent Robust Optimization Method for Power Capacity Expansion in Western Australia

Sorousha Moayer, PhD Student, Murdoch University, School of Engineering and Energy, South Street, Murdoch, Perth, WA, 6150, Australia, s.moayer@gmail.com, Parisa Bahri

The aim of this study is to identify an optimised capacity expansion plan for WA's electricity system that meets its future demand and also reduces the Greenhouse Gas (GHG) emission. The proposed framework generates scenarios by an intelligent scenario generator. Then, an intelligent robust optimisation method finds a robust investment option. The results of the case study show the robust expansion plan for WA based on the future demand and considering other constraints forced by government.

5 - Maximum Happiness: Amusement Park Rides as Closed Queueing Networks

Ronald Tibben-Lembke, Associate Professor, Supply Chain Management, University of Nevada, MGRS / 0028, Reno, NV, 89557, United States of America, rtl@unr.edu

New amusement park rides cost over $100m to develop, and yet have never been studied in the OR/MS literature. We estimate throughput as a function of the number of cars, unload/load time, ride time, and number of load/unload zones. We consider the deterministic case, and present preliminary results for the stochastic case. We look at California Screamin', the marquee ride at Disney's California Adventure, before concluding with a computational study.

■ WC35

M - Jackson

Georgia Tech Communication Instruction for Undergraduate & Graduate Engineering Students

Sponsor: INFORM-ED

Sponsored Session

Chair: Judith Norback, Director of Workplace & Academic Communciation, Georgia Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, judith.norback@isye.gatech.edu

1 - Strategic, Multimodal Communication to Analyze Critical and Complex Problems

Rebecca E. Burnett, Dir. of Writing & Communication, School of Lit, Communicatn & Culture, GA Tech, 765 Ferst Drive, Atlanta, GA, United States of America, Rebecca.Burnett@lcc.gatech.edu, Andrew Cooper

Communication is one critical component of effective decision-making. Simply put, professionals explore possibilities, analyze problems in complex contexts, interpret results, and implement solutions, all of which require strong communication skills. We describe our undergraduate communication curriculum, a strategic and multimodal approach that integrates written, oral, visual, electronic, and nonverbal communication.

2 - Workforce Communication Program: Instruction That Works and Assessment Built from Executive Input

Judith Norback, Dir. of Workplace & Academic Communication, Stewart School of ISyE, GA Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, jnorback@isye.gatech.edu, Tris Utschig, Rebecca E. Burnett, Garlie Forehand

Students benefit by learning to communicate as the workplace demands. This presentation will cover 1) the instruction, 2) self-report assessment showing the instruction works, and 3) a new scoring system for performance based on the literature and executives' as well as faculty input. Instructional and assessment materials will be shared.

3 - Developing a Graduate-level Communication Curriculum for STEM Communities

Donna Llewellyn, Director, Ctr for Enhancement of Teaching & Learning, GA Tech, 765 Ferst Drive, Atlanta, GA, United States of America, donna.llewellyn@cetl.gatech.edu, Karen Head

Effective and appropriate written, oral, and electronic communication is especially critical for graduate students in the STEM fields. For our presentation we will describe how our graduate-level communication curriculum has been and continues to be developed to help our students better understand the conventions of academic and professional discourse.

■ WC36

M - T. Marshall Ballroom East

Stochastic Processes I

Contributed Session

Chair: Wen Chen, Rutgers Business School, 617 Central Ave, Harrison, NJ, 07029, United States of America, echodrawing@yahoo.com

1 - The Diverse Linear Log-fractional Stable Motions

Joshua Levy, Truman State University, 100 E. Normal, Kirksville, MO, 63501, United States of America, levy_j@utpb.edu

Renewed study is made of the alpha-stable process known colloquially as "linear log-fractional stable motion." It is actually a collection of different processes defined only for 1< alpha <2. Its dependence structure is reviewed here, and a new result is given about the codifference of its increments which are stationary. Stability results may also be presented.

2 - Asymptotic Theory for the Maximum Likelihood Estimate

Stergios Fotopoulos, Professor, Washington State University, Department of Management and Operations, Washington State University, Pullman, WA, 99164-4743, United States of America, fotopo@wsu.edu, Li Tan, Krishna Jandhyala

The problem of estimating an unknown change-point in the parameters of a sequence of independent d-dimensional time-series from a general parametric family of distributions is considered. Adapting the estimation methodology that Hinkley pursued for the case of abrupt changes, we develop theory for deriving the asymptotic distribution of the MLE of the change-point under the contiguity condition. We apply the methodology to estimate the change-point for the log-returns of stocks from the NYSE.

3 - Employing an IP Formulation for Evaluating Real Options for Source Selection in Multi-stage Competiton

Jeremy Eckhause, Research Fellow, LMI, 2000 Corporate Ridge, McLean, VA, 22102, United States of America, jeckhause@lmi.org, Danny Hughes, Steve Gabriel

Employing a real options framework for determining source selection in government R&D programs, we formulate a mixed-integer program for obtaining optimal acquisition strategies. This formulation is an extension of previous work where we formulated the problem as a stochastic dynamic program (SDP). While the SDP is usually more efficient, specific problems where a two-level approach could be implemented may make the integer programming approach preferable.

4 - A Stochastic Model in Research and Development

Wen Chen, Rutgers Business School, 617 Central Ave, Harrison, NJ, 07029, United States of America, echodrawing@yahoo.com, Michael Katehakis

When a new technology appears, a manufacture can consider buy the new technology from the market or research and develop another technology for its new products. Rather the period of R&D and the lifetime of the new technique are both random numbers. The question is arise here, whether to buy new technology from market or to research and develop by itself, and when should give up the own research if result of own R&D is still unknown.

■ WC37

M - T. Marshall Ballroom West

Homeland Security I

Contributed Session

Chair: Carol Meyers, Lawrence Livermore National Laboratory, 7000 East Ave., L-229, Livermore, CA, 94550, United States of America, meyers14@llnl.gov

1 - Using Agent-based Modeling to Evaluate Operational Countermeasures

Carol Meyers, Lawrence Livermore National Laboratory, 7000 East Ave., L-229, Livermore, CA, 94550, United States of America, meyers14@llnl.gov, Sarah Riddell

We discuss how agent-based modeling techniques may be used to evaluate the effectiveness of conops countermeasures. We use a commercial agent-based software package to assess the defenses of a hypothetical public facility. Varying the number of officers and cameras in the facility, we can obtain data on the probability of interdicting a potential adversary. Combined with notional effects data, this can be used to give an estimate of the effectiveness of different patrolling strategies.

2 - Optimization of Container Inspection Systems

Elsayed Elsayed, Professor, Department of Industrial Engineering, Rutgers University, 96 Frelinghuysen Road, New Brunswick, NJ, 08854, United States of America, elsayed@rci.rutgers.edu, Christina Young, Minge Xi, Mingyu Li, Yada Zhu

The inspection of containers is a vital part of maintaining secure ports-of-entry. The inspection sequence of different attributes of the container has a major effect on the inspection cost and delays in the port. We present a multi-objective approach to determining the optimal inspection policy while considering cost and time. This involves making selections from a set of possible inspection stations and deciding when to make use of repeated measurements at higher resolutions.

3 - On Computing the Optimal Covering of Random Ellipsoids

Yuntao Zhu, Arizona State University, MC 0852, PO Box 37100, Phoenix, AZ, 85069-7100, United States of America, Yuntao.Zhu@asu.edu

We consider the well-known Minimum Volume Covering Ellipsoids (MVCE) problem under the assumption that some of the data are random. We formulate the new problem as a Stochastic Semidefinite Program and introduce a software package for solving it.

4 - Optimal Task Force Formation during Emergencies

Nezih Altay, Assistant Professor, University of Richmond, 28 Westhampton Way, Robins School of Business, Richmond, VA, 23173, United States of America, naltay@richmond.edu, Walter Green

Large emergencies may quickly deplete local resources. Task forces are bundled assets designed to assist local jurisdictions in responding to the incident. This paper develops an analytical approach for bundling available resources into task forces to replace degraded local resources.

5 - Interdicting Nuclear Smuggling with Imperfect Information

Alexander Gutfraind, Cornell University, Center for Applied Mathematics, 657 Frank Rhodes Hall, Ithaca, NY, 14853, United States of America, ag362@cornell.edu, Aric Hagberg, Feng Pan

We developed a model to allocate radiation sensors in a network to maximize the probability of detecting nuclear smugglers. In this model, the smuggling paths are probabilistic and sensors can be less than perfect. A heuristic method was developed to solve this problem. Sensor allocation and network detection probability depend on the knowledge of smuggling paths and sensor efficiency. We will show the computational results of those dependencies on various transportation networks.

■ WC38

M - Tyler

Approximation Algorithms for Routing and Scheduling

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Viswanath Nagarajan, PhD Student, Tepper School of Business, Carnegie Mellon University, Tech and Frew St, Pittsburgh, PA, 15213, United States of America, viswanat@andrew.cmu.edu

1 - Edge Coloring and Decompositions of Weighted Graphs

Mohit Singh, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15232, United States of America, mohits@andrew.cmu.edu

We consider a generalization of the edge coloring problem in bipartite graphs motivated by the study of Clos Networks. Given an edge-weighted bipartite graph G=(V,E), the task is to find a proper weighted coloring of the edges with as few colors as possible. We give an algorithm for the weighted bipartite edge coloring problem which returns a proper weighted coloring using at most 2.25 n colors where n is the total weight incident at any vertex. This is joint work with Uri Feige.

2 - Improved Approximations for Orienteering with Time Windows and Without

Nitish Korula, Computer Science, University of Illinois at Urbana-Champaign, 201, N Goodwin Ave, Urbana, IL, 61801, United States of America, nkorula2@uiuc.edu, Chandra Chekuri, Martin Pal

We consider the problems of Orienteering, and Orienteering with Time Windows, obtaining better approximations for both. In the Orienteering problem, given an edge-weighted graph, vertices s and t, and a time limit T, the goal is to find an s-t walk of length at most T that maximizes the number of distinct vertices it visits. Orienteering with Time Windows is the generalization in which each vertex v has a time window [R(v), D(v)], and only vertices visited within their time windows are counted.

3 - Primal Dual Online Algorithms for Routing and Scheduling

Nikhil Bansal, IBM Research, PO Box 218, Yorktown, NY, United States of America, nikhil@us.ibm.com

While many general techniques have been developed for design and analysis of approximation algorithms, this is not the case for online algorithms. Recently, Buchbinder and Naor developed a very general technique based on the online primal dual framework.In addition to obtaining various new results, the technique also gives substantially simpler proofs of various previous results. I will give an overview of the technique and consider various applications.

4 - Data Broadcast in Heterogenous Networks

Yoo-Ah Kim, Assistant Professor, University of Connecticut, Computer Science & Engineering Departmen, 371 Fairfield Way, U-2155, Storrs, CT, 06269, United States of America, ykim@engr.uconn.edu

We consider the data broadcast problem in a heterogeneous cluster where each node has different speed. Two models are considered: (i) the transfer time from X to Y is set by the speed of sender X, and (ii) the time is the maximum of the speeds of X and Y. We show that simple greedy algorithms give approximation ratios of 1.5 and 2 respectively. We also present instances in which the algorithms give solutions 8/7 and 7/6 times the optimal, respectively.

■ WC39

M - Truman

Prediction Markets

Sponsor: Optimization/ Networks
Sponsored Session

Chair: David Pennock, Yahoo!, 111 West 40th Street, 17th floor, New York, NY, 10018, United States of America, pennockd@yahoo-inc.com

1 - Can You Beat the Market? Accuracy of Individual and Group Post-prediction Market Judgments

Andreas Graefe, Institute for Technology Assessment and Systems Analysis, Research Center (Forschungszentrum) Karlsruhe, PO Box 3640, Karlsruhe, BW, 76021, Germany, graefe@itas.fzk.de, J. Scott Armstrong

Research with prediction markets indicates that confidence in market results is low. If so, it should be easy to improve market forecasts by posterior adjustments. We conducted experiments to compare market accuracy with posterior individual and group estimates. We hypothesized that posteriors would improve market results. The results were contradictory with our hypotheses: Posteriors were less accurate than the market results. Individuals performed even worse than simple random guessing.

2 - Toward Info Accounting in Prediction Markets

Robin Hanson, Associate Professor of Economics, George Mason University, MSN 1D3, Carow Hall,, Fairfax, VA, 22015, United States of America, rhanson@gmu.edu

Prediction market business cases need numerical estimates not only of costs, but also of business value. This requires estimates not only of accuracy improvements, but also of the associated value of information. Organizations will also need ways to estimate the value contributed by particular traders. Grounded in concrete examples, I consider possible approaches to these information accounting tasks.

3 - Using Prediction Markets to Track Information Flows: Evidence from Google

Eric Zitzewitz, Professor of Economics, Dartmouth, 6106 Rockefeller Hall, Hanover, NH, 03755, United States of America, eric.w.zitzewitz@dartmouth.edu, Bo Cowgill, Justin Wolfers

In the last 2.5 years, Google has conducted the largest corporate experiment with prediction markets we are aware of. In this paper, we illustrate how markets can be used to study how an organization processes information. We document a number of biases in Google's markets, most notably an optimistic bias. Newly hired employees are on the optimistic side of these markets, and optimistic biases are significantly more pronounced on days when Google stock is appreciating. We find strong correlations in trading for those who sit within a few feet of one another; social networks and work relationships also play a secondary explanatory role. The results are interesting in light of recent research on the role of optimism in entrepreneurial firms, as well as recent work on the importance of geographical and social proximity in explaining information flows in firms and markets.

4 - Combinatorial Betting

David Pennock, Yahoo!, 111 West 40th Street, 17th floor, New York, NY, 10018, United States of America, pennockd@yahoo-inc.com

I will survey our attempts to design combinatorial betting mechanisms that support doubly exponentially many allowable bets and propagate information appropriately across logically-related bets. The greater expressiveness comes at a computational cost for the auctioneer, who faces a difficult matching problem. In general, full expressiveness renders the matching problem intractable, though some reasonable restrictions on expressiveness admit polynomial-time matching.

■ WC40

M - Taylor

Advances in Complexity, Linear Programming, and Complementarity

Sponsor: Optimization/ Linear Programming & Complementarity Sponsored Session

Chair: Alexandre Belloni, Assistant Professor, Duke University, The Fuqua School of Business, 1 Towerview Drive, Durham, 27708, United States of America, alexandre.belloni@duke.edu

1 - Geometry, Problem Stability, and Complexity in Convex Optimization

Jorge Vera, Professor, Pontificia Universidad Catolica de Chile, Campus San Joaquìn, Vicuna Mackenna 4860, Santiago, 02142, Chile, jvera@ing.puc.cl, Robert Freund

We consider the problem: given only a separation oracle for a convex set S, compute a point in S. We examine the computational complexity of this problem and its relation to the geometry of S as well as to the stability of S under perturbation/deformation. We show that all of these three interests are inter-related in precise ways, thus showing that "stability", "complexity" and "geometry" are the same for this problem.

2 - On the Total Curvature of the Central Path for Linear Programming

Yuriy Zinchenko, AdvOL, McMaster University, ITB221, 1280 Main str W, Hamilton, ON, L8S4K1, Canada, yzinchen@optserv.cas.mcmaster.ca, Antoine Deza, Tamas Terlaky

By analogy with the conjecture of Hirsch, we conjecture that the order of the largest total curvature of the central path associated to a polytope is the number of inequalities defining the polytope. We prove a continuous analogue of the result of Klee-Walkup, namely, we prove that the special case where the number of inequalities is twice the dimension is equivalent to the general case. We indicate a direction for establishing a polynomial bound on the curvature.

3 - The Complexity of Augmented Lagrangian Method for Convex Programming

Renato Monteiro, renato.monteiro@isye.gatech.edu, Guanghui Lan

In this talk, we discuss the complexity results for a classical optimization algorithm, namely: the augmented Lagrangian method, in the context of a special but broad class of convex programs. In particular, we present specialization of these complexity results in the context of the conic programming problem.

■ WC41

M - Taft

Technology Mangement

Contributed Session

Chair: Manpreet Hora, Student, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6G3H1, Canada, mhora@ivey.uwo.ca

1 - On the Dynamics of Disruptive Technology Adoption

Hartanto Wong, RCUK Academic Fellow, Innovative Manufacturing Research Centre, Cardiff University, Colum Drive, Cardiff, CF10 3EU, United Kingdom, wongh@cardiff.ac.uk, Nazrul Islam, Mohamed Naim

We attempt to enhance the understanding of the dynamics of new-disruptive technology adoption. The paper addresses three main research questions. First, we explore whether the introduction time of the new technology influences the technology substitution process. Second, we examine different factors that may affect the decision to adopt the new technology. Finally, we are interested in identifying circumstances under which the new technology is able to substitute the established technology.

2 - Prediction of Emerging Technologies – Case of Printable Electronics

Srikanth Poranki, PhD Student, Binghamton University, 212 Harding ave, Endwell, NY, 13760, United States of America, sporank1@binghamton.edu, Kaustubh Kalkundri, Nagendra Nagarur

Printable electronics is a new and emerging technology that can be used for producing electronic circuits, with conductive inks. This paper presents the results of various technology forecasting techniques such as Patent analysis, and Delphi method to predict trends and forecast growth of this technology.

3 - Use of Fuzzy Logic in Evaluation of Advanced Technologies

Sharon Ordoobadi, Professor, University of Massachusetts-Dartmouth, 285 Old Westport Road, Dartmouth, MA, 02748, United States of America, sordoobadi@umassd.edu

Intangible risks of adopting a new technology are identified and used in the evaluation process. A process is proposed where decision maker's perceptions on the performance of technology alternatives along with the importance of the relevant risks are solicited in linguistic terms. Fuzzy numbers are then used to represent these linguistic perceptions. Fuzzy arithmetic operators are applied to calculate an aggregate fuzzy score for each alternative.

4 - Low-frequency Operational Failures and Population-level Learning

Manpreet Hora, Student, Richard Ivey School of Business, 1151 Richmond Street North, London, ON, N6G3H1, Canada, mhora@ivey.uwo.ca

Learning curve theory suggests that operational failures will decline with increased experience. However, this theory has not been verified with low-frequency operational failures. To investigate this verification, our study examines a panel data of over 2100 operational failures spanning multiple industries. The results show that learning only occurs under certain industry conditions. Moreover, learning is higher for industries with varied experience in past operational failures.

■ WC42

M - McKinley

Supply Chain Management III

Contributed Session

Chair: Soroosh Saghiri, University of East Anglia, Earlham Road, Norwich, NR44TJ, United Kingdom, s.saghiri@uea.ac.uk

1 - Reliability, Procurement Cost, and Lead Time

Qi Feng, Assistant Professor, The University of Texas at Austin, 1 University Station, B6500, Austin, TX, 78712, United States of America, Annabelle.Feng@mccombs.utexas.edu, Burcu Tan

We consider the problem of sourcing from two unreliable suppliers with procurement costs and lead times. The capacity of each supplier is uncertain upon ordering, which leads to nonconvex cost evaluation of the ordering strategy. We explore the optimal procurement strategy for different levels of net inventory, cost parameters, and supplier reliability.

2 - Mean-variance Analysis of a Supply Chain under Wholesale Pricing and Profit Sharing Scheme

Ying Wei, Post-doctoral Fellow, CORE, Université catholique de Louvain, 34, Voie du Roman Pays, Louvain-la-neuve, 1348, Belgium, ying.wei@uclouvain.be, Tsan-Ming Choi

Most incentive alignment schemes in supply chain management aim at improving the chain's expected profit, and ignore the risk attitude of channel members. Under the mean-variance framework, we analyze a wholesale pricing and profit sharing scheme (WPPS) in a two-echelon supply chain with risk averse agents. We study both the centralized and decentralized cases, and elaborate how WPPS is applied for channel coordination issues. A new measure is also proposed to avoid cheating of the retailer.

3 - Postponement Performance: A Study on Improving Delivery Lead time

Soroosh Saghiri, University of East Anglia, Earlham Road, Norwich, NR44TJ, United Kingdom, s.saghiri@uea.ac.uk

In time postponement, some value adding activities are delayed by the time demand becomes clearer. Shortfall of time postponement is prolonging delivery lead time. To improve the performance of the postponement, this paper develops modified postponement models to postpone forecasting and shipment operations. Inventory and backlogs are defined as models performance criteria. Outcomes shows that modified postponement models have considerable improvement in performance criteria.

■ WC43

M - Balcony D

Operations Management III

Contributed Session

Chair: Biying Shou, Assistant Professor, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong - China, biying.shou@cityu.edu.hk

1 - Improve the Existing Manufacturing Network in the Most Efficient Way

Kun Huang, NC State University, 509-21 Tartan Circle, Raleigh, NC, 27606, United States of America, khuang@ncsu.edu

Max Flow Value problem: Given certain amount of budget, how much can we increase the flow value at most; if there is a cost function associated with each source nodes' capacity? Min Cost Flow problem: Given certain amount of budget, and the requirements of demands at termination nodes; if cost on each arc can be decreased when you make improvement (invest and consequence satisfy certain functions), then, how to allocate this budget to minimize the cost of the flow.

2 - Forecast Horizon for a Two-Product Dynamic Lot-size Problem with Downward Substitution

Yinping Mu, University of Electronic Science and Technology of China, School of Economics & Management, No.4, Sce.2, North Jianshe Road, Chengdu, SC, 610054, China, muyingping@uestc.edu.cn, Milind Dawande, Suresh Sethi

We study a two-product dynamic lot-size problem with downward substitution. We develop a forward algorithm to compute the optimal decision of production and substitute quantity in each period, to minimize setup costs, holding costs and substitute costs. We prove the minimal optimal regeneration points monotonicity properties, which facilitate us to develop a computationally highly efficient forward algorithm for infinite period problem. A computational experiment is provided for the algorithms.

3 - Taking Decisions on Assignment of Tasks with Path Dependent Learning Curves

Jordi Olivella, Assistant Professor, Uni Politècnica Catalunya, Diagonal, 647, planta 11, Barcelona, 08028, Spain, jorge.olivella@upc.edu, Rafael Pastor, Albert Corominas

Performance in doing a task in the learning stage depends on the previous practice on other tasks -learning curve is path dependent. A mathematical program aimed to assign a set of tasks to a set of workers considering path dependent learning curves is presented. Each task has to be completed in a certain term, final knowledge objectives are possible, some tasks can be subcontracted and is possible to hire temporary workers. The model allows obtaining the cost of due dates and final knowledge.

4 - Operations and Supply Chain Flexibility: A Survey

Biying Shou, Assistant Professor, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong - China, biying.shou@cityu.edu.hk

Flexibility refers to the ability to cope with changing environments. It has become a key strategy for firms to cope with variations and improve market responsiveness. Early literature focused on issues related to measurement of flexible manufacturing systems. Recent work in this area studies investments, structure, and operational management of flexible resources (e.g., workers, assembly lines). We review the recent literature and provide insights into interesting future research directions.

■ WC44

M - Balcony C

Manufacturing Systems I

Contributed Session

Chair: Ivo Adan, Associate Professor, Department of Mathematics and Computer Science, Eindhoven University of Technology, HG 9.07, PO Box 513, Eindhoven, 5600 MB, Netherlands, iadan@win.tue.nl

1 - Production Line Throughout Prediction: A Hybrid Aggregation/Decomposition Method

Hatice Ucar, PhD Candidate, Wayne State University, 4815 Fourth St, Industrial & Mfg. Engg Dept, Detroit, MI, 48202, United States of America, hucar@wayne.edu, Alper E. Murat, Ratna Babu Chinnam

Aggregation and decomposition methods have been proposed in the literature for modeling throughput of production lines. In an attempt to improve computational efficiency, we offer a hybrid method that selectively aggregates parts of the production line based on the location of bottleneck machines. We also present performance comparison results from both synthetic and real production lines.

2 - Performance Evaluation of Multi-stage Assembly Lines with Blocking and General Processing Times

Michael Manitz, Dr., University of Colone, Department for Supply Chain Management, and Production, Koeln, 50923, Germany, manitz@wiso.uni-koeln.de

We study flow lines with assembly stations. At such stations, the workpieces from two or more input stations have to be merged to form a new composite part for further processing (synchronization constraint). We consider finite buffer capacities and generally distributed processing times. To approximate the throughput, a queueing-model based decomposition approach is used. It requires a system of decomposition equations. The quality of the presented approach is tested against simulation results.

3 - Optimal Condition-based Maintenance Policies for Systems under Periodic Inspection

Leonardo P. Santiago, Assistant Professor, Federal University of Minas Gerais, Escola de Engenharia, Av. Antonio Carlos, 6627 - Pampulha, Belo Horizonte, MG, 31270-901, Brazil, lsantiago@ufmg.br, Carlos Andrey Maia, Maxstaley L. Neves

This paper focuses on the definition of optimal condition-based maintenance policies for systems subjected to age deterioration and sudden failure. We consider the fact that the inspected condition might not be perfectly detected and propose an algorithm to estimate the input data.

4 - A Survey of Make or Buy Decisions in China-based Manufacturing Enterprises

Bin Xie, Associate Professor, Tsinghua University, School of Economics and Management, Tsinghua University, Beijing, 100084, China, xieb@sem.tsinghua.edu.cn, Huaijun Liu

We present the results of a 2007 survey on the Make or Buy decisions of 31 plants located primarily in Shenzhen area close to Hong Kong. Interviews using a questionnaire in Chinese were employed in terms of asset specificity, uncertainty, transaction volume, strategic importance, relative capacity, standardization, technology dependence and number of suppliers. Information sharing and the level of collaboration between buyers and suppliers were also discussed when making a Buy decision.

5 - Performance Analysis of Production Lines with No Buffers

Ivo Adan, Associate Professor, Department of Mathematics and Computer Science, Eindhoven University of Technology, HG 9.07, PO Box 513, Eindhoven, 5600 MB, Netherlands, iadan@win.tue.nl

We study production lines with no buffers and general process times (with an offset), and develop an efficient method to approximate performance measures such throughput and delay. The approximation is based on decomposition and moment-iteration. Comparison with simulation shows that the method produces accurate estimates. The method can also be applied to production lines with buffers, by treating buffer spaces as machines.

■ WC45

M - Balcony B

Assemble-to-order Systems and Allocation Rules

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management
Sponsored Session

Chair: Yao Zhao, Rutgers University, 180 University Ave, Newark, 07102, United States of America, yaozhao@andromeda.rutgers.edu

1 - No-holdback Allocation Rules for Continuous-time Assemble-to-order Systems

Yao Zhao, Rutgers University, 180 University Ave, Newark, 07102, United States of America, yaozhao@andromeda.rutgers.edu, Yingdong Lu, Jeannette Song

We consider a class of dynamic component allocation rules, termed no-holdback (NHB) rules, in continuous-review, multi-product assemble-to-order (ATO) systems. The lead times are positive and not necessarily identical. We analyzed the optimality condition for this class of rules and developed tools for performance evaluation. We also compared NHB rules to the common used FIFO allocation rule.

2 - Stochastic Programming Based Priority Allocation Rules for the M System

Marty Reiman, Bell Labs, 600 Mountain Ave., Murray Hill, NJ, United States of America, marty@research.bell-labs.com, Mustafa Dogru, Qiong Wang

The M system is an assemble-to-order inventory system with two components and three products. Applying a stochastic programming (SP) based approach that we previously developed, we identify four cost parameter regions for the M system, each of which has a distinct priority allocation rule. We consider allocation policies with and without component reservation. Our allocation rule, coupled with base-stock levels obtained from the SP, performs well in numerical experiments.

3 - Allocation Policies based on Demand Aggregation in an Assemble-to-order System

Yulan Wang, University of Michigan - Dearborn, 19000 Hubbard Drive, Dearborn, MI, United States of America, yulanw@umd.umich.edu, Fernando Bernstein, Gregory DeCroix

We consider an ATO system in which multiple products are assembled from a common component and a set of product-dedicated components. Component capacities are chosen prior to the selling season, and the common component is allocated to the products based on observed demands. We propose a collection of allocation mechanisms involving varying degrees of demand aggregation and explore the impact of the allocation scheme and customer impatience on sales, proﬁts, and capacity decisions.

■ WC46

M - Balcony A

Supply Chain Games

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - A Population Monotonic Allocation Scheme in Joint Replenishment Systems

Jiawei Zhang, Assistant Professor, Stern School of Business, New York University, 44 West 4th Street, 8-66, New York, NY, 10012, United States of America, jzhang@stern.nyu.edu, Xing Hu

We consider joint replenishment systems where retailers belong to different firms or are decentralized divisions of the same firm. The retailers form a coalition and operate in a centralized manner in order to reduce cost. This paper addresses the issue of how to allocate the cost of the coalition among the retailers. We propose a cost allocation scheme under which no retailer would be worse off when a new retailer joins the coalition.

2 - Auctions for Competitive Capacity Allocation and Scheduling

Zhixin Liu, University of Michigan - Dearborn, zhixin@umd.umich.edu, Nicholas G. Hall

We consider a capacity allocation and scheduling problem, and design an ascending auction mechanism to allocate capacity to the various jobs. We introduce flexible time blocks as markets goods, demonstrate the effectiveness and efficiency of our auction mechanism, and develop fast solution procedures for the winner- and bid-determination problems. We show that flexible time block auctions provide efficient schedules, and investigate tradeoffs in the facility owner's choice of market good.

3 - Geometric Rounding and Resource Allocation Problems

Dongdong Ge, Stanford University, 37 Angell Ct Apt 201, STANFORD, CA, 94305, United States of America, dongdong@stanford.edu, Simai He, Zizhuo Wang, Yinyu Ye, Shuzhong Zhang

This paper presents a general technique to develop approximation algorithms for resource allocation problems with integral assignment constraints. The core of the method is a randomized dependent rounding scheme, called geometric rounding. We apply this method to solve the winner determination problem in a single-minded combinatorial auction and prove its advantage on sparse auctions. It also provides theoretical bounds for the multi-unit combinational auction problem.

4 - Supply Uncertainty and the Reverse Bullwhip Effect

Ying Rong, Post-Doc, University of California, Berkeley, IEOR, Berkeley, CA, 94720, United States of America, yir204@lehigh.edu, Max Shen, Lawrence V. Snyder

We postulate the existence of a "reverse bullwhip effect" (RBWE) that occurs in the presence of supply uncertainty. Whereas the classical bullwhip effect (BWE) describes an increase in demand/order volatility as one moves upstream in the supply chain, the RBWE describes the opposite. Our model is based on the "rationing game" discussed by Lee, et al. (1997); we show that the RBWE occurs in this setting and reconcile this observation with Lee, et al.'s result that the BWE occurs instead.

■ WC47

M - Hoover

Process Improvement in the Hospitals

Contributed Session

Chair: Mark Isken, Associate Professor of MIS, Oakland University, School of Business Administration, Rochester, MI, 48307, United States of America, isken@oakland.edu

1 - Developing Hospital's Operating Unit Efficiency Measures

Antti Peltokorpi, Helsinki University of Technology, PO Box 5500, TKK, 02015, Finland, antti.peltokorpi@tkk.fi, Paulus Torkki, Vesa Kämäräinen

The study focuses on developing measures for hospital's operating unit efficiency. Resource utilization, output, quality and productivity measures were tested in order to evaluate how well they fill the criteria for good performance measure. Output/input-measure that considers an input as used personnel resources and an output as standardized surgeries was founded to be the best measure. This measure is objective and measurable. It can be easily derived from organization's mission and strategy.

2 - Go with the Flow: Constructing Patient Flow Paths from Health Information Systems Data

Renata Konrad, Purdue University, 315 N Grant Street, West Lafayette, IN, 98052, United States of America, rkopach@purdue.edu, Mark Lawley

For every hospital patient, electronic messages are generated regarding much of what happened to the patient. We present a methodology to reconstruct patient flow from these messages. This information is used to create an expression for expected resource consumption by diagnosis for duration of the visit. By modeling patient flow, this research lays the groundwork for future modeling of a hospital's operating environment, while providing insight into system wide waits and delays.

3 - Non-myopic Optimal Policy and Its Approximation for Sequential Clinical Scheduling with No-show

Ji Lin, Purdue University, Weldon School of Biomedical Engineering, West Lafayette, IN, 47907, United States of America, lin35@purdue.edu, Kumar Muthuraman, Mark Lawley

Patient no-show is a significant problem in clinical operations. Overbooking can be used to compensate for no-show effects. Myopic overbooking policy does not consider the future call-in pattern. To create the best schedule by using this useful information, we develop a MDP model and non-myopic optimal policy for Clinical Overbooking scheduling. It can be solved by Dynamic Programming. To overcome the high computational complexity, we apply approximation algorithms to solve the problem.

4 - Simulation Analysis of Empty Management Policies in Hospital Based Pneumatic Tube Systems

Mark Isken, Associate Professor of MIS, Oakland University, School of Business Administration, Rochester, MI, 48307, United States of America, isken@oakland.edu, Steve Littig

We present a framework for simulating hospital pneumatic tube systems using a collection of open source software tools. The model was used to explore the tradeoffs between various empty management policies and important system performance measures such as blower utilization and carrier wait times. We will also discuss the use of this modeling framework to explore other operational aspects of pneumatic tube systems including priority setting and general traffic analysis.

■ WC48

M - Coolidge

Flexibility Issues in Technology Management

Sponsor: Technology Management
Sponsored Session

Chair: Yingxia Yang, MIT, 550 memorial drive, apt 11b-3, Cambridge, MA 02139, United States of America, yingxia@mit.edu

1 - Simple Case Study of Multi-level Manufacturing Flexibilities Decision Making during Planning Stage

Yingxia Yang, MIT, 550 Memorial Drive, Apt 11b-3, Cambridge, MA 02139, United States of America, yingxia@mit.edu

This paper will use a simple case to study (1) the importance to incorporate uncertainty analysis during planning stage to make manufacturing flexibility decisions (2) the value of flexibility to manufacturing systems (3) the interactions between different flexibility sources and their impacts on decision making during planning stage.

2 - The Use of Flexible Manufacturing Capacity in Pharmaceutical Product Introductions

Asad Ata, Southern Methodist University, HQMO3D36, 919 Hidden Ridge, Irving, TX, 75038, United States of America, ata.asad@gmail.com, Eli Snir, Chester Chambers

This work considers the value of the flexibility offered by production facilities that can easily be configured to produce new products. The focus of this work is on technical uncertainty in the context of risky new product development in the pharmaceutical industry. A stochastic dynamic optimization problem is formulated to analyze the optimal capacity and allocation decisions for a flexible facility. An optimal policy solution to this problem is obtained using Linear Programming.

3 - Design of Partially Flexible Systems for Substitutable Products

Betul Lus, Graduate Student, University of Massachusetts, 160 Governors Drive, Elab 213 A, Amherst, MA, 01003, United States of America, blus@acad.umass.edu, Ana Muriel

We explore the design of production networks under demand uncertainty, pricing flexibility and product substitution. The production of substitutable products in different plants helps the firm improve its performance by diverting demand from one product to its substitute, and thus from one plant to another, through pricing. We show that production network designs that exploit product substitution in this way result in higher profits and require lower capacity investments.

4 - Understanding and Designing for the Uncertainties in the Development of Large Complex Products

Qi Van Eikema Hommes, General Motors, 30500 Mound Rd., MC 480-106-256, Warren, MI, 48322, United States of America, qi.hommes@gm.com

This study surveyed a number of literatures concerning design for flexibility. A summary of the approaches in the literatures is made to answer the following questions: (1) what uncertainties does product development have to address? (2) Which existing design methods address which type of the uncertainties? (3) At what time of the product development process is each design for flexibility method effective? Areas for further research are discussed.

■ WC49

M - Harding

Simulation and Optimization Methods

Contributed Session

Chair: Honggang Wang, Purdue University, 218 Grissom Hall, School of Industrial Engineering, West Lafayette, IN, 47907, United States of America, wang75@purdue.edu

1 - Simulation Based Optimization via Golden Region Search

Alireza Kabirian, PhD Candidate, Iowa State University, IMSE Department, Black Engineering, Ames, IA, 50011, United States of America, a_kabirian@yahoo.com, Sigurdur Olafsson

We propose a new simulation based optimization method called Golden Region (GR) search for continuous problems. GR partitions the feasible region into a number of (sub) regions and selects one region at a time for further search based on the quality and distribution of already simulated points and the result of scanning the response surface via a metamodel. We prove the asymptotic convergence of GR to the global optimum and study its efficiency through numerical examples.

2 - Simulation Optimization Based on Evolutionary Algorithms and Kriging

Heping Liu, PhD Student, Auburn University, 3301 Shelby Center, Auburn University, Auburn, AL 36849, United States of America, liuhepi@auburn.edu, Saeed Maghsoodloo, Alice E. Smith

Evolutionary Algorithms (EAs) are effective simulation optimization tools. However, EAs must frequently evaluate fitness functions, which can exhaust computation resources if running a simulation model is expensive. This paper explored adopting known observations to fit a computationally efficient Kriging metamodel to temporarily replace the actual simulation model to evaluate inputs. The goal is to significantly reduce computation effort while achieving good optimization performance.

3 - Linear Interpolation Search for Discrete Stochastic Optimization

Honggang Wang, Purdue University, 218 Grissom Hall, School of Industrial Engineering, West Lafayette, IN, 47907, United States of America, wang75@purdue.edu, Bruce Schmeiser

We consider a class of "smooth" discrete stochastic optimization where the objective function can be estimated only by a simulation oracle. We propose a family of methods based on linear-interpolation search embedded in a retrospective-optimization framework. Numerical experiments show that such methods find good solutions for a wide-class of problems quickly, while still allowing for convergence.

4 - Simulation of New Products Diffusion in Duopoly Market Based on Heterogeneous Cellular Automata

Ting Zhang, Visiting Scholar, Northeastern University; Xi'an Jiaotong University, 360 Huntington Ave, 202 HA, Boston, MA, 02115, United States of America, t.zhang@neu.edu, Baojun Gao

This research built a multi-products diffusion model using heterogeneous CA and simulated the external influence as the advertising strategy and the internal influence as the word-of-mouth between customers. The research explored the influence of wom, initial condition, and the potential market size, on the effect of advertising strategy and the diffusion process. The results informed that at the very initial launch, advertising is much more important than wom, which is the key for takeoff.

■ WC50

M - Wilson C

Mixed Integer Programming and Extensions

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Lizhi Wang, Iowa State University, 3016 Black Engineering, Iowa State University, Ames, IA, 50011, United States of America, lzwang@iastate.edu

1 - A Stochastic Optimization Method for Supply Chain Inventory Coordination under Private Information

Eric Beier, PhD Student, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ebeier@tamu.edu, Lewis Ntaimo

We present a method for supply chain inventory control designed to facilitate global coordination under private information restrictions and stochastic demand. In such a system, competition, confidentiality, etc, prevent a global view of the system. We decompose the system into private nodal MIP and stochastic MIP subproblems. Lagrangian relaxation and subgradient optimization facilitate negotiation between the nodal decisions without any entity gaining access to the private information.

2 - Inverse Mixed Integer Linear Programming

Lizhi Wang, Iowa State University, 3016 Black Engineering, Iowa State University, Ames, IA, 50011, United States of America, lzwang@iastate.edu

An inverse optimization problem is to minimally perturb the objective function of a mathematical program to make a feasible solution optimal. Inverse linear programming has been well studied. This paper presents cutting plane and heuristic algorithms for inverse mixed integer linear programming. Computational experiment results are reported.

3 - On Equivalent Reformulations for Absolute Value Equations and Related Problems

Oleg Prokopyev, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, droleg@pitt.edu, Sergiy Butenko, Andrew Trapp

We study absolute value equations (AVE) of the form $Ax+B|x|=c$. This problem is known to be NP-hard. We discuss relations of AVE with linear complementarity problem and mixed integer programming. Related problems in checking solvability of linear interval equations and inequalities are also considered.

4 - Numerical Algorithms for Solving MPEC Models Used Analyzing the Potential Impacts of PHEVs on LMPs

Anhua Lin, Assistant Professor, Middle Tennessee State University, 1301 East Main Street, Murfreesboro, TN, 37132, United States of America, alin@mtsu.edu, Lizhi Wang

The potential impacts of plug-in hybrid electric vehicles (PHEVs) on locational marginal prices (LMPs) can be modeled as a special kind of mathematical programs with equilibrium constraints (MPEC). This type of MPEC problems are highly structured. In this paper we will present some theoretically sound MPEC algorithms (for solving small and medium size problems) and certain heuristic algorithms (for solving large ones) that can exploit the structure of these problems.

■ WC51

M - Wilson B

IT-enabled Process Transformation and Strategic Renewal in Healthcare Organizations

Sponsor: Information Systems
Sponsored Session

Chair: Abhay Mishra, Visiting Assistant Professor, Carnegie Mellon University, David A. Tepper School of Business, Carnegie Mellon University, Pittsburgh, PA, 15213, United States of America, anmishra@andrew.cmu.edu

1 - Understanding the Relationship among Strategy, IT, and Performance in the Health Care Context

Lorraine Lee, UNCW, 601 S. College Road, Wilmington, NC, 28403, United States of America, lorraine_lee@moore.sc.edu, William Kettinger, Rajiv Kohli

Increasing competition is requiring hospitals to increase IT investments and offer differentiated services while also controlling costs. We identify three strategic groupings of U.S. hospitals based on cost leadership and differentiation and test a proposition that a combinational strategy rather than strategically striving for two extremes will have the strongest impact of IT investment intensity on hospital performance.

2 - Social Networks and Adapting to IT-enabled Change: The Case of Healthcare Information Technologies

Roopa Raman, PhD Candidate, Emory University, Goizueta Business School, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, roopa_raman@bus.emory.edu

Adapting to changes introduced by healthcare information technologies in patient-care work processes is challenging. This makes assimilation of the technology difficult, as evidenced by disparity in the extent of adaptation to IT-enabled process changes among patient-care units within the same hospital. Using the principles and methods of social network analysis, I explore the relational factors underlying such inter-unit variations in adaptability to IT-enabled process change.

3 - Sustainable Rural Telehealth Innovation – A Public Health Case Study

Rajendra Singh, Doctoral Student, Georgia State University, Robinson College of Business, 35 Broad Street, NW, Atlanta, GA, 30302, United States of America, raj.singh@ceprin.gsu.edu, Max Stachura, Elena Khasanshina, Lars Mathiassen

This research examines the process of integrating telehealth into the clinical and administrative routines of a rural public health district. We use the theory of punctuated equilibrium as expressed in the encounter-episode framework to present and make sense of the innovation process. Results suggest that extensive collaboration within and across institutional boundaries, and a combination of technology-push and opportunistic-pull can help create sustainable rural telehealth innovation.

4 - Product Customization and Customer Service Cost: An Empirical Analysis

Anuj Kumar, PhD Student, Carnegie Mellon University, 4800 Forbes Avenue, 243 HBH, Pittsburgh, PA, 15213, United States of America, akumar1@andrew.cmu.edu, Rahul Telang, Sunder Kekre

We examine the link between product customization and firm's cost to serve customers via call center at a major US health insurance firm. Process of customization is such that it increases users' familiarity with his coverage and improves the fit with his medical needs - reduces his incentives to call the firm's call center. Our results show that users with customized policies call 30% less frequently than users with standard plan - customized products may be operationally cheaper to serve.

■ WC52

M - Wilson A

Joint Session Humanitarian/WORMS: Getting Involved in Community, Humanitarian, or Public Service Research (Panel)

Cluster: Humanitarian Logistics and Disaster Preparedness, Women in OR/MS
Invited Session

Chair: Julie Swann, Associate Professor, Georgia Institute of Technology, Atlanta, GA, 30318, United States of America, jswann@isye.gatech.edu

Co-Chair: F. Sibel Salman, Assistant Professor of Industrial Engineering, Koc University, Rumeli Feneri Yolu 34450 Sariyer, Istanbul, NA, 34450, Turkey, ssalman@ku.edu.tr

1 - OR in Public Programs and Processes

John Hall, Assistant Vice President - Fire Analysis & Research, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 02169-7471, jhall@NFPA.org, Doug Samuelson

The mission of the InfORMS Section on Public Programs and Processes embraces a wide range of national, state, and local government functions, with special emphasis on criminal justice, public safety, homeland security, and the operations involved in government services. Two current officers of the section will give examples of particular relevance to humanitarian applications and to chapter officers looking to find speakers.

2 - Humanitarian Logistics- Challenges and Opportunities

Prashant Yadav, Professor of Supply Chain Management, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, pyadav@zlc.edu.es

This talk gives an overview of the current challenges in humanitarian logistics and discusses how operations research and management science applications can have a positive impact. Topics include modeling the spread of flu pandemic and preparing for food distribution and pre-positioning inventory for emergency response.

3 - Operations Research and Non-profit Organizations

Burcu Balcik, Postdoctoral Fellow, Norhwestern University, 2145 Sheridan Road, Evanston, IL, United States of America, burcub@u.washington.edu, Seyed Iravani, Karen Smilowitz

This talk reviews the unique characteristics of non-profit organizations, with particular reference to public, private, and community-based organizations. We discuss specific examples from the operations research literature that consider equity issues in non-profit organizations. Finally, we present areas of future work.

■ WC53

M - Nathan Hale- Wardman Tower

Financial Optimization and Applications

Cluster: Financial Engineering/Risk Management
Invited Session

Chair: Chanaka Edirisinghe, Professor, University of Tennessee, College of Business, Knoxville, TN, 37996, United States of America, chanaka@utk.edu

1 - Mixture Distribution Scenarios for Investment Decisions with Downside Risk

Gautam Mitra, Brunel University, CARISMA, Uxbridge, United Kingdom, Gautam.Mitra@brunel.ac.uk

We propose an integrated model for portfolio choice, where downside risk is considered explicitly in both scenario generation and optimization. Scenarios are generated using a mixture distribution of asset returns where lower tails and dependence are captured using copula functions while upside returns are modeled via multivariate GARCH. The model is an extended mean-variance approach, with a CVaR constraint. Computational results are presented for portfolios of ETFs of equity indices.

2 - Application of Interactive Surrogate Constraint Method to Index-plus-alpha Portfolio Optimization

Yuji Nakagawa, Professor, Kansai University, Department of Informatics, Takatsuki-shi, 569-1095, Japan, nakagawa@res.kutc.kansai-u.ac.jp, Ross James, Cesar Rego, Fred Glover

We present an interactive surrogate constraint method to solve non-separable non-convex optimization problems. The method is applied to index-tracking optimization problems of two variants of the index-plus-alpha-funds model. The fund tracks a market benchmark with respect to monthly return and

outperforms it by a small amount, alpha. The two index fund models are applied to the Tokyo Stock Market where high quality portfolios were found for the Japanese 225 NIKKEI stocks and 1440 TOPIX stocks.

3 - A Real Options-based Analysis for Quality Control

Wahab Ismail, Assistant Professor, Ryerson University, Mechanical and Industrial Engineering, Toronto, ON, M5B 2K3, Canada, wahab@ryerson.ca

We develop an option valuation framework for a manufacturing process and study how quality control strategy could be implemented when there are uncertain demand, uncertain price, and a stochastic product life cycle for a product in the market. This study helps decision makers understand how the profitability associated with quality control strategy varies with given uncertainties.

4 - Input/Output Selection in DEA for Portfolio Optimization: Optimality Conditions and Solution Methods

Xin Zhang, Assistant Professor, Austin Peay State University, School of Business, Clarksville, TN, 37043, United States of America, zhangx@apsu.edu, Chanaka Edirisinghe

This paper develops a framework for modeling input/output selection for DEA models of internal performance of a firm via an optimization of an external reward measure. First-order optimality conditions are derived and are used to develop solution algorithms. These local optimal solutions are further improved using theoretical properties of the global optimal solutions. The methodology is applied in financial optimization models to demonstrate the quality of the resulting portfolio selections.

5 - Portfolio Risk Control under Optimization-based Stock Screening: Case of U.S. Market Sectors

Chanaka Edirisinghe, Professor, University of Tennessee, College of Business, Knoxville, TN, 37996, United States of America, chanaka@utk.edu, Xin Zhang

Portfolio risk control is closely tied to the quality of selection of securities. This paper first describes a stock screening procedure based on optimization-based fundamental financial analysis of firms. Stock selections are subject to portfolio analysis under variety of risk metrics. Under tightened stock screening procedures, portfolio risks are well-managed even under relaxed risk control methods. Computational results are provided using US stock data of over 800 stocks for 9 major sectors.

■ WC54

M - Congressional - Wardman Tower

Metaheuristics and Optimization

Contributed Session

Chair: Alberto Garcia-Diaz, Professor, University of Tennessee, Knoxville, Industrial & Information Engineering, ESH 410, Knoxville, TN, 37996-0700, United States of America, agarcia2@utk.edu

1 - A Multiple Objective Evolutionary Algorithm for Power Systems Planning

Jose Espiritu, Assistant Professor, The University of Texas at El Paso, 500 West University Avenue, El Paso, TX, 79902, United States of America, jfespiritu@utep.edu

A new multiple objective evolutionary algorithm to solve design allocation problems commonly found in the power systems area is presented. The algorithm uses the universal moment generating function approach to evaluate the system availability. Therefore, system availability is represented by a multi-state availability function which extends the traditional binary state availability. Two different multiple objective problems are presented to show the performance of the algorithm.

2 - Determining Optimal Configurations of Multi-Task Production Systems: A Multiple Objective Approach

Heidi Taboada, Assistant Professor, The University of Texas at El Paso, 500 W. University Av., College of Engineering, A110, El Paso, TX, 79902, United States of America, hataboada@utep.edu

A new multiple objective evolutionary algorithm to determine optimal configurations of multi-state, multi-task production systems based on availability analysis is proposed. Availability can be used in the context of multi-task production systems to select a particular configuration that maximizes the probability of meeting a required demand for each specific task. The problem is treated as a multi-objective optimization problem. A Pareto-optimal set is presented as the solution to this problem.

3 - Improving NSGA-II for Solving the Biobjective Traveling Salesman Problem with Profits

Serdar Karademir, Associate Professor, Middle East Technical University, Industrial Engineering Department, ANKAAR, Turkey, karademirs@gmail.com, Haldun Süral, Esra Karasakal

We consider a routing problem where a profit is assigned to each city and it is not required to visit all cities. The aim is to minimize cost and maximize profit. We therefore study the biobjective problem using the genetic algorithm NSGA-II and the Lin-Kernighan heuristic. We propose several improvements and provide computational results for the Pareto-near-optimal fronts on a set of test instances. We also provide a framework for post-optimality analysis using data mining.

4 - A Network Flow Approach for Crane Scheduling Problem in a Shipbuilding Environment

Shu Zhang, Mississippi State Unversity, PO Box 9542, Mississippi State, MS39762, Starkville, United States of America, sz51@msstate.edu, Sandra Eksioglu

This talk describes a network flow approach for scheduling cranes in a shipbuilding environment. Cranes transport materials and perform lifts on a shared network. Inter-crane interference affects project makespan and crane utilization. The problem is modeled as a multi-commodity flow problem on a time-space network. The IP formulation of this problem is solved using CPLEX. A Lagrangean decomposition-based algorithm is developed which shows to give good quality solutions in reasonable time.

5 - Cost Minimization in Generalized Networks with Variable Lower Bounds

Alberto Garcia-Diaz, Professor, University of Tennessee, Knoxville, Industrial & Information Engineering, ESH 410, Knoxville, TN, 37996-0700, United States of America, agarcia2@utk.edu, Xiaoyan Zhu

A non-linear generalized-network methodology minimizes costs given demands, operation cost per unit of commodity for each distribution channel, and bounds on product flow on each of these channels. It is assumed that lower bounds are conditional, that is, only enforced when economically effective. Otherwise, channels are closed. Examples of distribution channels are pipelines for oil or natural gas, physical routes for vehicles with specialized containers, data transmission lines, etc.

■ WC55

M - Room 8217

Air Traffic Control and Management

Contributed Session

Chair: Alex Huang, Senior Systems Engineer, Sensis Corporation, 1700 Dell Avenue, Campbell, CA, 95008, United States of America, alex.huang@sensis.com

1 - Implementing Best Practices in Program and Portfolio Management at the FAA

Giovanni Carnaroli, Program Director, Federal Aviation Administration, 800 Independence Avenue, SW, Orville Building, room 712, Washington, DC, 20591, United States of America, giovanni.carnaroli@faa.gov

The modernization of the air traffic control system has challenged the FAA to implement best practices in program and portfolio management. The presentation will cover the IT Investment Management model that guides our best practices, how investment analysis and capital planning processes are performed, and the tools and information gathered to develop consistent metrics and criteria for evaluating and comparing the costs, risks, and benefits of different investment portfolios.

2 - A Model for Determining SFO GDP End Times Using a Probabilistic Forecast of Stratus Clearing

Lara Cook, Principal Analyst, Mosaic ATM, Inc., 33764 Old Trail Dr., Yucaipa, CA, 92399, United States of America, cook@mosaicatm.com, Cedric Walker, Bryan Wood

We explore an approach for using the probabilistic forecast of stratus clearing time at SFO to achieve more efficient Ground Delay Programs (GDPs). Given a probabilistic forecast, we use a Monte-Carlo simulation approach to generate likely stratus clearing times. Various key measures are included in the objective function such as unnecessary delay and the risk of airborne holding. Initial results show potential reductions of up to 32% of issued ground delay and 41% of delayed flights.

3 - Estimating Future Annual Flight Delay Distribution from a Sample of Daily Delays

Dou Long, Research Fellow, Logistics Management Institute, 2000 Corporate Ridge, Mclean, VA, United States of America, dlong@lmi.org, Shahab Hasan, Jing Hees

Based on the assumptions of the shape invariability of annual flight delay distribution and the same weather patterns in the target future year, we present a methodology for estimating the future annual delay distribution from the daily delays generated by a simulation model in a set of sample days. Included are the statistics supporting the modeling hypothesis, the calibration of flight delays from simulation models, the discussion of the model sensitivity, and a case study.

4 - A Configuration Method of Six MEMS Gyroscopes based on Regular Tetrahedron for FDIR

RuiHua Liu, Professor, Civil Aviation University of China, No. 2898,JinBei Road,TianJin, TianJin, 300300, China, rhliu_cauc@163.com

This paper introduces a configuration method of 6 MEMS-gyros based on regular tetrahedron for fault detection, isolation and reconfiguration (FDIR). The structure is so simple that the six gyros are only required to mount along the six diagonal lines of the cube(or the six edge of the regular tetrahedron). The measurement equation and parity equations offered in this paper can be used to detect, identify and isolate one, two, or even three fault gyros.

5 - NextGen Concept Evaluation Using AvDemand Demand Generation and Fast-time Simulation Models

Alex Huang, Senior Systems Engineer, Sensis Corporation, 1700 Dell Avenue, Campbell, CA, 95008, United States of America, alex.huang@sensis.com, Gregory Carr, Fred Wieland, Kris Ramamoorthy, Eric Wendel, George Hunter

To evaluate the performance of various future air traffic management concepts, a framework of performance evaluation is required. This presentation describes the process of demand generation, the mechanism of a fast-time simulation model (ACES), and example results from the use of these models in support of the JPDO and NASA studies.

■ WC56

O - Blue Room

Joint Session TSL/AAS: Aircraft Rerouting Models

Sponsor: Transportation Science & Logistics, Aviation Applications Sponsored Session

Chair: Bert Hackney, Metron Aviation, Inc., 45300 Catalina Court, Dulles, VA, 20166, United States of America, hackney@metronaviation.com

1 - Robustness of Aircraft Rerouting Strategies: Coevolutionary Approach

Rafal Kicinger, Metron Aviation, Inc., 45300 Catalina Court, Sterling, VA, 20166, United States of America, kicinger@metronaviation.com, Babak Khorrami, Joe Prete, Steven Penny

This presentation will introduce a coevolutionary framework for generating robust rerouting strategies for the NAS operating in inclement weather. It utilizes coevolutionary algorithms to concurrently search the solution spaces of rerouting strategies and hazardous weather scenarios. By using this approach, air traffic managers can achieve two key strategic objectives: identification of robust rerouting methods and vulnerabilities of the NAS with respect to certain weather conditions.

2 - Resource Allocation in Flow-constrained Areas with Stochastic Termination Times

Moein Ghanji, PhD Student, UMD, 3429 Tulane Dr., Apt 24, Hyattsville, MD, 20783, United States of America, moein_g@yahoo.com

We formulate an optimization problem for the assignment of dispositions to flights whose preferred flight plans pass through a FCA. Each flight can either depart on time via a secondary route avoiding the FCA, or use the originally intended route but depart with a ground delay. The model is a stochastic program that represents the time of a possible capacity windfall as a random variable. The goal is to minimize the expected cost over the entire distribution of possible capacity increase times.

3 - Optimal Reroute Strategy under Weather Uncertainty

Yoonjin Yoon, UC Berkeley, 107D McLaughlin Hall, Berkeley, CA, United States of America, yoonjin@berkeley.edu, Mark Hansen

Under adverse weather conditions on the schedule route such as storm activity, reduction in sector capacity is inevitable. In this research, we set up a geometric model to find an optimal reroute strategy assuming sectors in the storm regions have no capacity. We find an optimal take-off angle by solving a non-linear stochastic optimization, given probabilistic weather forecast. Analytic solutions are presented to understand correlations and sensitivity of relevant parameters and solution.

4 - Finding Alternative Routes between Airports under Weather Uncertainty

Wanjira Jirajaruporn, UC Berkeley, 107-E McLaughlin Hall, University of California, Berkeley, CA, 94720, United States of America, iamaung@yahoo.com

The stochastic dynamic ground-holding and rerouting model has been developed to enhance strategic planning tools, Ground Delay Programs and National Playbook for rerouting. The model combines the ground-holding and rerouting and is formulated as a heuristic shortest path problem. The probabilistic model generates flyable probabilities of storms from weather forecast. The ground-holding and rerouting model is implemented on the NAS network using results of the probabilistic model as its input.

■ WC57

O - Blue Room Prefunction

Enviromental and Safety Issues in Aviation

Contributed Session

Chair: Terry Thompson, Director, Strategic Development, Metron Aviation, 45300 Catalina Court, Suite 101, Dulles, VA, 20166, United States of America, thompson@metronaviation.com

1 - Assessing Impacts on Airline Fleet Emissions and Direct Operating Costs through Aircraft Allocation

Isaac Tetzloff, Graduate Research Assistant, Purdue University, 701 W Stadium Ave, School of Aeronautics and Astronautics, West Lafayette, IN, 47907-2045, United States of America, isaact@purdue.edu, William Crossley

Using fuel burn (as a surrogate for CO2 emissions) and direct operating costs as objective and constraint functions, the study assesses the impact of fleet-level emissions restrictions on the optimal aircraft allocation of U.S. domestic flights. This study also explores how new aircraft and / or new technology affect the optimal allocation in the presence of emissions restrictions. Impacts are measured relative to a representation of airline operations amongst the "102 LMINET" airports in 2005.

2 - The Computation of Safe Separation on Cross Track

Zhaoning Zhang, College of Air Traffic Management, Civil Aviation University of China, Road Jinbei 2829,CAUC,Tian Jin, China, Tian Jin, TJ, 300300, China, zzhaoning@263.net, Lili Wang

The inverse problem of safety evaluation for flight separation is studied, and the safe separation through establishing a collision risk model under the condition of a given safe target level can be obtained. The existed collision risk models on crossing track has been improve for computing safe separation between two flights,by the same step iterative arithmetic on the improved models, and the arithmetic is simple and practical for improved model calculations.

3 - Impact of Airport Noise Regulations and Noise-reduction Technology on Fleet Allocation

Prakash Dikshit, Graduate Research Assistant, Purdue University, School of Aeronautics and Astronautics, 701 W. Stadium Ave., West Lafayette, IN, 47907-2045, United States of America, pdikshit@purdue.edu, William Crossley

With growing noise awareness, airports and airlines may face increasing noise regulations. Using a representation of airline operations amongst the "102 LMINET" US airports in 2005, this study investigates the impact of noise regulations and of new technology on airport noise levels and fleet allocation. The approach is a part of a tool that will help policy makers and technology developers quantify fleet-level impacts of noise regulations and/or new technology on airline operations.

4 - Environmental Modeling for Next Generation Air Transportation High Density Case Study

Terry Thompson, Director, Strategic Development, Metron Aviation, 45300 Catalina Court, Suite 101, Dulles, VA, 20166, United States of America, thompson@metronaviation.com, Michael Marcolini, Michael Graham, Jeremiah Creedon

JPDO’s Systems Modeling & Analysis Division recently completed a NextGen High Density case study. As a part of that study, an environmental assessment has been performed. Noise exposure, in terms of number of people exposed to >65 dB DNL, was computed for the 34 CONUS OEP airports. In addition, fuel efficiency, in terms of Tg of fuel per Bkm flown, was also computed for the top 100 CONUS airports. These results will be compared with a 2006 baseline based on real traffic at those airports.

■ WC58

O - Capital

Assessing the Effectiveness of Aviation Capital Improvements

Sponsor: Aviation Applications Sponsored Session

Chair: Fran Melone, Manager, Operations Research, Federal Aviation Administration, 800 Independence Ave. SW, Washington, DC, 20591, United States of America, fran.melone@faa.gov

1 - An Upper Bound Look at FAA NEXTGEN Benefits
Marc Rose, Sr. OR Analyst, MCR LLC, 600 Maryland Ave, SW, Washington, DC, 20024, United States of America, marc.rose@baesystems.com

An examination of the claimed capabilities (capacity increase) of the FAA NEXTGEN program. This presentation will assume that NEXTGEN achieves the desired capabilities. Given that assumption, what is the magnitude of the benefits (primarily delay savings). This paper will address this in only the broadest of terms As a secondary look at some of the risks to achieving these capabilities (e.g., impact of uncertainties like wind and weather forecasts).

2 - Measuring Operational Performance of Selected FAA Weather Programs through Data Analysis
Dan Citrenbaum, Operations Research Analyst, Federal Aviation Administration, 14709 Silverstone Drive, Silver Spring, Md, 20905, United States of America, daniel.citrenbaum@faa.gov

The CIWS and the ITWS are two of FAA's weather systems expected to improve NAS performance in convective weather. These two products, which assist controllers and traffic managers with better forecasting capabilities, have been estimated to deliver benefits, i.e.,delay savings. This paper overviews our validation using data analysis versus modeling. These "data validations" compare the difference in operational performance duing the pre-acquisition period and the post-acquisition period.

3 - National Airspace System (NAS) Flow Analysis Model
Nastaran Coleman, Sr. OR Analyst, Federal Aviation Adminstration, 800 Independence Ave, SW, Washington, DC, 20591, United States of America, nastaran.coleman@faa.gov, Marc Rose

Modeled NAS including all its airports, fixes and routes as a network. Determined NAS capacity, i.e. maximum number of aircraft traveling using the Max Flow algorithms. This model can be used to evaluate potential benefits or disadvantages of various natural and artificial interventions such as reducing en-route separation standards, increasing airport capacities, utilizing regional airports, smoothing traffic, and disruptive weather phenomena.

4 - Post-implementation Review of RNAV Standard Terminal Arrival Routes into Washington National Airport
Jonathan Green, Operations Research Analyst, FAA, 800 Indepenence Ave., SW, Washington, DC, United States of America, jonathan.m.green@faa.gov

In an effort to examine the value of Area Navigation (RNAV) Standard Terminal Arrival Routes (STARs), a Post-Implementation Review (PIR) was conducted of Washington National Airport (DCA) using analysis of flight data.

■ WC59

O - Embassy Room

Learning and Distribution-free Methods in Revenue Management

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Lian Yu,University of California, Berkeley, Department of Industrial Engineering, Berkeley CA, United States of America, liany@ieor.berkeley.edu, Andrew Lim, J. George Shanthikumar

1 - Using Competitive Analysis of Online Algorithms in Revenue Management: A Modeling Perspective
Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu, Yingjie Lan, Michael Ball, Huina Gao

In our recent work, we successfuly used competitive analysis of online algorithms to design new distribution-free methods for capacity control in revenue management. This talk summarizes the modeling choices we made and the challenges encountered in extending our results.

2 - Objective Operational Learning in Inventory Control
Lian Yu, University of California, Berkeley, Department of Industrial Engineering, Berkeley, CA, United States of America, liany@ieor.berkeleyl.edu, Andrew Lim, J. Geoerge Shanthikumar

Suppose the demand depends on the inventory level. Any learning approach that ignores this dependency may be subject to spiral down effects. We present an objective operational learning approach where the operational order quantity determined by this approach will converge to the optimal order quantity.

3 - Revenue Optimization Algorithm with Adaptive Learning
Soonhui Lee, PhD Candidate, Northwestern university, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, soonhui@u.northwestern.edu, Tito Homem-de-Mello, Anton Kleywegt

We discuss stochastic optimization problems that involve unknown dependencies between control and random variables, where we lack information about both the distribution of uncertainty and the exact form of revenue function. We study adaptive algorithm that provides the decision which converges to the true optimal solution with learning demand and optimizing revenue iteratively.

4 - Non-parametric Inventory Control with Censored Demand
Woonghee Tim Huh, Columbia University, 500W 120th Street, MC 4704, New York, NY, 10027, United States of America, th2113@columbia.edu, Retsef Levi

We develop a new non-parametric algorithm for a stochastic inventory model with lost sales and censored demand, where the demand distribution is not known a priori. In the repeated newsvendor problem, we prove the convergence of our algorithm to the optimal solution, and demonstrate it numerically.

■ WC60

O - Hampton Room

Pricing and Revenue Management II

Contributed Session

Chair: Ertunga Ozelkan, UNC Charlotte, 9201 University Blvd, Charlotte, NC, 28269, United States of America, ecozelka@uncc.edu

1 - Continuous Approximation for Location and Pricing Problems
Rongbing Huang, York University, 4700 Keele Street, Toronto, ON, M3J1P3, Canada, rhuang@yorku.ca, Abdullah Dasci

We consider a pair of location and pricing problems defined in temporal and spatial spaces. Finding solutions to these problems via traditional methods is extremely difficult partly due to the nonlinearity introduced by the pricing variables. Here we present a heuristic solution method, continuous approximation, which simplifies the model and leads to near-optimal solutions without any significant computational effort.

2 - Reverse Bullwhip Effect in Pricing for Price-sensitive Demand and Joint Replenishment and Pricing
Ertunga Ozelkan, UNC Charlotte, 9201 University Blvd, Charlotte, NC, 28269, United States of America, ecozelka@uncc.edu, Churlzu Lim

A Reverse Bullwhip effect in Pricing-RBP occurs when an amplification of price variability takes place moving from the upstream suppliers to the downstream customers in a supply chain. Since price variability is one of the major factors of the Bullwhip Effect in order quantity, RBP requires a careful examination. Here, we investigate RBP conditions using a game theoretical model when demand is price sensitive and joint replenishment and pricing decisions are made.

■ WC61

O - Calvert Room

Facility Logistics

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yueyue Fan, Assistant Professor, University of California, Department of Civil Engineering, Davis, CA, 95616, United States of America, yyfan@ucdavis.edu

1 - Optimal Lignocellulosic Biomass Feedstocks Allocation for Biofuel Production in California
Chien-Wei Chen, graduate student, University of California, Institute of Transportation Studies, Davis, CA, 95776, United States of America, scwchen@ucdavis.edu, Yueyue Fan

A well designed Biofuel production system may alleviate greenhouse gas emission and energy security issues. In this paper, we propose an optimization model for allocation of multiple lignocellulosic biomass feedstock resources to satisfy long-term bioenergy demand in California. The impact of biofuel production and delivery on transportation infrastructure is also analyzed.

■ WC62

O - Governor's Boardroom

Revenue Management Applications in Hospitality Industry

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Utku Yildirim, Prorize, 12138 Madison Dr., Atlanta, GA, United States of America, uyildirim@prorize.com

1 - Forecasting Approach for Restaurant Guest Demand with a High Walkups

Mehmet Gulsen, Senior OR Analyst, Walt Disney, 1375 East Buena Vista Dr., TD_3S320A, Lake Buena Vista, FL, 32830, United States of America, mehmet.gulsen@disney.com, Hai Chu

Restaurant guest demand arrives in the form of advance bookings or walkups. The ratio of advance bookings to walkups can vary significantly from one restaurant to another depending on the features of each restaurant. High walkup ratio makes traditional booking curve approach to forecasting less effective as considerable portion of demand is not captured within booking curve. We present a robust forecasting approach that could handle varying level of walkup demand effectively.

2 - Modeling Nesting in Network Revenue Management

Burak Buke, burakbuke@gmail.com, Utku Yildirim, Ahmet Kuyumcu

The order in which the arrivals occur plays an important role in assessing the revenue generated by nested booking limit controls. The dynamic programming approach models the arrival process explicitly. However, for most real world problems, dynamic programming is computationally intractable. In this work, we propose a multistage stochastic programming model to approximate the dynamic programming model, while modeling the ordering of arrivals explicitly.

3 - Improving Passenger Demand Forecasts Airline Revenue Management

Subhashish Samaddar, Associate Professor, Department of Managerial Sciences, J. Mack Robinson College of Business, Georgia State University, PO Box 4014, Atlanta, GA, 30302, United States of America, s-samaddar@gsu.edu

Airline revenue management involves protecting the right number of seats for late-booking high-revenue-generating passengers from low-valued leisure passengers. Accurate demand forecasts for all flights are critical. Analysts often adjust the system forecasts to improve revenue opportunity. Little has been done to assess the effectiveness of such adjustments. This paper offers a framework to analyze analysts' performance that includes passenger demand characteristics.

■ WC63

O - Congressional B

Dynamic Network Equilibrium Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Travis Waller, Associate Professor, Department of Civil, Architectural, and Environmental Engineering /The University of Texas at Austin, 1 University Station, C1761, ECJ 6.204, Austin, TX, 78712, United States of America, stw@mail.utexas.edu

1 - A Dynamic Network Equilibrium Model in Face of Uncertain Capacities

ManWo Ng, Graduate Research Assistant, Department of Civil, Architectural, and Environmental Engineering / The University of Texas at Austin, 1 University Station, C1761, ECJ 6.208, Austin, TX, 78712, United States of America, mwng@mail.utexas.edu, Travis Waller

In previous studies, it has been shown that travelers select their paths not only based on an estimated deterministic travel time, but also based on travel time reliability. In this paper we extend the cell transmission model-based dynamic route choice model to account for travel time reliability caused by supply variations. Numerical examples are presented and discussed.

2 - Dynamic User Equilibrium and Stable System States in Transportation Networks

Gitakrishnan Ramadurai, PhD Student, Rensselaer Polytechnic Institute, JEC 4002 Dept of Civil and Environmental, Engineering, Rensselaer Polytechnic Inst, Troy, NY, 12180, United States of America, ramadg@rpi.edu, Satish Ukkusuri

The paper will focus on the properties of dynamic user equilibrium (DUE) and stable system states in transportation networks under both non-atomic and discrete individuals' assumptions. Stable system states arise when all users are better off compared to the DUE state and, therefore, have an incentive to continue in the state.

3 - Network Equilibrium under Information and Nonlinear Route Choice Behavior

Stephen Boyles, Graduate Research Assistant, University of Texas at Austin, 1 University Station, C1761, ECJ 6.202, Austin, TX, 78712, United States of America, sboyles@mail.utexas.edu, Avinash Unnikrishnan, Travis Waller

Past research gives guidance on how a single user chooses a route in a stochastic transportation network under nonlinear (e.g., risk averse) preferences and online information. This presentation describes methods for determining how multiple users choose routes simultaneously in such networks with congestion effects, and a formal statement of this type of equilibrium.

4 - Integrated Dynamic Multi-modal Traffic Assignment

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Mark Hickman

We present the developments of an integrated simulation-based multi-modal traffic assignment approach. The integrated approach consists of the passenger-oriented mesoscopic multi-modal traffic simulation model, the assignment of transit passengers to transit stops and routes based on time-dependent shortest paths in the transit network based on both origin-destination travel times (including trip time, walk time and wait time) as well as service reliability in the transit network.

■ WC64

O - Congressional A

Warehouse Automation

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yugang Yu, Assistant Professor, Rotterdam School of Management, T10-38, Burgemeester Oudlaan 50, Rotterdam, 3062 PA, Netherlands, yyugang@rsm.nl

1 - Performance Analysis of Alternate Designs for Autonomous Vehicle based Storage and Retrieval Systems

Debjit Roy, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI, 53706, United States of America, droy@wisc.edu, Ananth Krishnamurthy

Autonomous vehicle storage and retrieval System (AVSRS) is an alternative to AS/RS systems. In existing AVSR systems, horizontal movement is through autonomous vehicles whereas the vertical movement is through lifts. We consider alternative designs that provide increased autonomy in horizontal and vertical movement and evaluate their performance using queuing models.

2 - Pharmaceutical A-Frame Order Fulfillment Optimization and Throughput Models

Jen Pazour, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, jpazour@uark.edu, Russell Meller

Pharmaceutical distribution is characterized by high-value products requiring precision accuracy within short lead times. These requirements mean that highly-automated technologies like A-Frame systems are common in pharmaceutical order fulfillment processes. The main decisions to be addressed when designing an A-Frame are the assignment and allocation of items to the A-Frame as well as throughput considerations. We address these decisions using optimization and throughput models.

3 - Open Location Management in Automated Storage/ Retrieval Systems

Yugang Yu, Assistant Professor, Rotterdam School of Management, T10-38, Burgemeester Oudlaan 50, Rotterdam, 3062 PA, Netherlands, yyugang@rsm.nl, Rene de Koster

This paper studies the management of open locations in Automated Storage/Retrieval Systems (AS/RS) by minimizing the makespan of a block of storage and retrieval jobs. We propose an effective storage area (ESA) policy that defines a part of the open locations as effective, while the others as ineffective. A model is proposed and solved optimally. Our results show that the makespan can be reduced by more than 10% by using the ESA policy compared that with NN.

■ WC65

M - Virginia A

Inventory Policy II

Contributed Session

Chair: Amir-Behzad Samii, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, absamii@mit.edu

1 - Replenishment Policies for Incomplete Information Inventory System

Ruixia Shi, PhD Candidate, University of Texas at Dallas, PO Box 830688, SM 30, Richardson, United States of America, rxs048100@utdallas.edu, Alain Bensoussan, Metin Cakanyildirim, Suresh Sethi

We study a partially observed, periodic review inventory system. The order quantity is determined based on the partial information on the inventory level. The dynamic programming formulation of this problem has an infinite dimensional state space. Using a value iteration process we can show the existence of an optimal solution. We also provide numerical techniques to obtain this solution and compare this solution with the base stock policy based on the mean of the inventory.

2 - Inventory Rationing Impact on Order Fulfillment Performance Management

Amir-Behzad Samii, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, absamii@mit.edu, Richard Pibernik, Prashant Yadav

Companies that regularly ration a perishable resource among different customer classes commonly base their decisions on service level and fill rate targets. We derive exact expressions for different performance measures both for the individual customer classes and for the overall inventory system. These expressions determine the conditions under which it is prudent to pay the price of losing some overall system performance to achieve a certain performance for prioritized customers.

3 - Optimal Allocation Policy in a Multi-echelon Repairable-item Inventory System

Mohamed Ahmed, Professor, Kuwait University, Department of Stat. and OR, Faculty of Science, Kuwait, Kuwait, wakeel@kuc01.kuniv.edu.kw, Talal Alkhamis

This paper considers the problem of determining optimal allocation policy for a multi-echelon repairable item inventory model. Three allocation policies for sending the depot-repaired item to the base are considered. Due to the complexity of the model, a simulation study based on separate factorial experiments and multiple comparisons tests for four performance measures is developed.

■ WC66

M - Delaware A

Dynamic Programming I

Contributed Session

Chair: Jiejian Feng, Postdoctoral Fellow, The Hongkong Polytechnic University, GH141b, M628, LGT, PolyU, Hongkong, China, lgfengjj@polyu.edu.hk

1 - Policy Partitions for Markov Decision Processes

Weiwei Chen, Student, University of Wisconsin-Madison, 3247 Mechanical Engineering Building, 1513 University Avenue, Madison, WI, 53706, United States of America, wchen26@wisc.edu, Leyuan Shi

Nested Partitions (NP) is a recently developed metaheuristic method for large-scale optimization problems. Based on NP method, a policy partitioning framework is introduced for Markov decision processes. Local heuristics for specific problems can be embedded into the framework to improve the performance of the algorithm. This sampling based procedure targets to address the "curse of dimensionality" of exact methods.

2 - Value Functions and Transversality Conditions for Optimal Control Problems with an Infinite Horizon

Nobusumi Sagara, Professor, Faculty of Economics, Hosei University, 4342, Aihara, Machida, Tokyo, 194-0298, Japan, nsagara@hosei.ac.jp

We first derive the nonsmooth maximum principle and the adjoint inclusion for the value function as necessary conditions for optimality with an infinite horizon that exhibit the relationship between the maximum principle and DP. We then present sufficient conditions under nonsmooth nonconvex hypotheses. It is possible to provide necessary and sufficient conditions if we restrict our result under the convexity hypothesis. The role of the transversality conditions at infinity is clarified.

3 - Optimal Path Planning Problems in Evolving Media

Irina Dolinskaya, PhD Candidate, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, dolira@umich.edu, Robert Smith

Real-time determination of an optimal path in a changing medium (such as, winds and ocean waves) requires explicit incorporation of this cost function time and space dependency into the model. In this talk, we present methods to efficiently incorporate time-dependency and dynamics of the system into the path planning process. An application to ship routing is introduced throughout the talk to motivate this research.

4 - Sampled Fictitious Play for Solving Large-Scale Dynamic Programming Problems

Esra Sisikoglu, PhD Candidate, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48109, United States of America, esisikog@umich.edu, Robert Smith, Marina Epelman

We use a Sampled Fictitious Play (SFP) algorithm to solve large-scale finite-horizon discrete dynamic programming (DP) problems. We model the problem as an identical interest game between multiple players. We show that the SFP algorithm converges to the equilibrium strategies of the game. In addition, we use a multi-start version of the SFP to find global optimal solutions.

5 - An Efficient Dynamic Optimization Method for Sequential Identification of Group-testable Items

Jiejian Feng, Postdoctoral Fellow, The Hongkong Polytechnic University, GH141b, M628, LGT, PolyU, Hongkong, China, lgfengjj@polyu.edu.hk, Liming Liu, Mahmut Parlar

An electronics-equipment manufacturer can purchase chips with a fraction of them defective at a lower unit price than that of perfect chips, and test them in groups to obtain the perfect units. We construct a stochastic dynamic programming model (SDP) to determine the optimal group sizes and the optimal number of group-testable units to purchase initially. By identifying tight bounds, we develop an efficient solution approach that avoids the curse-of-dimensionality of the standard SDP model.

■ WC67

O - Forum Room

Decision Analysis II

Contributed Session

Chair: Jamison Kovach, Assistant Professor, University of Houston, 312 Technology Building, Houston, TX, 77204, United States of America, jvkovach@uh.edu

1 - Risk-based Framework for Establishing Environmental Windows for Sediment Dredging

Jongbum Kim, Engineer Research and Development Center, US Army Corps of Engineers, 3909 Halls Ferry Road, Vicksburg, MS, 39180, United States of America, Jongbum.Kim@usace.army.mil, Igor Linkov, Burton Suedel, Douglas Clarke

Environmental window was introduced to limit dredging operations to windows of time where effect to the ecosystem is minimized. Windows have become increasingly constrained by several restrictions to minimize ecological impacts, thus greatly limiting the amount of time available to dredge waterways. We will show how ecological risk assessment coupled with multi-criteria decision analysis can be used to assess risks to fish species associated with dredging activities.

2 - Use of Multi-criteria Decision Analysis by the US Army Corps: Overview of Methods and Applications

Igor Linkov, US Army Engineer Research and Development Center, 83 Winchester Str, Suite 1, Brookline, MA, 02446, United States of America, Igor.Linkov@usace.army.mil, Burton Suedel, Todd Bridges

The US Army Engineer Research and Development Center, has developed a risk-informed decision framework for several large-scale planning and restoration projects. The framework draws on current practice in the fields of risk and uncertainty analysis and MCDA to facilitate communication and collaboration among decision-makers and stakeholders. The methods provide an objective, analytical approach to making navigation, flood control, and ecosystem restoration decisions.

3 - Portfolio Selection with Multiple Criteria Decision Making

Jing Rung Yu, Associate Professor, National Chi Nan Univ., 470, Univ. Rd., Puli,, Nantou, 545, Taiwan - ROC, jennifer@ncnu.edu.tw, Ju-Yin Cho

For proper portfolio selection, the short selling proportion, risk, expected return, £], and skewness of the portfolio are considered. The results of our experiment, compared with the Taiwan 50 Index, showed that all the proposed portfolio models performed better, especially the model with skewness criteria. Hence, the maximization abilities of skewness are an important criterion for portfolio selection, even with the short selling considerations.

4 - Better Executive Decisions through Experiments

Victor W. Tang, Scientist, MIT, 55 Deerfield Lane South, Pleasantville, 10570, United States of America, victor.w.tang@gmail.com, Kevin Otto, Warren Seering

How to improve executive management decisions? Systematically explore the entire solution space under the entire space of uncertainty by means of systematic experiments. We propose using Design of Experiments (DOE) to understand the behavior of systems within which decisions are made and to estimate the consequences of alternative decisions. The statistical data and managerial results of an experiment with a large manufacturing company support the efficacy and validity of this novel approach.

5 - Exploring the Effects of Factor-level Constraints on a Robust Design Investigation

Jamison Kovach, Assistant Professor, University of Houston, 312 Technology Building, Houston, TX, 77204, United States of America, jvkovach@uh.edu

Experiments are often subject to physical restrictions and constraints. This work explores the implications of various types of constraints on the results of a robust design investigation. The experimental phase utilizes D-optimal designs as an efficient method for selecting the points at which to take observations when standard approaches are not appropriate.

■ WC68

O - Senate Room

Marketing III

Contributed Session

Chair: Jay Patankar, Professor, The University of Akron, College of Business Administration, Akron, OH, 443254801, United States of America, jgp@uakron.edu

1 - Conjoint Analysis Application to the Small Business Health Care Needs

Rahul Bhaskar, Professor, Cal State University, 800 North College Boulevard, Fullerton, CA, 92834, United States of America, rbhaskar@fullerton.edu

We interviewed, surveyed and analyzed the needs of the small private sector employers and employees in California. Our purpose is to measure and compare the small private employer and employee preferences of different attributes that constitute a typical health insurance product (e.g. PPO, HMO, and POS etc.) offered in California.

2 - The Effects of Demand Uncertainty on Channel Structure

Deming Zhou, Assistant Professor, The Chinese University of Hong Kong, the Chinse University of Hong Kong, Shatin, HK, Shatin, Hong Kong - China, dzhou@cuhk.edu.hk

Motivated by the observation that some manufacturers open their own retail stores despite the existence of more efficient independent retailers, this paper examines the duopoly manufacturers' choices of product distribution channels under demand uncertainty and resale price maintenance. We characterize the conditions for the equilibrium channel structures, and discuss the relations between the distribution channels and demand features, like substitution and market shares.

3 - Enterprise Warranty Programs in Two-dimensional Policies

Jay Patankar, Professor, The University of Akron, College of Business Administration, Akron, OH, 443254801, United States of America, jgp@uakron.edu, Amit Mitra

A product warranty policy involving two attributes, for example, warranty time and product usage, is considered. Enterprise warranty programs provide service and support that extend the original warranty coverage. A model is developed to determine warranty policy parameters in this context.

Wednesday, 4:30pm - 6:00pm

■ WD01

M - Marriott Ballroom 3

Marketing Interface I

Contributed Session

Chair: Min Shi, Assitant Professor, California State University, 3801 West Temple Ave, Pomona, CA, 91765, United States of America, jackmshi@gmail.com

1 - Analysis of Joint Pricing and Inventory Policy for Two Substitutable Products

Chirag Surti, PhD Student, McMaster University, 1280 Main Street West, DSB A-210, Hamilton, ON, L8S1J4, Canada, surtic@mcmaster.ca, Prakash Abad, Elkafi Hassini

We study the analytical and managerial implications of a single period joint pricing and ordering policy for two substitutable products with price sensitive demand. We also incorporate the resultant inventory cannibalization in case of stock out due to customer substitution. We analytically show that the expected profit is concave for a given inventory policy and numerically study the impact of product substitutability and resultant cannibalization on the price, inventory and expected profits.

2 - Encroachment Patterns the Best Products

Joseph Van Orden, PhD Student, University of Utah, 1645 Campus Center Dr. RM 101, Salt Lake City, UT, 84112, United States of America, joseph.vanorden@business.utah.edu, Glen Schmidt, Bo van der Rhee

Based on our examination of 239 the "best products", we extend and validate an analytical framework describing how new products encroach on old markets. A contribution of our work is to identify three distinctly different ways in which this high-end encroachment can occur; each of which has implications on product positioning and pricing. Our model helps explain some real-life observations, such as the precipitous price drop in Apple's iPhone only 68 days after its introduction.

3 - Product Pricing and Firm Value: Evidences from the Airline Industry

Min Shi, Assitant Professor, California State University, 3801 West Temple Ave, Pomona, CA, 91765, United States of America, jackmshi@gmail.com, Wei Yu

The firm-valuation implications of marketing activities have not received much research attention to date. This study examines the impact of marketing strategy, such as price adjustment events in airline industry, on the value of both stockholders and bondholders.

4 - Supply and Demand Planning in Cooperative Networks with Seasonality and Uncertainty

Omkar Palsule-Desai, Doctoral Student, Indian Institute of Managemenr Ahmedabad, Dorm 06 Room 07, IIMA Campus, Vastrapur, Ahmedabad, 380015, India, omkardpd@iimahd.ernet.in, Devanath Tirupati

We consider supply and demand planning problem in a cooperative network characterized by seasonality and uncertainty in supply and demand, and reprocessing capability of value-added products. We develop a non-linear system capturing the impact of operational level response to uncertainty and demonstrate that planning ignoring uncertainty results in significant penalty.

■ WD03

M - Marriott Ballroom 1

Forecasting II

Contributed Session

Chair: John Kros, Assistant Professor, East Carolina University, 3121 Bate, Greenville, NC, 27858, United States of America, krosj@ecu.edu

1 - Simulating the System Costs of Wind Power

Lindsay Anderson, Cornell University, 320 Riley-Robb Hall, Ithaca, NY, 14853, United States of America, cla28@cornell.edu, Judith Cardell

As new Greenhouse Gas Initiatives come online in the US, many states are becoming more interested in the ability to accommodate higher penetration of wind in their generation portfolios. Of great concern is the impact of forecast and generation uncertainty on power system operations. This work simulates power system operation with a high penetration of wind power and presents an analysis of the system costs associated with the variability of wind power generation.

2 - Dynamic Capacity Planning Using Bass Model and Markowitz Investment Model in AgentBased Supply Chain

Saman Alaniazar, PhD Student, Department of Industrial and Manufacturing Engineering, Wayne State University, 4815 Fourth St., Manufacturing Engineering Building, Detroit, MI, 48202, United States of America, dv2663@wayne.edu, Alper E. Murat, Ratna Babu Chinnam

We design an agent to facilitate capacity planning in supply chains supporting new product introductions. Given the non-stationary nature of demand, the agent employs a hybrid-strategy of short-term demand forecasting for incremental capacity expansion and long-term demand modeling based on the Bass diffusion model for termination of expansion process. To address associated risks, the agent employs a Markowitz investment model. We report experimental results based on the Tamagotchi Case.

3 - Forecasting Funding Availability for Antimalarial Procurement

Justin Cohen, Consortium for Strategic HIV Operations Research, Clinton Foundation HIV/AIDS Initiative, 383 Dorchester Avenue, Suite 400, Boston, MA, 02127, United States of America, JCohen@clintonfoundation.org, Megan O'Brien

Although artemisinin-based combination therapies (ACTs) are the most effective treatment for Plasmodium falciparum malaria, their high cost and short shelf-life have complicated treatment efforts. Since better prediction of resource availability will improve planning, we derived predictive models to forecast the availability of ACT funding from the Global Fund, the largest source of ACT financing. The utility of these models for estimating drug procurement by specific countries is demonstrated.

4 - An Algorithm for Decomposing Mixed Market Hotel Data

John Kros, Assistant Professor, East Carolina University, 3121 Bate, Greenville, NC, 27858, United States of America, krosj@ecu.edu, Christopher Keller

Hotel managers set availability restrictions and price for hotel rooms. Availability and price are principal components of hotel revenue management. Revenue management procedures typically have wide flexibility and significant responsibility for overall hotel performance. Of the components of hotel management performance, revenue management is the single most controllably variable measure. Therefore, our research focuses on forecasting in the revenue management system.

■ WD04

M - Delaware B

To the Memory of Richard Rosenthal: Notes from All Over

Cluster: To The Memory of Richard Rosenthal
Invited Session

Chair: Doug Samuelson, Principal Decision Scientist, Serco-NA, 8711 Chippendale Court, Annandale, VA, 22003, United States of America, samuelsondoug@yahoo.com

1 - Implementing ARFORGEN: Installation Capability and Feasibility Study of Meeting ARFORGEN Unit Reset Guidelines

Steven Wilcox, Senior Operations Research Analyst, Serco-NA, 1818 Library Street, Suite 1000, Reston, VA, 22090, United States of America, steven.wilcox@serco-na.com

The Army's new Army Force Generation (ARFORGEN) model promotes decentralized decision-making and redefined readiness, based on a brigade-based structure. These smaller units are designed to be agile, expeditionary, tailored to specific circumstances (e.g., nature of threat, climate, terrain, etc.), and capable of rapid assembly. This study, completed in July 2007, based on a discrete event simulation model of the unit reset process and installation resource constratins, identified adjustments to resources and/or procedures that appear to be necessary for units to meet ARFORGEN guidelines.

2 - Smart Solutions: Identifying Top-Selling Product Configurations Using Branch And Bound

Jule Drew, HP, jpward@hp.com

We present a branch-and-bound based algorithm for identifying top-selling product configurations from order history. This problem, an example of frequent itemset counting problem in data mining, arose at HP through efforts to improve sales productivity and reduce the number of iterations required to perfect a customer sales quote.

■ WD05

M - Virginia B

Game Theory III

Contributed Session

Chair: Jian Yang, New Jersey Institute of Technology, Department of IME, Newark, 07102, United States of America, yang@njit.edu

1 - Gradient Learning for a Buyer Seller Game

Harri Ehtamo, Professor, Systems Analysis Laboratory, Helsinki University of Technology, PO Box 1100, Espoo, 02015, Finland, ehtamo@tkk.fi, Kimmo Berg

We examine a buyer seller game for a monopoly. Usually, the problem is modeled as a one-period Bayesian game, where the incomplete information about the buyers' utilities is handled with a subjective probability distribution. We suggest an iterative online scheme to solve the problem. The scheme can be seen as gradient adjustment, and it can be done with limited information, benefiting both the seller and the buyers. Our method uses special features of the problem and it is easily implementable.

2 - Investment Dynamics under a Cap & Trade Regime

Tiago Filomena, PhD Student, George Washington University, 8009 Eastern Avenue, Apt 302, Silver Spring, MD, 20910, United States of America, tiagopf@gwu.edu, Enrique Campos-Nanez

We model capacity investment as a dynamic game, where players decide on electricity prices, emission permits and capacity investments for a portfolio of power generation technologies. We compute the subgame perfect equilibrium of the game and use it to estimate electricity prices, their volatility, and the technology mix that arises from these markets.

3 - Mechanism Design in Vaccine Allocation

Liu Yang, Duke University, 1 towerview drive, Durham, NC, 27708, United States of America, ly11@duke.edu

A mechanism is designed to obtain an optimal vaccine allocation strategy. In our setting, each individual has private information about her risk of infection, which is her type. Her risk can be affected by other people's type as well. Moreover, she can insert effort to change her risk after the vaccine allocation is realized. A government wants to maximize social welfare given limited vaccine supply. Therefore, this is a combined problem of adverse selection and moral hazard.

■ WD06

M - Virginia C

Economics

Contributed Session

Chair: P. J. Lamberson, MIT Sloan, 625 S. 1st St., Ann Arbor, MI, 48103, United States of America, pjl@mit.edu

1 - Estimating Mexican Migration Behavior to the United States

Su-Hsin Chang, Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218, United States of America, suhsin@jhu.edu

A model employing optimization techniques is proposed to analyze the factors determining Mexican migration behavior to the US by estimating the coefficients in the model. This model considers the unobserved heterogeneity and the selection problems. The well-known maximum likelihood estimation is carried out; nonetheless the maximization problem is not trivial since it involves identification problems. This paper then explores the method to solve the problem and applies new algorithm to solve it.

2 - Strategic Location Decisions for Firms Facing an Opening of Market

Jin Zhang, School of Business and Management, Hong Kong University of Science and Technology, 409B,TowerA, HKUST, Clearwater Bay, Kowloon, Hong Kong - China, zhangjin@ust.hk

The paper investigates a two-period discrete location model. The competing firms face an opening of market with limited possible location choices.Firms are different in the size and time of entry. We find central locations are optimal for the big firm (minimum differentiation) while the periphery location is optimal for the small firm (maximum differentiation).

3 - Projections for Earth's Environmental Plimsoll Line through the History of Easter Island

Umit Tursun, Research Assistant, UIUC Energy Biosciences Institute, 3308 SHARP DRIVE, Champaign, IL, 61822, United States of America, utursu2@uiuc.edu

The self eco-destruction of Easter Island preserves valuable insights for the future of our civilization. The dynamic economic simulation model is created in order to reconstruct the events that led island population to starvation and almost to extinction. This model also investigates what should Easter Island Population do to change their fate.

4 - A New Interest Rate Rule for Policy Makers and the Rest of Us

Abul Jamal, Professor, Southeastern Louisiana University, Department of Management, Hammond, La, 70402, United States of America, ajamal@selu.edu, Sang Lee, Yu Hsing

The Federal Reserve is mandated to seek full employment and price stability through its monetary policy role. A policy instrument often used by the Fed is to target the federal funds rate, generally using a rule suggested by John Taylor. In this paper we propose an alternative rule which is more cognizant of the projected GDP growth rate and fully adjusts for any deviation from the target inflation and the potential GDP.

5 - Superstars and Long Tails: The Consequences of Localized Increasing Returns

P. J. Lamberson, MIT Sloan, 625 S. 1st St., Ann Arbor, MI, 48103, United States of America, pjl@mit.edu

The theory of increasing returns predicts winner-take-all markets; however, many markets exhibit a "Long Tail."† I describe a model in which attribute requirements and information costs limit willingness to trade preferences for popularity.† The model predicts a power law distribution of shares. By understanding the tradeoff between preferences and popularity, managers can assess the value of consumer preference data in predicting market success and the shape of the market share distribution.

■ WD08

M - Maryland B

Supply Chain Management IV

Contributed Session

Chair: Hiram Moya, Texas A&M University, 3131 TAMU, College Station, TX, 77843-3131, United States of America, hiram@tamu.edu

1 - Stochastic Programming Model for Supply Chain Contract Using Scenario Aggregation Algorithm

Gitae Kim, PhD candidate, Kansas State University, 2033 Durland Hall, Kansas State University, Manhattan, KS, 66506, United States of America, gitaekim@ksu.edu, Chih-Hang Wu

We propose a two stage stochastic programming model for the supply chain contract with flexible options. There are two models for the decentralized decisions of the buyer and the supplier to maximize the expected revenue respectively. Each possible unknown demand is a scenario. We use the scenario aggregation algorithm to solve the problem iteratively. Experimental results show the convergence behavior of the algorithm and show the sensitivity of parameters.

2 - Relationship Management Enhanced Total Cost of Ownership (TCO) Models: An Optimized Approach

Kuntal Bhattacharyya, PhD Student, Kent State University, 9291 Paulding St NW, Massillon, OH, 44646, United States of America, kb-pedagogy@lycos.com

A holistic approach towards Total Cost of Ownership helps to analyze cost impact;a relationship model predicts capacity constraints on suppliers that make the relationship profitable,sustainable,and mutually beneficial.A mid-western manufacturer and its 225 global suppliers were surveyed.Cost drivers were defined by superimposing inputs from the customer and suppliers.Trust,a cost driver,was measured by Relationship Length,defining the TCO effort as a function of length.

3 - Analysis of a Stochastic Supply Chain Model under NAFTA

Hiram Moya, Texas A&M University, 3131 TAMU, College Station, TX, 77843-3131, United States of America, hiram@tamu.edu

This research characterizes and analyzes uncertainties in the transportation of goods between countries. And although some research assumes a deterministic nature of the data, true to life characterization of the data introduces uncertainty to the formulation and solution of the problem. The objective is to optimize the model and compares results of the stochastic model and a deterministic equivalent using metrics common in industry, while exploring differences in the solutions.

4 - Implementation of the Newsvendor Model with Customer Segmentation and Inventory Substitution

M. Mümtaz Bakan, MSc., Koc University, Rumelifeneri Yolu, 34450 Sariyer, Istanbul, 34450, Turkey, mebakan@ku.edu.tr

In this study, we propose a base case of two customer segments with normally distributed demands and compute the corresponding optimal newsvendor order quantities with the resulting profits and compare them with the single segment (aggregate demand) case. We then incorporate inventory substitution into the case of customer segmentation and set up a simulation model to estimate profits for several order quantity pairs.

■ WD09

M - Maryland C

Panel Discussion: QSR Cluster Academic Directions

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu

1 - Panel Discussion: QSR Cluster Academic Directions

Moderator: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu, Panleist: Satish Bukkapatnam, Yu Ding, Shiyu Zhou, Jan Shi

The panel will discuss the academic research directions in the future for Quality, Statistics, and Reliability.

■ WD10

M - Room 8206

Financial Engineering in Energy Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Shi-Jie Deng, Associate Professor, Georgia Institute of Technology, Industrial & Systems Engineering, Atlanta, GA, 30332, United States of America, deng@isye.gatech.edu

1 - Scenario Reduction for Futures Market Trading in Electricity Markets

Antonio J. Conejo, Professor, University of Castilla - La Mancha, Department of Electrical Engineering, Campus Universitario s/n, Ciudad Real, 13071, Spain, Antonio.Conejo@uclm.es, Salvador Pineda, Juan Miguel Morales, Miguel Carrion

To make informed decisions in futures markets of electric energy, stochastic programming models are commonly used. The number of scenarios needed to accurately represent the uncertainty involved is generally large, which renders the associated problem hard to solve. Hence, scenario reduction techniques are needed to trim down the number of scenarios while keeping most of the stochastic information embedded in such scenarios. This presentation provides a novel scenario reduction procedure.

2 - Iterative Scenario Based Reduction Technique for Optimizing the Conditional Value-at-Risk

Roberto Minguez, University of Castilla-La Mancha, Avda. Camilo Jose Cela s/n, Ciudad Real, CR, 13071, Spain, roberto.minguez@uclm.es, Raquel Garcia-Bertrand

In the last decades, several tools for managing risks in competitive markets, such us CVaR, have been developed. These techniques are primarily based on scenarios, which in case of large-scale models increase considerably the size of the problems to be solved according to the number of scenarios, resulting in intractable problems. An iterative scheme is proposed which allows obtaining the equivalent solution for a given number of scenarios but solving problems with a reduced number of scenarios.

3 - Valuation of Natural Gas Storage Capacity Incorporating Forward Price Curve

Jieyun Zhou, Georgia Institute of Technology, jzhou@isye.gatech.edu, Shi-Jie Deng

We propose a model for natural gas storage capacity valuation in which the operational strategies of the storage consist of both spot and forwards trading actions.We derive a market-based valuation and the corresponding optimal operating and trading strategy, taking account of various operational constraints and realistic market characteristics.

4 - Impact of Transmission Congestion on the Forward Risk Premium in Electricity Markets

Shi-Jie Deng, Associate Professor, Georgia Institute of Technology, Industrial & Systems Engineering, Atlanta, GA, 30332, United States of America, deng@isye.gatech.edu, Haibin Sun

We examine the optimal hedging and equilibrium pricing of electricity with the presence of both forwards and spot markets subject to transmission system constraints. Given the day-ahead and spot markets' clearing rules set by a system operator and the fact that LSEs' and GenCo's maximize their risk-adjusted profits, we derive the forward and spot market equilibrium prices which incorporate the transmission congestion information. Empirical analysis is conducted to test our model.

■ WD11

M - Room 8209

Facility Location

Contributed Session

Chair: Daniel Serra, Professor, Universitat Pompeu Fabra, Trias Fargas 25-27, Barcelona, 08006, Spain, daniel.serra@upf.edu

1 - The Determination of Confidence Intervals for a Multi-commodity Location and Allocation Problem

M. Hakan Akyuz, Research Assistant, Galatasaray University, Ciragan Caddesi No: 36, Ortakoy, Istanbul, 34357, Turkey, mhakyuz@yahoo.com, I. Kuban Altinel, Temel Oncan

The problem that we consider consists of locating capacitated facilities in the Euclidean plane to satisfy customer demands, for multiple commodities, with minimum transportation cost under capacity restrictions on the total quantity of commodities shipped from facilities to customers. We propose two heuristics and determine confidence intervals using the samples of objective values. Computational results are discussed.

2 - A Decision Support Model for Network's Extension of the Small Claims Courts in Portugal

Maria Cortinhal, ISCTE-CIO, Av Forças Armadas, Lisbon, Portugal, mscc@iscte.pt, Pedro Costa, Maria Gonçalves, José Caldas

A decision support model for policy decision making concerning the extension of small claims courts throughout the entire Portuguese territory is considered. In order to help managing the value conflict between justice and efficiency, different criteria are defined and a location model for the clustering of municipalities is presented. Since the goal of expanding the network is constrained by budgetary constraints a Pareto method for ranking the clusters is used.

3 - Workforce Supply and Facility Location

Nathan Palmer, Doctoral Candidate, University of Alabama, 1900 Rice Mine Road, Apt. 311, Tuscaloosa, AL, 35406, United States of America, npalmer@cba.ua.edu, John Mittenthal, Charles Sox

We introduce a version of the facility location problem where the primary tradeoff is between wages paid to workers and the cost of transporting goods. A mathematical model and a key function validation are discussed. Preliminary analytic results are also presented.

4 - Locating Lottery Retail Stores in Barcelona: A Consumer Oriented Approach

Daniel Serra, Professor, Universitat Pompeu Fabra, Trias Fargas 25-27, Barcelona, 08006, Spain, daniel.serra@upf.edu, Vladimir Marianov

The optimal location of retail stores is one of the most important factors that affects both service quality in terms of consumer access and business profitability. In this paper a model is presented that locates multiproduct retail stores such as lottery stores maximizing demand capture. The model formulation is extended to consider hierarchical facilities and consumer preferences. Then the model is applied to the location of lottery retail stores in the city of Barcelona.

■ WD12

M - Room 8212

Data Mining III

Contributed Session

Chair: Victor S. Sheng, Postdoc, Stern Business School, New York University, 44 W. 4th St., New York, NY, 10012-1126, United States of America, ssheng@stern.nyu.edu

1 - Clustering the Open Ended Future Needs

Didem Cynar, Res. Assist., Istanbul Technical University, Istanbul Technical University, management faculty macka, Istanbul, Turkey, cinard@itu.edu.tr, Gülgün Kayakutlu

This paper aims to propose a solution for clustering the trends in vague conditions by comparing the results of hard c-means and fuzzy c-means algorithms. Application is done on an SME survey indicating the future needs for the improvements in regional innovation. Application results indicate that fuzzy c-means clustering algorithm gives significantly achievable results that guide innovation experts in their regional development perspective.

2 - Research on the Unbalance Dataset Analysis Algorithm in Customer Churn Prediction

Xiu Li, Associate Professor, Tsinghua University, Automation Department,Tsinghua Univ., Beijing, 100084, China, lixiu@tsinghua.edu.cn

In the global competition, customer churn prediction problem has been paid more and more attention. Due to large scale and imbalanced churn data, nowadays data mining algorithms could not do well on the prediction of customer churn. The novel data mining algorithms, Improved Balanced Random Forests was introduced and used to the problem. The test of enterprise real data set approve that the algorithms has better performance in solving large scale data set and imbalanced data than others.

3 - Data Mining Challenges in Biological Systems

Wandaliz Torres-Garcia, PhD Student, Arizona State University, 919 E. Lemon St. #225, Tempe, AZ, 85281, United States of America, wandaliz@asu.edu

Despite the increasing molecular knowledge and the technological advances to gather data from biological processes, there remains area for innovation in data mining to unravel knowledge needed to close the gaps in current methods for early diagnosis and intervention. Data mining techniques that address inherent challenges in biological and biomedical data, like curse of dimensionality, uncertainty of expected behavior, nonlinearity, among others, will surely discover important relationships.

4 - Multi-labeling When Data Pre-processing is Costly

Victor S. Sheng, Postdoc, Stern Business School, New York University, 44 W. 4th St., New York, NY, 10012-1126, United States of America, ssheng@stern.nyu.edu, Panagiotis G. Ipeirotis, Foster Provost

This talk addresses acquiring multiple labels for data when labeling is imperfect. Our primary focus is to improve training data for supervised learning, but we also examine the improvement in the label quality via multi-labeling. With the outsourcing of small tasks becoming easier, for example via Rent-A-Coder or Amazon's Mechanical Turk, it is possible to obtain less-than-expert labeling at low cost. We present multi-labeling strategies of increasing complexity, and show several main results.

■ WD13

M - Room 8216

Data Mining Applications

Sponsor: Data Mining
Sponsored Session

Chair: Errol Caby, ecaby@att.com

1 - Modeling the Propensity to Make Significant Disconnects

Errol Caby, ecaby@att.com

This paper uses data mining methods to model the propensity to make significant disconnects of a telecommunications service. Since there were adverse effects from setting the thresholds for significant disconnects too high or too low, these thresholds were determined by mining the data.

2 - Geographic Information Systems (GIS) Layering Facilitates Analysis and Interpretation

Turkan Gardenier, Director of Research, Pragmatica Corp., 115 Saint Andrews Drive NE, Vienna, VA, 22180, United States of America, gardeniert@yahoo.com

Geographic Information Systems (GIS) has emerged as a new scientific discipline in addressing many important environmental and energy-related challenges. By enabling data integration from a multitude of sources and, through the layering feature to display such data on a map, GIS is able to identify "hot spots" for further exploration and analysis. Interpretability, relative to bivariate and multivariate association, is approached in this presentation, using a Trinomial-oriented framework.

3 - A Two-stage Methodology for Bad Debt Optimized Presumptive Write-off

Jeremy Wortz, Manager - Operations Research & Analytics, West Asset Management, 7171, Mercy Road, Omaha, NE, 68130, United States of America, jwortz@west.com, Gediminas Murauskas, Abhinav Anand

Presumptive write-off of bad debts portfolios while minimizing potential collection losses is a key cost containment strategy for lenders and creditors. Using an example of a healthcare bad debt portfolio we present a two-stage methodology to achieve this. First we develop a predictive model to prioritize delinquent accounts for liquidation and then use stochastic and non-stochastic binary programming to optimize account balance and model scores on a segmented surface.

■ WD14

M - Room 8218

Multicriteria Decision Making II

Contributed Session

Chair: Ibrahim Karahan, Research Assistant, Middle East Technical University, Department of Industrial Engineering, Ankara, 06531, Turkey, karahan@ie.metu.edu.tr

1 - Pareto Plateau Structure and the Effect on Multiobjective Metaheuristic Performance

Deon Garrett, University of Memphis, 7864 Club Dr. #153, Cordova, TN, 38016, United States of America, deong@acm.org

This paper proposes the plateau connection structure imposed by Pareto dominance as a useful metric affecting the performance of common metaheuristic algorithms for multiobjective optimization. We show that a simple plateau connection estimation procedure can be used to aid in the selection of appropriate optimization algorithms for a given problem instance. The plateau exit distribution is also used to provide quantitative estimates of the effects of increased objective space dimensionality.

2 - A Decision Framework for the Evaluation of Knowledge Management Tools

Orhan Feyzioglu, Assistant Professor, Galatasaray University, Ciragan Caddesi No: 36 Ortakoy, Istanbul, na, 34357, Turkey, orhanfeyzioglu@gmail.com, Gulcin Buyukozkan

KM tools are information technology based systems developed to support the organizational processes of knowledge creation, storage/retrieval, transfer, and application. They are used as enablers to supply chain management to build dynamic communities. The objective of this paper is to aid decision makers in identifying the most appropriate KM tool. Considering decision criteria dependencies, Choquet integral is an interesting aggregation operator and is applied in an industrial case.

3 - A Territory Defining Evolutionary Algorithm for Preference-based Multiobjective Optimization

Ibrahim Karahan, Research Assistant, Middle East Technical University, Department of Industrial Engineering, Ankara, 06531, Turkey, karahan@ie.metu.edu.tr, Murat Köksalan

We develop a Territory Defining Evolutionary Algorithm for multiobjective optimization. The algorithm is designed to converge to the entire Pareto-optimal frontier or to regions specified by the decision maker, if desired. We test our algorithm and compare with other leading algorithms in the literature on various problems and obtain favorable results.

■ WD15

M - Room 8219

Global Delivery of Services

Sponsor: Service Science
Sponsored Session

Chair: Gyana Parija, IBM Research, IBM India Research Lab, Plot-4, Block-C, Inst. Area, Vasant Kunj, New Delhi, DL, 110070, India, gyana.parija@in.ibm.com

1 - Trends and Challenges in Global Application Services Delivery

Fausto Bernardini, Sr Mgr, Application Services Technologies, IBM Research, 19 Skyline Drive, Hawthorne, NY, 10532, United States of America, fausto@us.ibm.com

Global software development has become the norm for managing complex enterprise IT. At the same time, componentization and abstraction, ofetn expressed in Service Oriented Architectures (SOA) have proven their value in managing complexity in software methodologies. In this talk I will explore the current boundaries of the practice and research in the field, review some of the most promising new approaches to the problem, and lay out the next technical challenges.

2 - BlueReach: Supporting Global Expertise Sharing through Synchronous Chat

Kevin Singley, Research Staff Member, IBM Research, 19 Skyline Dr, Hawthorne, NY, 10532, United States of America, ksingley@us.ibm.com, Lei Kuang, Jung-Mu Tang, Jennifer Lai, Keith Grueneberg

We present a case study of BlueReach, an expertise sharing application that uses synchronous chat to connect question askers with experts. BlueReach provides a browsable directory of expertise categories to allow an information seeker to locate the right kind of expert. BlueReach has been deployed globally and is currently being used in 23 different countries. We discuss how the solution evolved over time, and the generally high level of acceptance from users and volunteer experts.

3 - Stochastic Modeling Approach for Workforce Management for Non-voice Managed Business Process

Tarun Kumar, IBM Research, IBM T.J. Watson Research Center, Yorktown Heights, NY, 10598, United States of America, ktarun@us.ibm.com, Gyana Parija, Vinayaka Pandit

We present a stochastic programming model to help BPO firms make optimal workforce hiring and deployment decisions across all the business processes. The model uses MILP approach to minimize the total cost of managing the workforce. It uses scenario trees to model stochastic demand. We further present two scenarios of usage of the model that optimize the client's effectiveness metric and enable firms to provide differentiated services by entering into revenue sharing agreement with the client.

■ WD16

M - Room 8222

Strategies in Supply Chain Competition

Contributed Session

Chair: Chenggang Huang, ESSEC Business School, 60 Avenue Du Hazay, Les Hauts De Cergy N HD353, Cergy, Paris, 95801, France, chenggang.huang@essec.fr

1 - Strategically Sharing Demand Information in Competing Channels

Hongtao Zhang, Associate Professor, Hong Kong Univ. of Sci & Tech, Clear Water Bay, Kowloon, Hong Kong, China, imhzhang@ust.hk

We consider two competing supply chains, each with a manufacturer and a retailer. Retailers conduct market research which may not generate valuable information; if it does, he may choose to disclose that information to his manufacturer. The uncertainty in the success of market research enables a retailer to credibly conceal high-demand news. We study the firms' equilibrium behavior and examine how market research capability and competition intensity impact information sharing and profits.

2 - More Than Quick and Accurate Response: A Strategic Viewpoint

Tong Wang, Assistant Professor, National University of Singapore, 1 Business Link, Singapore, 117592, Singapore, tong.wang@alumni.insead.edu, Nils Rudi, Doug Thomas

We analyze firms' strategic choices of being responsive (able to deliver quickly) or efficient (slower response but with lower cost) in a competitive market with demand uncertainty. We find that, even when responsiveness comes at no extra cost, there are situations where being efficient is a dominant strategy, because the efficient firm gets to commit first. Depending on the setting, the value of this first-mover advantage can exceed the value of the resolved uncertainty from delayed commitment.

3 - Does Competition in the Complementary Market Help the Durable Good Manufacturer?

Sreelata Jonnalagedda, Doctoral Student, University of Texas, Austin, 3457 Lake Austin Blvd E, Austin, TX, 78703, United States of America, sree.jonnalagedda@phd.mccombs.utexas.edu, Stephen Gilbert

We consider a monopolist manufacturer of durable good for which consumers derive utility only by using this durable together with a consumable contingent product, e.g. a consumer derives utility from a printer only by using it together with an ink cartridge. We assume that consumers are differentiated according to their marginal utilities for consumption of the complement, and examine the effect of competition in the market for consumables. We find that the role of competition in the consumables market depends upon the number of competitors and the extent of differentiation among the consumers. We find that, if there are relatively few competitors in the consumables market, then the manufacturer's lost market share in a still profitable consumables segment dominates the higher prices that she can charge in the durables market. On the other hand, when competition in consumables is sufficiently intense, the consumers' increased willingness to pay for the durable dominates the manufacturer's lost margins in the consumables market. When consumers are more highly differentiated, the effect of competition in the consumables market is more complex. When consumers are differentiated, competition in the consumables segment creates an interesting trade-off between increased consumer surplus, and the manufacturer's ability to extract that surplus through higher prices for the durable. As a result of this delicate trade-off, we find that the manufacturer may benefit most from moderate amounts of competition in the consumables segment.

4 - Dynamic Models in Technology Competition: A State of the Art and Opportunities for Future Research

Chenggang Huang, ESSEC Business School, 60 Avenue Du Hazay, Les Hauts De Cergy N HD353, Cergy, Paris, 95801, France, chenggang.huang@essec.fr, Fouad El Ouardighi

In this paper, we review the existing models using a dynamic setting in technology competition. We present the main approaches in the literature and suggest opportunities for future research.

5 - Planning and Scheduling Decisions in Supply Chains with Multiple Supply Modes

Peeyush Mehta, Asst. Professor, IIT Kanpur, India, Department of Ind & Management Eng, IIT Kanpur, Kanpur, India, pmehta@iitk.ac.in, Rohit Bhatnagar, Teo Chee Chong

We investigate the benefits of coordinating planning and scheduling decisions in supply chains with supply options of long lead time, low cost sea shipments, and short lead time but expensive air shipments. Minimizing inventory, shortages and shipping costs, our results suggest cost savings over some of the existing scheduling policies used in real-life situations.

■ WD17

M - Room 8226

Panel Dicussion: Strategic Research Directions

Sponsor: Quality, Statistics and Reliability
Sponsored Session
Strategic Research Directions

Chair: Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu, Yu Ding, Jan Shi

The panel will discuss the possible research directions for the QSR community.

■ WD18

M - Room 8228

Novel Optimization Techniques II

Contributed Session

Chair: Muharrem Mane, Purdue University, 3715 Cal Dr, West Lafayette, In, 47906, United States of America, mane@purdue.edu

1 - On the Global Optimality of the Generalized Trust Region Subproblem

Qingwei Jin, NCSU, 443 Daniels Hall, North Carolina State Univ., Raleigh, NC, 27695, United States of America, qjin2@ncsu.edu, Shi-Cherng Fang, Wenxun Xing

Quadratically constrained quadratic programming is an important class of optimization problems. We consider the case known as the "generalized trust region subproblem". The theory and algorithms of this problem has been well studied under the Slater's condition. In this paper, we use the extended Lagrangian to show that the strong duality theorem holds even without Slater's condition. We also provide a solution method that finds a (near) optimal solution without Slater's condition.

2 - MANGO: A Multiagent Environment for Global Optimization
Figen Öztoprak, Sabanci University, Orhanlı Tuzla 34956, İ Istanbul, Turkey, figen@su.sabanciuniv.edu, Akı n Günay, Pı nar Yolum, S. Ilker Birbil

Obtaining good solutions for global optimization problems in an efficient way is a challenging issue. The performance of existing solution methodologies are generally problem-dependent. MANGO is an ongoing project that follows an alternative approach; it involves the design of an extensible and flexible multiagent platform, in which autonomous and heterogenious agents solve global optimization problems cooperatively. In this study, we present an overview and current progress of the project.

3 - PI Control of Two Coupled Optimizing Processes
Zheng Wang, Associate Professor, School of Automation, Southeast University, 2 Si Pai Lou, Nanjing, 210096, China, wangz@seu.edu.cn

This research is motivated by multidisciplinary design optimization problems in aerospace engineering. Suppose that we have two coupled optimization problems, in which the decision variables of one problem are the parameters of the other, and vice versa. The two problems are solved concurrently and a proportional and integral (PI) control policy is proposed to coordinate the two optimizing processes. Numerical experiments show the effectiveness and confines of this optimizing control policy.

4 - Concurrent Aircraft Design and Allocation for On-demand Air Transportation via Decomposition and Approximation
Muharrem Mane, Purdue University, 3715 Cal Dr, West Lafayette, In, 47906, United States of America, mane@purdue.edu, William Crossley

The study intends to concurrently design a new aircraft and allocate it with existing aircraft to provide on-demand air service. The yet-to-be-designed aircraft makes this an allocation of variable resources problem; this is a Mixed-Integer, Non-Linear Programming problem. The study will investigate the fleet operating cost impact of the new aircraft that is specifically for fractional aircraft ownership operations. Decomposition strategies and approximation models will be investigated.

■ WD19

M - Lincoln 4

Decision Analysis III

Contributed Session

Chair: Natali Restrepo, Research Assistant, Universidad de Los Andes, Carrera 1E No 19A-40 Oficina ML752, Bogota, Colombia, na-restr@uniandes.edu.co

1 - On the Reciprocity of Preferences
Pedro Linares, Professor, Universidad Pontificia Comillas, Alberto Aguilera 23, Madrid, 28015, Spain, pedro.linares@upcomillas.es

Although the intransitivity of preferences is well established, most multiple criteria decision-making processes assume the reciprocity of preferences (if A is 3 times more preferred than B, then B is 3 times less preferred than B). We test this hypothesis in an experiment, showing that, although reciprocity is almost never perfect, it only affects decisions in a small percentage of cases. However, these cases should be considered appropriately.

2 - Decision Analysis of Mine Rescue Operations
Rayan Hafiz, Grad Student, University of Illinois at Urbana-Champaign, 205 Transportation Building, MC-238, 104 South Mathews Ave, Urnaba, IL, 61801, United States of America, rhafiz2@illinois.edu, Ali Abbas

We develop a decision analytic model to evaluate mine-rescue alternatives, and use the recent Crandall Canyon collapse case as a practical example. The model incorporates trade-offs between two attributes: money and lives saved, and incorporates new information that is revealed during the rescue operation. We compare the results obtained by constructing a two-attribute utility function using a value function or by direct utility assessment over the attributes.

3 - Decision Making Methodology for the Cost-effectiveness Study of Deafness Treatments
Natali Restrepo, Research Assistant, Universidad de Los Andes, Carrera 1E No 19A-40 Oficina ML752, Bogota, Colombia, na-restr@uniandes.edu.co, Mario Castillo H.

This work develops a decision analysis methodology to identify and select the most cost-effective treatment for deafness in Colombian children. This methodology is supported in an influence diagram that calculates and evaluates the cost and effectiveness of headphones and cochlear implant, using real patient's data and clinical costs. The methodology was originally applied to the deafness case but can be adapted for other diseases and treatments.

■ WD20

M - Lincoln 3

Advances in Decision Support Systems II

Contributed Session

Chair: Yu Wang, Univ. of Pittsburgh, 1048 Benedum Hall, Univ. of Pittsburgh, Pittsburgh, PA, 15261, United States of America, yuw9@pitt.edu

1 - Decision Support System (DSS) for the Selection of Machines through Modeling and Cost Minimization
Mayra Mendez, Graduate Student, Texas A&M University, PO Box 11181, College Station, TX, 77842, United States of America, mmendez@tamu.edu, Cesar Malave

The challenge to choose the machine to use for each different product if there is more than one type of machine on an assembly process is the focus of this research. Using a model driven decision support system (DSS), an informed, timely decision can be made thus minimizing production disruption. A DSS has been developed for an electronics assembly environment to optimize available resources, and minimize cost. The model has been developed in Microsoft Excel as well as with a mathematical model.

2 - Adding AIMMS' Optimization Power to Microsoft Excel
Ming Fang, Associate AIMMS Specialist, AIMMS (Paragon Decision Technology), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, m.fang@aimms.com

AIMMS' Excel Add-in provides a point-and-click interface for use within Excel. Although Excel offers optimization functionality itself through a Solver Add-in, AIMMS offers a more intuitive, better maintainable and more natural way of building (large-scale/complex) optimization models. The Add-in allows for easy deployment of any AIMMS model and thus enables many powerful solvers and model types. End users (thus Excel users) benefit from all while working on data in their trusted Excel.

3 - Cluster Analysis Based Ranking Methodology and Its Application to Competitiveness of Nations
Sule Onsel, Dogus University, Acibadem, Kadikoy, Istanbul, XX, 34722, Turkey, sonsel@dogus.edu.tr, Ozgur Kabak, Fusun Ulengin

This paper provides a framework to rank competing entities in terms of their overall performance. Similarities of the entities are used for ranking. The framework is composed of three stages. Initially, the data is standardized. Secondly, cluster analysis is conducted to capture the similarities among the entities. Then a mixed integer model is run for ranking. The methodology is applied to rank 129 nations according to their competitiveness based on 115 criteria of World Economic Forum database.

4 - Intelligent Agent Based Simulation System for Emergency Response Strategy
Yu Wang, Univ. of Pittsburgh, 1048 Benedum Hall, Univ. of Pittsburgh, Pittsburgh, PA, 15261, United States of America, yuw9@pitt.edu

In order to make simulation easy to establish and understand, we propose to develop an intelligent agents system at the operational level, where the artificial agent entity can detect the environment and decide its next action based on given rules. Such a system can become an effective and economical tool for emergency response strategy selection and validation, and the knowledge obtained from simulations could be a valuable for aiding practical strategy decision.

■ WD21

M - Lincoln 2

Sustainable Operations

Contributed Session

Chair: Baris Yalabik, Assistant Professor, The University of Tampa, 401 W Kennedy Blvd - Box O, Tampa, FL, 33606, United States of America, byalabik@ut.edu

1 - Determining Optimal Schedule Requirements for Green Hotel Renovations
Cara Dienes, PhD Student, Iowa State University, 3013 Black Engineering, Ames, IA, 50011, United States of America, cdienes@iastate.edu, Zhaoyang Duan, Lizhi Wang

With growing interest in green buildings and the need for renovations in the hospitality industry, there is potential for hotels to initiate green renovations of their structures. We use mixed integer programming to incorporate guest room renovation scheduling with revenue management to assist hotels in determining optimal scheduling requirements.

2 - Discount Pricing and Consumer Segmentation for Reusable Goods

Michael Pangburn, University of Oregon, 488 Lillis Building, Eugene, OR, 97403, United States of America, pangburn@uoregon.edu, Tolga Aydinliyim

We consider the problem of setting optimal price-discounts for a firm that sells a product with complementary reusable resources, e.g., Starbucks coffee with a reusable cup and sleeve. Our model captures the effects of such a policy on the profitability of the firm and its environmental impact. Using an appropriate demand model, we also analyze the sensitivity of the decisions depending on the customer segments that the policy creates.

3 - GreenOR at the US Coast Guard Academy and Beyond

Ian Frommer, Assistant Professor, US Coast Guard Academy, 27 Mohegan Avenue, New London, CT, 06320, United States of America, Ian.D.Frommer@uscga.edu, Mark Case

Operations research techniques increasingly are being applied to problems of sustainability such as energy efficiency, alternative energy, and waste flow. In this talk we give an overview of some of these works and then discuss an undergraduate project we advised on waste flow optimization at the US Coast Guard Academy. We close with suggestions for similar projects that could be undertaken by others at their own institutions.

4 - Optimizing Environmental Investments for Value Maximization

Baris Yalabik, Assistant Professor, The University of Tampa, 401 W Kennedy Blvd - Box O, Tampa, FL, 33606, United States of America, byalabik@ut.edu

We model and solve for the optimal environmental investment for a firm operating in a market where buyers observe and care about the firm's environmental decisions. In addition, considering a case where shareholders also care about the firm's environmental decisions, we describe the effects of alternate objective functions on the decisions made by the firm.

■ WD22

M - Lincoln 1

Computer Science Applications

Contributed Session

Chair: Mohammed Quasem, Howard University, Washington, DC, United States of America, quasem2@hotmail.com

1 - A Revenue Management Approach to the Restaurant's Table Top Reservation

Lila Rasekh, Disney, 13001 Mulberry Park Dr #131, Orlando, FL, 32821, United States of America, lila.rasekh@hec.ca

Walt Disney World (WDW) owns 43 restaurants location which account for 110 different meal period. Annually, 5M reservations are made to these restaurants. This paper presents a unique algorithm to optimally assign a set of sequential reservations to a set of table tops at WDW restaurants. This algorithm combines the branch and cut and column generation technique to efficiently solve the problem.

2 - ProMo- A Scalable and Efficient Framework for Online Data Delivery

Avigdor Gal, Associate Professor, Technion Israel Institute of Technology, Faculty of IE and Management, Technion City, Haifa, 32000, Israel, avigal@ie.technion.ac.il

Online data sensing and delivery for emerging platforms require increased sophistication to meet client customization. Applications include RSS streams, geo-location, and on demand Grid computing. ProMo is a data delivery solution that can accommodate push and pull delivery methods and exploits server capabilities in meeting client needs. ProMo provides expressive profiles that are translated into execution intervals with which schedules for probing resources or sensors are constructed.

3 - Mathematical Model Development for Multiplicity Adjustment Method for Correlated Response Variables

Mohammed Quasem, Howard University, Washington, DC, United States of America, quasem2@hotmail.com, Mohammad F. Huque

When Multiple comparison tests are performed in multiple correlated response models to the same level of alpha, then these tests inflate the probability of false positive findings to a level greater than alpha. The error probability of multiple hypothesis testing is called family wise type I error rate. We develop the mathematical model using SAS proc program to control the type I error rate by adjusting significance level of each test.

■ WD23

M - Lincoln 5

Sequential Change Detection and Identification

Sponsor: Applied Probability
Sponsored Session

Chair: Kazutoshi Yamazaki, Princeton University, ORFE, E-Quad, Princeton NJ 08544, United States of America, kyamazak@princeton.edu

1 - Asymptotically Optimal Bayesian Sequential Change Detection and Identification Rules

Savas Dayanik, Princeton University, Department of Oper. Res. and Fin. Eng., Olden St, E-Quad, Princeton, NJ, 08544, United States of America, sdayanik@princeton.edu, Warren Powell, Kazutoshi Yamazaki

We study the problem of sequential detection and identification of a sudden unknown and unobservable change as quickly and accurately as possible. We propose a sequential decision rule that declares and identifies a change as soon as the posterior probability of a change type exceeds some fixed threshold. We show that the rule is asymptotically optimal under Bayesian and fixed-error formulations as the unit sampling cost and misdiagnosis probability go to zero, respectively.

2 - Detection of Changes in Lifetime Data

Emmanuel Yashchin, IBM, Thomas J. Watson Research Center, PO Box 218, Yorktown Heights, NY, 10598, United States of America, yashchi@us.ibm.com

We consider the problem of monitoring data corresponding to a sequence of lifetime tests. The main difficulty of the monitoring problem is related to the dynamic nature of the data acquisition process, as the information collected at consecutive points in time generally affects data for a broad range of lifetime tests in progress. In this paper we present an approach to monitoring such type of data and give examples related to the problem of monitoring reliability of computer components.

■ WD24

M - Lincoln 6

Multi-agents Methods and Applications

Sponsor: Computing Society
Sponsored Session

Chair: David Jeffcoat, Principal Engineer, Air Force Research Lab, 101 W. Eglin Blvd, Eglin AFB, FL, 32542, United States of America, david.jeffcoat@eglin.af.mil

1 - Intelligent Agent Strategies for Dynamic Vehicle Routing Problems

Martijn Mes, Assistant professor, University of Twente, PO Box 217, Enschede, 7500 AE, Netherlands, m.r.k.mes@utwente.nl

We study a pickup and delivery problem where time-sensitive jobs are offered through sequential auctions, and where a fixed set of vehicles compete with each other to service these jobs. We model this as a multi-agent system consisting of shipper agents and vehicle agents that both apply profit maximizing look-ahead strategies. We use simulation to study the impact of applying these local strategies - in the absence of any form of central coordination - on the system-wide logistical costs.

2 - A Multi-agent System Modeling on Agricultural Technology Adoption, Labor Mobility and Land Market

Lin Zhang, Penn State University, University Park, State College, PA, 16686, United States of America, luz1@psu.edu, Jill Findeis

A multi-agent system is used to simulate new agricultural technology diffusion and explore different possible scenarios coupled with household characteristics under certain markets conditions. Simulation results provide insight into 1) the economic strategies relative to rural labor mobility and time allocation decision, 2) agricultural land leasing market conditions in underdeveloped regions, and 3) technology adoption constraints.

3 - Weakly Cooperative Systems

David Jeffcoat, Principal Engineer, Air Force Research Lab, 101 W. Eglin Blvd, Eglin AFB, FL, 32542, United States of America, david.jeffcoat@eglin.af.mil, Pavlo Krokhmal

We introduce a concept of weakly cooperative systems that can represent a wide range of multi-agent systems. Our mathematical model is the Markov process. We present a general framework and illustrate it on a number of search and engage systems. Our analysis shows that the impact of cooperation on overall system performance is inherently bounded. Finally, we introduce a measure of cooperation that enables one to quantify the "degree of cooperativeness" in a given multi-agent system.

■ WD25

M - Lincoln 6A

Vehicle Routing III

Contributed Session

Chair: Sarah Root, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, seroot@uark.edu

1 - A Local Search Procedure for the Multi-compartment Capacitated Arc Routing Problem

Luc Muyldermans, Dr, Nottingham University Business School, Jubilee Campus, Wollaton Road, Nottingham, NG81BB, United Kingdom, luc.muyldermans@nottingham.ac.uk, Gu Pang

We investigate the multi-compartment capacitated arc routing problem - an extension of the classical capacitated arc routing problem where the edges have a demand for different commodities. Multi-compartment vehicles are available to co-collect these commodities. We present a local search procedure and we report on extensive computational tests to find out when co-collection is better than separate co-collection. Sensitivities in key problem parameters are explored.

2 - A Branch-and-cut Algorithm for the Capacitated Location Routing Problem

Claudio Contardo, Université de Montréal, CIRRELT, 2920 Chemin de la Tour, Bureau 3484, Montreal, QC, H3T 1J4, Canada, ccontard@crt.umontreal.ca, Jean-Francois Cordeau, Bernard Gendron

The Capacitated Location-Routing Problem (CLRP) addresses with a particular class of LRP in which both facility and vehicle capacities are homogeneous. We introduce a new compact 2-index formulation and propose several new valid inequalities, separation algorithms and shrinking routines. Computational results over known instances from the literature show that we are able to get tight lower bounds in reasonable times, and moreover some instances are solved to optimality for the very first time.

3 - Dial-a-ride Problem with Flexible Destinations

Sarah Root, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, seroot@uark.edu, Julie Braden

We introduce a variant of the Dial-A-Ride Problem that has Flexible Destinations (DARP-FD). Instead of submitting requests with a pre-specified destination, users can instead submit a set of destinations that they would consider visiting. The DARP-FD then determines which destination they will visit. We present a framework for addressing this problem, two models for DARP-FD, and computational results of both optimization and heuristic approaches to this problem.

4 - Automotive Frequency Routing and Mode Estimation

Amit Garg, Logistics Engineer, Penske Logistics, 3000 Auburn Drive, Beachwood, 44122, United States of America, amit.garg@penske.com, Vishwa Ram, Tony Knechtges, Kevin Troyer

We develop an algorithm to simultaneously identify frequency of service and shipment mode for every Origin-Destination pair. This algorithm uses a variation of "Fractional Bin Packing Problem" (FBPP) to identify efficient direct and hub routes. It also uses a MIP model based on "Multiple Traveling Salesman Problem Optimization" (MTSPO) to find consistent supplier appointments. FBPP as well as MTSPO were separately formulated for hub routing and direct routing and solved using CPLEX 11.0.

■ WD26

M - Lincoln 5A

Conic Optimization Approaches for Integer Programming Problems

Sponsor: Computing Society: Mixed Integer Nonlinear Programming (Joint Cluster Optimization)

Sponsored Session

Chair: Miguel Anjos, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, manjos@uwaterloo.ca

1 - Convex Hulls of Low-dimensional Quadratic Forms Over Polytopes

Sam Burer, University of Iowa, samuel-burer@uiowa.edu

When optimizing a nonconvex quadratic function over a polytope, approximating the convex hull of variable products is a fundamental issue. In this talk, we show how to exactly represent such convex hulls over simplices (in dimension 4 or less) and over boxes (in dimension 3 or less) using linear and semidefinite programming.

2 - On Interior-point Warmstarts for Combinatorial Optimization Problems

Alexander Engau, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, aengau@alumni.clemson.edu, Miguel Anjos, Anthony Vannelli

The solution of discrete optimization problems often depends on the ability to efficiently solve series of closely related subproblems commonly arising from branch-and-bound or alternative cutting schemes. In this talk, we discuss our recent progress on warmstarting an interior-point algorithm to quickly solve the associated LP/SDP relaxations, for which we present encouraging preliminary results on several numerical test instances.

3 - Ensemble Clustering Via Semidefinite Programming

Jiming Peng, Professor, University of Illinois at Urbana-Champaign, Department of Industrial & Enterprise Systems, 104 S. Mathews Ave., Urbana, IL, 61801, United States of America, pengj@uiuc.edu, Vikas Singh, Jinhui Xu, Lopamudra Mukherjee

We consider the ensemble clustering problem where the task is to agrregate multiple clustering solutions into a single one that maximizes the shared information among given clustering solutions. In this talk we first propose a new agreement measure based on 2D string encoding. We show that the maximization of the new agreement measure can be tranformed to the so-called 0-1 SDP, which can further be reduced to polynomial solvable SDP. Experiments based on the new measure will be reported.

■ WD28

M - Washington 1

Logistics

Contributed Session

Chair: Malini Natarajarathinam, Assistant Professor, Texas A&M University, 3367 TAMU, College Station, TX, 77840, United States of America, malini@entc.tamu.edu

1 - Tax Reform in Brazil: Some Effects on the Brazilian Logistic Network

Hugo Yoshizaki, Associate Professor, University of São Paulo, Dept of Production Engineering, Av Prof Almeida Prado Trav 2 no 128, Sao Paulo, SP, 05508-900, Brazil, hugo@usp.br, Celso Hino

The Tax Reform now under analysis by the Brazilian Congress will radically change state sales taxes for goods and services. This work evaluates, using an integer linear programming model of a hypothetical case, what is the potential influence of the proposed Reform upon current distribution networks. It concludes that the Reform will not solve logistical inefficiencies caused by current tax structure, although some changes in the logistic network could be quite noticeable.

2 - Some Strategic Considerations on Open Service/Logistics Networks

Clemens van Dinther, Dr., FZI - Forschungszentrum Informatik Karlsruhe, Haid-und-Neu-Str. 10-14, Karlsruhe, Germany, vanDinther@fzi.de, Tobias Conte, Marc Schleyer

In open logistics or service networks service providers cooperatively perform services. Service contributions differ in their functional characteristics and also in profit (from a personal and network perspective), and thus, in their importance for the networked service. This impact the service providers' negotiate power regarding its share on the network profit. We study consequences of this diversity in respect to profit distribution, balance of power and allocation of service offers.

3 - Planning the Harvest and Distribution of Perishable Crops for Supply Chain Profit Maximization

Omar Ahumada, Arizona State University, University Dr. and Rural Rd., Tempe, AZ, 85287, United States of America, omar.ahumada@asu.edu, Rene Villalobos

In this presentation we introduce an integrated model for maximizing the profits of grower-shippers in the fresh produce supply chain. The profitability of producers is influenced by their management of labor costs, the preservation of the value of their perishable crops, and the use of efficient transportation modes that provide the best trade-off between time (quality of products) and cost. Our model optimizes harvesting, packing and transportation decisions in the fresh produce industry.

4 - Intermodal Transportation Systems for Asian Goods to U.S. via Mexico: An Analysis

Malini Natarajarathinam, Assistant Professor, Texas A&M University, 3367 TAMU, College Station, TX, 77840, United States of America, malini@entc.tamu.edu, Ismail Capar, Arunachalam Narayanan

The objective of our research is to investigate the potential advantages of importing Asian goods into the US through Mexico as opposed to bringing them in through ports in western United States. The output of this research would be inputs to a mathematical programming model to best describe the problem. The data for this research will be collected using our resources at Texas A&M University's Global Research Center at Monterrey and governmental agencies in the United States.

■ WD29

M - Washington 2

Data Envelopment Analysis III

Contributed Session

Chair: Herbert Lewis, Stony Brook University, Department of Technology and Society, Stony Brook, NY, United States of America, hlewis@notes.cc.sunysb.edu

1 - Multiparametric Sensitivity Analysis of the Additive Model in Data Envelopment Analysis

Sanjeet Singh, Professor, Indian Institute of Management Calcutta, Diamond Harbour Road, Joka,, Kolkata, WB, 700104, India, sanjeet@iimcal.ac.in

In this paper, we study multiparametric sensitivity analysis of the additive model in data envelopment analysis using the concept of maximum volume in the tolerance region. We construct critical regions for simultaneous and independent perturbations in all inputs/outputs of an efficient decision making unit. Necessary and sufficient conditions are derived to classify the perturbation parameters as 'focal' and 'nonfocal'.

2 - Comparison of DEA and SFA Methods in the Philippine Manufacturing Industry

Emilyn Cabanda, Dr, Regent University, 1000 Regent University Drive, Global Leadership&Entrepreneurship, Virginia Beach, VA, 23464, United States of America, ecabanda@regent.edu, Eduardo Gayosa

This paper investigates the efficiency performance of 100 firms from 10 selected manufacturing industries in the Philippines for the period 1995-2004 using data envelopment analysis (DEA) and stochastic frontier analysis (SFA). This research provides significant evidence on the usefulness of the two frontier methods as alternative tools for performance measurement.

3 - Determining the Priority of Transport Policies Using DEA's Ranked Voting Data

Seock-Jin Hong, Professor, Univ. of Incheon, 7-46 Songdo-Dong, Yeonsu-Gu, Incheon, 406-840, Korea, Republic of, sjhong@incheon.ac.kr

Previous Korea transport policies have been focused mostly on the supply of infrastructure. The fast growth of motor vehicles until the late 90s in Korea led to an acceleration of the imbalance between the demand and supply. As such, there is a need to establish an innovative transportation policy. This research has developed strategies and policies based on interviews. The most urgent issues identified were the development of an intermodal transport system.

4 - Measuring Extraordinary Performance in Airport Operation in Korea

Seungkee Baek, University of Michigan, 1306 McIntyre, Ann Arbor, MI, 48105, United States of America, skbaek@umich.edu

This research measures operational efficiency of airports in Korea. We apply super efficiency DEA model to our approach and identify normalized industry level of efficiencies. We analyze airport operation in Korea and suggest strategic approach to increase utilization of regional airport in Korea.

5 - Using DEA Factor Efficiency Scores to Eliminate Subjectivity in Goal Programming

Herbert Lewis, Stony Brook University, Department of Technology and Society, Stony Brook, NY, United States of America, hlewis@notes.cc.sunysb.edu

In this paper, we present a model framework designed to eliminate the arbitrary assignment of target values and unit penalty weights when applying goal programming to solve multi-criteria decision problems. In particular, when neither of these parameters is available, we show how to integrate factor efficiency scores determined from data envelopment analysis into the model.

■ WD31

M - Washington 5

Resource Allocation

Contributed Session

Chair: John Zhang, University of Pennsylvania, 3730 Walnut St, Philadelphia, PA, United States of America, zjzhang@wharton.upenn.edu

1 - A Computational Analysis of Market-based Distributed System Optimization

Zhiling Guo, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, MD, 21250, United States of America, zguo@umbc.edu, Gary Koehler, Andrew Whinston

This paper presents a computational market model to support distributed resource allocation in a dynamic trading environment. We experimentally investigate how strategic behaviors of market participants, namely, agent learning of market price and the dealer's inventory policies, affect market dynamics, efficiency, and performance. We find that agent learning has a positive effect on market convergence, while the dealer's liquidity provision conditionally improves market performance.

2 - Discrete Time/Resource Trade-off Problems with Variable Resource Allocation

Mareike Bauer, University of Hamburg, Von-Melle-Park 5, Hamburg, 20146, Germany, mareike.bauer@uni-hamburg.de

The Time/Resource Trade-Off problem of the RCPSP is usually based on variable processing times. In contrast, a model is developed here, which is focused at the trade-off between the project makespan and the allocation of resources while processing times remain fixed. Suitable solution approaches will be discussed.

3 - Impact of Uncertainty in HIV Resource Allocation

Katherine Hicks, RTI International, 3040 Cornwallis Rd, RTP, NC, 27709, United States of America, khicks@rti.org, Anke Richter

Mathematical programming techniques are used for allocating HIV prevention funds with the goal of maximizing the number of infections that interventions can avert. A challenge in that effort is accurately forecasting disease spread when data are difficult to acquire and the dynamics of disease spread constantly changing. We will explore the potential effects of allocating funds based on erroneous forecasts, and methods that can be incorporated into resource allocation to mitigate their impact.

4 - Optimal Partitioning of Jobs Among Heterogeneous Servers

John Zhang, University of Connecticut, 2100 Hillside Road Unit 1041, Storrs, CT, United States of America, john.zhang@business.uconn.edu

We study the allocation of repair jobs to multiple servers with unequal processing capacities. Repair jobs arrive at a central administrator following a Poisson process. The central administrator needs to optimally partition the arriving jobs to multiple servers so as to minimize the average number of jobs in the entire system. Practical implications of the proposed partitioning scheme is discussed for the railcar industry.

5 - Agent-based Modeling and Simulation (ABMS) for Hierarchical Resource Allocation Network

Yu Teng, Purdue University, 206 S. Martin Jischke Dr., West Lafayette, IN, 47907, United States of America, yteng@purdue.edu, Nan Kong

We consider an abstract hierarchical allocation network in which resources are allocated based on some geographic preference. Such a network may arise in many public OR applications. We developed an ABMS model to evaluate allocation policy alternatives. We found that agents with more partners have less average waiting time and a tradeoff exists between the number and distance of partners. We will apply simulation optimization to select the optimal policy and study self organization issues.

■ WD32

M - Washington 6

Inventory Control II

Contributed Session

Chair: GAO Junjun, Associate Professor, Shanghai University, Shanghai, Jiading Distinct, Shanghai, 201800, China, gaojunjun@staff.shu.edu.cn

1 - An Inventory Management Model with Reputation-dependent Demand

Eugene Khmelnitsky, Tel-Aviv University, Levanon St., Tel-Aviv, Israel, xmel@eng.tau.ac.il, Gonen Singer

We deal with a problem of inventory control, which incorporates the reputation of the system as a key factor influencing the distribution of future demand. The analysis of optimality conditions developed for the problem allows formulating some structural properties of optimal dynamics of inventory and reputation.

Further analysis shows that there are two types of optimal behavior, and correspondingly, two cases of the locally optimal policy. A numerical procedure is also presented.

2 - How to Deal with Uncertain Inventory Control Parameters

Elleke Janssen, Tilburg University, PO Box 90153, Tilburg, 5000 LE, Netherlands, e.janssen_1@uvt.nl, Fred Janssen, Leo Strijbosch

For some industries, like process industry, it is difficult to produce exactly the required replenishment quantity, due to, e.g., yield problems. Hence the optimal control parameter is more a target than an exact result. We provide a method to deal with this uncertainty in inventory control by considering the control parameters to be random, unlike classical inventory control. We use our method with a periodic review, order-up-to policy and real life data to show that it works in practice.

3 - Combined Ordering and Pricing Decisions for a Perishable Product with Fixed Lifetime

Li-Ming Chen, University of Florida, 2777 SW Archer Rd. Apt 307, Gainesville, FL, 32608, United States of America, lmchen@ufl.edu, Amar Sapra

We consider joint inventory control and pricing decisions for a perishable item with a fixed lifetime of two periods. The demand in each period is random, and excess demand is backlogged. Further, inventory is allocated on a first-come, first-serve basis. We derive results on the structure of the optimal policy. We also develop effective heuristics.

4 - A Joint Decision Model of Variants Selection, Shelf-space Allocation, and Inventory Control

GAO Junjun, Associate Professor, Shanghai University, Shanghai, Jiading Distinct, Shanghai, 201800, China, gaojunjun@staff.shu.edu.cn

The problem of jointly determining product variety (PV), shelf-space allocation (SSA) and inventory control (IC) is studied. A joint decision model is established to maximize total profits, subject to given stocking space constraints and service level constraints. Also a heuristics solving algorithm is given and numerical results are presented, which show that this joint decision model could evidently increase 115 percent profit higher than the policies applied by retailer before.

5 - Revenue and Inventory Management for Perishable Products

Arvind Sainathan, PhD Student, University of Rochester, Simon School, Rochester, NY, 14627, United States of America, sainathana2@simon.rochester.edu

We consider a product with a sales life of two periods sold by a retailer. There are two types of stock: old and new. Consumers have three choices - buy old, buy new or buy neither. Demand substitution (under stockouts) is also considered. We find the policy (the decision variables are quantity to produce each period and prices of old and new products) that maximizes average profit per period. Some simple "myopic" policies are also evaluated and analyzed. Managerial conclusions are provided.

■ WD33

M - Johnson

Emergency Department Improvement in Healthcare

Contributed Session

Chair: John Fowler, Professor, Arizona State University, Dept of Industrial Engineering, PO Box 875906, Tempe, AZ, 85287, United States of America, john.fowler@asu.edu

1 - Applying a Shift Auction to a Complex System

Melanie De Grano, IBM Global Business Services, 1101 South Joyce Street, Apt. 2544, Arlington, VA, 22202, United States of America, melanie.degrano@us.ibm.com

This research applies a scheduling system that allows nurses to express shift preferences via auction. Requirements from the emergency department at York Hospital are used to create model constraints, and scheduling requests are translated into bids. The auction awards the highest bids insofar as possible while maintaining hospital requirements. The auction system yields a high award percentage, showing that auctions have potential to be applied in hospitals with complex constraints.

2 - Analyzing Patient Flow from the Emergency Department to the Medical Intensive Care Unit

Jillian Berry, Doctoral Student, Harvard Business School, Soldiers Field, Wyss Hall, Boston, MA, 02163, United States of America, jberry@hbs.edu, Christian Arbelaez, Anita Tucker

Admitting a patient to the medical intensive care unit from the emergency department is currently a timely and cumbersome process involving multiple patient care providers. This early stage study aims to understand and represent the existing process in a Boston hospital through interviews and the tracer method; identify areas where bottlenecks occur; and provide suggestions for improvements to the system.

3 - A "Slicing" Approach for IMRT Optimization Using Linear Programming

Hao Zhang, University of Wisconsin-Madison, 922 Erin St. Apt. 4, Madison, WI, United States of America, haoz@cae.wisc.edu, Warren D'Souza, Robert Meyer, Leyuan Shi

In this research, we propose a two-stage approach in which the aperture specific dose distributions were calculated using Monte Carlo and then optimized using sequential linear programming techniques. Compared with the "conventional" IMRT planning approach and a single-stage process known as "direct aperture optimization", our results demonstrate that the two-stage optimization process yields superior results relative to the conventional approach and to the direct aperture-based approach.

4 - Analysis of Diversion Decisions in Emergency Departments Using a Markov Decision Process Model

John Fowler, Professor, Arizona State University, Dept of Industrial Engineering, PO Box 875906, Tempe, AZ, 85287, United States of America, john.fowler@asu.edu, Adrian Ramirez Nafarrate, Esma Gel

The overcrowding of emergency departments (ED) in the United States is a major problem with important consequences, such as the diversion of ambulances. There is evidence that emergency departments have increased the number of hours per year on diversion and there is not a well-accepted procedure to trigger the onset of diversion. This research proposes the use of a discrete time Markov Decision Process to determine when to go on diversion in an ED from a financial perspective.

■ WD34

M - Jefferson

Resource Allocation and Scheduling in Healthcare

Contributed Session

Chair: Yuri Smirnoff, Adjunct Professor, CMU-West, Building 23, Moffett Field, CA, 94035, United States of America, ysmirnoff@gmail.com

1 - Patient Scheduling in Healthcare Nuclear Medicine Departments (NMDs)

Eduardo Perez, Texas A & M University, 3131 TAMU, College Station, TX, United States of America, eduardopr@tamu.edu, Lewis Ntaimo

NMD procedures deal with medical imaging, diagnosis, and therapy using properties of radioisotopes. These procedures have to be performed under restrictive time constraints to get good images/diagnoses. The complex nature of NMD and the need to provide high levels of patient service leads to challenging scheduling issues such as uncertainty in patient/radioisotope arrivals. We present stochastic online scheduling models and a discrete event simulation towards improving patient service in NMDs.

2 - Optimal Incentive-based Schemes for Multi-level Allocation of HIV Prevention Resources

Monali Malvankar, PhD Student, University of Western Ontario, 1151 Richmond St N, London, ON, N6A3K7, Canada, mmalvankar@ivey.uwo.ca, Greg Zaric

HIV prevention funds normally traverse through multiple-levels of distribution and decision making. Decision makers at each level use equity-based heuristics that may lead to sub-optimal allocation of HIV prevention resources. We model multiple incentive schemes for multiple regions, multi-level HIV resource allocation process to promote optimal allocation of HIV prevention funds.

3 - Pricing of Combination Vaccines

Ruben Proano, Assistant Professor, Rochester Institute of Technology, 81 Lomb Memorial Drive, KGCOE, Rochester, NY, 14823, United States of America, rapeie@rit.edu, Sheldon Jacobson, Edward Sewell, Uday Shanbhag

As a result of the introduction of better and more expensive combination vaccines, vaccine supply in developing countries is more limited. This study formulates a MINLP to find the optimal price of combination vaccines so that they are more affordable to developing nations. The problem is solved via a constructive two-step approach. The first step finds the optimal vaccine allocation between manufacturers and countries, while the second step solves the optimal pricing of such allocations.

4 - Physician Personnel Scheduling

Yuri Smirnoff, Adjunct Professor, CMU-West, Building 23, Moffett Field, CA, 94035, United States of America, ysmirnoff@gmail.com, Harry Bovik

Severe shortage of nurses and doctors in the US leads to demanding work schedules, lack of rest, costly errors, high turnover in the medical area. Physician personnel scheduling is a complex problem due to staff profiles and preferences, varying demand, complex scheduling rules, shift compatibility, requests for vacations and specific shifts. We designed a user-friendly language that models a wide range of scheduling problems and automates schedule generation.

■ WD35

M - Jackson

Operations Research in Education II

Contributed Session

Chair: Danielle Lanigan, Graduate Student, Clemson University, Department of Industrial Engineering, 110 Freeman Hall, Clemson, SC, 29634, United States of America, dlaniga@clemson.edu

1 - The Undergraduate Quantitative Business Curriculum

Ismael Dambolena, Professor, Babson College, Mathematics/Science Division, Babson Park, MA, 02457, United States of America, dambolena@babson.edu

We present a new approach to the introduction of hypothesis testing for business students. The new approach is intuitive and places the concept of p-values in a central role. We have tested this intuitive introduction several times, always with much better results than those we obtained with the old introduction based on test statistics and critical values.

2 - Incoming First Year Minorities' Technology Skill Backgrounds Relationships to Operations Interests

Alex Citurs, Assistant Professor, Eastern Connecticut State University, 83 Windham Street, Willimantic, CT, 06226, United States of America, citursa@easternct.edu

Entering first year minority college students' decisions to pursue academic interests in operations management and similarly related discipline fields are examined in relationship to the students' background learning environment experiences and previously acquired technology skill sets. Technology skill set assessment results, skill learning environment contexts, and students' discipline interests are examined for a northeastern university's incoming first year class.

3 - Using Virtual Networks to Promote Individual and Organizational Learning

Luis Pinzon, Universidad de los Andes, Cra 1 Este No.18A-10, Bogota, Colombia, lpinzon@uniandes.edu.co, Roberto Zarama Urdaneta, Marìa Margarita Botero, Marìa Cristina Carulla, Astrid Ximena Bejarano, Ricardo Barros

The authors present their experience in designing collaborative virtual networks to foster the development of mathematical problem solving skills among young students. The authors use social network theory, mathematical tests, and qualitative analysis to explore how the structure of the networks is related to the students' problem solving skills, their beliefs and attitudes towards mathematical problem solving, and their collaborative work.

4 - Introducing Authentic Engineering Projects into a Middle School's "Gateway to Technology

Maria Mayorga, Assistant Professor, Clemson University, Department of Industrial Engineering, 146 Freeman Hall, Clemson, SC, 29634-0920, United States of America, MAYORGA@exchange.clemson.edu, Danielle Lanigan

We present a case study of a project in which Industrial Engineering students apply and implement principles of networked learning, the use of virtual organizations in engineering and other issues related to improving the quality engineering education in an advanced science and "pre-engineering" curriculum for 6th - 8th graders at McCants Middle school. Motivated by a recent NSF-Research Experience for Teachers (RET), a team of students develop and implement web-tools and course modules.

■ WD36

M - T. Marshall Ballroom East

Stochastic Processes II

Contributed Session

Chair: Asgeir Tomasgard, NTNU, Gloeshaugen, Trondheim, NA, 7491, Norway, asgeir.tomasgard@iot.ntnu.no

1 - A Multi-processor Approach for Stochastic Programming

Marcel Hunting, AIMMS (Paragon Decision Technology), Schipholweg 1, Haarlem, 2034 LS, Netherlands, Marcel.Hunting@aimms.com

The Benders decomposition algorithm in AIMMS is written as a user-customizable procedure within the GMP library, allowing modelers to adapt the algorithm to their own needs. We have extended the Benders decomposition algorithm such that a distributed computing system can be used to solve the Benders sub-problems in parallel.

2 - Development of a Stochastic Process to Model Nurses Activities and Behaviors

Fehime Utkan, Doctoral Associate, Western Michigan University, Department of IME,College of Engineering, &Applied Science Parkview, Kalamazoo, MI, 49008, United States of America, fehime.utkan@wmich.edu, Steven Butt, Ilgin Acar, Stephanie Means

We develop a stochastic process to model the activities and behaviors of nurses on a hospital unit. Scenarios and layouts are considered to determine the impact of unit layout on nurses. A case study will be presented based on a Neonatal Intensive Care Unit (NICU).

3 - Buffer Design for the Stochastic Service Line with Batch Processing and a Finite Buffer

Seok Ho Chang, Assistant Professor, Nanyang Technological University, 50 Nanyang Avenue, Singapore, 639798, Singapore, seokhochang@ntu.edu.sg

This paper considers the stochastic service line with batch processing and a finite buffer. The purpose of this paper is to present the stochastic modeling and performance analysis of this system. We also address the issue in the design and operation of this sytem using numerical example.

4 - Stochastic Multistage Portfolio Optimization for a Natural Gas Producer

Asgeir Tomasgard, NTNU, Gloeshaugen, Trondheim, NA, 7491, Norway, asgeir.tomasgard@iot.ntnu.no, Kjetil Midthun, Frode Römo, Marte Fodstad

We present a multistage portfolio optimization model for a large natural gas producer using spot markets to supplement physical production capabilties in contract management. We also study the value of using a stochastic model as compared to a deterministic model. The model is tested over two 60-days periods using real market data and realistic production and transportation capacities.

■ WD37

M - T. Marshall Ballroom West

The Summer Program for Operations Research Technology at the National Security Agency

Contributed Session

Chair: Kevin Drummey, Technical Director, National Security Agency/Enterprise Operations Research, Modeling & Simulation Group, 9800 Savage Road, Ft. Meade, MD, 20755, United States of America, dr_kev21144@msn.com

1 - Overview of NSA and its Summer Program for Operations Research Technology

Kevin Drummey, Technical Director, National Security Agency/Enterprise Operations Research, Modeling & Simulation Group, 7923 Severn Hills Way, Severn, MD, 21144, United States of America, kwdrumm@nsa.gov

In this talk, we introduce the Summer Program for Operations Research Technology (SPORT) in the context of NSA's main missions, signals intelligence and information assurance. We also provide a technical overview of the primary areas for operations researchers at NSA as well as specific projects within SPORT.

2 - Tracing the Value of Information to its Source

Daniel Erceg, erceg4084@hotmail.com

Determining the value of information in non-for-profit organizations can be challenging. We present a mathematical formulation to tackle this issue based on measurable aspects of information. To motivate this presentation, we will be determining which author has the most "authority" on particular key terms.

3 - A Classification Tool Based on IP Network Traffic Patterns

Deanna Kennedy, University of Massachusetts Amherst, Isenberg School of Management, 121 Presidents Drive, Amherst, MA, 01003, United States of America, dkennedy@som.umass.edu

Internet traffic is comprised of users on public and private networks. The IP (Internet Protocol) traffic, or packet volume, sent from source to destination ports may be used to characterize networks by type. Herein we consider the IP traffic patterns across ports to develop a classification tool that identifies networks as either public or private.

4 - Graph Splitting Techniques Using Seidel's Adjacency Matrix

Andrew Clark, agc@sfsu.edu

Clustering large sparse graphs has practical applications in many areas. This presentation discusses a comparsion of two clustering techniques.

■ WD38

M - Tyler

Efficient Algorithms for Linear Programming

Contributed Session

Chair: Peter Nieuwesteeg, Senior AIMMS specialist, AIMMS (Paragon Decision Technology), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, Peter.Nieuwesteeg@aimms.com

1 - Sensor Information Monotonicity in Disambiguation Protocols

Xugang Ye, Johns Hopkins University, Department of Applied Math and Statistics, 3400 North Charles Street, Baltimore, MD, 21211, United States of America, xye@ams.jhu.edu, Carey Priebe

We investigate the performance of disambiguation protocols that use sensor readings. In particular, we investigate the difference in performance when a disambiguation protocol employs various sensors ranked by the sensors'estimation quality. We demonstrate that a superior sensor can yield superior traversal performance. In so doing, we provide to the decision-maker the wherewithal to quantitatively assess the advantage of a superior (and presumably more expensive) sensor.

2 - An Efficient Algorithm for Large-scale Linear and Convex Minimization in Relative Scale

Peter Richtarik, postdoctoral fellow, Catholic University of Louvain, Batiment Euler A-116, Avenue Georges Lemaitre 4, Louvain-la-Neuve, 1348, Belgium, peter.richtarik@uclouvain.be

We propose two variants of a single efficient first-order algorithm simultaneously solving a number of related optimization problems in relative scale. From among the many possible applications we outline those to truss topology design and optimal design of statistical experiments.

3 - A Case Study: How to Speed Up the Simplex Algorithms on Problems Minimizing L1 and Linf Norms

Bo Jensen, MOSEK ApS, Copenhagen, Denmark, bo.jensen@mosek.com

Minimizing the L1 or Linf norm often arise in many applications. This talk will investigate the performance of the primal and dual simplex algorithm on such problems. We will show how speed up can be achieved by identifying and understanding algorithmic bottlenecks. The talk will be based on experiments with the simplex optimizers in MOSEK. MOSEK is a commercial software package which is capable of solving large-scale sparse linear optimization problems.

4 - Graphical Tools in AIMMS to Analyze Infeasible Optimization Models

Peter Nieuwesteeg, Senior AIMMS specialist, AIMMS (Paragon Decision Technology), 5400 Carillon Point, Kirkland, WA, 98033, United States of America, Peter.Nieuwesteeg@aimms.com

Building an infeasible optimization model is easy. Finding the cause of the infeasibility is much more difficult. The AIMMS Math Program Inspector is a graphical tool that allows you to analyze an (infeasible) model. The goal of this presentation is to show how AIMMS can help you in finding the cause of the infeasible or unrealistic solution. We will do this, by showing, through a live demo, the IIS, the substructure causing infeasibility and the relationship between variables and constraint.

■ WD39

M - Truman

Optimization and Graph-Theoretic Methods in Bioinformatics

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Sebastien Roch, Microsoft Research, One Microsoft Way, Redmond, WA, United States of America, Sebastien.Roch@microsoft.com

1 - Network Delay Inference from Additive Metrics

Shankar Bhamidi, Postdoctoral Researcher, Dept of Mathematics, University of British Columbia, Dept of Mathematics, UBC, Room 121, 1984 Mathematics Road, Vancouver, BC, V6T 1Z2, Canada, shanky@stat.berkeley.edu, Ram Rajagopal, Sebastien Roch

We use computational phylogenetic techniques to solve a central problem in inferential network monitoring. We design a novel algorithm for Multicast-based delay inference, i.e. the problem of reconstructing delay characteristics of a network from end-to-end delay measurements on network paths. Our inference algorithm is based on additive metric techniques used in phylogenetics.

2 - Maximal Accurate Forests From Distance Matrices

Constantinos Daskalakis, Postdoc, Microsoft Corporation, costis@eecs.berkeley.edu

We present a method for distance-based phylogenetic inference, which is novel in two respects. It is the first method (to our knowledge) to guarantee accuracy when knowledge about the model tree, i.e., bounds on the edge lengths, is not assumed. Second, our algorithm guarantees that, with high probability, no false assertions are made; instead, the algorithm produces a maximal edge-disjoint subforest of the model tree.

3 - Detecting Motifs in Biological Networks

Mohsen Bayati, mohsenb@microsoft.com

We use Sequential Importance Sampling (SIS) to design the fastest algorithm for generating random graphs with given degree sequences. These types of algorithms are very useful in detecting motifs (non-random patterns) in genetic networks. Unfortunately, the existing algorithms for this problem have large running times, making them impractical to use for networks with thousands of vertices.

4 - Tradeoffs in Barter-based Systems

Christina Aperjis, Stanford University, caperjis@stanford.edu, Michael Freedman, Ramesh Johari

Bilateral barter-based systems such as BitTorrent have been attractive in large part because of their simplicity; however, little attention has been devoted to studying the efficiency and robustness lost in return for this simplicity. We rigorously analyze the efficiency and robustness gains that are enabled by price-based multilateral exchange and show that multilateral exchanges satisfy several desirable efficiency and robustness properties that bilateral exchanges such as BitTorrent do not.

■ WD40

M - Taylor

Gradient-based Methods for Large-scale Convex Programming and Applications

Sponsor: Optimization/ Linear Programming & Complementarity
Sponsored Session

Chair: Zhaosong Lu, Assistant Professor, Simon Fraser University, 250 - 13450 102nd Avenue, Surrey, BC, V3T 0A3, Canada, zhaosong@sfu.ca

1 - Variable Selection: Tractable Upper Bounds on the Restricted Isometry Constant

Alexandre D'aspremont, Asst. Professor, Princeton University, Olden St, Princeton, NJ, 08544, United States of America, aspremon@princeton.edu, Francis Bach, Laurent El Ghaoui

We use recent semidefinite relaxation results to produce tractable upper bounds on sparse eigenvalues. We then test the performance of these bounds on various random matrices from compressed sensing, for which asymptotic estimates are known.

2 - Gradient Based Methods for Large-scale Cone Program

Zhaosong Lu, Assistant Professor, Simon Fraser University, 250 - 13450 102nd Avenue, Surrey, BC, V3T 0A3, Canada, zhaosong@sfu.ca

In this talk, we discuss various gradient methods for cone program whose underlying cones are product of nonnegative orthant, second-order and semidefinite cones. Their associated iteration computational costs are compared. We finally demonstrate the performance of these methods based on some randomly generated cone programming problems.

3 - In Pursuit of a Root

Michael Friedlander, Professor, University of British Columbia, 2366 Main Mall, Vancouver, BC, Canada, mpf@cs.ubc.ca, Ewout van den Berg

The basis pursuit problem seeks a minimum 1-norm solution of an underdetermined least-squares problem. Basis pursuit denoise fits the least-squares problem only approximately. A single parameter determines a curve that traces the optimal trade-off between the least-squares fit and the 1-norm of the solution. We show how to derive a root-finding algorithm for finding arbitrary points on the optimal trade-off curve. We give extensions to more general norms, including complex-valued problems.

■ WD41

M - Taft

Product Development

Contributed Session

Chair: Thanujan Ratnarajah, Virginia Polytechnic Institute and State University, Industrial and Systems Engineering Department, Room 430, Northern Virginia Center,, 7054 Haycock Road,, Falls Church, VA, 22043, United States of America, thanujan@vt.edu

1 - Impact of "Bug-Finding" Tools on Testing Capability – Evidence from Software Development

Allan Sumiyama, Harvard University, Soldiers Field Road, Boston, MA, 02138, United States of America, asumiyama@hbs.edu

Testing is a fundamental activity in product development because it is the primary means to learn about errors (or "bugs") in a product design. Through an in-depth field study of a large, commercial software development organization, we examine the use of automated "bug-finding" tools in software development, how the tools are integrated into the development organization, and their impact on the organization's testing capability.

2 - Modeling Product Development Rework Cycle: Comparing Alternative Formulations

Kun Hu, PhD Student, Virginia Polytechnic Institute and State University, Industrial and Systems Engineering Department, Room 433, Northern Virginia Center, 7054 Haycock Road, Falls Church, VA, 22043, United States of America, hukun@vt.edu, Hazhir Rahmandad, Thanujan Ratnarajah

Rework cycle, the cycle of (re)work - testing - defect identification - rework, is at the heart of budget and schedule overruns in product development projects. Multiple aggregate (differential equation) and task-level (discrete event) formulations are available to model rework cycle. We introduce an enhanced aggregate formulation that accounts for multiple defects per task and compare it with three alternative formulations from the literature.

3 - Cell Phone HoUsing Benchmarking and Design

A. Kader Mazouz, Associate Professor, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, 33433, United States of America, mazouzk@fau.edu

Abstract not available at this time.

■ WD42

M - McKinley

Supply Chain Management V

Contributed Session

Chair: Hsu-Shih Shih, Professor, Graduate Institute of Management Sciences, Tamkang University, 151 Ying-Chuan Rd., Tamsui, Taipei, 25137, Taiwan - ROC, hshih@mail.tku.edu.tw

1 - A Sequential Procedure for Adding Flexibility in Supply Networks

Sangdo Choi, PhD Student, TAMU, 905 Balcones #101, College Station, TX, 77845, United States of America, samuel4u@tamu.edu, Eylem Tekin

We study how sequential addition of resource flexibility impacts order admission when the service rates are heterogeneous. We present a number of criteria and a heuristic rule to add flexibility to the system in a sequential manner. We investigate how various system parameters such as mean-service time, inter-arrival rate, and capacity affect system performance.

2 - Utilizing the House of Quality to Link Product/Service Attributes and Supply Chain Capabilities

Heather Lutz, PhD Candidate, Syracuse University, 721 University Avenue, Syracuse, NY, 13244, United States of America, hlutz@syr.edu

We combine the methodology from quality function deployment with customer utility functions to link product / service attributes and supply chain capabilities. This approach reduces the subjectivity of the House of Quality by calculating the strength of the relationship through seemingly unrelated regression. A framework for including the voice of the customer into supply chain design decisions is created.

3 - Supply Chain Design Research: Past, Present & Future

Vincent Mabert, Professor, Indiana University, Kelley School of Business, Bloomington, IN, 47401, United States of America, mabert@indiana.edu, Kyle Cattani

This presentation provides a review of developments over time that influenced past and current thinking about supply chain design issues, the components that comprise a supply chain, and the processes that link components together in a coordinated manner. A review of research conducted during the last decade will also be given to highlight what are recent contributions and avenues under investigation. Understanding past and current developments provide guidance for future improvements.

4 - A Strategy Selection of Green Supply and Manufacturing through ANP

Hsu-Shih Shih, Professor, Graduate Institute of Management Sciences, Tamkang University, 151 Ying-Chuan Rd., Tamsui, Taipei, 25137, Taiwan - ROC, hshih@mail.tku.edu.tw

The study concentrates on the issues of green supply and manufacturing strategies of Taiwanese computer industries so that suitable actions could be identified. A survey is made on international regulations, issues of green supply chain, technology concerns, and others. Thus, the influences among these items can be recognized and a diagram with clusters and elements will be drawn. The interdependence and feedback in the diagram will be analyzed by analytic network process (ANP).

5 - RFID as the Next Generation Supply Chain Management System: Integrating the Last Mile's Supply Chain

Hak Kim, Assistant Professor, University of Houston at Clear Lake, 4606 Pine Heather Ct., Houston, TX, 77059, United States of America, kimhak@uhcl.edu

Though RFID is not a new technology, its popular use in a firm's supply chain is just now becoming a reality as a part of enterprise information system. Implementing this powerful technology on top of an existing supply chain requires a thorough understanding of the technology and careful planning for its implementation. The paper is aimed at richer understanding of RFID technologies and designing an enterprise information system which is connected a RFID system to a firm's database.

■ WD43

M - Balcony D

Operations Management IV

Contributed Session

Chair: Zhong Jun Tian, Assistant Professor, Shanghai University of Finance and Economics, School of International Business Adminis, Shanghai, China, tian@wustl.edu

1 - Designing Service Level Agreements for Inventory Management

Liping Liang, PhD Candidate, University of British Columbia, Sauder School of Business,2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, liping.liang@sauder.ubc.ca, Derek Atkins

Service level agreements (SLA) are often observed in practice to manage suppliers' performance. Under an SLA, a supplier agrees to meet a pre-specified service level over a review period. We consider one common application of SLAs to inventory management in decentralized supply chains from a principal-agent perspective. We examine some fundamental issues of SLA design.

2 - A Study of an Integrated Production Inventory Model with Controllable Lead Time and Production Rate

Huaming Song, Nanjing University of Science & Technology, 200, Xiaolingwei Street, Xuanwu District, Nanjing, 210094, China, huaming@mail.njust.edu.cn

Lead-time is assumed to be dependent on the lot size and the production rate of the manufacturer, an integrated production inventory model is to optimize supply chain. For this model, we develop effective iterative procedures for finding the optimal policy and numerical examples are used to illustrate the benefits of integration.A sensitivity analysis is also performed to explore the effect of key parameters on re-order point,lead time and expected total cost.

3 - Crisis Management Operations for Workload Crises

Yao Cheng, Northwestern University, 2145 Sheridan Rd, Evanston, United States of America, yaocheng2009@u.northwestern.edu, Wallace Hopp, Seyed Iravani

Effective crisis management has become a core responsibility for many organizations. We propose a formal modeling framework for characterizing the structural ability of organizations to respond quickly and effectively to crises. The model integrates decision making with task processing by taking into account both the quality and speed of service.

4 - Flexible Capacity Investments and Product Mix: Optimal Decisions and Value of Embedded Postponement

Zhong Jun Tian, Assistant Professor, Shanghai University of Finance and Economics, School of International Business Adminis, Shanghai, China, tian@wustl.edu, Panos Kouvelis

We study a firm's interdependent decisions in investing in flexible capacity, mix of products to produce, capacity allocation to individual products, and eventual production quantities and pricing in effectively meeting uncertain demand. We propose a three-stage sequential decision model to analyze the firm's decisions made at three distinct time points. We explore the optimal solutions at each decision stage and investigate their optimal properties.

■ WD44

M - Balcony C

Manufacturing Systems II

Contributed Session

Chair: Ahad Ali, Assistant Professor, Lawrence Tech, 21000 West Ten Mile Road, Southfield, MI, 48334, United States of America, aali@ltu.edu

1 - Reducing Scrap in the Aluminum Extrusion Industry in Kuwait

Mohammed Hajeeh, Research Scientist, Kuwait Institute for Scientific Rsearch, Techno-Economics Division, PO Box 24885, Safat, 13109, Kuwait, mhajeeh@kisr.edu.kw

This paper presents an approach to reduce the scrap generated in the various stages of the extrusion process in the aluminum industry. This process consists of several stages: casting, log cutting, extrusion, aging, polishing, painting, and anodizing. A mathematical model is built with the objective of minimizing scrap generated. Actual data are used to compare the amount of scrap generated by using the model. The model performed superior to the current techniques used by the industry.

2 - Building Multiple Criteria Process Windows (MCPW) through Data Envelopment Analysis

Matilde Sanchez, Graduate Research Associate, University of Puerto Rico - Mayaguez, PO Box 9043, Mayaguez, PR, 00681, Puerto Rico, matitasanchez@gmail.com, Mauricio Cabrera Rìos, Marìa Guadalupe Villarreal, Jose M Castro

A Multiple Criteria Process Window (MCPW) is a graphical aid used to prescribe the operating conditions of two process variables in presence of two or more performance measures. There is, indeed, an associated Multiple Criteria Optimization problem involved in the construction of MCPWs. In this work the use of Data Envelopment Analysis along with Data Clustering strategies is demonstrated in the context of plastic injection molding to create MCPWs.

3 - Redesign Minivan Door for Weight Reduction

Ahad Ali, Assistant Professor, Lawrence Tech, 21000 West Ten Mile Road, Southfield, MI, 48334, United States of America, aali@ltu.edu, Izlal Haider, Leo Oriet, James Nooks

This paper presents a car body redesign for weight reduction for the cost saving and fuel efficient. ULSAB (Ultra Light Steel Auto Body Structure) concept is used for weight reduction. Cost of modules, cost of assembly, common design and weight of the car are considered. We used commonization, elimination and combination of the parts/components/modules for redesigning of the minivan door. Comparison for the material cost, weight and assembly time has been done for proposed and existing design.

4 - A Flow Analysis Model for Cycle Estimation of Systems with Correlated Queue Size and Service Rate

Raha Akhavan-Tabatabaei, Intel Corp., 4500 S. Dobson Rd, Chandler, AZ, 85224, United States of America, raha.akhavan-tabatabaei@intel.com, Shengwei Ding

We Propose a model to estimate cycle time of wafers for a typical toolset in Semiconductor Fabrication Facilities (Fabs). In this work a new approach for cycle time estimation in semiconductor manufacturing systems is proposed and applied to real data from a fab. Then potential causes for failure of classical models are discussed and their advantages and disadvantages are compared with the Flow Analysis Model.

■ WD45

M - Balcony B

Global Issues in Supply Chain

Contributed Session

Chair: Yang Sun, Assistant Professor, College of Business Administration, California State University, Sacramento, 6000 J Street, Sacramento, CA, 95819-6088, United States of America, suny@cba.csus.edu

1 - Global Manufacturing Network Resources Configuration: Align Plant Capabilities with Product Value

I-Chen Wang, University of Illinois at Urbana-Champaign, 350 Wohlers Hall, Champaign, IL, 61820, United States of America, iwang5@uiuc.edu

Extending the resource-based view, diverse capabilities of manufacturing plants represent heterogeneous resources, which, combined with product characteristics, affect performance. Using a three-way classification, I propose that 'pilot' plants provide strategic value through product development effectiveness, 'performance' plants are conducive to process improvement efficiency, and 'soldier' plants provide cost competitiveness.

2 - Achieving Competitiveness through Distribution Strategies

Bernardo Villarreal, Professor, Universidad de Monterrey, I. Morones Prieto 4500 Pte., San Pedro Garza Garcia, 66238, Mexico, bvillarreal@udem.edu.mx

A fundamental challenge that Mexican companies are facing today to become global competitors is that of devising and implementing strategies to reduce distribution costs and improve on-time delivery. This paper describes the efforts of several Mexican companies to achieve this goal while overcoming the country¥s unfavorable transportation infrastructure and environment.

3 - Global Supplier Selection Using Fuzzy AHP: The Case of East Asia

Sungwoo Lee, PennState University, 795 Ashworth Ln, Boalsburg, PA, 16827, United States of America, sxl363@psu.edu

Since all business market boundaries have collapsed and domestic market growth is limited at this time, the manufacturing companies are now seeking suppliers around the world. In this paper, real global supplier selection problem in East Asia is discussed using fuzzy AHP considering three main factors - proper evaluation criteria, evaluation methods, and desirable data for evaluating. Based on real data from survey, the best supplier for the global manufacturing company is chosen.

4 - Launching Chinese-brand Automobiles in the US Market: An Empirical Study

Yang Sun, Assistant Professor, College of Business Administration, California State University, Sacramento, 6000 J Street, Sacramento, CA, 95819-6088, United States of America, suny@cba.csus.edu, Ken Chinen

A few Chinese automakers have announced their plans to enter the US market in the near future. This research evaluates, empirically, the attitude of US consumers towards Chinese-brand automobiles made in nine different countries. Based on the survey data, ordinal logistic regression models are built to relate US consumers' buying intentions towards Chinese automobiles made in various countries to US consumers' perceived product quality, country image, ethnocentrism, and ethnicity.

■ WD46

M - Balcony A

Unconventional Problems in Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt/ Supply Chain Management

Sponsored Session

Chair: Hans Sebastian Heese, Indiana University, 1309 E 10th St, Bloomington, IN, 47405, United States of America, hheese@indiana.edu

1 - A Contest Among Distributors Over Who is the Better Newsvendor

Yigal Gerchak, Professor, Tel-Aviv University, Department of Industrial Engineering, Tel-Aviv, IS, 69978, Israel, Ygerchak@eng.tau.ac.il, Oshry Azriel

Marketers often attempt to provide sales staff with extra incentive by awarding a prize to the "best" agent. But if the agents are newsvendors (in different regions), what does being "better" mean here? Presumably the better newsvendor has lower underages and overages than others, i.e., forecasting their respective demands better. That creates a game among the newsvendors. How does the equilibrium differ from a non-competitive setting?

2 - Trade-in Rebates for Price Discrimination or Product Recovery

Vishal Agrawal, PhD Student, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, gth767p@mail.gatech.edu, Mark Ferguson, Gilvan Souza

We study the impact of trade-in rebates on the firm's ability to price discriminate when there are remanufactured products. When there is no secondary market for a product, a firm can base the amount of a trade-in rebate on the customer's willingness-to-pay rather than on the condition of the returned unit since the customer lacks a reference. If the firm decides to sell remanufactured units, she loses this ability to perfectly price discriminate. We analytically study this trade-off.

3 - The Optimality of Overreporting Demand in Vendor-managed Inventory Systems

Lawrence W. Robinson, Johnson Graduate School of Management, Cornell University, 433 Sage Hall, Ithaca, NY, 14850, United States of America, lwr2@cornell.edu

Under consignment VMI, a vendor owns the inventory of a product, or a family of products, on the retailer's shelves. She restocks it periodically and is paid when it leaves is reported sold. It will somtimes be optimal for the retailer to discard inventory off of his own shelves and report it as sold. We construct the distribution of the retailer's reported demand from the true demand distribution, and extend the model to allow for constraints on the shelf space for a family of products.

4 - An Analysis of Revenue Sharing Contracts when Retailers Cheat

Eda Kemahlioglu Ziya, UNC-Chapel Hill, CB # 3490, Chapel Hill, NC, United States of America, Eda_KemahliogluZiya@unc.edu, Hans Sebastian Heese

Revenue sharing contracts are widely used to align the incentives of different channel members. Under a typical revenue sharing contract, if it is impossible or prohibitively expensive for the manufacturer to verify the retailer's sales reports, the retailer has incentive to under-report sales and cheat the manufacturer out of part of its profit. We develop a simple analytical model to investigate the impact of cheating on the different supply chain constituents.

■ WD47

M - Hoover

Models and Healthcare Systems

Contributed Session

Chair: Wei Xiong, Instructor, Cornell University, Weill Medical College, 411 E69th Street, New York, NY, 10021, United States of America, wmz2001@med.cornell.edu

1 - Optimal Implementation of Non-pharmaceutical Interventions During Pandemic Influenza

Feng Lin, Purdue University, 206 S. Martin Jischke Drive, West Lafayette, IN, 47906, United States of America, linf@purdue.edu, Mark Lawley, Kumar Muthuraman

The world is closer to an influenza pandemic,so CDC suggests to use non-pharmaceutical interventions before vaccines and antiviral drugs become available.These measures target to reduce the spread by reducing social contact; however they are not without costs. An optimal control approach is developed from a epidemic model with the objective to minimize expected person-days lost. An optimal policy is derived for the model with an exponentially distributed terminal time and compliance models.

2 - Medical Resource Redistribution During Global Influenza Epidemics: A Game Theory Approach

Shouqiang Wang, Doctoral Student, Fuqua School of Business, Duke University, 1 Towerview Dr., Duhram, NC, 27705, United States of America, sw55@duke.edu, Peng Sun, Francis de Vericourt

We consider the interaction of two decentralized countries in redistributing their medical resources when confronting the threat of global influenza. Each country's objective is to minimize the casualties on their own territory caused by the spread of disease. Due to the externality of the epidemic disease, we use a game theoretical model to analyze the trade-off faced by each country.

3 - Lead Series Selection Policy for Improving the Profitability of New Drug Discovery Projects

Jiun-Yu Yu, Department of Business Administration, National Taiwan University, 1, Sec. 4, Roosevelt Road,, Taipei, Taiwan - ROC, jyyu@ntu.edu.tw, John Gittins

The pharmaceutical industry is highly competitive, and the discovery of new drugs is extremely expensive and time consuming. The models developed investigate how many scientists to be allocated to the successive stages of a pre-clinical new drug discovery project to increase its profitability. The number of distinct series of compounds to be explored in the search for candidate drugs is also investigated. The results suggest that a potentially dramatic improvement in profitability is achievable.

4 - Estimate Medical Resource Requirement in a Potential Pandemic Influenza

Wei Xiong, Instructor, Cornell University, Weill Medical College, 411 E69th Street, New York, NY, 10021, United States of America, wmz2001@med.cornell.edu, Shirish Chinchalkar, Nathaniel Hupert

Knowing the consumption profile of key medical resources may help healthcare systems be better prepared for a potential pandemic. We use compartment epidemic models to investigate the spread of disease, number of hospitalized people, and patient severities during the course of a pandemic. A multi-state probabilistic hospital model, combined with the epidemic model and clinic information, was used to project resource requirements for different units of a hospital in a pandemic flu outbreak.

■ WD49

M - Harding

Decision Support Systems and Analysis

Contributed Session

Chair: Shiling Ruan, Food and Drug Administation, 1350 Piccard Drive, HFZ-550, Rockville, MD, 20850, United States of America, shilingr@hotmail.com

1 - Developing a Model to Assist Earthquake Retrofitting Projects

Fei Ying, PhD Student, University of Auckland, Private Bag 92019, Auckland, New Zealand, jyin018@ec.auckland.ac.nz

Buildings built prior to the earthquake codes do not conform to these codes making them more vulnerable to damage and destruction during an earthquake. Decisions about the future use of such buildings are currently being considered. Due to different objectives, building owners tend to make different decisions for retrofitting earthquake risk buildings. Decision analysis is an ideal tool to assist the owners making such decisions.

2 - Social Mobility Models for Urban Planning

Yris Olaya, Assistant Professor, Universidad Nacional de Colombia, Cra. 80 No.65-223, Medellin, Colombia, yolayam@unal.edu.co, Elizabeth Zapata, Lisbet Garzòn, Sofia Morales

Residential and social mobility affect demand for urban services such as housing and transportation. We propose system dynamics and cellular automata models of residential and social mobility to support integrated urban planning. Our models simulate socioeconomic distribution patterns that are inputs for other urban planning models. The residential model was fitted and tested for the city of Medell"n and we present preliminary results.

3 - Asset Evaluation and Modeling and Selection Using the Analytic Hierarchy Process

Myron Hatcher, Professor, Craig School of Business, California State University, 5245 N. Backer MS PB 7, Fresno, 93740-8001, United States of America, myronh1225@hotmail.com

A hierarchical model for asset selection is developed and applied. This approach to prioritization of investments includes both subjective and objective information. The Analytical Hierarchical Process (AHP) is used to develop a ratio scale of preferences over investment alternatives. The hierarchical structure is developed with various criteria and multiple decision makers. The focus is the modeling methodology with a case study to demonstrate and depict the approach.

4 - Using Simulation-based Optimization to Analyze Disastrous Events in Critical Infrastructures

Mark Nesselrode, Director of Modeling and Simulation, Addx Corporation, 1030 University Blvd, Suite 2226, Suffolk, VA, 23435, United States of America, mnesselrode@addxcorp.com, Rafael Diaz

Critical infrastructures worldwide are increasingly exposed to risks associated with the potential of damage produced by disastrous events. Preparedness for these events can be characterized by factors such as training, operational procedures, and communications systems. The complexity and uncertainty of disastrous events, demands the use of advanced techniques to maximize readiness for a wide range of events. Simulation based optimization can provide significant insights for these situations.

5 - The Poisson Race Model and the Analysis of Conjoint Choice Data

Shiling Ruan, Food and Drug Administation, 1350 Piccard Drive, HFZ-550, Rockville, MD, 20850, United States of America, shilingr@hotmail.com

The multinomial logit model has been used to analyze discrete choice data. However, the model does not take into account the stochastic nature of decision making. A new class of choice models-the Poisson race models,is going to be applied to discrete choice data. These models assume the observer's decision is a process of accumulating evidence over time. In this talk, a dependent Poisson race model is proposed and applied to conjoint choice data with Bayesian techniques.

■ WD50

M - Wilson C

Algorithms for Uncertainty and Market Forces

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)

Sponsored Session

Chair: Nedialko Dimitrov, Postdoctoral Fellow, The University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, ned.dimitrov@gmail.com

1 - Enhancing Computational Techniques for Stochastic Linear Programs

Udom Janjarassuk, Student, Lehigh University, 200 West Packer Avenue, Mohler Lab, Bethlehem, PA, 18015, United States of America, udj2@lehigh.edu, Jeffrey Linderoth

We focus on solving large-scale two-stage stochastic linear programs with a trust-region enhanced, L-shaped decomposition method. Techniques for improving the computational efficiency of the algorithm, including warm-starts and dynamic cut aggregation will be discussed. Computational results will be given to demonstrate the effectiveness of the various techniques.

2 - Simulating Agent Behaviors in a Deregulated Electricity Market

Zhi Zhou, Graduate Student, Rensselaer Polytechnic Institute, 110 8th St., Troy, NY, 12180, United States of America, zhouz@rpi.edu, Wai Kin Chan

In a deregulated electricity market, market participants make their own decisions to maximize their profit. Their decisions are made competitively, cooperatively, or both. Meanwhile, the market administrator needs to design market rules to

maintain efficiency and reliability. In this talk, we present an agent-based simulation model that includes a 30-bus transmission network and study the behaviors of generator agents under different market scenarios controlled by the market administrator agent.

3 - An Integer Programming Formulation to Generate Airline Crew Pairings

Shervin AhmadBeygi, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, United States of America, Shervin@umich.edu

We present an Integer Programming formulation to generate crew pairings to solve the airline crew scheduling problem. We exploit the problem structure to use a parallel processing framework to improve the algorithm tractability. We also introduce the idea of ,Äúflight potentials,Äù to restrict the problem size. Computational results based on a U.S. major airline show that this solution approach in conjunction with the existing crew pairing generators can be implemented to solve large problems.

■ WD51

M - Wilson B

Emerging Issues in MIS

Sponsor: Information Systems
Sponsored Session

Chair: Dengpan Liu, Assistant Professor, University of Alabama in Huntsville, 301 Sparkman Dr., Huntsville, AL, United States of America, Dengpan.Liu@uah.edu

1 - Cost of Software Failure

Fusun Gonul, Dr., School of Business, Slippery Rock University, Slippery Rock, PA, 16057-1399, United States of America, fusun.gonul@sru.edu, Elina Petrova

This research aims to glean the users' perspective on the factors contributing to software quality and to obtain an economic assessment of the implications of software failure. Using two different datasets, we obtain $17 billion and $48 billion as conservative estimates of the annual economic loss from software failure.

2 - IS Outsourcing to China: The Perspective of Hong Kong SME

C.H. Cheng, Associate Professor, The Chinese University of Hong Kong, Dept of Syst Engg & Engg Mgmt, The Chinese University of Hong Kong, Shatin, NT, Hong Kong - China, chcheng@se.cuhk.edu.hk, J. Motwani, K.F. Wong

We conduct a study to examine the working relationship between Chinese Software Developers and Hong Kong SMEs through interviewing eight executives. Specifically through our study, we hope to increase our understanding of how the outsourcing decisions are made, how the operations are managed, and how the concerns are addressed. We believe that their experience will be also useful to non-Hong Kong companies.

3 - Generalized Maximum Commonality Problems

Yunxia Zhu, Doctoral Student, University of Texas at Dallas, Richardson, Richardson, tx, 75070, United States of America, yunxia.zhu@student.utdallas.edu, Milind Dawande

Motivated by applications in software project management, we generalize the notion of commonality presented in Dawande et al. (2008) in the context of pair programming. Preliminary algorithmic results on the generalized commonality problem are discussed.

4 - A Model to Quantify the Return on Information Assurance (ROIA)

Charley Tichenor, Operations Research Analyst, Defense Security Cooperation Agency, 201 12th St. South, Ste. 203, Arlington, VA, 22202, United States of America, charley.tichenor@dsca.mil, Ronald Greenfield

The return on investment (ROI) for any program is one indicator of the degree to which a program contributes to an organization's strategic plan. It can help prioritize investments and can be used to help quantify an individual's or team's job performance. This paper presents a model to quantify the financial ROI of Information Assurance (ROIA). Potential users of the ROIA Model are encouraged to either use or modify this structure and populate the variables with their own data.

■ WD52

M - Wilson A

Allocation and Planning for Emergency Resources

Cluster: Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Karen Smilowitz, Associate Professor, Northwestern University, 2145 Sheridan Road, TECH M233, Evanston, IL, 60201, United States of America, ksmilowitz@northwestern.edu

1 - Disaster Relief Assignment Problems: Including Conflict Between Communities and Relief Organizations

Caity Bogdan, University of Massachusetts-Amherst, 219 Engineering Lab I, 160 Governor's Drive, Amherst, MA, 01002, United States of America, mapsbysirius@gmail.com, Jenna Marquard

The allocation of disaster relief organizations to projects can be characterized as an assignment problem with several unique attributes. For instance, characteristics of relief organizations (race, gender, nationality, etc.) and disaster-struck communities may constrain organization-project assignments. We use existing literature and focus groups to explore the nature of these potential conflicts and propose how conflicts can be included in the construction of these assignment problems.

2 - Facility Location in Humanitarian Relief

Burcu Balcik, Postdoctoral Fellow, Norhwestern University, 2145 Sheridan Road, Evanston, IL, United States of America, burcub@u.washington.edu, Benita Beamon

We consider facility location and stock pre-positioning decisions for a humanitarian relief chain responding to quick-onset disasters. Our model, which is a variant of the maximal covering location model, integrates facility location and inventory decisions, considers multiple item types, and captures budgetary constraints and capacity restrictions. We present computational results and illustrate how the proposed model works on a realistic problem.

3 - Assessing the Needs of the Working Poor during a Pandemic

Vicki Bier, Professor, University of Wisconsin - Madison, 3234 Mechanical Engineering Building, 1513 University Ave, Madison, WI, 53706, United States of America, bier@engr.wisc.edu, Lorna Zach, Terrence O'Sullivan, Susan King

A pandemic could cause enormous suffering. One intervention for controlling disease is closing of non-critical businesses. Hospitality and entertainment could therefore experience dramatic downturns. Counties dependent on tourism would be hard hit; the average wages of lost jobs would be extremely low. We identified policy options to address these concerns.

■ WD53

M - Nathan Hale- Wardman Tower

Models and Theories in Financial Engineering

Contributed Session

Chair: William Cheng, Associate Professor of Finance, Sorrell College of Business, Troy University/Global Campus, PO Drawer 4419, Montgomery, AL, 36088, United States of America, wmcheng168@yahoo.com

1 - A Stochastic Model for Hedge Fund Relative Returns

Kun Soo Park, PhD Student, Columbia University, S.W. Mudd Building, MC 4703, New York, NY, 10027, United States of America, kp2143@columbia.edu, Emanuel Derman, Ward Whitt

We model the annual relative returns of a hedge fund by a stochastic difference equation $X_n=A_n X_{(n-1)}+B_n$, where A_n and B_n are independent random variables with general distributions. We fit this model to the TASS data. The model captures observed performance persistence through $E[A_n]$ and the shape of the relative-return distribution through the remaining flexibility. The model can capture observed heavy-tailed distributions in some strategies and light-tailed distributions in others.

2 - The Valuation of Convertible Bonds with Parisian-style Call Provisions

Kyoko Yagi, Research Fellow, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan, yagi@e.u-tokyo.ac.jp

This paper presents a valuation model of callable convertible bonds with Parisian-style call clauses in a setting of optimal stopping problem between the holder and the issuer. The Parisian-style call clause is a contract that the issuer can redeem the bond once the stock price remains above some level continuously over some pre-specified length of time. We investigate how the clause affects the value of the convertible bond and the optimal policies for the holder and the issuer, respectively.

3 - An Asymmetrical Duopoly Investment Game Model Based on Mothballing Option

Guoxing Zhang, The School of Management Xi'an JiaoTong University, Xi'an JiaoTong University 1843#, Xi'an, 710049, China, zguoxing@gmail.com, Wenjuan Yan, Li Gong, Ju-e Guo

In this paper, impact of the investment and variable cost on firms' strategic investment timing is investigated under an asymmetric duopoly mothballing option game-theoretic framework. Three equilibriums are identified, the first-move advantage on firms' strategic investment timing and derives the conditions for the preemptive, sequential and simultaneous equilibrium.

4 - A Comparative Study of Anomalies in the Emerging Markets

William Cheng, Associate Professor of Finance, Sorrell College of Business, Troy University/Global Campus, PO Drawer 4419, Montgomery, AL, 36088, United States of America, wmcheng168@yahoo.com

This paper explores the Small Firm Effect, January Effect, Weekend and Year-end Effects in a few selected emerging markets — China, India, Russia, Brazil and South Africa. Traditional CAPM model is employed to test the validity of hypothesis. All data and information about trading prices, returns, volumes, market capitalization, and company related statistics were obtained through Bloomberg.

■ WD54

M - Congressional - Wardman Tower

Queueing Models V

Contributed Session

Chair: Ho Woo Lee, Professor, Department of Systems Management Engineering, Sungkyunkwan University, Jan An Gu, Suwon, Korea, Republic of, hwlee@skku.edu

1 - Finite Queuing Models in Construction Management

Mostafa Ghandehari, Senior Lecturer, University of Texas at Arlington, civil engineering, box19308, Arlington, TX, 76019, United States of America, ghandeha@uta.edu, Mohammad Najafi

Finite population queuing models has been used in construction management. In many situations a finite number of resources are served by finite number of resources in a cyclic fashion. For example a finite number of trucks can arrive to be loaded by one or more loaders. Usually exponetial arrival time and exponential service time is used for these finite queues. Data is tested to see if lognormal and uniform distributions will fit this model.

2 - Product-form Results for Queuing Networks with Shared Resources

Wemke van der Weij, PhD Student, Center for Mathematics and Computer Science, Kruislaan 413, Amsterdam, 1098SJ, Netherlands, W.van.der.Weij@cwi.nl

We consider queuing networks with two stations, in which all jobs in service receive service capacity from a common resource. For these networks, we give and apply a necessary and sufficient criterion to decide whether a given model possesses a product form or not. We show that proper truncation of the state space of several non-product form networks lead to product form networks. The results provide new fundamental insight into the behavior of multi-layered queuing networks.

3 - Public Logistics Network Design

Ling Xiang, NC State University, 3601 Burt Dr. Apt A, Raleigh, NC, 27606, United States of America, lxiang@ncsu.edu, Michael Kay

To evaluate different design for public logistics network (PLN), packages average waiting time in queue is the key criteria to be used. Since a PLN is a huge bulk arrival and bulk service queueing network, queueing approximation is used to obtain the package average waiting time.

4 - The Discrete-time MAP/G/1 Queue under Workload Control

Ho Woo Lee, Professor, Department of Systems Management Engineering, Sungkyunkwan University, Jan An Gu, Suwon, Korea, Republic of, hwlee@skku.edu, Se Won Lee

In this talk, we analyze the discrtete-time MAP/G/1 queue under the D-policy. Queueing length and waiting time distributions are derived. Then mean performance measures are obtained.

■ WD55

M - Room 8217

Stochastic Processes III

Contributed Session

Chair: Tze Chao Chiam, Purdue University, 315 North Grant Street, Rm 210, West Lafayette, IN, 47907, United States of America, tzechao@purdue.edu

1 - Planning Production Model in Swine Farm under Uncertainty

Rodrìguez Sànchez, Mrs, University of Lleida, Jaume II, 73, Lleida, 25001, Spain, srodriguez@matematica.udl.es, Albornoz Sanhueza, Lluìs Miquel Plà-Aragonés

A multi-stage stochastic programming model has been designed to determine the planning production of a swine farm. The uncertainty in the profit determined for the herd structure is incorporate by scenarios. We investigate the performance of alternative hedging strategies through extensive numerical tests with real market data. Our results demonstrate that the stochastic programming framework provides a flexible and effective decision support tool for planning production of swine farm.

2 - Seafood Value Chain Stochastic Optimization Model

Yousaf Shad Muhammad, Post doc., Industrial Economcs and Technology Managment, NTNU, Trondheim, Norway, yousaf@iot.ntnu.no, Asgeir Tomasgard, Peter Schütz, Kristin Uggen

We are structuring a seafood value chain model for a multi-facility and multi-location business management organization. This is a problem of multi-product, multi-facility locations, multi-period and a supply chain design. The objective of this study is to develop tools for producing economically sound management guidelines by structuring an economic optimization model that accommodates the operational complexity of the economical modeling, stock dynamics, logistics and yield under uncertainty.

3 - Capturing State Visits and Transition Probabilities of a System Modeled Using the Markov Process

Tze Chao Chiam, Purdue University, 315 North Grant Street, Rm 210, West Lafayette, IN, 47907, United States of America, tzechao@purdue.edu, Yuehwern Yih

Based on a complex NASA system, several methodologies are developed and tested to maximize state visits and "accurate" transition probabilities of the system. This is performed to obtain an accurate description of the system by using the Markov process. Dynamic policies are then developed for system recovery when the system visits undesirable states. A heuristic that can be used in most systems is proposed. Performance measures include state visits, frequency of visits, cost and reward values.

■ WD56

O - Blue Room

OR in Transportation Operations

Contributed Session

Chair: David Cantor, Assistant Professor, University of North Florida, 7651 Gate Parkway, #2104, Jacksonville, FL, 3225, United States of America, david.cantor@unf.edu

1 - A Dynamic Model for Signal Optimization with Enhanced Traffic Flow Formulations

Yue Liu, University of Maryland, Department of Civil Engineering, College Park, MD, 20742, United States of America, troybest@umd.edu, Jie Yu, Gang-Len Chang

This paper presents a non-linear model for design of arterial signal control strategies based on a set of enhanced dynamic traffic flow formulations. Depending on traffic patterns, the model's control objective can switch between minimizing the total travel and queue time and maximizing the total throughput of the target area. Extensive experimental results reveal that the proposed model is quite promising for use in design of arterial signals, especially under congested, high demand levels.

2 - Formulation and Evolution of Airline Service Networks

Daniel DeLaurentis, Purdue University, School of Aeronautics & Astronautics, 701 West Stadium Avenue, West Lafayette, IN, 47907, United States of America, ddelaure@purdue.edu, Donald Fry, Tatsuya Kotegawa, En-Pei Han

The air transportation system is a set of airline fleet service networks which can be combined to create a network-wide network. Analysis of both fleet and combined network topology and their evolution is presented. Driving mechanisms (e.g., market demand, airline profitability) are investigated to better understand formation and evolution of the network structure. Understanding how airlines develop service networks enables development of effective policies to encourage system-wide improvements.

3 - Examining Procedural Justice of Electronic Logbook Use in the U.S. Motor Carrier Industry

David Cantor, Assistant Professor, University of North Florida, 7651 Gate Parkway, #2104, Jacksonville, FL, 3225, United States of America, david.cantor@unf.edu, John Macdonald

The U.S. Department of Transportation is interested in creating a rule which would require the most unsafe motor carriers to adopt electronic on-board recorders for hours of service recording purposes. Through the use of a survey instrument that was distributed to commercial vehicle motor carrier drivers, we examine the antecedents and outcomes of a procedural justice model. In doing so, we proposed to shed new light on this important and timely national public policy issue.

■ WD57

O - Blue Room Prefunction

Air Space Design and Management

Contributed Session

Chair: Michael Drew, Research Analyst, University of California Santa Cruz, NASA Ames Research Center, Mail Stop 210-8, Moffett Field, CA, 94035, United States of America, michael.c.drew@nasa.gov

1 - Crossing Analysis of Tube Networks

Min Xue, Research Scientist, University of California at Santa Cruz, N210 NASA Research Center, Moffett Field, CA, 94035, United States of America, Min.Xue@nasa.gov

Tube is one of the potential concepts for Dynamic Airspace Configuration. A group of aircraft with similar equipage following proximate arrival to departure city-pairs would be potential candidates for tube operations. Identification of the interaction between aircraft operating within the corridors and other aircraft as a function of traffic conditions will enforce the analysis of corridor design. The proximity of the corridor and its effect on crossing traffic is of particular interest.

2 - A Preliminary Complexity Metric to Assess the Flexibility of the Airspace

Arwa Aweiss, Aerospace Engineer, NASA, Ames Research Center, Mail Stop 210-10, Moffett Field, CA, 94035, United States of America, arwa.s.aweiss@nasa.gov

An understanding of complexity is key for future concepts in ATC. Most airspace complexity research has focused on controller workload instead of automated systems. The objective of this study is to identify traffic conditions where aircraft have a limited number of short-term (e.g. less than 5 minutes) conflict-free resolution options when encountering an unexpected conflict. It is hypothesized that this method could be a useful metric of traffic complexity for trajectory-based operations.

3 - An Air Route Pricing Method and its Application in Dynamic Airspace Management

Rui Geng, Tsinghu University, Main Building, Room 614, Beijing, China, rgeng@wisc.edu, Peng Cheng

The air route network of China is highly structured and restricted, the air route capacity is also resource constraint besides runway and sector capacity. This paper addresses the air route pricing problem, selecting some price levels in proportion to delay cost, and assigning one price level to each air route at each time period using linear and logit discrete resource choice models. Genetic algorithm is used to select and assign the price. The price is used in Dynamic Airspace Management.

4 - The Discussion for Airspace Dynamic Management Problem

Lili Wang, College of Air Traffic Management, Civil Aviation University of China, Road Jinbei 2829,CAUC,Tian Jin, China, Tian Jin, TJ, 300300, China, wll_nwpu@hotmail.com, Zhaoning Zhang, Fuqing Dai

With the increasing of air transportation amount, more and more flight delays show that airspace has became a rare resource. The research on how to maximum utilize the airspace is very important. The paper focus on four areas: the problem of airspace management in China,the concepts for dynamic airspace,the initial concept and correlative factors analysis for air dynamic route,the theory research on optimal design and management of air dynamic route.

5 - Optimal Sector Design with Geometric Constraints

Michael Drew, Research Analyst, University of California Santa Cruz, NASA Ames Research Center, Mail Stop 210-8, Moffett Field, CA, 94035, United States of America, michael.c.drew@nasa.gov

A method of optimal airspace sector design is presented that improves an existing method based on discrete airspace cells. The existing MIP model provides contiguity, equitable resource sharing, and dominant flow constraints to the sector design. The improved model provides better stability and similarity among near-optimal solutions and better resulting sector shapes. Additionally, a heuristic smoothing method is applied to the cell-based edges to create feasible sector boundaries.

■ WD58

O - Capital

Modeling and Methods for Aviation Safety and Airspace Systems

Sponsor: Aviation Applications

Sponsored Session

Chair: Sharon Monica Jones, NASA, Langley Research Center, MS 442, Hampton, VA, 23681, United States of America, sharon.m.jones@nasa.gov

1 - Topological Considerations for Air Transport Networks

Rex Kincaid, Professor, College of William & Mary, Department of Mathematics, Williamsburg, VA, 23187-8795, United States of America, rrkinc@wm.edu, Scott Billie, Erik Vargo

We examine the emergent historical route structures for the NAS network (1920 to the present). Tools developed to analyze the impact of graph-theoretic attributes (e.g. degree distribution, assortativity, and synchronization) on traditional measures of performance are presented. We explore how these tools can support air transportation topology decisions.

2 - Analysis of Aviation Accidents and Incidents Related to Integrated Vehicle Health Management

Jeffrey Briggs, NASA, 21000 Brookpark Road MS 500-105, Glenn Research Center, Cleveland, OH, 44135, Jeffrey.L.Briggs@nasa.gov, Mary Reveley

NASA's Integrated Vehicle Health Management (IVHM) Project systems analysis team performed an analysis of historical accident and incident data related to system component failure in FAR part 121 and 135 aviation. Data from the National Transportation Safety Board (NTSB) accident database and the Aviation Safety Reporting System (ASRS) database were analyzed. The results from this study will be used by IVHM leadership to evaluate the suite of safety related technologies whose research is supported by the project.

3 - Developing the National Aviation Safety Strategic Plan

Wendell Ricks, NASA, 1 N. Dryden St., MS 449, Langley Research Center, Hampton, VA, 23681, United States of America, Wendell.R.Ricks@nasa.gov, Stephen Darr

The U.S. National Aviation Safety Strategic Plan (NASSP) defines national goals, objectives, and strategies for aviation safety improvements. The NASSP was developed and vetted by the JPDO partner departments and agencies with close collaboration of industry stakeholders and academia subject matter experts. The planning for the NASSP included an analysis that drew upon the collective experience and expertise of the aviation community.

4 - Safety Evaluation of Airborne Precision Spacing Concepts

Stephen Eisenhawer, President, Logic Evolved Technologies, Inc., PO Box 1807, Santa Fe, NM, United States of America, seisenhawer@logicevolved.com, Terry Bott, John Foggia, Michael Sorokach, Sherilyn Brown

Many factors: alternative systems, CONOPS and accident sequences are considered in evaluating a concept for Next Generation Air Space. Combination of factors results in many possibilities. Logic Evolved Decision analysis uses Logic Gate Models to represent possibilities in compact form. An LED study of Airborne Precision Spacing, used to control the spacing of aircraft on the final approach was performed. The results of the study show how an LGM integrates elements of risk and systems analysis.

■ WD59

O - Embassy Room

Revenue Management in Service Industries

Sponsor: Revenue Management & Pricing (Sponsored/Invited)

Sponsored Session

Chair: Itir Karaesmen, University of Maryland, Robert H Smith School of Business, College Park, MD, United States of America, ikaraes@rhsmith.umd.edu

1 - Service and Price Differentiation in Grid Computing

Inbal Yahav, UMD, 4358 VMH, RH Smith School of Business, College Park, United States of America, iyahav@rhsmith.umd.edu, Itir Karaesmen, Louiqa Rashid

Motivated by the grid computing, we analyze a service system with multiple types of customers and a shared resource. We investigate admissions control and scheduling decisions when customers are heterogeneuous in their service frequency, usage predictability, urgency of the service, delay penalties, and price sensitivity.

2 - Decomposition Approaches for Planning Targeted Online Ad Campaigns

John Turner, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, jgt@andrew.cmu.edu, Alan Scheller-Wolf, Sridhar Tayur

Ad campaigns may be targeted toward certain demographic groups or geographic areas. Linear programming may be used to decide what rate to serve each campaign in each inventory type; however, 1) as targeting becomes sophisticated the number of inventory types grows combinatorially; and 2) the number of impressions of each inventory type is unknown ex-ante. We explore some decomposition techniques and provide experimental results applied to the scheduling of ads in online video games.

3 - Decentralization in Dynamic Pricing and Network Revenue Management

Peng Li, University of California, Berkeley, Department of Industrial Engineering, Berkeley, CA, 94720, United States of America, pengli@ieor.berkeley.edu, J. George Shanthikumar, Andrew Lim

We consider the problem of decentralization in dynamic pricing and network revenue management problems. We consider both the case where agents are risk neutral as well as when they are risk averse (with different aversion levels), and determine conditions under which decentralization which achieves a centralized optimal can be achieved.

■ WD60

O - Hampton Room

Rail Transportation

Contributed Session

Chair: Thomas Schlechte, Research Assistant, Zuse Institute Berlin, Takustrasse 7, Berlin, 14195, Germany, schlechte@zib.de

1 - Evaluation of Green-wave Policy in Real-time Railway Traffic Management

Andrea D'Ariano, Roma Tre University, Via della Vasca Navale, 79, Roma, RM, 00146, Italy, a.dariano@dia.uniroma3.it, Francesco Corman, Marco Pranzo, Dario Pacciarelli

We analyze the effectiveness of a new railway traffic control policy called green wave, which consists in letting trains waiting at the stations, thus avoiding speed profile modifications in open corridors. We use an optimization algorithm to reschedule trains in case of perturbation, and compare the delays obtained when trains are allowed or not to change their planned running times. Extensive computational study for two practical dispatching areas of the Dutch railway network is reported.

2 - News on the Track Allocation Problem

Thomas Schlechte, Research Assistant, Zuse Institute Berlin, Takustrasse 7, Berlin, 14195, Germany, schlechte@zib.de, Ralf Borndoerfer

This talk focuses on the macroscopic track allocation problem, which consists in finding a conflict free set of train routes of maximum value in a given railway network. We present extensions of an integer programming formulation for solving (TTP) to deal with robustness and passenger connections. Preliminary results on a part of German long distance area are shown; tttplib.zib.de provides these simplified realistic data sets.

■ WD61

O - Calvert Room

Transportation Planning I

Contributed Session

Chair: Alexandre Pigatti, GAPSO, Inc., Rua Lauro Muller 116/3402, Rio de Janeiro, RJ, 222290-160, Brazil, apigatti@gapso.com.br

1 - Petrobras Optimizes Helicopter Transport of Personnel to Offshore Platforms

Marcus V. S. Poggi de Aragão, Associate Professor, Department de Informatica - Pontifical Catholic University of Rio de Janeiro - PUC-Rio, R. Marques de São Vicente 225, Rio de Janeiro, RJ, 22451-900, Brazil, poggi@inf.puc-rio.br, Oscar Porto, Hernan Abeledo, Billy Alves, Lorenza Moreno, Marcelo Reis, Frederico Guth, Eduardo Uchoa, Fernanda Menezes, Nelci Nascimento

Petrobras has 65 offshore platforms producing 84% of all Brazilian oil. Helicopters carry over 1600 workers daily. We present a flight planning system to improve service and minimize cost. Achievements comprise strict enforcement of safety guidelines, reductions of 18% in number of offshore landings, 8% in total flight time, and 14% in flight costs. Daily planning corresponds to intricate routing and packing problems solved with column generation. Long term planning adds time-tabling aspects.

2 - Study on the Train Conflict Resolution Problem

Yun-Hong Min, Seoul National University, San 56-1 Shilim-Dong, Kwanahk Gu, Seoul, Korea, Republic of, myh@snu.ac.kr, Sung-Pil Hong, Myung-Ju Park

In practice, a train conflict resolution is decentralized around the dispatchers who control traffics spanning a few segments. A global sub-optimality or infeasibility of such a decentralized system is resolved by a network controller who reschedules the timetable soon enough for dispatchers to adapt in a seamless manner. However, since this problem is NP-hard, we propose a column-generation-based heuristic and test it on the real data from Seoul metropolitan railway network.

3 - Vehicle Routing Plan for Travel Time Data Collection

Haifeng Yu, NJIT, 218 Brighton Ave, Kearny, NJ, 07032, United States of America, hy42@njit.edu

It is a challenge to design a data collection plan to establish a reliable database with enough samples to reflect travel time.The study extended the challenge to a vehicle routing problem with time windows. By using linear programming objective is to minimize the number of vehicles,the total traveling time and distances of vehicles with the constraint of required number of data samples.

4 - Optimization for Vehicle and Crew Scheduling in Public Transportation

Natalia Kliewer, Professor Dr., University of Paderborn, Warburger Str.100, Department of Business Information Systems, Paderborn, 33098, Germany, kliewer@upb.de

Scheduling vehicles and crews in public transportation aims an efficient resource assignment covering trips of the given timetable. Traditionally, crews are scheduled after vehicles. Integrated approaches assign crews and vehicles simultaneously and lead to better results. Further savings are obtainable e.g. by introducing time windows for trips. We discuss modelling and solution techniques for different variants of such problems and compare the potential savings of different approaches.

5 - SPTF: Tactical, Operational and Online Optimization in Forestry Industry

Alexandre Pigatti, GAPSO, Inc., Rua Lauro Muller 116/3402, Rio de Janeiro, RJ, 222290-160, Brazil, apigatti@gapso.com.br, Marcelo Reis, Marcus V. S. Poggi de Aragão, Fernanda Menezes

SPTF is a planning system aimed at log supply for pulp producers. At the higher level, the system decides which month each area should be cut down and when its logs should be taken to the mill. This annual plan considers crane utilization and displacement, working groups logistic and, above all, the log mix that is processed. The operational level adds the truck fleet movements and plans the next 10 days. Finally, online decisions are taken to specify truck use within the mill.

■ WD62

O - Governor's Boardroom

Revenue Management in Supply Chain

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Man Yu, Ross School of Business, University of Michigan, 701 Tappan, Ann Arbor, MI, United States of America, manyu@umich.edu

Co-Chair: Goker Aydin, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, ayding@umich.edu

1 - Sales Format Decisions in a Supply Chain

Chia-Wei Kuo, National Taiwan University, 1, Sec. 4, Roosevelt Rd., Taipei, Taiwan - ROC, cwkuo@ntu.edu.tw, Goker Aydin, Hyun-soo Ahn

We consider a supply chain where the manufacturer has limited capacity and the retailer chooses one of two pricing regimes, posting a fixed price or negotiating, when selling to customers who are heterogeneous in their willingness-to-pay. We analyze the retailer's quantity and pricing regime decisions as well as the manufacturer's inducement of a pricing regime via the wholesale price. We show how capacity influences the manufacturer's wholesale price decision and the resultant pricing regime.

2 - Optimal Spot Market Inventory Strategies in the Presence of Cost and Price Risk

Ming Yuen, UC Berkeley, IEOR, Berkeley, CA, 94720, United States of America, ming@ieor.berkeley.edu, Phil Kaminsky, Xin Guo, Pascal Tomecek

We consider a firm facing random demand at the end of a period. At any time, the firm can either increase or decrease inventory by buying or selling on a spot market where price fluctuates randomly over time. We show that this is equivalent to a two-dimensional singular control problem, and use this insight combined with recent control-theoretic results to characterize the optimal policy. Finally, we explore the managerial implications of both our closed-form solutions and computational study.

3 - Empirical Markov Decision Processes and Applications

William Cooper, University of Minnesota, Department of Mechanical Engineering, 111 Church Street SE, Minneapolis, MN, 55455, United States of America, billcoop@me.umn.edu, Bharath Rangarajan

We consider Markov decision processes with unknown transition probabilities and unknown expected cost functions, and study a method for estimating these quantities from data. The procedure is based on taking expectations with respect to empirical distribution functions of the data. Once the estimates are in place, the method obtains a policy by solving the obtained empirical MDP as if the estimates were correct. We discuss performance guarantees and applications including revenue management.

4 - A Multi-Period Inventory Duopoly with Substitutable Inventory
Tava Olsen, Washington University in St. Louis, Olin Business School, 1 Brookings Dr., St. Louis, MO, 63141, United States of America, olsen@wustl.edu, Rodney Parker

We consider multiple period competition between retailers who stock substitutable inventory. We compare the equilibrium policy to that found in the static game. We show the sustained equilibrium policy is base-stock and that competition increases total system stock.

■ WD63

O - Congressional B

Transportation Planning II

Contributed Session

Chair: Helene Gunnarsson, Post doctor, Department of Management and Engineering, Linköping University, Linköping, 581 83, Sweden, helene.gunnarsson@liu.se

1 - Markov Property of Discrete Choice Model for Trip Chaining Behavior
Yudai Honma, Assistant Professor, Tokyo Metropolitan University, Asahigaoka 6-6, Hino-shi, Tokyo, Japan, yudai@sd.tmu.ac.jp, Osamu Kurita

Trip chaining behaviors have been frequently observed in our daily lives and analyzed in a number of researches. Discrete choice model is one of methods to estimate trip chaining behaviors, but computational complexity caused by the number of alternatives is concerned. In this study, to avoid this problem, we propose a new calculation method based on Markov property under the simple conditions.

2 - Improved Column Generation Method for Solving Airline Crew Scheduling Problems
Xiaodong Luo, Lead Engineer, Sabre Holdings, Inc, 1 Kirkwood Blvd, Southlake, TX, 76092, United States of America, Xiaodong.Luo@sabre.com

We study the possibility of introducing heuristics into the column generation framework. We show that it can significantly improve the performance of the algorithm and can be applied to solve very large airline crew scheduling problems

3 - Value of Reliability: Empirical Study of Route Choice after the I-35W Bridge Collapse
Shanjiang Zhu, University of Minnesota, 500 Pillsbury Dr. S.E., Minneapolis, MN, 55455, United States of America, zhuxx120@umn.edu, David Levinson

Most existing individual route choice models are based on equilibrium analysis or surveys of stated preferences, which likely fail to accurately capture the value of time, much less the value of reliability. To bridge this gap, this study analyzes commuters' route choices after the I-35W bridge collapse at the Twin Cities, using longitudinal observations of route choices and traffic conditions. The value of reliability is captured.

4 - Web Service Based Transportation Route Planning for Express Packages
Minmin Qiu, IBM China Research Lab, Building 19 ZGC Software Park, Haidian District, Beijing, 100193, China, qiumm@cn.ibm.com, Yanqing Xie, Wei Wang, Hongwei Ding, Jin Dong

A package routing system deployed as a web service is presented in this paper. The routing system interfaces with several custom systems and the ordering system, The design is implemented as a SOA. The routing service is responsible for generating optimal routes for each package based on multiple criteria: number of hubs passed, safety of the route, cost, and time requirements. Heuristic and depth-first-search algorithms are developed as the core optimization engine.

5 - Evaluating the Public Procurement for Bus Transports in Terms of Emissions and Costs
Helene Gunnarsson, Post doctor, Department of Management and Engineering, Linköping University, Linköping, 581 83, Sweden, helene.gunnarsson@liu.se

The contracts resulting from a public procurement of bus transports in Sweden are very detailed. The specifications of, for example, used bus sizes can lead to unnecessary large busses in the sense that many of them are half empty. Other public procurement processes that could result in more flexible and less specified contracts and in turn reduced CO2-emissions will therefore be tested and evaluated by optimization models. Computational results from a large bus transport company are reported.

■ WD64

O - Congressional A

Transportation Networks

Contributed Session

Chair: Hossein Soroush, Associate Professor, Kuwait University, Department of Statistics & Opns. Res., Safat, 13060, Kuwait, hsoroush@kuc01.kuniv.edu.kw

1 - Metholodogy for Evaluating Urban Traffic Policies Study Case: Toluca City's Traffic Light Network
Javier Garcia-Gutierrez, Ph. D., UAEM, Bordo de Xochiaca s/n, Nezahualcoyotl, EM, 57000, Mexico, jgarciagtz@uaemex.mx

A procedure for the analysis and implementation of urban traffic policies through the evaluation under three different criteria is developed here. This methodology is based on the design of alternative scenarios and assessing of the main factors that compose the urban traffic. An analysis of a sub-network involved simulation and experimental design. Finally a multi-criteria analysis is made to determine the convenience of the different strategies created.

2 - Modeling and Performance Assessment of a Transit-based Emergency Evacuation Plan
Cheng-Chieh Chen, Research Asssistant, UMCP, 4323 Rowalt Dr. Apt 101, College Park, MD, 20740, United States of America, frank542@umd.edu, Chih-Sheng Chou

A transit-based emergency plan is developed for optimizing combinations among waiting positions and corresponding shelters. An improved routing algorithm is used to dispatch rescue vehicles. A contra-flow simulation is elaborated to disperse the internal and ambient traffic, which can also be used for modifying routing plans to avoid traffic bottlenecks.

3 - Flow Equilibrium in a Network with Random Arc Attributes
Hossein Soroush, Associate Professor, Kuwait University, Department of Statistics & Opns. Res., Safat, 13060, Kuwait, hsoroush@kuc01.kuniv.edu.kw, Talal Alkhamis

The flow equilibrium problem is to predict flows in a network given the demands for flows between the nodes. We study a flow equilibrium problem in a network in which arc attributes are arbitrary random variables and the cost functions for path evaluation are nonlinear. Our examples demonstrate that the proposed stochastic model provides flows that are more realistic than those of the classical models.

■ WD65

M - Virginia A

Inventory Models

Contributed Session

Chair: Jun-Yeon Lee, Assistant Professor, University of Houston-Victoria, 3007 N. Ben Wilson St., Victoria, TX, 77901, United States of America, leej@uhv.edu

1 - A Simple Heuristic for Dual-supply Inventory Models
Steffen Klosterhalfen, University of Mannheim, Department of Logistics, Schloss S 233, Mannheim, 68131, Germany, klosterhalfen@bwl.uni-mannheim.de, Daniel Kaiser, Stefan Minner

We propose a new heuristic for setting base-stock levels in an inventory model with two suppliers depending on the cost structure present. We present an easily implementable algorithm for the parameter computation. Compared with other heuristics of similar complexity, simulation affirms the general superiority of this new heuristic.

2 - Analysis of an Inventory Model for Multiple Demand Classes with Backordering
Benjamin Neve, PhD Candidate, University of Alabama, 800 Energy Ctr Blvd, Apt. 1208, Northport, AL, 35473, United States of America, bneve@cba.ua.edu, Chuck Schmidt

We develop an inventory model that addresses inventory rationing based on customer priority. Similar to recent literature, we use the framework of a multi-echelon inventory system to describe the physics of a critical level policy. However, instead of considering fill rates we seek to minimize a cost objective. Under a similar framework other research has considered 2 demand-classes, and we extend to multiple demand classes. We assume either an (S-1,S) or (r,Q) ordering policy with the supplier.

3 - A Buyer-supplier Integrated Inventory Model for Items with Imperfect Quality

Daesung Ha, Marshall University, One John Marshall Drive, College of Business, Huntington, WV, 25755, United States of America, ha@marshall.edu, Seung-Lae Kim

The study develops a buyer-supplier integrated inventory model when the supplier's production process is not perfect. We show that the optimal inventory policy adopted by both buyer and supplier in a cooperative manner can be economically beneficial to both parties. Numerical results are also presented.

4 - A Multi-period Stochastic Inventory Model with Quantity Discounts

Jun-Yeon Lee, Assistant Professor, University of Houston-Victoria, 3007 N. Ben Wilson St., Victoria, TX, 77901, United States of America, leej@uhv.edu

We examine a multi-period, stochastic inventory model with quantity discounts, in which the buyer receives a price discount on purchases in excess of a price break point. Our analysis suggests that the buyer's optimal inventory policy depends on the sum of initial inventory and the price break point. We also provide some counter-intuitive results, compared with the traditional multi-period newsvendor model.

■ WD66

M - Delaware A

Dynamic Programming II

Contributed Session

Chair: Cigdem Gurgur, Professor, Division of Economics and Business, 1500 Illinois St., Golden, CO, 80401, United States of America, cgurgur@mines.edu

1 - Acceleration Operators in the Value Iteration Algorithms for Average Cost Markov Decision Processes

Oleksandr Shlakhter, PhD candidate, University of Toronto, 171 Erskine Av., # PH1, Toronto, ON, M4P 1Y8, Canada, shlakht@mie.utoronto.ca, Chi-Guhn Lee

One of the methods for solving average cost MDP is the value iteration, often computationally impractical. We propose acceleration operators that improve the performance of the value iteration. These operators are based on contraction and monotonicity properties. It is known that value iteration methods for average cost MDP do not involve either. To overcome this difficulty we propose to combine acceleration operators with value iteration for stochastic shortest path problems.

2 - Stochastic Optimal Control of a Quasi Batch Production Process

Ezgi Eren, Texas A&M University, 1600 Welsh Ave Apt 212, College Station, TX, 77840, United States of America, ezgi@tamu.edu, Natarajan Gautam

We consider a tunnel freezer where the cooling level is controlled with the aim of minimizing cost (which is a function of energy consumed, performance and quality). For this, we formulate a stochastic optimal control problem with multi-dimensional state space. We develop: (i) structural results for the optimal policy and (ii) algorithms to numerical obtain the optimal solution. Further, we fine tune our algorithm to efficiently compute the optimal policy for large instances.

3 - Dynamic Programming Approach to Multiclass Scheduling Problems

Yasin Gocgun, Doctoral Student, University of Washington, Industrial Engineering, Box 352650, Seattle, WA, 98195-2650, United States of America, gocgun@u.washington.edu, Archis Ghate

We study a class of multiclass scheduling problems with random job arrivals. These problems can be formulated as finite horizon Markov Decision Processes (MDPs). We provide structural results and present applications in healthcare focusing on multi-category patient scheduling problems in a diagnostic facility.

4 - Dynamic Cash Management of Warranty Reserves in a Multi-region Setting

Cigdem Gurgur, Professor, Division of Economics and Business, 1500 Illinois Street, Golden, CO, 80401, United States of America, cgurgur@mines.edu

Companies typically plan for warranty costs through creation of a reserve fund. The objective is to prevent fluctuations in earnings from potential spikes and troughs in warranty claims. An optimal policy rule is developed to guide management along two lines: (1) The amount of cash additions and subtractions at the beginning of each period; (2) The amount to contribute to the reserve after each sale. The extension of the developed methodology for a "multi-region-sales" setting is provided.

■ WD67

O - Forum Room

Production Scheduling II

Contributed Session

Chair: Joao Moccellin, Professor, University of Sao Paulo, Av. Trabalhador Sao-Carlense, 400, Sao Carlos, SP, 13566-590, Brazil, jvmoccel@sc.usp.br

1 - Order Selection and Postponement in Dynamic Scheduling Problems

Harald Reinertsen, PhD Candidate, University of Colorado at Boulder, Leeds School of Business, 419 UCB, Boulder, CO, 80309-0419, United States of America, Harald.Reinertsen@Colorado.edu, Thomas Vossen

Scheduling problems commonly appear in the context of running operations where demand arrives randomly and production takes place in a make-to-order fashion. Considering future rescheduling opportunities and demand, together with partial postponement of production until demand is realized, leads to significant reduction in scrap for cutting stock problems and setup times in the one machine scheduling problem with sequence dependent setup times, without increasing due date violations.

2 - Lot Sizing Rules for a Warm/Cold Process

Ayhan Ozgur Toy, Bilkent University, Department of Management, Bilkent, Ankara, Turkey, aotoy@bilkent.edu.tr, Emre Berk

We consider the capacitated lot sizing problem for a process that could be kept warm at unit variable cost for the next period if more than a threshold value has been produced. Production with a cold process incurs a fixed setup cost. Warm process cost is negligible. We develop lot sizing rules based on the rules proposed for the classical problem. In a numerical study we explore the performance of each rule in terms of proximity of their cost rate to that of the optimal production plan.

3 - The Total Earliness Tardiness Flowshop Scheduling Problem

Rym M'Hallah, Associate Professor, Kuwait University, PO Box 5969, Kuwait, Kuwait, mhallah@kuc01.kuniv.edu.kw

The earliness tardiness flowshop scheduling problem with distinct due dates is modeled as a mixed integer program, and solved using an exact and an approximate approach. This latter is based on a recovering filered beam search where the recovering step applies some dominance rules. Computational results show the efficiency of the proposed approximate approach.

4 - A Priority-based Randomized Policy for the Re-entrant Line with Finite Capacity

Jin Young Choi, Assistant Professor, Ajou University, San 5, Woncheon-dong, Yeongtong-gu, Suwon, 443-749, Korea, Republic of, choijy@ajou.ac.kr

In this paper, we suggest a genetic approach for the capacitated re-entrant line scheduling problem. The structure of a chromosome is defined by considering all possible states of the system and a preferred job stage is assigned to each component in order to generate a chromosome. A job priority-based randomized policy is developed, while reflecting the job priority and the properness of local non-idling. The performance of the suggested algorithm is validated through a numerical experiment.

■ WD68

O - Senate Room

Marketing Interface II

Contributed Session

Chair: Jing Zhou, Assistant Professor, UNC Charlotte, 9201 University City Blvd, Department of BISOM, College of Business, Charlotte, NC, 28223, United States of America, jzhou7@uncc.edu

1 - Mail-in Rebates in a Distributed Channel with Demand Uncertainty

Qin Geng, Assistant Professor, Robert Morris University, 322 Massey Hall, 6001 University Boulevard, Moon Township, PA, 15108, United States of America, geng@rmu.edu

Mail-in rebates are heavily used in retail stores. Despite its prevalence, little research has studied rebates in a distributed channel with demand uncertainty. This project applies a newsvendor framework to a distributed channel consisting of a manufacturer and a retailer to study the following questions: How does rebate affect pricing and service level? How does rebate affect profits? And how does demand uncertainty affect rebates and answers to the above questions?

2 - Incentive Mechanisms for Price Discriminating Retailers

Ozgun Caliskan Demirag, Assistant Professor, Chinese University of Hong Kong, 705 William Mong Building, Chinese University of Hong Kong, Shatin, Hong Kong - China, ozgun@se.cuhk.edu.hk

We study a 2-stage supply chain with a single manufacturer that sells through a retailer where the manufacturer may offer incentives to the retailer to increase profits. We analyze quantity-based and non-quantity based incentives to determine which type is more effective for the manufacturer under different pricing strategies by the retailer. We find that incentive schemes based on a threshold order quantity generates the highest profits when the retailer can perfectly price discriminate.

3 - If You Spend $50, You Will Get a $10 Gift Card - The Use of Gift Cards to Increase Retailer's Profits

Jing Zhou, Assistant Professor, UNC Charlotte, 9201 University City Blvd, Department of BISOM, College of Business, Charlotte, NC, 28223, United States of America, jzhou7@uncc.edu, Jingming Pan, Moutaz Khouja

Retailers use various marketing tools, such as gift cards, to increase profits. When retailers offer gift cards to consumers who spend above certain thresholds in a single store visit, some consumers may buy more. We develop a model to derive the optimal purchase thresholds and gift card values for retailers. Profitability of gift cards depends on the retailer's margin, consumer value of additional spending, and gift cards values. We extend the model by considering a consumer budget constraint.

4 - Effect of Demand and Supply Interactions on Price and Delivery Time Differentiation

Sachin Jayaswal, Mr., University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, sjayaswa@engmail.uwaterloo.ca, Saibal Ray, Elizabeth Jewkes

We study the effects of supply-side interaction, caused by sharing of capacity, and of demand-side interaction, caused by product substitution, on price and delivery time differentiation.

A

Abayomi, Kobi SA01
Abbas, Ali SA20, TA20
Abdelghany, Khaled SA57
Abeledo, Hernan WA55, WB55
Adams, Brian WB29
Adan, Ivo WC44
Adelman, Dan TA07
Adida, Elodie MB59
Agarwal, Narendra SC46
Agha, Iqbal WC28
Agrawal, Anupam WA08
Agrawal, Vishal MC46
Ahmed, Shabbir SB37
Ahn, Sang Hyung SD29
Akan, Mustafa SB23, SC59
Akella, Ram SC12
Alagoz, Oguzhan SA47
Albert, Joseph MB31
Albin, Susan SC09
Ali, Ahad WD44
Allen, Theodore WA04
Allon, Gad SD16, MA07, MD46, TB16
Alptekinoglu, Aydin MB46
Altner, Doug SB50
Anderson, Edward TC41
Anderson, Richard MB20
Andradottir, Sigrun SA49
Angst, Corey WB21
Anitescu, Mihai TC05
Anjos, Miguel SA38, WD26
Anupindi, Ravi TA08
Aperjis, Christina SD59
Apley, Dan MC17
Araman, Victor MD59
Argon, Nilay MA33, TA65
Armony, Mor SA23
Asef-Vaziri, Ardavan SB56
Ata, Baris SC59
Aydin, Goker WD62
Ayhan, Hayriye MC23

B

Babich, Volodymyr MB08
Bacon, Lynd SC68
Badinelli, Ralph TA18
Baker, Erin TA11, TB11
Balakrishnan, Anant TB65
Balasubramanian, Hari MB33
Ball, Michael SD64
Bandyopadhyay, Subhajyoti SC51, MD51
Bansal, Nikhil TA39
Ban, Xuegang (Jeff) MD05, TA61
Bariff, Martin WC01
Barnes, Andrew TB31
Barnett, Arnie SA03, MB37
Baron, Opher MD07
Barquin, Julian WA10
Barton, Dr. Russell SA17
Bassamboo, Achal MB23, TB16
Batur, Demet WA49
Bayati, Mohsen MB39
Baykal-Gursoy, Melike TA55, TB61
Bayraksan, Guzin SA40, TA50
Beasley, J E MD42
Belenky, Alex TA04
Belloni, Alexandre WC40
Bell, Peter MD43, TA43
Belobaba, Peter TB04
Benjaafar, Saif TB07, TC07
Bennett, Gary TC37
Benson, Hande TA05
Berger-Wolf, Tanya MB21
Berman, Oded SB67
Berry, Heather SB54, SC54
Besbes, Omar SB23, TA16
Bhadra, Dipasis TB57
Bhandari, Amit TB08
Bhattacharjee, Sudip MB02, MC51
Bhulai, Sandjai SA25
Bienstock, Dan SD38
Bilginturk Yalcin, Zehra TB54
Biller, Bahar MA49
Billups, Stephen TC42
Blacksten, H. Ric SA50
Blanchet, Jose MB27
Bloemhof, Jacqueline SD52
Bock, Stefan MB66
Bodin, Lawrence MA54
Borchers, Brian TC26
Boros, Endre SC38
Bose, Abhijit TC18
Bouffard, Francois TD10
Boyer, Ken SD07
Boyko, Nikita TA53
Boylu, Fidan TA51
Bradley, James TD32
Braun, Michael TA68
Briskorn, Dirk TC22
Broekmeulen, Rob WC32
Brooks, Paul MA13
Brown, David SB40
Brudno, Michael MD21
Buckshaw, Don TB19
Budescu, David TB20
Bukkapatnam, Satish TB09, TC09, WD17
Butler, Allen MA32, TA32 MB32, MC32, MD32
Buzacott, John SC43

C

Caby, Errol WD13
Cakanyildirim, Metin MB44
Cakici, Ozden Engin MD03
Callander, Steven SA29
Campos-Nanez, Enrique WC33
Cantor, David WD56
Capar, Ismail SA16
Caramanis, Constantine WB57
Carlsson, John TD56
Carlyle, Matthew TA25
Caro, Felipe SC07
Carrillo, Janice SB48
Carter, Michael MC33
Cashbaugh, David MC31
Cekyay, Bora SA18
Cerrito, Patricia MD13
Chan, Eddie Yon Sim WB60
Chang, Chun-Lan WA42
Chang, Yih-Long WB65
Chao, Raul SD41, TD41
Chaovaitwongse, Art SB47, TB42, WB09
Charlier, Bruno SA10
Chatfield, Dean WB32
Chayet, Sergio SB07
Chelst, Ken SB29
Chen, Andrew MC02
Chen, Chun-Hung SB49, SC49, SD49
Chen, Lijian MB26, TA59
Chen, Richard MB56
Chen, Victoria TD13
Chen, Wen WC36
Chen, Xi WA32
Chen, Xin TD07
Chen, Yong WA09
Chen, Zhi-Long TA46, TB59
Cheng, William WD53
Chiam, Tze Chao WD55
Chinneck, John SD50
Chiu, Yi-Chang SC61, TB64
Chu, Sydney WA36
Churchill, Andrew MC58
Ciarallo, Frank TB46
Clarke, John-Paul TC58
Cobb, Barry MC19, WB19
Cochran, James WA35, WB35
Cohn, Amy SB58, MD65
Colak, Selcuk WB24
Coldren, Gregory TA58
Cole, Sam TB32
Comez, Nagihan MC62, TD60
Conitzer, Vincent TC39
Constantino, Miguel TB38
Côté, Murray TC33
Cottle, Richard TA03, TC03
Cowing, Michelle WB33
Cox, Jr., Louis A (Tony) MD55
Crainic, Teodor Gabriel TA37, TC64 WA60
Creasey, Roy TA49
Crissey, Mary SB13, SD13
Cruz, Jose TD16
Cunha, Claudio B. TD25

D

Daim, Tugrul TD18
Damodaran, Purushothaman SA42
Dasgupta, Tirthankar WB17
Das, Sanmay MA25
Day, Bob MB01
de Farias, Ismael MB38
de Miguel, Victor TC59, WA05
Deckro, Dick SD30
Delaney, James WA17
Deleris, Lea WA20
Dell, Robert TB24
Demirel, Suleyman WB16
Demirkan, Haluk SA51, SB51, MB15
Deng, Shi-Jie WD10
Denizel, Meltem MA52
Dentcheva, Darinka SC40
Denton, Brian MD47
Desai, Jitamitra SC50, MA42
Devanur, Nikhil SD39
Devaraj, Sarv WC21
Dhillon, Manpreet WB36
Dillon-Merrill, Robin SB03
Dimitrov, Nedialko WD50
Ding, Amy MB25
Ding, Yu SB09
Dong, Jin WA18, WB18
Dooms, Michael SC56
Drew, Michael WD57
Drezner, Tammy SD67
Drezner, Zvi MA67
Drummey, Kevin WD37
Duan, Rong SA13
Dube, Parijat TD59
Dubrawski, Artur TB13
Dukes, Anthony SB68
Dumas, Jonathan SC58
Durango-Cohen, Elizabeth WA56

E

Earnshaw, Stephanie SD34, MA47
Easton, Todd MD50
Eckstein, Jonathan MB06
Edirisinghe, Chanaka WC53
Eisenhauer, William TB66
Elahi, Ehsan TA44
Elhedhli, Samir TD50
Elmaghraby, Wedad MA06, MC06, MD06
Elwany, Alaa TC17
Enders, Paul WB22
Erat, Sanjiv SA41
Erdogan, S. Ayca WB47
Erera, Alan MD63
Erhun, Feryal SD01, MC44, TC46
Erwin, Michael SB19
Evgeniou, Theodoros MB12

F

Fampa, Marcia WC18
Fan, Ming SD51
Fan, Yueyue MC63, WC61
Farias, Vivek SC28
Faulin, Javier TA64
Feng, Jiejian WC66
Ferrer, Juan Carlos WB59
Figliozzi, Miguel MB64
Fixson, Sebastian MD48
Florian, Michael WB63
Forrester, Richard SB35
Fourer, Robert SD26
Foutz, Natasha SA68
Fowler, John WD33
Fox, William SA30, SB30
Franco, Alberto TC43
Fridgeirsdottir, Kristin WA59
Friederichs, Stefan WB55
Frost, John SB32, MD31
Fuchs, Erica MC39
Fujisaki, Norman WB31
Fukasawa, Ricardo MA50
Fu, Michael TD37
Furman, Kevin MA56, WA26
Furmans, Kai SC63

G

Gabraeel, Nagi TB17, TC17
Gabriel, Steve MD10
Gallien, Jeremie TD46
Gamarnik, David TD23
Ganesan, Rajesh TA57, TD09
Gao, Guodong (Gordon) TD21
Gao, Song SD61
Gao, Su TD22
Garcia-Diaz, Alberto WC54
Gass, Saul TB03, TD03
Gaukler, Gary TB44
Gavirneni, Srinagesh WA46
Gay, David M. SA66
Geisler, Elie TC48
Geismar, Neil WA07
Gel, Esma TC65
Gendreau, Michel MC56
Gerhardt, Ira WC22
Geunes, Joseph WB46
Goerger, Niki MC30
Golden, Bruce MD19
Golias, Mihalis WC24
Gomes, Paulo WA48
Goncalves, Joao MA26
Gorman, Michael MA60, MD60, TA60, TC60
Gosavi, Abhijit WA44
Goul, Michael SA51, SB51, MB15
Grande, Darby WB03
Gray, Genetha TB05
Greene, Marjorie WA24
Green, Linda SC37
Gregory, John SB25
Groleau, Thomas TD35
Gromoll, Christian TB23
Grushka-Cockayne, Yael SD20
Gu, Bin MD01
Guan, Yongpei SD40, MD56, TA38
Gue, Kevin TD64
Guide, Daniel SA52
Guikema, Seth MC54
Gulpinar, Nalan TD01
Gunalay, Yavuz TC55
Gunnarsson, Helene WD63
Gupta, Aparna MC53
Gurgur, Cigdem WD66
Gutierrez, Marco WA52
Gutwenger, Carsten TA26
Guyton, John SC32

H

Haas, Peter MD49
Hackney, Bert WC56
Haerem, Thorvald SA02
Hahn, Peter WA50
Haight, Robert SA11, SB11, SC11, SD11, MA11
Hajiaghayi, Mohammad Taghi MD39
Hall, Andrew MD30
Hall, Nicholas G. SB36, MA35, MB35, MD37, WB07, WC46
Halper, Russell SD63
Hanowsky, Michael TD57
Hansen, Mark SB64, MD58
Hardin, Jill SA35, SD24
Harper, Steven WA37
Harrill, Richard TB32
Harrod, Steven SC60, SD60
Hart, William SB26
Hasdemir, Baris TD54
Hasenbein, John TC23
Hatch, Nile TB48
Heese, Hans Sebastian WD46
Heier, Jessica TC52
Heitz, Christoph WB15
Henderson, Shane G. SC47, SD23
Henrion, Max MA20, TA66
Heragu, Sunderesh SB63
Herbsleb, James SD66
Herrmann, Jeffrey TC21
Hertzler, Christopher SB10
Hickman, Mark WA61
Hicks, Illya SC01
Hobbs, Benjamin F. MC10
Hoffman, Robert SC64
Holder, Allen MC42
Homem-de-Mello, Tito WC59
Hong, Jeff TB49
Hooker, John MA22, WB37
Hora, Manpreet WC41
Houghtalen, Lori SC36
Howard, Ronald TA19
Hsuan, Juliana TA48
Hu, Bin SC21
Huang, Alex WC55
Huang, Chenggang WD16
Huang, Hongming WA01
Huang, Kai MB40
Huang, Kenneth WB48
Huang, Qiang WB17
Huang, Zan SD12
Hughes, Richard SA34
Hutton, David SB33

I

Iqbal, Majid TA15
Ishfaq, Rafay WB28
Isken, Mark WC47
Iyer, Ananth WC07

J

Jacobs, Brian SA45
Jain, Rahul TD59
Jank, Wolfgang SB12, TB37, TC12
Jans, Raf TD28
Jarrah, Ahmad TD63
Jasinski, Joseph SD32
Jeffcoat, David WD24
Jenni, Karen SC20
Jeong, Myong K. (MK) MA17
Jia, Hongzhong MC67
Jiang, Hai WB56
Jin, Judy SD17
Joglekar, Nitin MD08
Johansen, Soren G. SD56
Johari, Ramesh SC39, SD59, WC23
Johar, Monica MA51
Johnson, PhD, Michael SB01, TA67, TB67
Johnson, Alan MA30, MB30
Johnson, Andy WB12
Johnson, Christer SA32
Jones, Sharon Monica WD58
Jose, Victor Richmond TD19
Joshi, Pawan WC16
Juenger, Michael TA26
Junjun, GAO WD32

K

Kale, Satyen TB39
Kamarthi, Sagar MD09
Kane, Gerald TA21
Kannan, P. K. SD68
Kaplan, Ed MB03
Karaesmen, Itir SA62, SB45, TC12, WD59
Karahan, Ibrahim WD14
Karimi, Iftekhar WB26, WC26
Karisch, Stefan SD58, MA58
Karray, Salma WB68
Katok, Elena SD45, TB06
Kauffman, Robert SC66
Kavadias, Stylianos MB41, MC48
Keeling, Kellie SC18
Keisler, Jeffrey MB19, TD66
Keller, L. Robin SD19
Kemahlioglu Ziya, Eda SC45
Kennedy, Deanna WB20
Kennington, Jeff SA28
Kesavan, Saravanan TC08
Keskinocak, Pinar TB52, WB52
Kianfar, Kiavash TC38
Kim, Dan WA51
Kim, Sang-Hyun TD44
Kim, Seoung Bum SA12, MB17, TB12
Kim, Youngwook MA55
Kingsford, Carl MC21
Kirkizlar, Eser SB34
Kirkwood, Craig MD20
Klabjan, Diego TC63
Klampfl, Erica SB31
Klein, Cerry MA29
Klinger, Tim MA66
Knorr, Dave WA58
Knott Eck, Cynthia SD18
Ko, Jeonghan WB44
Kok, Gurhan SA37
Kong, Nan SC34
Kong, Zhenyu (James) MA18, MD18, WD09
Koole, Ger WA23
Koppius, Otto TC06
Kou, Steven WB53
Kouvelis, Panos TC29
Kovach, Jamison WC67
Krass, Dmitry TC67
Krishnamoorthy, Srinivas SB62
Krishnamurthy, Ananth SB16, WB64
Krishnamurthy, Rajesh SB43
Krishnan, Vish TA41
Kristjansson, Bjarni TD24
Krokhmal, Pavlo TC53
Kros, John SC62, WD03
Kucukyavuz, Simge TD38
Kuhl, Michael SD31, TA31
Kulkarni, Vidyadhar MC55
Kulturel-Konak, Sadan SB55
Kumar, Nanda TB68
Kumar, Sanjay SC44, SD43, SD44, MD44, MB43
Kunnumkal, Sumit TB28
Kurt, Murat MD34
Kurz, Mary Beth TC25
Kutanoglu, Erhan TD67
Kwak, N.K. WC29
Kwon, Dharma WA19

L

Laird, Carl TB26
Lamberson, P. J. WD06
Lang, Karl Reiner SD02
Lan, Guanghui TB50
Lanigan, Danielle WD35
Lariviere, Martin MB07
Larson, Richard MA03
Lasdon, Leon WC19
Lasry, Arielle TC34, TD34
Lau, Edward SA53
Lawphongpanich, Siriphong MA05
Lederer, Phillip MA08
Lee, Chris P. MC34
Lee, Eva MB42, MC50, TC47, TD47
Lee, Ho Woo WD54
Lee, Jun-Yeon WD65
Lee, Loo Hay SB49, SC49, SD49
Leemis, Lawrence SA22
Lesaja, Goran TD40, WA40
Leung, Siu-Tang (Tim) WA53
Levesque, Moren SC48
Levin, Tanya TA28
Levin, Yuri SD62
Levi, Retsef SB46, MA40
Lewis, Herbert WD29
Lewis, Mark MD23
Leyton-Brown, Kevin TD06
Liebe, Robert TA54
Li, Jing SA09, WC17
Li, Kate WA14
Lim, Gino MD24, TA33
Lim, Yun Fong MA62, TD65
Linares, Pedro WB10
Linderoth, Jeff MC24
Linetsky, Vadim TD53
Lingaya, Norbert MB58
Linton, Jonathan MB52
Lin, Wei-Hua SA56
Lin, Wuqin MD27
Li, Shanling TD15
List, Barry MB29
Liu, Dengpan WD51
Liu, Guoquan (George) SC16
Liu, Tie WC12
Liu, Tieming MA44
Li, Wei (Mike) SA31
Li, Xinxin TB01
Li, Zack SA24, SB24
Lobo, Miguel TB62
Lodree, Emmett SB44
Long, Elisa WB34
Lougee-Heimer, Robin SA26, MA24
Lovell, David MA64
Lownes, Nicholas MD61

Lucia, Angelo WB26, WC26
Lu, Zhaosong WD40

M

Macal, Charles MB49
Madhuranthakam, Chandramouli WA28
Madrigal, Marcelino TA10, TB10
Magazine, Mike SC33, SD33
Magrogan, Mary TC37
Mahdian, Mohammad MA39
Maji, Avijit SA63
Makarychev, Konstantin TD39
Mak, Ho-Yin SC67
Mancilla, Camilo TA22
Mane, Muharrem WD18
Marquard, Jenna WA47
Martinez de Albeniz, Victor TD62
Martin, Kipp MD26
Martonosi, Susan TC35
Mathews, Scott TD08
Matis, Timothy MB55
Mayernik, George TA30
McComb, Sara A. WB20
McLay, Laura SC03
Mehrotra, Sanjay MC40, TC50
Mehrotra, Vijay MB65
Mehta, Kumar TC51
Mehta, Sameep MD12
Meisel, Stephan WB25
Melone, Fran WC58
Mercier, Anne TB58
Meyers, Carol WC37
Mifflin, Tom MA31
Mihm, Jurgen SB41
Miller, Andrew TD26
Miller-Hooks, Elise TA52, TC61
Miller, Lisa TA24
Millhiser, Will MC35, MD35
Milner, Joseph SA08
Min, Jo SC53, TA35
Mirchandani, Prakash SA55
Mirrokni, Vahab WA39
Mishra, Abhay WC51
Mitchell, John WB40
Mitra, Saby SC02
Mitttelmann, Hans MB24
Mlakar, Joseph TB30
Moallemi, Ciamac SD28
Moccellin, Joao WD67
Montibeller, Gilberto SB20
Moore, David MA48
Moore, James SA61, SB61, WA63
Morecroft, John TD43
Moreno Centeno, Erick MD22
Morgan, Kara MA19
Morton, Alec MB19
Moya, Hiram WD08
Mukherjee, Avijit TC57
Murat, Alper E. MC66
Muriel, Ana MD52
Murphy, Frederic MB10
Murphy, Jamie TD68
Murray, Talisa MC29, TB29
Murray-Tuite, Pam TD61
Murthi, B.P.S. MA68
Murynets, Ilona MB13
Myklebust, Jogeir WB11

N

Nagarajan, Viswanath WC38
Nagi, Rakesh TC30
Nagurney, Anna MA61, TA63
Namazifar, Mahdi TD26
Naor, Seffi WB39
Natarajarathinam, Malini WD28
Nazzal, Dima MA63
Nelson, Barry L. SD09
Nembhard, Harriet MA09
Netessine, Serguei MC57
Newman, Alexandra MB11
Nie, Marco MC05
Nieuwesteeg, Peter WD38
Niggley, Jason SA44
Nohadani, Omid SB28
Noonan, Patrick TC66
Norback, Judith WC35
Notz, William TA09
Ntaimo, Lewis MD40

O

Oberstone, Joel WB66
O'Brien, Frances TB43
Ochiumi, Hiroshi WC03
Olinick, Eli MC25
Oliveira, Fernando MB10
Oliveira, Pedro MB48
Olsen, Tava MA07
Olvera-Cravioto, Mariana SB27
Onal, Mehmet MC03
Oren, Shmuel MA10
Orlin, James SA39, TC24
Osborn, John SD47
Ozaltin, Osman Y. WA34
Ozaydin, Ozay WC14
Ozcan, Ozan WB41
Ozdaglar, Asu MA59
Ozekici, Suleyman SA43
Ozelkan, Ertunga WC60
Ozer, Ozalp MA45
Ozkan, Gulru SA48
Ozsen, Leyla MD67

P

Pachamanova, Dessislava SB53
Palocsay, Susan WB01
Pan, Fei WB05
Pardalos, Panos MD11
Parija, Gyana WA65 WD15
Park, Jin-Kyu MD02
Park, Namkyu MA15
Parnell, Gregory TC19
Paschalidis, Yannis MA27
Pasiliao, Eduardo WA03
Pataki, Gabor MD38
Patankar, Jay WC68
Paz, Alexander MD64
Pena, Javier SB42
Pennock, David WC39
Perakis, Georgia SC57, SD57, MC59
Perlich, Claudia WC13
Perry, Marcus TA17
Petrushin, Valery WA68
Philpott, Andy TC10
Pierson, Margaret WA43
Pigatti, Alexandre WD61
Pinedo, Michael SD37
Popescu, Andreea TC16
Popescu, Ioana TA62
Popkowski Leszczyc, Peter TA06, WA06
Posner, Marc E. SB08
Powell, Warren MA37, MC11, TC28
Primbs, James MA53
Proano, Ruben MA34
Przytycka, Teresa MA21

Q

Qi, Lian MB67
Qian, Peter MC18, MD17, WC09
Qiu, Robin SC15
Qu, Shelly MC65
Quadrifoglio, Luca MC61
Quasem, Mohammed WD22

R

Rabani, Yuval WA22
Racer, Michael SC35, SD35
Raffensperger, John WA66
Raghavan, S. SC55
Rakas, Jasenka WA57
Raman, Roopa WA21
Ramanan, Kavita TA23
Ramdas, Kamalini SC41
Randhawa, Ramandeep SC23
Rardin, Ronald L. TB33
Ratchford, Brian MC68
Ratnarajah, Thanujan WD41
Rau, Devaki SA02
Ravindran, A. Ravi MA43
Raz, Gal SB65
Realff, Matthew MC15
Reeves, Kingsley SA33
Reitter, Norman WA30
Ren, Changrui SC65
Ren, Justin MB16
Resende, Mauricio TD29
Restrepo, Natali WD19
Reveliotis, Spyros MC27
Rhodes, James TC15
Richard, Jean-Philippe MA38
Roch, Sebastien WD39
Roels, Guillaume TD62
Romeijn, Edwin TA47, TB47
Root, Sarah WD25
Rosenberger, Jay MC47
Roy, Asim WC20
Royset, Johannes SC30, TB40
Ruan, Shiling WD49
Rudi, Nils SA07
Runger, George TA13
Rungtusanatham, M. Johnny SC08 MC43
Rusmevichientong, Paat MD28

S

Saar-Tsechansky, Maytal MA12
Sabbaghi, Navid WB42
Saghiri, Soroosh WC42
Sahinidis, Nick SC42
Salam, A. F. WB51
Salman, F. Sibel WC52
Saltzman, Matthew MC26
Samii, Amir-Behzad WC65
Sampson, Scott SA15
Samuelson, Doug TD04, WB04, WC04, WD04
Sandholm, Tuomas MD29, WB06
Sansom, Stephanie TC34, TD34
Sarkar, Sumit MD12
Sasaki, Mihiro WC11
Sauma, Enzo WC10
Savaskan, Canan SB52
Savin, Sergei MD33
Saxena, Anureet SB38
Schaub, Cornelius SB20
Scherrer, Christina TB35
Schilling, Martin SC19
Schlechte, Thomas WD60
Schleyer, Marc WA64
Schmitt, Thomas G. SC44
Schulz, Andreas S. SB39
Sebastian, Hans-Juergen MA46
Secomandi, Nicola SB59 MC08
Sellmann, Meinolf MB22
Semet, Frédéric MD66
Serra, Daniel WD11
Shahabuddin, Syed WB13
Shah, Shital TC32
Shanbhag, Uday TA40, TD05
Sharkey, Thomas WB50
Shaw, III, Charles H. SC31
Shechter, Steven TB34
Shen, Max MB45
Sheng, Olivia MC12
Sheng, Victor S. WD12
Shenoy, Prakash P. TD20
Sherali, Hanif MC38
Shi, Min WD01
Shih, Hsu-Shih WD42
Shittu, Ekundayo TC11
Shortle, John F. TB55
Shou, Biying WC43
Shreve, Steven E. MA23
Shrivatsava, Abhishek WC09
Shumsky, Robert MD62
Siddiqui, Afzal SC10
Siemsen, Enno TD48
Simmons Ivy, Julie MC45, TA34
Sivaramakrishnan, Kartik TC50
Smilowitz, Karen TA56, WD52
Smirnoff, Yuri WD34
Smith, Cole MD25
Smith, Sanjukta TD51
Smith, Stephen SD46
Smith-Daniels, Dwight WC31
Snyder, Lawrence V. SA65, MA57, MB57
Snyder, Lawrence V. MD45
Sofer, Ariela SD25
Sohoni, Milind SB57
Solak, Senay SA58, TD58
Somani, Kamalesh MC60
Son, Young-Jun MC49
Song, Zhe SA67
Sorenson, Olav MA41
Sorochuk, Craig TB60
Soroush, Hossein WD64
Sosa, Manuel TB41
Sosic, Greys TC45

Souza, Gilvan "Gil" TA29
Soyer, Refik MB09, TA12
Sprintson, Alex MB54, TD55
Staats, Richard WA67
Stecke, Kathryn E. SD44
Stier-Moses, Nicolas SC39, MA59
Street, Nick MC13
Stumbo, Bill TB15
Subramanian, Ravi SC52
Suharko, Arief MA65
Sun, Daewon MC01
Sundaramoorthi, Duraikannan WB49
Sundaresan, Shankar TC62
Sun, Yang WD45
Su, Ping TC44
Susarla, Anjana SB02
Sutton, Warren WA12
Su, Xuanming MB62
Swaminathan, Jayashankar SD08
Swann, Julie SB34, WC52
Swinney, Robert WB08

T

Tang, Kaizhi TD12
Tang, Victor W. SB15
Tarr, Peri SB66
Taskin, Zeki Caner WA38
Tawarmalani, Mohit SD42
Tekin, Eylem MD57, TB45
Tezcan, Tolga SA27
Theofanis, Sotiris SA64
Thiele, Aurelie WA62
Thomas, Lyn SD53
Thompson, Terry WC57
Tian, Chunhua WB56
Tian, Zhigang (Will) SB18
Tian, Zhong Jun WD43
Tibben-Lembke, Ronald WC34
Tilson, Vera TB21
Tits, Andre TC40
Tomasgard, Asgeir WD36
Tomlin, John SC25
Topaloglu, Huseyin MB28, MC28
Townsend, Janell D. MD68
Treharne, James TD30
Trkman, Peter SA54
Tsung, Fugee SD15
Tursun, Deniz WA11
Tuzhilin, Alexander MC37

U

Ukkusuri, Satish TB63
Ulu, Canan MC20
Unnikrishnan, Avinash MB61
Urban, Tim SD65
Uryasev, Stan WA29

V

Valenzuela, Jorge SD10
Van Dyke, Carl MB60
van Hoeve, Willem-Jan SC22, SD22
van Ooijen, Henny WB54
Van Oyen, Mark TB45
Vanderbei, Robert SC24
Veeraraghavan, Senthil MA16
Veit, Daniel J. TD11
Vengazhiyil, Roshan Josep TD17
Verma, Kunal WA15
Verma, Rohit MD15
Verter, Vedat MB47, WB61
Vigerske, Stefan SC26
Vila-Parrish, Ana TD33
Voss, Stefan SD55
Vulcano, Gustavo SA59

W

Wagner, Michael SC07
Wakolbinger, Tina MA01, WC05
Walczak, Darius WB62
Wallenius, Hannele WC06
Waller, Travis WC63
Walther, Grit MC52
Wan, Hong SC17, MB18
Wang, Bruce TB56
Wang, Chen TC20
Wang, Haibo TB25
Wang, Honggang WC49
Wang, Hui WB44
Wang, Jianrui TC49
Wang, Lizhi WC50
Wang, Sijian SC13
Wang, Tianyang MC09
Wang, Yimin TA45
Wang, Yu WD20
Wang, Yunzeng SA21, SB21
Wang, Zheng MB63
Ward, Amy SC27, MD16
Warden, Clyde TC68
Weber, Bruce MA02, MD53
Weber, Charles SD48
Weintraub, Gabriel SD16, MA28, TD45
White, Preston TA49
White, Sheneeta WC15
Wieland, Dr. Frederick WB58
Wierman, Adam TB22
Wilck, Joseph WC25
Williams, Damon SA46
Willis, Henry SD03
Wilmer, COL, USA, Michael WA31
Wilson, Daniel WC30
Woodaman, Ronald WB30
Wooten, Russell SD31, TA31, TD31
Wortman, Martin MA18

X

Xanthopoulos, Petros TB42, WA13
Xia, Li SD21
Xia, Yusen WA45
Xiao, Wenqiang WC08
Xie, Wei TA42
Xiong, Wei WD47
Xu, Jie MC41
Xu, Lu (Wendy) MD41
Xu, Shenghan WA16
Xu, Yan MB50
Xue, Mei MB53

Y

Yadav, Prashant TD52
Yalabik, Baris WD21
Yamazaki, Kazutoshi WD23
Yang, Catherine TA01
Yang, Jian WD05
Yang, Qingyu SD17
Yang, Shitao TC54
Yang, Yingxia WC48
Yashchin, Emmanuel WD23
Yavuz, Mesut WB14
Yayla-Kullu, Muge MC07
Ye, Yinyu TD56
Ye, Yinyu TC01
Yildirim, Utku WC62
Yildiz, Hakan TC56
Yin, Yafeng MB05
Yuen-Reed, Gigi TC31
Yu, Yugang WC64
Yu, Man WD62
Yunes, Tallys SB22

Z

Zabarankin, Michael SA19, TB53, WD67
Zayas-Castro, Jose MB34
Zechman, Emily SD54
Zeevi, Assaf SD27
Zeid, Abe MD09
Zeng, Bo WA33
Zhang, Dan SA60
Zhang, Fuqiang WB45
Zhang, Han MB51
Zhang, Hang WB09
Zhang, Hongbo TD49
Zhang, John WD31
Zhang, Kuilin WA25
Zhang, Muhong WB38
Zhang, Qin MB68
Zhao, Hui WB45
Zhao, Yao WC45
Zhao, Zhenying WB43
Zhdanov, Dmitry TB51
Zheng, Qiancheng WA41
Zhou, Jing WD68
Zhou, Ruoyi TB18
Zhou, Sean MC22
Zhou, Shiyu SB17
Zhou, Xuesong MC64
Zhou, Yongpin MC16
Zhu, Mengxiao TC04
Zhu, Mu TC13
Zhu, Xiaowei (Linda) TD42
Zhuang, Jun MD54
Ziya, Serhan SB60
Ziya, Serhan WB23

A

Aas, Björnar MC63
Abad, Andres MD25
Abad, Prakash WD01
Abayomi, Kobi SA01
Abbas, Ali SA20, TA20, TB20, WD19
Abdelgawad, Hossam WA61
Abdelghany, Ahmed SA57
Abdelghany, Khaled SA56, SA57
Abdellaoui, Mohammed TA20
Abdulhai, Baher WA61
Abdus-Salaam, Husniyah
Abe, Naoki SC12
Abeledo, Hernan SA28, WA55, WC33, WD61
Abhishek, Kumar SB38, SC50
Aboolian, Robert SD67
Abouee Mehrizi, Hossein MD07, TC67
Abraham, Dolphy TB66
Abrams, Robert MA05
Acar, Ilgin TD55, WD36
Acemoglu, Daron MA59, MB59
Acharya, Dharma MB60
Achterberg, Tobias SB21, SC22, SC50, SD22
Acquisti, Alessandro TB51
Adamantiades, Misha MC10
Adams, Brian WB29
Adan, Ivo TA55, WB64, WC44
Adelman, Dan SC28, MC28, TA07, TB62
Adida, Elodie MA34, MB59
Adler, Ilan TD05
Adomavicius, Gediminas SD12, MC37, TC51
Afanasyev, Maxim TC59
Afeche, Philipp SA60
Aflaki, Sam TA16
Afordakos, Orestis TB43
Afshar, Abbas
Agarwal Lalit, Vishal SD44
Agarwal, Anurag WB24
Agarwal, Ashish MA51, TD51
Agarwal, Deepak SC25
Agarwal, Narendra SC46
Agarwal, Ritu TD21, WB21
Aggarwal, Anil WA37
Aggarwal, Gagan WA39
Aggarwal, Rohit MB01
Aggour, Kareem TB31
Agha, Iqbal SA43, TD54, WC28
Agra, Agostinho TB38
Agrali, Semra WB46
Agrawal, Anupam WA08
Agrawal, Vishal MC46, WD46
Aguado, José A. TA10
Aguayo, Jose J. WB09
Agustin, Clara SA45
Aha, David SC12
Ahipasaoglu, S. Damla TC50
Ahiska, S. Sebnem WB65
Ahlatcioglu, Aykut SD42
AhmadBeygi, Shervin SB58, MB56, WD50
Ahmed, Mohamed WC65
Ahmed, Shabbir SA40, SB37, MA50, MC38, TA50, TB47
Ahn, Hyunchul IS-M
Ahn, Hyun-soo SA08, TC18, WD62
Ahn, Jae Hyun WC01
Ahn, Jaemyung TC63
Ahuja, Ravindra SB50, SD14, TA60, TB65, TC30
Ahumada, Omar WD28
Ai, Jing SB51
Aibangbee, Edosa MD65
Aithnard, Fati SC58
AitSahlia, Farid TA53, TB08
AitSahlia, Farid MA53
Aiyama, Toshikazu SC44
Akan, Mustafa SA52, SB23, SC59, MC34
Akar, Nail TC55
Akcali, Elif MA52, MA57, MB46, MB47
Akcay, Yalcin MC62
Akella, Ram SC12
Akesson, Johan TB26
Akhavan-Tabatabaei, Raha WD44
Akin, Haluk MA26
Akram, Kaveh MD44
Aksin, Zeynep TB16, TD60
Aksu, Salih MC44
Aktekin, Tevfik TA12
Akturk, Selim TA22
Akyuz, M. Hakan WD11
Al Jalahema, Rashid TD38
Alaeddini, Adel IS-T
Alaei, Saeed WB39
Alagoz, Oguzhan SA47, SA47, SB65, MC20, MC34, MD34, MD54, TB34, WB22, WC17
Alaniazar, Saman WD03
Alanis, Ramon SC47
Albert, Reka MC42
Albin, Susan SD13, MB17
Aleman, Dionne TA33
Alexander, Gordon WA53
Alexe, Gabriela MB42
Alexopoulos, Christos SD49
Ali, Ahad SD63, WD44
Alidaee, Bahram TB25
Alirezazadeh, Pantea TA51
Alkhamis, Talal WC65, WD64, IS-T
Allebach, Jan P. IS-M
Allee, Verna TD41
Allen, Dave MC25
Allen, Stuart J. TC22
Allen, Theodore SC13, SC13, MA17, TB42, TD17, WA04
Allon, Gad SA65, SD16, MA07, MB23, MC34, MD46, TB16, WA43
Almeida, Adiel Teixeira WC14
Almeida, Paul WA48
Almojel, Ibrahim TA19
Almutairi, Hossa TD50
Alon, Noga TB39
Aloysius, John SD19
Alparslan, Emre SA66
Alptekinoglu, Aydin MB46, TC15
Alspaugh, Julie TD46
Alston, April TB05
Altan, Alper MD07
Altay, Nezih WC37
Altenstedt, Fredrik MA58
Altinel, I. Kuban WD11
Altman, Eitan TD59
Altner, Doug SB50
Altug, Mehmet Sekip SB60, MA45
Altus, Stephen MA58
Alvarez, Lindsay TD49, WC24
Alvarez, Pablo SA50
Alves, Billy WD61
Amaral, Luis WC34
Amato, Henry WA37
Amaya, Jorge MB11
Ambani, Saumil TB17
Amini, Mehdi MC31
Aminnayeri, Majid
Amis, John TC04
Amorim, Marlene MB48
Anand, Abhinav WD13
Anandalingam, G. Anand MA35, MB35
Anand, Farminder TC34
Anand, Krishnan TB22
Andersen, Reid WA39
Anderson, Brad MA30
Anderson, Bruce WB01
Anderson, Catherine WB21
Anderson, Chris SA62, SB62, SB62, MD15
Anderson, Eddie TC10, WB43
Anderson, Edward MA35, MB35, MD08, IS-T, TC41
Anderson, Leif TB54
Anderson, Lindsay WD03
Anderson, Mark MD31
Anderson, Michael H. MC41
Anderson, Richard MB20
Anderson, Timothy TD18
Andersson, Erik SD58
Ando, Amy WA11
Andradottir, Sigrun SC49, MD23, TA65
Andreoli, Derik SB56
Ang, Marcus WA64
Angelis, John SC48
Angst, Corey TD21, WC21
Animesh, Animesh SD68
Anitescu, Mihai TA40, WA40
Anjos, Debora SB56
Anjos, Miguel SA38, SC42, WD26
Ankenman, Bruce WA17
Ano, Katsunori SA22
Anokhin, Sergei WB48
Ansel, Clarke MC43, WA28
Anthony, Denise IS-T
Anstreicher, Kurt WA50
Antonakopoulos, Spyridon TA39
Anupindi, Ravi TA08
Anzanello, Michel SD13
Aperjis, Christina SD59, WA22
Apley, Dan SC09, SC18
Appari, Ajit SC66, IS-T
Applewhaite, Nolan TC52
April, Jay MC31
Aquiahuatl, Xachitl MB52
Aracena, Pablo SD11
Arakji, Reina Yahya SD02
Araman, Victor MD59
Arbelaez, Christian WD33
Arcaute, Esteban D. SC39
Archer, Kellie MA13
Arciszewski, Tomasz SD54
Arena, Peter SA32
Argon, Nilay SA47, TA34, TA65, WB23
Argote, Linda SA48
Arifoglu, Kenan SA43
Arikan, Emel WA44
Arikan, Mazhar SB57
Arkali, Gokcen WA41
Armbruster, Benjamin SB33
Armbruster, Dieter TD65
Armony, Mor MD16
Armstrong, Derek SC03
Armstrong, J. Scott WC39
Armstrong, Ronald TA01
Arney, Kristin SB30
Aron, Ravi SC51
Arratia, Andrea SC11
Arslan, Hasan MD07, WA62
Arulselvan, Ashwin TD55
Asadpour, Arash MB39
Asgeirsson, Eyjolfur IS-T
Asgharzadeh Talebi, Zohreh TD28
Ashe, Gina TA21
Ashley, Mary MB21, TB42, WB50
Askin, Ronald MD25
Aspelund, Audun WB11
Assavapokee, Tiravat WB52
Astrovskaya, Irina MB21
Asudegi, Mona
Ata, Asad WC48
Ata, Baris SA52, SB23, SC59, MC34
Atahan, Pelin MA12
Atamturk, Alper SD42, TA22, MC38, MD22, TC38
Atar, Rami SA23, SA27, TA23
Atasu, Atalay SC52, TB06
Atkins, Derek MB33, WD43
Au, S. Tom MB13
Au, Timothy SA13
Au, Tom SB13
Auseklis, Nora SB51
Avci, Buket SA07
Aviv, Yossi SB59
Avnet, Mark TC04
Awad, Hernan SB27
Awaysheh, Amrou MC22
Aweiss, Arwa WD57
Axsäter, Sven MB07

Aydin, Burcu IS-T
Aydin, Goker SB60, MB08, MB46, TD60, WB44, WD62
Aydin, Saniye IS-M
Aydinliyim, Tolga TA46, WB54
Aydinliyim, Tolga WD21
Ayer, Turgay SA47
Ayhan, Hayriye MD23, MD23, TA65
Aylward, Matt TB30
Aytac, Berrin SB49
Ayvaci, Mehmet TC33
Azadian, Farshid MC66
Azadivar, Farhad SD65
Azadivar, Justin MC28
Azizoölu, Meral MB63
Azriel, Oshry WD46

B

Baba, Yasunori SB54
Babich, Volodymyr MB08, TA08, TA44, TD59
Babineau, Timothy TC21
Bach, Francis WD40
Badinelli, Ralph TA18, WC15
Badiru, Adedeji SC54, TC30
Bae, Min Hyeok WC12
Baek, Seungkee WD29
Baer, Dennis MC29
Bagchi, Arijit MB54
Baharnemati, M.Reza TC67
Baharnemati, MohammadReza WB52
Bahri, Parisa WC34
Bai, Lihui IS-M
Bai, Xinxin SA13
Bai, Xue TB51
Bai, Yanqin WA40
Bailey, Brian SD47, MB33
Bailey, Matthew MD34
Bailey, Michael TB30
Baillon, Aurelien TB20
Bakan, M. Mümtaz WD08
Baker, Erin MA20
Baker, Jeff SD10
Baker, Kenneth TA66
Bakir, Niyazi SC44
Bala, Ram TA41, TB68
Balaban, Carey SC50, TC61
Balakrishnan, Anant SA55, TC60, TD63, WC31
Balakrishnan, Hamsa WC03
Balakrishna, Poornima TA57, TD09
Balas, Egon MC50, MD38, TB03
Balasubramanian, Hari SC34, MA47, MB33, MD65
Balasubramanian, Sridhar TD48
Balasundaram, Baski SC01, MA42
Balci, Hakan SD10
Balcik, Burcu WA32, WC52, WD52
Balcioglu, Baris MD07
Baldick, Ross TB10
Baldwin, Carliss MD48, TB41
Baldwin, Sam MA20
Balinski, Michel
Ball, Michael SD49, SD64, MC49, MC58, TB04, TB28, TB59, TD57, WC59
Banavar, Guruduth WA65
Bander, Jim MB53
Bandyopadhyay, Subhajyoti MD51
Banerjee, Ritesh TB34, WC17
Banjevic, Dragan SA18
Banovac, Fil WC33
Bansal, Mukul S. TC42
Bansal, Nikhil TA39, TD39, WC38
Bansal, Saurabh MD08
Ban, Xuegang (Jeff) MA05, MD05, TA61
Baptista, Alexandre WA53
Bardhan, Indranil WA41
Bard, Jonathan MB33, TD63
Bardossy, Gisela SA55
Bar-Gera, Hillel MD05, WB63
Bariff, Martin WC01
Barkaoui, Mohamed MD66
Barker, Theresa SC31
Barlatt, Ada SB31, MC50
Barnes, Andrew TB31
Barnes, Wes TD67
Barnett, Arnie MB37, TA04
Barnhart, Cynthia SD64, WB57
Baron, Opher SA08, MD07, TC67
Barroso, Luiz Augusto TA10
Barros, Ricardo WD35
Bartholdi, John J. MC61
Bartholomew Fisher, Emily MC10, WC10
Bartlett, Roscoe TB26
Barton, Russell SA40, SC17, MB01
Barton, Paul WB26
Barz, Christiane MC28
Basole, Rahul C. TD41
Bassamboo, Achal SC23, SC67, SD27, SD44, MA07, MB23, MC16, MD46, TB16, TB23, WB23
Basten, Rob SC16
Bastin, Fabian TB40, TC05
Basu Choudhary, Atin MC19
Basu, Preetam MB53
Basu, Sourav SA63
Batarseh, Ola MA63
Batson, Ginny TC35
Batta, Rajan SD61, MA67, TA31, WA25, WA63, WB61
Batun, Sakine MD65
Batur, Demet WA49
Baucells, Manel TA20, TD20
Bauer, Mareike WD31
Baumann, Frank TA26
Baumert, Stephen SD23
Baveja, Alok SB56
Bayati, Mohsen MB39, WD39
Bayen, Alexandre TA61
Baykal-Gursoy, Melike TA55, TB61
Baykoc, Omer Faruk IS-M
Bayraksan, Guzin TA50, TB40
Baysal, Evern SC17
Baysek, Michael TB13
Bazant, Martin MB27
Bbandopadhay, Amit SA66
Beamon, Benita WA32, WD52
Beasley, J E MD42
Beck, Chris SD24
Becker, Adrian TB31
Bedford, Tim TB18
Befurt, Rene SC68
Begen, Mehmet MA40, MD33
Behdani, Behnam WA13
Behkami, Nima TD18
Beier, Eric WC50
Beil, Damian MB08, MB56, TA44, TB06, WB45
Bejarano, Astrid Ximena WD35
Belavina, Elena SA07
Belenko, Steven SD34
Bell, Brad MD26
Bell, David SA20, MB68
Bell, Michael WB61
Bell, Peter MD43
Belobaba, Peter SB58, TB04
Belotti, Pietro SB38, WA26
Beltran, Jose Luis MA62
Belyi, Dmitriy IS-M
Ben Amor, Sarah WC14
Benaroch, Michel SC66
Benayon, Jay IS-M
Bengtsson, Lennart MA58
Benisch, Michael WB06
Benjaafar, Saif SC21, TB07, TC07
Benkard, C. Lanier MA28
Benli, Omer S. SC16
Bennett, Ashlea WA56
Bennett, Kristin WB40
Bennett, Steve TA54
Benneyan, James WA12
Bensalah, Karim SA12
Benson, Hande WA26
Benson, Steve SA24
Bensoussan, Alain TB44, WA01, WB53, WC65
Ben-Tal, Aharon SB40
Bentzen, Eric TA48
Bergemann, Dirk WB06
Berger, Jonah TA68
Berger, Susanne TC56
Berger-Wolf, Tanya MB21, TB42, WB50
Berg, Kimmo WD05
Berk, Emre SB45, WD67
Berling, Peter TB08
Berman, Oded SA08, SB67, SD67, MC67, TC65, TC67
Bernal Lopez, Endwin Andres SA67
Bernales, Alejandro IS-M
Bernardini, Fausto WD15
Bernshteyn, Mike WA04
Bernstein, Fernando SD46, WC45
Berrocal, Veronica SA01
Berry, Jillian WD33
Berthold, Timo SC50, SD22, SD50, MB24
Bertrand, Will WB54
Bertsekas, Dimitri SA25
Bertsimas, Dimitris SA33, SB28, SB40, TC23, WB57
Besbes, Omar SB23, TB28, TB62
Besiou, Maria SD52
Bestavros, Azer WB57
Besterfield-Sacre, Mary E. SD52
Better, Marco MC31
Beuermann, Diether
Bewernitz, Michael WA13
Bhadra, Dipasis TB57
Bhaduri, Budhendra MD12
Bhadury, Joy WA25
Bhamidi, Shankar WD39
Bhandari, Atul SB59
Bhardwaj, Pradeep TB68, TD48
Bhaskaran, Sreekumar SD20, WA14
Bhaskar, Rahul WC68
Bhaskhar, Umang SD39
Bhatnagar, Rohit TD46, WD16
Bhat, Navin TC39
Bhattacharjee, Sudip SA17, MB02, TD16
Bhattacharya, Abhik SC34
Bhattacharya, Shantanu WB41
Bhattacharyya, Kuntal WD08
Bhatt, Atul SA54
Bhulai, Sandjai SA25, WA23
Bichescu, Bogdan TD22
Bickel, Eric TD19, WC20
Bidanda, Bopaya SC50, TC61
Biehl, Markus SC52
Bienstock, Dan MD38
Bier, Vicki MD54, TC20, WA52, WB19, WD52
Bierwirth, Christian TC56
Bigras, Louis-Philippe TB58
Bijvank, Marco MD03
Bilegan, Ioana Codrutsa TB60
Bilgili, Mehmet SA24
Bilginturk Yalcin, Zehra TB54
Biller, Bahar MA49, MB13
Billie, Scott WD58
Billups, Stephen TC42
Bilsel, Ufuk SC56, MA43, WC06
Bimpikis, Kostas MB59
Bingham, Chris TB48
Birbil, S. Ilker SA58, TA63, TD25, WD18
Bird, Chris SD66
Birge, John SB49, MA08, MB08, TA03, TA40, TA59, TB08, WA45
Bisgaard, Soren TA17
Bish, Douglas SA46
Bish, Ebru SA46, SB07
Bisi, Arnab MC45, WC07
Biyalogorsky, Eyal MD62
Bjarnadottir, Margret SA33
Blackburn, Joe SD48
Black, Jason TD08
Blacksten, H. Ric SA50, WB66
Blackstone, Tanja MC31
Blair, Nate WA11
Blanchet, Jose SA49, SC27, MB27, MC23
Blanchette, Christopher MA47
Blaszczyk, Tomasz IS-T
Bley, Andreas MB11
Bloemhof, Jacqueline SD52
Blumberg, Michal MD05
Blumstein, Alfred SA03
Blyth, William WA10
Boasson, Emil TD35
Boatwright, Peter SD16

Bockstedt, Jesse MC51, TC51
Bock, Stefan MB66
Bodea, Constanta-N SC15
Bodily, Samuel SA20, TC20
Bodin, Lawrence MA54
Boeschen, Hans WB44
Bogdan, Caity WD52
Boginski, Vladimir TB42
Bog, Suat SB50
Bohmer, Richard SA48
Boile, Maria SA64, SB56, WC24
Boland, Natashia MA56
Bolia, Nomesh MC55
Bollapragada, Ramesh WC16
Bollapragada, Srinivas TC16, TD08
Bomsdorf, Felix TC22
Bonami, Pierre MD38
Bond, Samuel MB51
Boner, Chris MA31
Bonfrer, Andre TA68
Bonilla Jiménez, Ricardo SA67, TC49, WB29
Bonn, James MD58
Bookbinder, James H. MB56
Booker, Graham MB54
Boone, Edward MA13
Boone, Tonya TB48
Boot, Lee WA51
Bora, Selim TA46
Borchers, Brian TC26
Borener, Sherry WA58
Borenstein, Denis TC49
Borgs, Christian MB39
Borkar, Vivek MD40
Borkowski, Nicki MC43
Borndoerfer, Ralf MC67, TC60, WD60
Boros, Endre SC38, MC20, TA46
Borshchev, Andrei MB14
Bortfeld, Thomas TB47
Bose, Abhijit TC18
Bose, Dipankar WA44
Bosset, Evan SB19
Botero, Marìa Margarita WD35
Bott, Terry WD58
Bouchard, Mathieu SD11
Bouffard, Francois TD10
Bougnol, Marie-Laure WB29
Bouly, Hermann MD66
Bountourelis, Theologos MC27
Boutilier, Craig TD06
Bouzaiene-Ayari, Belgacem TA60
Bouzdine-Chameeva, Tatiana SA15
Bovik, Harry WD34
Bower, Geoffrey MA58
Bowers, Debra MA34, WB66
Bowers, Melissa TD22
Boyabatli, Onur WA08
Boyce, David WB63
Boyd, Stephen SD26
Boyko, Nikita TA53, WA13
Boyles, Stephen TB63, WC63
Boylu, Fidan TA51
Braden, Julie WD25
Bradley, Billy TA30
Bradley, James TC41, TD32
Bradlow, Eric SC68, TA68
Brady, Malcolm IS-T
Bragg, Daniel J WB54
Braithwaite, R. Scott WB47
Brandão, Luiz WC20
Brandeau, Margaret SB33, TC47, TD02, WB34
Brandyberry, Alan WB36
Brann, David SC32, TC49
Brantley, Mark SC49
Braun, Michael TA68
Braunscheidel, Mike TD44
Braunstein, Alfredo MB39
Bravata, Dena TC47
Brekelmans, Ruud TD40
Breneman, Curt WC12
Brennan, Michael TD57
Brenneman, William WA17
Breschan, Jochen SB10
Bresnick, Terry SB20, TC19
Bria, Frank SD53
Bricker, Dennis TD50
Bridgeland, David TA15
Bridges, Todd MC43, WC67
Bridgford, Brendan IS-T
Brigantic, Robert TC47
Briggs, Jeffrey WD58
Briggs, Tony TB48
Briones, Francisco WA28
Briskorn, Dirk TC22
Bristol, David SB14
Bristow, Elizabeth TA54
Britto, Rodrigo TD22
Broadie, Mark TA28
Brockett, Patrick SB51
Brock, Luther SB44
Broder, Andrei SC25
Broekmeulen, Rob WC32
Brogan, Anita MA47
Brooks, Paul MA13, TC42
Brotcorne, Luce TB60
Brown, Daniel MB21
Brown, David SA19, SA30, SB40, SD28, WA19
Brown, Gerald MD56, TA25, WB35
Brown, Mark SC36
Brown, Rex TC20
Brown, Sherilyn WD58
Browning, Tyson SB66, TB41, TC41
Broyles, James IS-M
Bruce, Peter TD14
Brudno, Michael MD21
Brumbelow, Kelly SD54, MB54, MC54, TA54
Brunner, Jens MB33
Brynjolfsson, Erik MA02
Bucci, Michael TD67
Buchbinder, Niv WB39
Bucheli Guerrero, Victor Andres SA67
Bucklin, Randolph SD68
Buckshaw, Don TB19
Budescu, David TA20, TB20
Budge, Susan TB21
Buede, Dennis SC19, TC19
Bui, Tung MA46
Buke, Burak WC62
Bukkapatnam, Satish SB47, MA18, MD09, TC09, TD17, WC17, WD09, WD17
Bulbul, Kerem SA58
Bulfin, Robert TD28
Bullitt, Elizabeth IS-T
Bulut, Önder WB65
Bulut, Zumbul MA44, MD45
Bunn, Derek SB10, WA10
Bunyaratavej, Kraiwinee SC65
Burbano, Angelica TB33
Burch, Damian MB27
Burer, Sam WD26
Burke, Edmund SA58
Burke, James V. WC12
Burnett, Rebecca E. WC35
Burnside, Elizabeth SA47, SB65, WC17
Burns, Shekinah TB35
Burns, Wil IS-M
Busic, Ana TD46
Busshoff, Yvonne MC41
Bussieck, Michael SC26, SC42
Bustillos, Brenda SB56, SC61
Butenko, Sergiy SC01, MA42, MB42, WC50
Butler, Andrew MD30
Butler, Brian MA02
Butler, Renee TB35, TB35
Butry, David SA11, SB11, MA11
Butt, Steven MA56, TD55, WB14, WD36
Buyukkaramikli, Nasuh Cagdas WB54
Buyukozkan, Gulcin WD14
Buyuktahtakin, Esra MD24
Buyurgan, Nebil TB33
Buzacott, John SC43
Byon, Eunshin TB12
Byrd, Richard TA05
Byrnes, Kevin SA42

C

Caballero, Isabel TB42, WB50
Cabanda, Emilyn WD29
Cabantous, Laure TB20
Cabrera Rìos, Mauricio WC33, WD44
Cabrera, Victor TB08
Caby, Errol WD13
Cachon, Gerard SC45, MA07, MA16, MB08, TA16, WB08
Cadeddu, Jeffrey SA12
Cadenillas, Abel WA53
Cai, Gangshu SB63, MC22, TD16
Cai, Ning MA53, WB53
Cai, Xiao WB64
Cai, Xiaoqiang SB08
Cai, Xiongfei TD01
Cakanyildirim, Metin MB44, TB44, WC65
Cakici, Eray MB63
Cakici, Ozden Engin MD03
Cakir, Kemal WC24
Caldas, José WD11
Caldentey, Rene MD59, TA08
Calderon, Aurora SC65
Calhoun, Charles TC31
Caliskan Demirag, Ozgun WD68
Caliskan, Fethullah WB41
Callaway, Duncan MC50, TD10
Camelio, Jaime MA17
Camlibel, Kanat TD40
Campbel, Dennis SD08
Campbell, James SD67
Campos, Danilo TD25
Campos-Nanez, Enrique WC33, WD05
Canahuate, Guadalupe SC13
Canakoglu, Ethem TC01
Canale, Silvia MB38
Cannon, Jim TD45
Cantor, David WD56
Cantor, Murray SB66
Cao, Mei TC54
Cao, Qing MB51
Cao, Rongzeng TB67, TC15
Capar, Ismail SA16, WD28
Capizzi, Giovanna TA09
Caramanis, Constantine SB40, MD40, TD57, WB57, WC23
Carare, Octavian MC06
Carayannis, Elias TC48
Carbajal, J. Antonio MD63
Cardell, Judith WD03
Cardoen, Brecht SC33
Carikci, Baris MA65
Carley, Kathleen SC32
Carlo, Hector J. SD56, MA63
Carlson, Robert MA57
Carlsson, Fredrik TA47
Carlsson, John TD56
Carlyle, Matthew TA25, WB35
Carmon, Yair SA22
Carnaroli, Giovanni WC55
Carniol, Ted SC64
Caro, Felipe SC07, MD59
Carpenter, Adam IS-T
Carpenter, Joseph SA48
Carr, Gregory WA58, WC55
Carr, Peter TD53
Carr, Sean TC56
Carrasco-Gallego, Ruth SB52
Carrell, John WB11
Carreras, Ashley TC43
Carrier, Emmanuel TA58
Carrillo, Janice SB48
Carrion, Miguel WD10
Carroll, Owen MA56
Carswell, Lori SD14
Carter, Michael MC33, MD65, TB21
Carty, Steven SA11
Carulla, Marìa Cristina WD35
Carvajal, Rodolfo SC11
Casadesus-Masanell, Ramon MD01
Casas, Irene WB61
Case, Mark WD21
Caserta, Marco TD25
Cashbaugh, David MC31
Cassandras, Christos MA27, WB57
Castillo H., Mario TB54, WD19

Castillo, Marco TB58, WC05
Castro, Jose M WD44
Caswell, David TA19
Caswell, Nathan TD08
Catalan-Cardenas, Andres MA16
Cataldi, Michele TC35
Cattani, Kyle WD42
Catts, Glen SD11
Caudillo-Fuentes, Luz TA65
Caulkins, Jonathan P. SA03, MA34, TA35
Cavalier, Tom WC25
Cawlfield, David TA66
Cekyay, Bora SA18
Cencki, Tuna WC16
Centeno, Grisselle SB61
Ceryan, Oben MD02
Cetinkaya, Sila MA52, MA57, MC03, MD32, MD67, TC62
Ceyhan, Mehmet WA12
Chabar, Raphael MD11
Chachuat, Benoit WB26
Chae, Junjae WC11
Chai, Yueting WA18
Chakraborty, Bibhas TA34
Chakraborty, Santanu SC34, MA33
Chakravarty, Amiya SD44
Cha, Kyungduck SB21, MC50, TA33
Challa, Aditya TA62
Chambers, Chester WB42, WC48
Chan, Carri MA40
Chan, Collin TC07
Chandaver, Nahush SA33
Chan, David MA19
Chandra, Pankaj IS-T
Chandrasekaran, Aravind SB48
Chandrasekaran, Deepa SD51
Chandra, Wenny MA09
Chan, Eddie Yon Sim WB60
Chaneton, Juan Manuel MD59
Chan, Kwong MD68
Chan, Lap Mui Ann WA32
Chan, Nicolas MC59
Chan, Ping Shing SD09
Chan, Stephen SB44
Chan, Timothy TB47
Chan, Wai Kin WD50
Chan, Yupo TB63
Chang, Chun-Lan WA42
Chang, Gang-Len TB67, WD56
Chang, Junxia TA60
Chang, Kuohao MD17
Chang, Liang SD61
Chang, Ling-Cheng SB49
Chang, Peter TD61
Chang, Seok Ho WD36
Chang, Shi-Chung SC49
Chang, Shing TD09
Chang, Su-Hsin WD06
Chang, Woojin SA12
Chang, Yih-Long WB65
Chang, YoungJung TA42
Chang, Yu-Heng SA58
Chao, Gary H. TD42
Chao, Raul TA41
Chao, Xiuli WB23
Chaovaitwongse, Art SB47, SC58, SD13, MB21, MD47, TB42, WA13, WB09, WB50
Chapman, Randall G. TD14
Chareonsiriwath, Chayakrit
Charikar, Moses TD39
Charlier, Bruno SA10
Charoensiriwath, Supiya
Chatterjee, Ashis Kumar WA44
Chaudhry, Mohammad Asad R TD55
Chavarro Bohòrquez, Diego Andrés TC49, WB29
Chayes, Jennifer MB39
Chayet, Sergio SA46, SB07
Che, Hai WB68
Chebolu-Subramanian, Vijaya TB44
Chee Chong, Teo TD46, WD16
Chekuri, Chandra WC38
Chellappa, Ramnath SB02, MC51
Chelst, Ken SB29
Chen, Argon SB49
Chen, Bintong MB15
Chen, Binyuan SD40
Chen, Cheng-Chieh WB28, WD64
Chen, Cheng-Kang TA35
Chen, Chialin MD41
Chen, Chien-Hung MA32, TC47, TD47
Chen, Chien-Ming SC43
Chen, Chien-Wei WC61
Chen, Chien-Yu IS-M
Chen, Chin-Sheng SA42
Chen, Chun-Hung SB49, SC49, SD49, TD37
Chen, Chyi-Mei WA68, WB68
Chen, Frank TD07
Chen, H. Michelle MC51
Chen, Hao-Wei SD46
Chen, Ho-Lin TB22
Chen, Hsinchun MB25
Chen, Jianqing SD02, SD68
Chen, Jiayi TB25
Chen, Jie TB07
Chen, Judy TC68
Chen, Kay-Yut SA44, MA45, MD46
Chen, Li MC02
Chen, Lichun (Lisa) TC61
Chen, Lijian MB26, MB63, TA59
Chen, Li-Ming MC44
Chen, Li-Ming WD32
Chen, Liwen WA45
Chen, Lucy WB16
Chen, Lujie TB13
Chen, Min MD12
Chen, Minder MC02
Chen, Ming TB59
Chen, Nai-Hua TC68
Chen, Nan MA53, WA49, WB53
Chen, Nan WA09
Chen, Pei-yu TD51
Chen, Rachel WA33
Chen, Richard MB56, MC50, TD10
Chen-ritzo, Ching-hua WB16
Chen, Si SB55
Chen, Victoria MA01, TD13, WB49
Chen, Wei WC19
Chen, Weiwei WC66
Chen, Wen WC36
Chen, Xi WA32
Chen, Xin SB65, TD07
Chen, Xin IS-T
Chen, Yan SA02
Chen, Yao-Hsuan WB33
Chen, Yihsu SD10, TC11, WA10
Chen, Yong WA09
Chen, Yuguo MD49
Chen, Yuxin TB68
Chen, Zhi-Long TA46, TB59
Cheng, Bowei WA59
Cheng, C.H. SC63, TB25, WB56, WD51
Cheng, Clark TA60
Cheng, Feng WA18, WB18
Cheng, Hsing MD51
Cheng, Liang-Chieh TB54
Cheng, Peng WB55, WD57
Cheng, Russell SD49
Cheng, Shih-Fen TB63
Cheng, William WD53
Cheng, Yao WD43
Cheong, Tae Su MD63
Cheraghi, S.Hossein SA43
Cheran, Elango MD21
Cherapanov, Vadim TD51
Cheridito, Patrick SA19, SC24, TC53
Chevalier, Philippe SC21
Chew, Ek Peng SC49, WB14, WB59
Chhajed, Dilip MC07, MD41
Chhatwal, Jagpreet SA47, SB65, WC17
Chiam, Tze Chao WD55
Chiang, David TB60
Chiang, Wei-yu Kevin SB65
Chiang, Wen-Chyuan TD15
Childers, Ashley SD47
Chimka, Justin SC18, MA09
Chinchalkar, Shirish WD47
Chin, Chang-Ho SC18, MB17
Chinchuluun, Altannar TB42
Chinen, Ken WD45
Chinnam, Ratna Babu MC66, WC44, WD03
Chinneck, John SD50
Chiraphadhanakul, Virot SD64
Chirkova, Rada TD28
Chiu, George T. C. IS-M
Chiu, Ted TC31
Chiu, Yi-Chang SB56, SC61, MB61, MD64, TA52, TB64, TD61, WA61, WC63
Chiyoshi, Fernando WC22
Cho, Christina TC35
Cho, Joohyun TD54
Cho, Ju-Yin WC67
Cho, Man TC31
Cho, Nayoung IS-T
Cho, Soo-Haeng MC20
Cho, Sungzoon TB12
Chockalingam, Arun MA53
Chod, Jiri TA45, WC07
Choi, Byung-Cheon TA22
Choi, JeongHye MB68
Choi, Jin Young WD67
Choi, Jiyoung SD29
Choi, Minnseok WB36
Choi, S. Chan MD68
Choi, Sangdo WD42
Choi, Sungyong SC40
Choi, Tsan-Ming WC42
Choi, Young Sang SA34
Chong, Edwin MC27
Choo, Adrian SA17
Choobineh, Fred WA49
Chopra, Sunil SC67, SD44
Chou, Chih-Sheng WD64
Chou, Chun-An TB42, WB50
Chou, Mabel C. MC45
Chou, Shan-Yu WA68
Choubey, Suresh SC09
Choudhuri, PhD, Shabbir MC66
Chouman, Mervat TC64, WA60
Chow, Alix TB22
Chow, Andy MD05
Chowdhary, Pawan WB18
Chow, Vincent MB33, TB34
Christophel, Philipp MB50
Chu, Hai WC62
Chu, Leon Yang WC08
Chu, Sydney WA36
Chun, Sung TD59
Chung, Casey WA07
Chung, Kwanghun SD42
Chung, Sung Hoon WC06
Chung, Timothy SC30
Chung, Woodam SD11
Chung, Yenho Thomas MC44
Chung, Yong-Hun WA03
Churchill, Andrew MC58
Church, Richard MA11
Chutani, Anshuman WA01
Ciarallo, Frank TB46
Cicek, Deniz TA28
Cichocki, Andrzej WC33
Ciemnoczolowski, David MC60, MD60
Cillo, Alessandra TA20
Cimren, Emrah WB07
Cipriano, Aldo MC61
Cire, Andre Augusto SB22
Citrenbaum, Dan WC58
Citurs, Alex WD35
Civelek, Ismail SB45
Claerhout, Diederik SD21
Clancy, Carolyn TD02
Clark, Adam TB19
Clark, Alistair WD67
Clark, Andrew WD37
Clark, Michelle TB65
Clarke, Douglas WC67
Clarke, John-Paul SA58, SB58, SD58, TC58, TD58
Clarke, Leon TA11
Claudio, David MD09
Clautiaux, François MD66
Cleary, Kevin WC33
Cleary, Paul TD33
Clemen, Robert MD20
Coban, Elvin SA58
Cobb, Barry MC19

Cochran, James SC36, TA35, WC04
Cocking, Cara IS-M
Cohen, Alan SD07
Cohen, Justin TD52, WD03
Cohen, Morris MB16, MD45, TD44
Cohen, Stephane SB64
Cohn, Amy SB31, SB58, MB56, MC50, MD65, TD10
Coit, David SA10, SB18
Colak, Selcuk WB24
Coleman, Nastaran WC58
Cole, Michael SA63
Cole, Sam TB32
Colfer, Lyra TB41
Collins, Andrew SA57
Collins, John TD51
Collins, Linda M. TA34
Collins, Phil MA30
Colon, Alfredo WB58
Comez, Nagihan MB44, TD60
Commander, Clayton TB42
Comm, Clare SC62
Conejo, Antonio J. TD10, WC10, WD10
Conitzer, Vincent TD06, WB06, WC05
Constantin, Isabelle WB63
Constantino, Miguel SC11, TB38
Contardo, Claudio WD25
Conte, Tobias WD28
Contractor, Noshir SD51, TC04, WC12
Cont, Rama MC53, SC53
Contreras, Marco SD11
Cook, Daniel P. Plenary-W
Cook, Lara WC55
Cook, William MC24
Cooper, Andrew WC35
Cooperman, Kathleen SB34
Cooper, Martha MB30
Cooper, William SA59, WD62
Cope, Eric WA20
Corbett, Charles SA45, MB57, TC34, TD33
Corbo, Jacomo TD08
Cordeau, Jean-Francois WD25
Corley, Bill TD13, WB19
Corman, Francesco WD60
Cornejo, Mario MB26
Cornejo, Oscar SD67
Corner, James TC20
Corominas, Albert WC43
Correa, Jose Rafael SB39, SC59, MA59
Corsten, Daniel TC08, WA42
Cortazar, Gonzalo IS-M
Cortinhal, Maria WD11
Costantini, Kevin SD31
Costa, Pedro WD11
Côté, Jean-Philippe TB58
Cotelle, Pauline WB52
Côté, Murray TA33, TC33
Cotteleer, Mark SC08
Cottle, Richard TB03
Coughlan, Anne SB52
Coulter, Brian SB62
Cowan, Nuala MB60
Cowell, Alexander SD34
Cowgill, Bo WC39
Cowing, Michelle WB33
Cox, Jr., Louis A (Tony) MD55, TC55
Crainic, Teodor Gabriel MC56, TA37, TC64, WA60
Crama, Pascale WA59
Cramer, Mike TC49, WC19
Creasey, Roy TA49
Creedon, Jeremiah WC57
Creemers, Stefan SD65
Crissey, Mary SB13, MA01
Critchley, Elizabeth TB52
Crites, Jim WB02
Crocker, Ian TB47
Cronin, Matthew SB03
Cronin, Timothy WB10
Crossley, William WC57,WD18
Crowder, Harlan SD01
Crowe, Julien SC47
Cruz, Jose TA44, TD16
Cruz, Marcelo SD37
Cruz, Yesenia IS-T
Cui, Jie SC15
Cui, Linlin WA18
Cui, Tingting SC67
Cui, YanWu SD18
Cui, Zhijian SB41
Cummings, Derek TC34
Cunha, Claudio B. TD25
Cunningham, Bill MB30
Cure, Laila MB34
Curtis, Frank TA05
Cynar, Didem WD12

D

D'Ariano, Andrea WD60
D'Amours, Sophie SD11
D'aspremont, Alexandre SC24, TB50, TC51, WD40
D'Auria, Bernardo TA55
D'Souza, Warren MC47, WD33
Dabkowski, Matthew F. TC19
Dabrowski, Paul TD10
Dada, Maqbool MC45, WC07
Daganzo, Carlos TA52
Dahan, Ely SA68
Dahlberg, Randall MA49
Dahleh, Munther MA59, WB57
Dai, Fuqing WD57
Dai, Hua WB51
Dai, Jim SC27, TC23, TD23
Dai, Yue TD16
Daim, Tugrul TD18
Dalkiran, Evrim WA38
Dallery, Yves TB16
Dalwai, Imran IS-M
Damay, Jean MC56
Dambolena, Ismael WD35
Damnjanovic, Ivan IS-T
Damodaran, Purushothaman SA42, WC22
Dana, James SC59
Danczyk, Adam TA61
Dandurand, Brian TD26
Dang, JiXiang SD18
Danna, Emilie SB25, MA50
Darr, Stephen WD58
Darud, Mike TB34
Das, Abhiman WC29
Das, Kaustav TB13
Das, Sanmay MA25, MB12
Das, Sourav TA60
Das, Tapas TD11, TD47, WA33, WB47
Dasci, Abdullah WC60
DasGupta, Bhaskar MB21, MC42, TB42, WB50
Dasgupta, Subhasish WB36
Dasgupta, Tirthankar WB17
Daskalakis, Constantinos SD39, WD39
Daskin, Mark SC67, SD44, MD67, MB56
Dass, Mayukh SB12, TB37
Datta, Dr. Pratim WB48
Daubenspeck, Fred TC19
Dauberman, Jamie TC35
Dauwels, Justin WC33
Davies, Jane MD08
Davies, Ruth TC43
Davies, Stephen WB20
Davila, Saylisse TA13
Davino, Carolynn WB33
Davis, Andrew MA06
Davis, Cheryl TA49
Davis, Darwin J. SC09
Davis, Fred SD19
Davis, Jillian MB48
Davis, Lauren SB44, TC52
Davis, Paul MB25
Dawande, Milind MA51, MC25, TC45, WA07, WC43, WD51
Daxhelet, Olivier SA10
Dayanik, Savas SB49, MB13, WD23
Day, Bob SC15, MB01, TC24
Dayhim, Muhammad SB19
De Causmaecker, Patrick SA58
de Farias, Ismael SD38, MA38, MB38, TA38
De Giovanni, Pietro WA41, WC16
De Grano, Melanie WD33
de Kok, Ton MB40, TB61, WA32
de Kok, Ton TB07
de Koster, Rene SD63, WA64, WC64
de Lange, Gertjan WB37
De Maere, Geert SA58
de Matta, Renato MD02
de Miguel, Victor MB59, TC59, WA05
De Reyck, Bert SD20, MC32, MD35,
de Souza, Robert SD56
de Veciana, Gustavo WC23
de Vericourt, Francis WD47
de Weck, Olivier TC63
Dean, Angela IS-M, MC18, MD17
Dearing, P. M. MA67
Deblaere, Filip MD35
Debo, Laurens SC59, SD16, MA07, TA08, TB22, TC46, WA46, WB22, WB23, WC28
Debo, Laurens WB08
Dechter, Rina MA22
Decker, Dave TA59
Deckro, Dick SD30, TA31
DeCroix, Gregory WC45
Dees, Robert TC19, WB03
DeFauw, Megan WB34
Degraeve, Zeger SD20
Deguest, Romain MC53
DeHoratius, Nicole SC46, SD46
Dekker, Rommert MC46, MD45
Delage, Erick SB40, TC01, TD56
Delaney, James MC17
Delaney, Patrick TB54, TD49
DeLaurentis, Daniel WD56
DeLaurentis, Po-Ching MA34
Deleris, Lea TB18, WA20
Delgado, Felipe MC61
Delin, Henrik MA58
Dell, Robert WB35
Delong, Suzanne MC30
Delquié, Philippe TA20
Demaine, Erik MD39
Demeulemeester, Erik SC33, MD35
Demirci, Mehmet C. WA34
Demirel, Suleyman WB16
Demirkan, Haluk SB51
Dempsey, James WA38
den Hertog, Dick TD40
DeNegre, Scott SA50, SC50
Deng, Shi-Jie WD10
Deng, Shijie IS-T
Deng, Xiaotie SD39
Denisov, Denis MC23
Denizel, Meltem MA52
Deniz, Erhan IS-M
Denli, Zelal IS-M
Dentcheva, Darinka SC40, MC40, TB53
Denton, Brian SC33, SD34, MA47, MB33, MD34, MD65, WA34
Deo, Sarang MB47, MC34, TC34, TD33
De, Prabuddha MC01
DePuy, Gail SB19
Derigs, Ulrich TC22, WC25
Derigs, Ulrich SA66, SD64, WA60
Derman, Emanuel SA53, WD53
Derpich, Ivan MB50
Desai, Jitamitra MA42
Desai, Preyas SB68, MA68
Desai, Vijay MC59
Desai, Vinit SA48
Desaulniers, Guy MA60
Deshmukh, Abhijit WC05
Deshpande, Vinayak SB57, WC07
Dessouky, Maged MC61, MD56
Devalkar, Sripad TA08
Devanbu, Premkumar SD66
Devapriya, Priyantha SD43
Devaraj, Sarv WC21
Dewan, Sanjeev MB02

Dexter, Franklin SA09, WA47
Dey, Asoke WB21
Dey, Debabrata SB02
Dey, Santanu MB38, WB38
DeYong, Gregory SB16
Deza, Antoine TC40, WC40
Dhanasobhon, Samita MD01
Dhillon, Manpreet WB36
Diana, Tony TB57
Diaz, Rafael WA49, WD49
Dickens, Andrea SC20
Diecidue, Enrico TA20
Diehl, Kathleen MB42
Dieker, Ton MC23
Dienes, Cara WD21
Dikshit, Prakash WC57
Dilkina, Bistra MB22
Dillon-Merrill, Robin SB03
Dimitrov, Nedialko MD40, TA25
Dimitrov, Stanko SD55, WA12
Dimoka, Angelika SA66
Din Daily, Noriah WA38
Ding, Amy MB25
Ding, Guoli SC38
Ding, Hongwei SC65, WA18, WD63
Ding, Min SC68
Ding, Qing MA62
Ding, Shengwei WD44
Ding, Wei TB67, TC15, WC12
Ding, Yu MD17, TB12, WA09, WD09, WD17
Dinitz, Laura WB52
DiPalantino, Dominic SC39
Dirkse, Steven SA14, SC26, TD24
Dissanayake, Sahan SB11
Dixit, Vinayak TA52
Dixon, Michael MD15
Do, Chuong MD21
Dobson, Gregory MD33
Dobson, Gregory MC47
Dogan, Gokhan MC41
Dogan, Ibrahim IS-T
Dogru, Mustafa WC45
Dolinskaya, Irina WC66
Donaghy, Kieran TA63
Dondi, Riccardo MC42
Dong, Jianrong TC42
Dong, Jin SA13, SC65, SD21, TD49, WA18, WB18, WD63
Dong, Jing MC05
Dong, Jingyan TB09
Dong, Su MA51
Dong, Yan SB57
Donohue, George MD58
Donoso, Macarena WA55
Donovan, Geoffrey SA11, SB11
Dooms, Michael SC56
Dorr, David TD18
Dover, Howard TA68
Down, Douglas MC23, MD23
Downs, Brian TA14
Downs, Julie WA47
Draganska, Michaela SB68, TD54
Drake, David SA07
Drake, Matt TD16
Drapkin, Dimitri MC40
Drew, Jule WD04
Drew, Michael WD57
Drezner, Tammy MA67
Drezner, Zvi SB67, MA67
Drobouchevitch, Inna WA07
Dronzek, Rainer TA14, TC49
Dror, Moshe MD22, TA12
Drozdowski, Tad TD18
Druehl, Cheryl TD41
Drummey, Kevin SC03, WD37
Drury, Colin TA31
Du, Alex TD21
Du, Lili MD64, TB63
Du, Ye SD39
Duan, Rong MB13
Duan, Wenjing SD51, MB51, MD01
Duan, Zhaoyang WD21
Duan, Zhe TA55, TB61
Duarte, Marina WC14
Dube, Parijat SB23, TD59
Dubois, Charles TD46
Dubrawski, Artur TB13
Ducarroz, Caroline WA06
Duchenne, Eric MD66
Duenyas, Izak MD02, WA59, WB45
Duintjer Tebbens, Radboud SC20
Dukes, Anthony SB68
Dula, Jose MA13, WA12, WB29
Dulin, John SB30, MB30
Dul, Jan SD63
Dumas, Jonathan SC58
Dunbrack, Roland TA42
Duncan, George WC21
Dunham, Adrienne TB13
Dunlap, Laura SD34
Dupuis, Paul MB27, TA23
Durango-Cohen, Elizabeth WA56
Durango-Cohen, Pablo WA56
Duran, Rodrigo MB17
Duran, Serhan SC65
Durgavich, Joel MC26
Dutta, Goutam SB19, TA62
Dutta, Kaushik SC02
Dutton, Richard TC21
Duvvuri, Sri MC68
Duzgun, Ruken MA42
Dyer, James MC09, MD20, WC19
Dyson, Robert TB43

E

Easton, Todd MA24
Easwaran, Gopal SA52, MD32
Eaton, Jeff WA30
Eck, Chris TA30
Eckhause, Jeremy WC36
Eckstein, Jonathan SA26, MB06
Edara, Praveen WA63
Edelman, Paul TA04
Eden, Maya MA39
Edirisinghe, Chanaka WC53
Edmonds, Jae TA11, TB02
Edson, Robert WB01
Edwards, Thomas SB29
Ee, Mong Shan IS-M
Egging, Ruud SA26, MD10
Ehmke, Jan WB49
Ehrenmann, Andreas MB10
Ehrlich, Kate WB20
Ehrlichman, Samuel M. T. SD23, TB49
Ehrmann, Thomas WB15
Ehtamo, Harri TD28, WC25, WD05
Eiselt, H.A. TC67
Eisenhawer, Stephen WD58
Eisenstein, Donald MC61
Eisner, Howard TD04
Ekici, Ali SB34
Ekren, Banu SB63
Eksioglu, Burak WA32
Eksioglu, Sandra WB52, WC54
El Ghaoui, Laurent WD40
El Ouardighi, Fouad SA16, WC16, WD16
Elahi, Ehsan TA44
Elcan, Amie TB55
El-Chammas, Manar TA19
Elder, John SB13
Elefteriadou, Lily TD55
ElHafsi, Mohsen TC07
Elhedhli, Samir MC50, TD50
Elkamel, Ali WA28, WC26
Elkind, Edith TC39
Ellis, Scott MC43
Ellwein, Laura SD25
Elmaghraby, Wedad TC12, TD45
Elmes, Brandon SB19
Elòi-Santos, Daniel T. SC48
ElRouayheb, Salim TD55, WA55
Elsayed, Elsayed TB17, WC37
Elverhöi, Morten SC10
Elwany, Alaa TC17
Embrechts, Mark WC12
Emil, Emre SD65
Enders, Paul TC22, WB22
Engau, Alexander WD26
Engelbrecht-Wiggans, Richard SD45
Engineer, Faram MC33
Engstrom, Ryan MB60
Enholm, Jake WA30
Eno, Josh TB33
Epelman, Marina SD55, TB47, WC66
Eppinger, Steven SA41
Epstein, Rafael TD45
Erat, Sanjiv SA41, MB41
Erceg, Daniel WD37
Erdahl, Randy TA24
Erdem, Ahmet WC24
Erdogan, S. Ayca SC33
Erenay, Fatih Safa MC34, TB34, WC17
Eren, Ezgi WD66
Erera, Alan MD63, TA56, WA56
Ergun, Ozlem SB50, MA56, TC52, TD52, TD58
Erhun, Feryal SC45, SD01, MA57, MC44, TC46
Erickson, Anthony TD18
Erkin, Zeynep SB18, MD34
Erkip, Nesim WB14
Erkoc, Murat WA46
Ervolina, Tom WA18, WB18
Erwin, Michael SB19
Erzurumlu, Sinan SB48, WA48
Esen, Mustafa SD42
Esensoy, Ali Vahit TB21
Espinoza, Daniel MB11
Espiritu, Jose WC54
Etemadnia, Hamideh SA56
Eterno, Rosa MB48
Ettl, Greg SC11
Ettlie, John E. MB48
Ettl, Markus WA18
Etzweiler, Dominik WA20
Evans, Antony D. WB10
Evans, Elizabeth WB14
Evans, Galen MB60
Evans, Gerald W SB19, SC63, TD61, WA66
Evgeniou, Theodoros SC68, MB12
Ewing, Ben WC19
Eynan, Amit MC03
Eyres, Greg TC15
Ezell, Barry TA54

F

Fabregas, Aldo SA61
Fabri, Peter SA09, SC34, MB34, MC65
Fadyloölu, Murat WB65
Faehnle, Andrew SD33
Fagerholt, Kjetil SB25
Fahringer, Philip SC31
Fajardo, David SC61
Falk, James WB01
Fallah Fini, Saeideh WA28
Fampa, Marcia WC18
Fan, Huiyuan TD13
Fan, Lin MA10
Fan, Ming SB02
Fan, Neng TB42
Fan, Wei (David) MD61
Fan, Ya-Ju MD47, SB47
Fan, Yueyue MC63, TC64, WC61
Fang, Ming TB14, WD20
Fang, Shi-Cherng WC18, WD18
Fang, Xiang WA46
Fang, Xiao MC12
Farahat, Amr MA59
Farias, Vivek SA39, SC28, MA40, TB28
Farnham, Paul TD34
Farokhi-Sadabadi, Kaveh
Farzan, Farnaz MD44, TB54
Fasano, John Peter TB67
Fathi, Yahya TC05, TD28
Faulin, Javier TA64, TC63
Fawcett, Allen TB11
Fayed, Asser SD48
Fazel, Maryam TB39
Fearing, Douglas TD57
Federgruen, Awi TA07, WA43
Fedorka-Cray, Paula J. TB13
Feige, Uri SC25, WB39
Feillet, Dominique TB60
Feinberg, Eugene MC27
Felder, Frank A. SA10
Feldman, Jon WA39
Feldman, Moran MD39
Feldman, Pnina MA07, TA16
Feldman, Zohar MC16, WA65
Felli, James MB19
Fellingham, Gilbert SC36
Feng, Haolin WC07

Feng, Jiejian WC66
Feng, Jin WB44
Feng, Juan MD51
Feng, Keli TB46
Feng, Qi MB44, WC42
Feng, Tianjun SD19
Feng, Youyi WB11
Fera, Toni MA09
Ferguson, Mark MA52, MC46, MD57, TA62, TB06, WD46
Ferhatosmanoglu, Nilgun SC13, TB42
Fernandez Pons, Diego Olivier SB25
Fernçndez-Baca, David TC42
Fernandez, Elena MA67
Ferrand, Yann SD33
Ferreira, Kevin MA62
Ferreira, Placid TA56, TB09
Ferrell, William WA64
Ferrer, Juan Carlos WB59
Ferris, Michael MA05, MC10, TD26, WC09
Ferrucci, Francesco MB66
Fertis, Apostolos SB28
Feyzioglu, Orhan TA63, WD14
Fichman, Rob TA21, TA21
Fichtinger, Johannes WA44
Fiddaman, Thomas WB31
Fields, Erica MD09
Fifarek, Brian MA48
Figliozzi, Miguel MB64, TB56, TC63
Figueira, Jose Rui TD01
Figueiredo, Paulo TD41
Filomena, Tiago WD05
Findeis, Jill WD24
Fine, Charles TC52
Fink, Andreas SD55
Finkelstein, Stan SD32
Fiorillo, Ricardo TA60
Firth, Zachary MC26
Fischer, Martin TB55
Fisher, Marshall SD46, MB46
Fixson, Sebastian TA48
Flahault, Antoine MA09
Flaherty, Theresa TD68
Flanigan, David WB03
Flapper, Simme Douwe SD52
Fleder, Daniel SD12
Fleischer, Lisa SD39
Fleischhacker, Adam MB45
Fleischmann, Moritz TC54
Fleming, Lee MA41, TA41
Fleten, Stein-Erik SC10
Floehr, Eric TD19
Flores, Eduardo WB59
Florian, Michael WB63
Floudas, Christodoulos MC21, WB26
Fodstad, Marte WD36
Foggia, John WD58
Fogliatto, Flavio SB09
Fong, Duncan K. H. SC62
Fong, Steve IS-M
Fontana, Matthew TD03
Fontanesi, John MA34, WB66
Fon, Vincy TA04
Ford, Daniel MA03
Ford, Thom MB31
Forehand, Garlie WC35
Foreman, John IS-T, TD46
Foretsch, Tracy SC32
Forman, Ernest IS-M
Foroozanfar, Fateme IS-M
Forrester, Richard SB35
Forrest, John SA26
Forsgren, Anders TA47
Forsten, Karen WC10
Forza, Cipriano WA43
Foster, Michael TA34
Fotopoulos, Stergios WC36
Fourer, Robert SB19, SC14, MD26, TB26
Foutz, Natasha SA68
Fowe, Adeyemi TB63
Fowler, John SD22, MB63, TC65, WA34, WD33
Fox, Tim TB47
Fox, William SA30, SB30
Fradkin, Yakov SB31, MC32
Fraisse, Clyde TB08
Fralix, Brian TA55
Francas, David MA52
Franco, Alberto TB43, TC43
Frangioni, Antonio TD50
Frank, Jordan MC27
Fransoo, Jan TC07, WA32
Frazier, Peter SB49, MA37, TC28
Fredendall, Lawrence MB48
Freedman, Michael WA22
Freitas, Luiz WA11
Freivalds, Andris MD09
French, John TB34
Freund, Robert WC40
Fricker, Ronald MA09, WB35
Fridgeirsdottir, Kristin WA59
Friederichs, Stefan SD64
Friedlander, Michael TB26, TC40, WD40
Friedman, Jed TD52
Frie, Dr. Robert SC15
Friesz, Terry MC05, MD05, WA62, WC06
Friggstad, Zachary TD39
Frittman, Jaime MC43
Froehle, Craig SD33
Frommer, Ian WD21
Fronczak, Robert MB60
Frost, John MD31
Fry, Donald WD56
Fry, Michael J. MD32
Fu, Michael SD49, MC49, TD37, WA04
Fuchs, Erica MC39
Fujisawa, Katsuki TC26
Fujita, Yuji MA26
Fukasawa, Ricardo MA50
Fukuda, Mituhiro TC26
Fukushima, Masao WB67
Fuller, David MD10
Fuller, John TB65
Fuqua, Ben TA14
Furman, Jeff MC39
Furman, Kevin SD24
Furmans, Kai SC63
Furuta, Takehiro WC11
Fussell, Susan WC19
Fylstra, Daniel H. TC14

G

G. del Valle, Alejandro TC63
Gabali, Ola TB61
Gaba, Vibha WB41
Gabraeel, Nagi TB17, TC17
Gabriel, Steve MD10, WC36
Gaertner, Nathaniel MA64
Gaimon, Cheryl SA48, SB48, SC52, MC48
Gajpal, Yuvraj IS-T
Gal, Avigdor MB06, WA06, WD22
Galbreth, Michael TA66
Galindo, Gina WB16
Galinier, Philippe SD22
Gallego, Guillermo MA62, MB62, MC59, MD28, MD62, TA59
Gallego, Julian SA11
Gallien, Jeremie MD59, TD46
Galli, Laura WA25
Gamarnik, David TC23, TD23
Gamboa, Dorabela MB64
Gan, Heng-Soon MA56
Gandhi, Anshul WB22
Ganduri, Chandrasekhar MD22
Ganesan, Rajesh TA57, TD09
Ganeshan, Ram TB48
Ganguly, Auroop SB43
Gangwar, Manish MB68
Gans, Noah MC16
Ganzfried, Sam SB42
Gao, Baojun WC49
Gao, Guodong(Gordon) TD21
Gao, Huina TB59, WC59
Gao, Long TC60
Gao, Robert WB57
Gao, Song SD61, TA64
Gao, Su TD22
Gao, Wei MC12
Gao, Xin WB43
Garber, Alan WB34
Garber, Russ WB19
Garces, Lina WC10
Garcia-Bertrand, Raquel WC10, WD10
Garcia-Diaz, Alberto WC54
Garcia, Elizabeth TB54
Garcia-Gonzalez, Javier WA10, WD64
Garcia, Rosanna SD41, MD68
Gardenier, Turkan WD13
Gardner, Lauren TA64
Garen, John TC32
Garfinkel, Robert SC15
Garg, Amit WD25
Garrett, Deon WD14
Garrido, German IS-T
Garrido, Gredy IS-T
Garrido, Rodrigo WB61
Garrow, Laurie TA58, TB58
Garvey, Jane WB02
Gary, Shayne TD43
Garzòn, Lisbet WD49
Gass, Saul TA03
Gassmann, Horand MD26, TD24
Gatto, Michael MC60
Gaukler, Gary TB44, WC32
Gauri, Dinesh MB68
Gaur, Vishal TC08
Gautam, Natarajan SD21, WD66
Gauthier, Remy MB58
Gauthier, Stephen WB03
Gavirneni, Srinagesh SB16, WA46, WB65
Gawdiak, Yuri WA58
Gay, David M. SA66, SC14
Gayosa, Eduardo WD29
Ge, Deng WB22
Ge, Dongdong TD56, WC46
Gebraeel, Nagi WB09
Geiger, Christopher IS-M
Geisler, Elie TC48
Geismar, Neil MB63
Gel, Esma MD57, TC65, TD65, WD33
Gelfand, Alan SA01
Gemici-Ozkan, Banu MA65
Genc Kaya, Latife SB39
Genc, Talat TA40, TC10, TD38
Gendreau, Michel SC47, MC56, MD66, TC64, WA60, WB61
Gendron, Bernard TC64, TD50, WD25
Geng, Qin WD68
Geng, Rui WD57
George, Abraham MC11
Georgiadis, Patroklos SD52
Gerchak, Yigal WD46
Gerhardt, Ira WC22
Geroulo, Michael WB18
Gershwin, Stanley SA31
Geunes, Joseph SB50, MB67, MD67, TD07, WB46
Geylani, Tansev SB68
Ghacibeh, Georges WA13
Ghaddar, Bissan SA38
Ghaffar, Abdul TA25
Ghaffari-Hadigheh, Alireza SB24
Ghamami, Samim SC27
Ghandehari, Mostafa WD54
Ghanji, Moein WC56
Ghate, Archis SC42, SD23, TA47, WB50, WD66
Ghiani, Gianpaolo TD63
Ghoniem, Ahmed MC38
Ghose, Anindya SD59
Ghosh, Arka MD52
Ghosh, Arpita TC39
Ghosh, Soumyadip WA07
Gibson, Hise WB03
Gibson, John SC60
Giesecke, Kay TD53
Giesen, Ricardo MC61, MD61
Gifford, Ted L. SB56
Gilbert, Kenneth TD22
Gilbert, Stephen WA14, WA45, WA48, WD16
Gilbo, Eugene SC64, TD57
Gill, Philip TC05
Gilland, Wendell MA44
Gillen, David TA58, WB02

Gilpin, Andrew SB42, MB01
Gini, Maria TD51
Gino, Francesca SD16
Girardot, Rob MC60
Girotra, Karan SC41
Gittins, John WD47
Glankwamdee, Wasu MC24
Glass, Celia WB07
Glasser, John TD34
Glassman, Yael TA21
Glickman, Theodore S. MB60, WA38
Glied, Sherry SA03
Glover, Charles SD64
Glover, Fred MC31, WC53
Glover, Wiljeana IS-M
Glowacka, Karolina WC31
Glucksberg, Matthew TA33
Glynn, Peter W. SB27, SC27, SD23, MA28, MC23, TA40, TD05
Gneiting, Tilmann TD19
Gocgun, Yasin WD66
Godfrey, Greg SC31, MA31, MB31
Goel, Ankur SD20
Goel, Ashish WA39
Goel, Sharad MA39
Goerger, Niki MC30
Goertz, Simon MB66
Goes, Paulo MC02, TA51
Goh, Kim Huat MC51
Goh, Mark SD56
Goins, Sheila SA68
Gokay, Selim WA01
Gokce, Elif TD38
Gokpinar, Bilal MB41, TB41
Golany, Boaz MB03
Golaszewski, Richard WA58
Golbeck, Jennifer
Goldberg, David TD23
Goldberg, Jeffrey TD38
Goldberg, Leslie TC39
Goldberg, Noam MC20
Goldberg, Paul TC39
Goldenberg, Jacob SD41
Golden, Bruce MD19, TC21
Goldner, Dan WB31
Goldsman, Dave SD49
Goldsman, David MA09, MA34
Goldstein, Dan TB20
Golias, Mihalis SA64, WC24
Golmohammadi, Davood MC53
Golovnya, Mikhail SC14
Gomadam, Karthik WA15
Gomes, Carla P. SC22, MB22
Gomes, Paulo WA48
Gomez, Tomas WA10
Gomory, Ralph TC03
Goncalo, Jack MB41
Gonçalves, Diogo MB48
Goncalves, Joao SA26
Gonçalves, Maria WD11
Gondo, Maria TC04
Gong, Li WA01
Gong, Li WD53
Gong, Weibo WB57
Gong, Yeming WA64
Gonul, Fusun WD51
Gonzalez, Tere
Goodchild, Anne SB56, SD56, SD64
Goodson, Justin TD63
Gopalappa, Chaitra WA33
Gopal, Ram MA51, TA51, TB51
Gordon, Brett SC68
Gordon, Lawrence MA54
Gorman, Michael MA60
Gorman, Mike TC60
Görmez, Nihan WA52
Gosavi, Abhijit WA44
Gossin, Stephen MC26
Gotham, Douglas J. WB11
Goto, Mika WC29
Gotoh, Jun-ya SB53
Goul, Michael SB51
Gouveia, Luis SA55, SC55
Goyal, Munish WA65
Goyal, Vineet SB39, WB38
Goycoolea, Marcos SC11, MB11
Gozbasi, Halil Ozan TB47
Grabarnik, Genady IS-M, WB36
Grabbe, Dr. Shon TC57
Graefe, Andreas WC39
Grage, Sandie WC34
Graham, Michael WC57
Gralla, Erica TC52
Grams, M. SA03
Grande, Darby WB03
Granville, Sergio MD11
Grasas, Alex MB46
Grasman, Scott MB67, TA64
Grass, Dieter MA34
Graveline, Denise MB29
Graves, Stephen TB07, WA62
Gray, Brian SA16
Gray, Genetha TB05
Gray, John SD07, MA43, MD60
Grechuk, Bogdan SA19
Greco, Salvatore TD01
Greene, Marjorie WA24
Greenfield, Ronald WD51
Green, Jonathan WC58
Greenleaf, Eric WA06
Green, Linda SA03, SC37, SD33, MD33
Green, Walter WC37
Greenwood, Brad WC21
Gregory, Mark SB11
Grewal, Dhruv MB68
Gribbon, D.J. WB02
Griffin, Jacqueline TD47
Griffin, Paul MA34, TD47
Grimes, Seth SB13
Griva, Igor TA05
Grodal, Stine MA41
Groenevelt, Harry MD03, TD16, TD62, WB42
Groer, Chris MD19
Groleau, Thomas TC66, TD35
Gromoll, Christian TA23
Grosman, Benyamin WC26
Grossmann, Ignacio SC16, SD42, MA24, MA65
Grossman, Thomas TC66, TD66
Groznik, Ana WA16
Grubesic, Tony SB01
Gruca, Thomas SA68
Grueneberg, Keith WD15
Gruenspecht, Howard TB02
Grushka-Cockayne, Yael SD20, MC32
Gu, Bin MC51, MD01
Gu, Wenjun MC07
Gu, Yuhong TA20
Guajardo, Jose MB16
Guan, Jiancheng WC29
Guan, Yongpei SD40, MD56, TA38, TC38
Guardiola, Ivan MB55
Guarracino, Mario TB42
Gudergan, Gerhard WB15
Gue, Kevin MD27, TD64
Guerrero, Hector TC41, TD32
Guide, Daniel SA52, SB52
Guide, V. Daniel R. SA45
Guignard-Spielberg, Monique SD42, WA50
Guikema, Seth SD54, MA57, MB54, MC54
Gul, Serhat WA34
Gulding, John MD58
Guler, Huseyin WB24
Guler, Osman TC05
Gullu, Refik WB14
Gulpinar, Nalan TD01
Gulsen, Mehmet WC62
Gultas, Ilkay WB01
Gumersindo, Queijo G. TA10
Gumrukcu, Seda TA47
Gumus, Mehmet TD15
Gunalay, Yavuz TC55
Günay, Akin WD18
Gundogar, Emin MD22, WC24
Guner, Ali R. MC66, MC66
Gunes, Canan MB13
Guney, Baha MD22, WC24
Gung, Roger SD53
Gunnarsson, Helene WD63
Gunn, Eldon SD11
Gunter, Lacey TA34
Guo, Dihua SA67
Guo, Dong MA27
Guo, Hong MD51, TA51
Guo, Ju-e WD53
Guo, Ju-e WA01
Guo, Mingyu TD06
Guo, Pengfei MB44
Guo, Xin WD62
Guo, Zhiling WD31
Gupta, Alok TD51
Gupta, Anshul TC11
Gupta, Aparna SA51
Gupta, Diwakar SC33, SD46
Gupta, Gagan MA27
Gupta, Gautam SD64, TC57
Gupta, Kapil MD42
Gupta, Manish WA36
Gupta, Mukul TC51
Gupta, Narain SB19
Gupta, Rakesh MC25
Gupta, Sudheer WC08
Gupta, Varun WB22
Gurbaxani, Vijay SD51
Gurel, Sinan TA22
Guresen, Erkam WB24
Gurgel, Angelo WB10
Gurgur, Cigdem WB66
Gurler, Ulku SB45
Gurnani, Haresh SD46, WA45, WA46
Gurnani, Haresh SB52
Gurvich, Itay SC23, SD16, MA07, MC16, MD16,
Gurzick, David WA51
Gusikhin, Oleg SB31, MC50
Gustafsson, Tomas MA58
Gutfraind, Alexander WC37
Guth, Frederico WD61
Gutierrez, Cesar TC35
Gutierrez, Gabriel WA55
Gutierrez, Genaro IS-T
Gutierrez-Jarpa, Gabriel SD67
Gutierrez, Marco WA52
Gutjahr, Walter MB34
Gutwenger, Carsten TA26
Guvenen, Orhan IS-M
Guzelsoy, Menal TA38, TC38, TD26
Guzhva, Vitaly SA57
Guzik, Dennis MC26
Guzman, Mauricio SD30
Gylfadottir, Gudbjort MA53

H

Haaland, Ben MC18
Hackney, Bert MD58
Ha, Daesung WD65
Hadjiliadis, Olympia IS-M
Hadzic, Tarik SD22, MB22
Haefliger, Stefan WA48
Hafiz, Rayan WD19
Hagberg, Aric WC37
Haggerty, Ryan TB20
Haghani, Ali SA64
Haghnevis, Moeed IS-M
Hagiwara, Motohiro WB24
Hagstrom, Jane MA05
Hagtvedt, Reidar MA34
Hahn, Eugene SC65
Hahn, Joe WA19
Hahn, Peter SD42, WA50
Haider, Izlal SD63, WD44
Haight, Robert SB11, MA11
Haijema, Rene TD33
Hajeeh, Mohammed WD44
Hajiaghayi, Mohammad Taghi MD39, WA39
Hajizadeh, Iman SA08, SD67
Hale, Trevor WB67
Hall, Andrew MD30
Hall, John WC52
Hall, Nicholas G. SB36, MA35, MD37, WC46
Hall, Randolph W WC05
Hall, Shane MA30
Hall, William TD58
Halman, Nir SA39
Halper, Russell SC55, SD63
Hämäläinen, Raimo P MC19, WC20
Hamaoka, Yutaka MA26, WB41
Hamedi, Masoud IS-M
Hamel, Andreas TC53
Hamilton, Sharon TB13
Hampshire, Robert SC23

Hamzaoui, Leila MB52
Han, En-Pei WD56
Han, Ingoo WB36
Han, Lanshan TD40
Hanafi, Said MD66
Hanany, Eran SB19
Handley, John TB15
Handley, Sean MA43
Hanna, Arthur SD24
Hannah, Lauren MC11, MD11
Hanowsky, Michael TD57
Han, Peng MD01
Han, Sang Pil WC01
Hansen, Mark SB64, SD64, MC58, MD58, TC57, WA57, WB55, WC56
Hanson, Jared Lee WA37
Hanson, Robin WC39
Han, Sung Won SA12
Haphuriwat, Naraphorn MD54
Haq, Zia MC10
Harchol-Balter, Mor WB22
Hardin, Jill SA35, SD24
Hare, Colin SA54
Hargaden, Vincent WB15
Hargreaves, Jeremy TD10
Hariharan, Sharethram WA44
Harle, Christopher WA47
Harmon, Robert SB51
Harper, Steven WA37
Harrill, Richard TB32
Harrington, Afi MC29
Harrington, Michael TC21
Harrison, J. Michael MB07
Harrison, Robert SB53
Harrison, Terry MB01, MB65, WB35
Harrod, Steven SC60, SD60, TC60
Harstad, Ronald MA06
Hartline, Jason MA39
Hartman, Joseph MD24
Hart, Thomas P. SA32
Hartsock, Peter TD02
Hartvigsen, David SA29
Hart, William SB26, SD26
Haruvy, Ernan TA06
Hasan, M M Faruque WB26, WC26
Hasan, Shahab WA58, WC55
Hasan, Sharique WC21
Hasdemir, Baris TD54
Hasegawa, Toshiharu WB49
Hasenbein, John SC27
Hassan Aly, Ahmed WA64
Hassan, Ahmed SA57
Hassanmirzaei, Foad SA16, WB32
Hassini, Elkafi WD01
Hassin, Refael TB16
Hatch, Nile TB48
Hatcher, Myron WD49
Hatcher, Myron IS-M
Hatchett, Richard MA03
Haugh, Martin TA08
Hauser, John SC68
Hausman, Warren H. MC46
Hawkins, Caitlin TC35, WB47
Hayel, Yezekael TB60
Hayes, Jennifer E. SC54
Hazan, Elad TB39
Hazelrigg, George MA18
Hazen, Dan MA30
He, Jiping WB09
He, Miao MB34
He, Polly Biyu TD33
He, Qi-Ming WC22
He, Qing SA56
He, Simai TC45, WC46
He, Haibo MB13
He, Xiaozheng SB61
Head, Karen WC35
Head, Larry SA56
Healey, Adam TB64
Healey, Christopher SC49
Hearn, Donald MC57
Hecht, Patrick IS-T
Heck, J. Gregory TA54
Hedman, Kory WC10
Heese, Hans Sebastian WA16, WD46
Hees, Jing WC55
Hefley, Bill SB51
Hegde, Vish WC03
Heggedal, Ane Marte SC10
Heidenberger, Kurt MB34
Heier, Jessica MA24, TC52
Heiman, Ted MB30
Heimlich, John SD58
Heino, Rebecca SA02
Heinz, Stefan SB25, SC22, SD22
Heitsch, Holger TD24
Heitz, Christoph WB15
Hejazi, Behrang SA64
Helander, Mary SD66, WB20
Held, Christopher TB06
Helms, Josh SA30
Hemker, Thomas TB05
Hemm, Robert WA58
Hempsch, Christoph MA46
Henao Piza, Juan Felipe TC43
Henderson, Shane G. SC47, SD23, TB49
Hendrick, Kevin MA08
Hennessy, Sean SC32
Hennig, Frank MA56
Henrion, Max MA20, MD14, TA66
Heragu, Sunderesh SB63, SC63, MB63, WA66, WB64
Herbots, Jade WC31
Hernandez, Esther TB57
Hernçndez, Luis TB54
Herndon Ford, Kelley TB13
Herring, Ryan TA61
Herrmann, Jeffrey TC21, WA47
Herroelen, Willy MD35, WC31
Hers, Sebastiaan TD10
Hertz, Alain SD22
Hertzler, Christopher SB10
Hervas-Drane, Andres MD01
Hewitt, Mike MD63
Heydari, Somayeh SC10
Hickman, Mark SB56, MD61, TA52, WA61, WC63
Hicks, Illya SC01, SD38, MB42, WA38
Hicks, Katherine SD34, TD34, WD31
Hicks, Robert L. TB48
Higgins, Thomas SA34
Hill, Arthur SA15, SA44
Hill, Shawndra MB12
Hill, Stephen WC28
Hino, Celso WD28
Hinrichs, Curt SB14
Hirsch, Michael TA30, TC30
Hitt, Lorin MB53, TB01
Hizir, Ahmet Esat TA63
Hjorring, Curt MA58
Ho, Celine TB44
Ho, James WA36
Ho, Teck MB62
Ho, Yu-Chi SB49, SC49
Hoad, Katy TA49
Hobbs, Benjamin F. MA10, MB20, MD06, TD10, WA10
Hobeika, Antoine TD49
Hochbaum, Dorit WC14
Hoda, Samid SB42, MC50
Hodge, Jonathan TA04
Hodgson, Thom SB30
Hoeck, Michael MC41
Hoehn, Michaela Isabel MC22
Hoff, Arild WB28
Hoffman, Alan TD03
Hoffman, Douglas TB30
Hoffman, Karla SD01
Hoffman, Robert MA64, TD57
Hohmann, Samuel TC32
Holder, Allen SB47, SD24, MC42, MD24, TC33
Hollister, Kimberly
Holmberg, Par TC10
Holmes, Gregory WA13
Holmes, Thomas SB11
Holsopple, Jared SD31
Holty, Jon-Erik TC47
Holz, Franziska MD10
Homem-de-Mello, Tito MB56, MC40, TB40, WC59
Hong, Jeff SA49, TB49
Hong, Seock-Jin WD29
Hong, Sung-Pil WD61
Hong, Yoo S. IS-T
Hong, Yoon G. WA03
Hong, Yushin MC22
Honhon, Dorothee SB07
Honma, Yudai WD63
Hooker, John SD22, MB22, WB37
Hopp, Wallace MB41, MC41, MD41, TB41, TD44, WD43
Hora, Manpreet WC41
Horbar, Jeffrey SA48
Hosanagar, Kartik SA65, SD12, MA51, MD01, TD51
Hosking, Jonathan TB18
Hotta, Keisuke WB01
Houck, Mark SD54
Houde, Linda SB34
Hough, Patricia SB26
Houghtalen, Lori SC36
Houser, Kimberly SD34
Houssam, Nassif WC17
Hovenkamp, Ashley TD55
Howard, Ronald SA20
Howell, Seth WB30
Hoy, Darrell SD39
Hsiao, Chieh-Yu SB64
Hsiao, Lu WA68
Hsing, Yu WD06
Hsuan, Juliana TA48
Hsu, Vernon Ning WB14
Hu, Bin SC21, WB45
Hu, Bo TD16
Hu, Daning MB25
Hu, Jian TB40
Hu, Jianying SC15
Hu, Jing WB40, WB40
Hu, Kun WD41
Hu, Ming SA60, MA62
Hu, Ming-Che MA10
Hu, Peter TC21
Hu, S. Jack WB44
Hu, Shou-Ren MB61
Hu, Xiangling TD54
Hu, Xiaolin MC49
Hu, Xing WC46
Hu, Yu MC01
Hu, Qaiohai (Joice) MA08
Huang, Alex WC55
Huang, Changjian WC12
Huang, Chenggang WD16
Huang, Chien-Chung SD39
Huang, Chih-Wei WA01
Huang, Chikong TD04
Huang, Dongling MC68
Huang, He TA64
Huang, Hongming WA01
Huang, Hsin-I SC21
Huang, Huei Chuen SC58
Huang, Kai MB40
Huang, Kan MB08, MC53
Huang, Kenneth WA41
Huang, Kun WC43
Huang, Minxue WA51
Huang, Ping Heidi MD50
Huang, Pu WA20
Huang, Qiang TD17, WB17
Huang, Rongbing SC67, MC67, WC60
Huang, Samuel IS-T
Huang, Simin WA44
Huang, Siming SB24, WB13
Huang, Stephen TC68, WA68
Huang, Suzhou WA14, WB05
Huang, Wenhai MB33
Huang, Wenzhen SB17, WA09
Huang, Xiao TC45
Huang, Xuan TA17
Huang, Yongxi MC63
Huang, Yun SD51, MD01, WC12
Huang, Zan MC37
Huber, Christian SC63
Hubner, Ursula SD32
Huchzermeier, Arnd SD08, MC22, TC44
Huckabee, Mark TB13
Huff, Brain WB49
Huggins, Eric SB36

Hughes, Danny WC36
Hughes, Ed TC14
Hughes, Richard SA34
Huh, Woonghee Tim SB46, SB46, MA40, MC59, MD28, WC59
Hui, Sam K. SA21
Hui, Vivian SB10
Huisman, Dennis MA60, MD60
Hulett, Maria WC22
Hull, Jeff TC35
Hullah, Peter WB31
Hultberg, Tim MD26
Hult, Henrik TB23
Hung, Ying MC18
Hunt, Dave MB60
Hunter, George WC55
Hunting, Marcel WD36
Huo, Yumei SB08
Hupert, Nathaniel SD47, TC47, WD47
Huq, Faizul WB67
Huque, Mohammad F. WD22
Hur, Youngmi SC17
Hurd, Donna TC33
Hurt, Tom MC30
Huschka, Todd MB33, MD65
Hutchinson, Angela TD34
Hutchison-Krupat, Jeremy SB41
Huth, Thomas TC63
Hutson, Kevin SB35, TC35
Hutton, David SB33, WB34
Hwang, Sangheum
Hwang, Wookyeon SC09
Hwang, Yuhchang SC08
Hyafil, Nathanael TD06

I

Iancu, Dan SB28
Ibrahim, Rouba MC16
Icten, Gozde TC17
Ierapetritou, Marianthi SA64, WC26
Ikuta, Seizo
Iliadis, Niko MD11, TA10
Illes, Tibor TD40
Imhof, Henrik WB62
Immorlica, Nicole MA39, WB39
Immorlica, Nicole SC25
Inderfurth, Karl MC46
Infanger, Gerd MA28, TA40, TD05
Ingalls, Ricki MB26
Ingolfsson, Armann SC47, TB21
Inman, Brant MA47
Inoue, Yu WB49
Ipeirotis, Panagiotis G. WD12
Ipeirotis, Panos SD59
Ipsilandis, Pandelis WA08
Iravani, Seyed MB41, TB41, TD44, WC52, WD43
Irohara, Takashi TD64
Irony, Telba MA19
Isaacs, Abigail SD18
Isaza, Clara WC33
Ishfaq, Rafay WB28
Ishibashi, Hisaya SA31
Ishizaki, Fumio WC11
Isken, Mark WC47
Islam, Hafizul WA51
Islam, Nazrul WC41
Isler, Karl WB62
Ismail, Wahab WC53
Ivanovic,, Goran TD64
Ivarsson, Johan MA58
Iwasaki, Atsushi WB06
Iyer, Ananth SD08, WA42, WC07

J

Jabari, Saif SB61
Jackman, John TA35
Jackson, Peter MB07, TB07, TC07
Jacobs, Brian SA45, MC52
Jacobson, Sheldon SA29, SB34, TA31, TC22, WD34
Jafari, Mohsen SB19, TB54, MC53, MD44
Jahnke, Hermann WA67
Jain, Aditya WC07
Jain, Kamal MC29, WB39
Jain, Rahul TC11, TD59
Jain, Shailendra MA62
Jaksic, Marko TC07
Jalil, Muhammad TC54
Jamal, Abul WD06
James, Gareth SA68, SB12
Jameson, Terry MD30
James, Ross WC53
Jamil, Mamnoon WA18
Jammernegg, Werner MC43, WA44
Jamshidi, Taher WB19
Janakiraman, Ganesh SB46, MA40
Jandhyala, Krishna WC36
Jang, Kyunam MA55
Jang, Wooseung TC56
Jang, Yoonhee TB20
Jang, Yunemi SB56
Janjarassuk, Udom SA40, WD50
Jank, Wolfgang SA68, SB12, TA12, TB37, TC06, TC12, TD68, WA06, WC13
Jans, Raf TD28
Janssen, Elleke WD32
Janssen, Fred WD32
Jardine, Andrew K.S SA18
Jarrah, Ahmad TD63
Jaruphongsa, Wikrom WB14
Jayant, Rajiv MA26
Jayaswal, Sachin WD68
Jecan, Sergiu SC15
Jeffcoat, David WD24
Jeffery, Mariah WA38
Jelenkovic, Predrag SB27
Jenelius, Erik MA61
Jenni, Karen MD20
Jennings, Otis SC27
Jensen, Bo WD38
Jensen, David SC12
Jeong, Bongju IS-M
Jeong, David SD54
Jeong, In-Jun MC09
Jeong, Myong K. (MK) MA17
Jeong, Yong-Kee SD15
Jeong, Youngseon MA17
Jepsen, Chris TC32
Jermaine, Chris MD49
Jett, Quintus SB03
Jewkes, Elizabeth WD68
Jha, Manoj SA56, SA63, WB28
Jia, Hongzhong MC67
Jia, Justin MA06
Jia, Qing-Shan SB49, SC49
Jiang, Albert Xin TC39
Jiang, Bin MC08, WB16
Jiang, Hai TA58
Jiang, Houyuan SD62
Jiang, Li TC46
Jiang, Miao (Joyce) TA34
Jiang, Shun TC15
Jiang, Wei SA13, MC17
Jiang, Wei MB13
Jiang, Xiaoyue IS-T
Jiao, Kai WB18
Jimenez, Jesus MA63, MA63
Jin, Judy SC13, SD17, MD25, TD09
Jin, Mingzhou MB67, WA46
Jin, Qingwei WD18
Jin, Ran SD17
Jin, Yue MD52, SA51, TB68
Jirajaruporn, Wanjira WC56
Jobin, Marie-Helene WC15
Joglekar, Nitin MD08, SB48, TC41, TD41
Johansen, Soren G. SD56, MD03, TD64
Johansson, Bjorn SA02
Johari, Ramesh SC39, SD16, SD59, WA22
Johar, Monica MA51
John, Andy TA60
John, Georganne MC43, WA28
John, Leslie TB51
John, Richard SD03
Johnson, PhD, Michael SB01, WA31, WC19
Johnson, Alan MB30, MB30
Johnson, Andy MA63, WB12
Johnson, Chris TD08
Johnson, Ellis SA58, SC58, TD03, TD58
Johnson, Eric MA54, TB51, IS-T
Johnson, John MB30
Johnson, Tim MC10
Jones, Crystal TB56
Jones, Dean SA64
Jones, Gregory Todd MA34
Jones, Thomas MC31
Jonnalagedda, Sreelata WD16
Jorjani, Soheila MA01
Joseph, Jenish WB04
Jose, Victor Richmond TD19
Joshi, Pawan WC16
Joshi, Yogesh TA41
Josifovski, Vanja SC25
Jotshi, Arun TA67
Jouini, Oualid TB16, WA23
Juan, Angel TA64, TC63
Juditsky, Anatoli TB50
Jun, Yeowoon WB25
Jung, Kyomin MB39
Jung, Yoon WB55
Junjun, GAO WD32
Junkunc, Marc SB54

K

Kabak, Ozgur WD20
Kabbani, Wareef SA12
Kabiling, Wiko TB54, TD49
Kabirian, Alireza WC49
Kachalo, Sema MC42
Kachani, Soulaymane MC59, WA62
Kadioglu, Serdar MA22
Kahruman, Sera MB42
Kaisar, Evangelos WC18
Kaiser, Daniel WD65
Kalafatas, Georgios MB61
Kalagnanam, Jayant TC11, WA07
Kalcsics, Jörg MA67
Kalczynski, Pawel MA67
Kale, Satyen TD39
Kalkanci, Basak TC46
Kalkundri, Kaustubh WC41
Kallrath, Josef MD11
Kalyanaraman, Shivkumar MD64
Kamakura, Wagner TB15
Kämäräinen, Vesa WC47
Kamarthi, Sagar MD09
Kamath, Manjunath WB60
Kambhampati, Subbarao SD22
Kambhatla, Nandakishore WA65
Kaminsky, Phil WD62
Kammerdiner, Alla WB09
Kan, Yu Hang SC53
Kane, Gerald TA21, TD21, WA21
Kanel, Keith MA09
Kang, Changmuk IS-T
Kang, Lulu WA17
Kang, Pilsung TB12
Kang, Seungmo MC63, TB65, WA63
Kang, Shugang MB26
Kang, Tao SD53
Kang, Weining TA23
Kang, Weining TB23
Kang, Wooseong TB15
Kannan, Karthik MD51
Kannan, P. K. SD68, MC68
Kanta, Lufthansa MC54
Kantor, Paul MC20
Kanturska, Urszula WB61
Kao, Gio TC22
Kao, Yu-ting SC49
Kaplan, Ed MB03, TA04
Kaplan, Ozge MC10
Kapuscinski, Roman SA08, WB16
Kapuscinski, Roman SB46
Kar, Soummya TD23
Karabati, Selcuk MD07
Karademir, Serdar WC54
Karaer, Ozgen SC45
Karaesmen, Fikri MD07, TB16
Karaesmen, Itir SA62, SB45, TB28, TB59, TC12, WC59, WD59
Karahan, Ibrahim WD14
Karakayali, Ibrahim MA52
Karakul, Mustafa WA32
Karasakal, Esra WC54
Kardes, Erim SC44, WC05

Karimi, Iftekhar MA56, WB26, WC26
Karimi, Sahar SA28
Karisch, Stefan SD58
Karmarkar, Uday MB47, TA18
Karnes, Conny MC51
Karray, Salma WB68
Karwan, Mark WB61
Karwan, Mark TC30, WA44
Kasilingam, Raja SD62
Kasiri, Narges WC15
Kasper, Daniel WB02
Kaspi, Haya TB23
Katariya, Abhilasha TB45
Katehakis, Michael WC36
Katok, Elena SA07, SB41, SD45, MA06, TB06, TD45
Katsuda, Hideki WB24
Kauf, Teresa MA47
Kauffman, Robert SA51, SC66
Kaufman, David TA65
Kaufman, James MA03
Kaur, Parmjit TC43
Kaushik, Anjali WA36
Kaut, Michal MD26, TC64
Kavadias, Stylianos SB41, SD48, TA41
Kavadias, Stylianos SA41, TD48
Kawai, Reiichiro SB53
Kawas, Ban SA24, SC53
Kayakutlu, Gülgün WB24, WD12
Kaya, Murat MA45, TD46
Kaya, Onur WA08
Kayhan, Mehmet WB14
Kayis, Enis TC46
Kay, Michael TD67, WD54
Kaza, Siddharth MB25
Kc, Diwas SC08, MB16, MC34, TD15
Ke, Jau-Chuan SC21
Keane, Jack SC30
Keane, Karen SB29
Kearney, Trevor TC14
Keblis, Matthew MB65
Kececioglu, John MD21
Keck, Steffen SA07
Kedia, Vikas MD12
Keeling, Kellie SA35, SC18
Keeney, Ralph SA20
Keeney, Ralph MD20
Kefeli, Ali IS-T
Keha, Ahmet MA38
Kehlenbeck, Alex SC12
Keisler, Jeffrey MA20, TD66
Keith, Mark SB51
Kekre, Sham WC28
Kekre, Sunder TC46, WB46, WC28, WC51
Kella, Offer TA55
Kelle, Peter WB33
Keller, Brian TA50
Keller, Christopher WD03
Keller, Colleen MD31
Kellerer, Hans WB07
Keller, L. Robin SD19
Kelley, C. T. SD25
Kelley, Lynda TB13
Kelley, Matthew SC50, TC61
Kelley, Wade WB56
Kelly, James MC31
Kelton, David MD56
Kemahlioglu Ziya, Eda SC45, WD46
Kennedy, Deanna WB20, WD37
Kennedy, Justin MB21
Kennedy, Kevin TA31
Kenney, Melissa A. MB20
Kennington, Jeff SA28
Keovimol, Dr. Satapon SC56
Keppo, Jussi WB53
Kerbache, Laoucine TD32
Kershenbaum, Aaron IS-T, WB36
Kesavan, Saravanan SC46, SD08, TC08
Keskin, Burcu SB44, MA01, MD32, MD67
Keskin, Nuri Bora TD42
Keskinocak, Pinar SB34, MA34, MC33, TC34
Keskin, Tayfun TD42
Kessler, Larry MA19
Kethley, R. Bryan TB25
Ketter, Wolfgang TD51
Kettinger, William WC51
Kettunen, Janne SD20, WA10
Keyes, Vincent SD34
Keysan, Gizem MD63
Khajavirad, Aida SC42, WA26
Khan, Aejaz SA52, SB52
Khandekar, Rohit MD39, TA39
Kharoufeh, Jeffrey TC17
Kharraziha, Hamid MA58
Khasanshina, Elena WC51
Khawam, John MC46
Khazeni, Nayer WB34
Khmelnitsky, Eugene WD32
Khodadadegan, Yasaman IS-M
Khorrami, Babak SC64, WC56
Khot, Subhash WA22
Khouja, Moutaz WD68
Khoury, Theodore SB54
Khuller, Samir MD39
Khuntia, Jiban TD21
Khurana, Anil TC41
Kianfar, Kiavash TC38
Kiatsupaibul, Seksan SD23
Kicinger, Rafal WC56
Kicklighter, David WB10
Kienitz, Karl Heinz WA03
Kiesmueller, Gudrun P. WB32
Kiker, Greg MC43
Kilinc Karzan, Fatma SD50
Kilinc, Mustafa MC24, TD26
Kim, Adlar MA25
Kim, Amy MC58
Kim, Bara SC27
Kim, Byoungsoo WB36
Kim, Byung-In WB25
Kim, Byungwhan MA17
Kim, Chiwon TB44
Kim, Dan MB51
Kim, Deok-Hwan SB09
Kim, Dohoon MD55
Kim, Gitae WD08
Kim, Hak WD42
Kim, Hongil SD29
Kim, Hyun Ho MD27
Kim, Hyun-chan MC64
Kim, Hyun-Jin SD15
Kim, Ilhyung SB63
Kim, Iljoo MC12
Kim, Jack TD53
Kim, Jongbum MC43, WC67
Kim, Jungkyu MC22
Kim, Kibum IS-M
Kim, Kiman IS-M
Kim, Kwang-Jae SB09, SD15, MA15, MB17, MC09
Kim, Minsun TA47
Kim, Namhun SA66
Kim, Pansoo WC11
Kim, Phillip TC35
Kim, Sang-Hyun SA21, MB16, MD45, TD44
Kim, Seokjin SC67, MC67, TC67
Kim, Seong Dae WC20
Kim, Seong-Hee SC17, SC49
Kim, Seong-Jun MA17
Kim, Seoung Bum SA12, SB47, TB12, WB49
Kim, Seung-Chul SD29
Kim, Seung-Lae WD65
Kim, Sujin SA10
Kim, Sukron TB45
Kim, Sungsu TA22
Kim, T. John WA63
Kim, Tae Il MC05, MD05, WC06
Kim, Taehyeong IS-T
Kim, Wanseok SD29
Kim, Woo Chang SA24, SB53
Kim, Yong Sik SA12
Kim, Yoo-Ah WC38
Kim, Youn Sung SD29
Kim, Youngwook MA55
Kimbrough, Steven WB62
Kincaid, Rex WD58
King, Alan MD26, TD24
King, Russell E. MC45, TD33, WB65
King, Ruth WB51
Kingsford, Carl MC21
King, Susan WD52
Kirby, Michelle WB58
Kirkizlar, Eser TA65
Kirsch, Andy SA11
Klabjan, Diego SB58, SD38, MC28, TA56, TB44, TC63
Klampfl, Erica MC32, SB31
Klapper, Daniel SB68
Klassen, Robert D MC22
Klastorin, Ted MA35, MB35, WC31
Klau, Gunnar W. TA42
Klavin, Eric WB57
Kleber, Rainer MC46
Kleinberg, Jon MA39
Klein, Cerry MA29, MC15, MC57, TC09
Kleindorfer, Paul WA08
Kleywegt, Anton WC59
Kliewer, Natalia WD61
Klincewicz, John MA55, MD55
Kline, Jeff MD56, TA25
Kloeber, Jack WA20
Klosterhalfen, Steffen WD65
Kluberg, Jonathan MB59
Knapp, David MD30
Knechtges, Tony WD25
Knight, Michael TB13
Knorr, Dave TB57
Knott Eck, Cynthia SD18
Knutsen, Aren MB31, SC31
Ko, Hong Seung TD01
Ko, Jeonghan WB44
Ko, Young Myoung SD21
Ko, Young-Don MA17
Kobayashi, Kazuhiro TC26
Kobylski, Gerald SA30
Kobza, John SC18
Kocabiyikoglu, Ayse SB59
Kocaga, Levent MD16
Koch, Thorsten SC22, SD22
Koehler, Gary MD51, TA51, TA51, WD31
Koenigsberg, Oded SB68
Koester, Robert SB32
Kogan, Konstantin MB03
Kohli, Rajiv WC21, WC51
Koide, Takeshi TC62
Kojima, Masakazu TC26
Kok, Gurhan SA37, SC45, SD46
Köksalan, Murat WA52, WC06, WD14
Kolarz, Steven IS-M
Kolfal, Bora SC47, TB45
Kolisch, Rainer MB33
Kollberg Thomassen, Maria IS-T
Kolokathis, Christos TD10
Komanduri, Ranga MA18, TB09
Komurcu, Gizem SD18
Konak, Abdullah SB55
Konana, Prabhudev MC51
Kondo, Akira TB57
Konemann, Jochen TA39
Konewko, Ramon TC21
Kong, Nan MC65, WD31
Kong, Zhenyu (James) SB17, MA18, WA09, WD09
Konrad, Renata WC47
Konsynski, Benn R. SC66
Koo, Bon TB58
Koo, Jeongin WB25
Koole, Ger MD33, WA23
Koonce, Joseph F. MB20
Koonin, Eugene MA21
Koontz, Stephen WA08
Kopfer, Herbert MB66
Koppenhaver, Robert WB47
Koppius, Otto TC06
Koren, Yoram MD02
Kornish, Laura MA68
Korolev, Nikolay MC16
Korpeoglu, Evren WB32
Korsvik, Jarl SB25
Kortbeek, Nikky TD33
Kortsarz, Guy MD39
Korula, Nitish WC38
Koskulics, Michael TB17
Kostamis, Dimitris WB45
Kotegawa, Tatsuya WD56
Kothia, Tarun MD09
Koufi, Vasso TB21

ISi-M Interactive Session, Monday (12:30-1:30) ***IS-T Interactive Session, Tuesday (12:30-1:30)***

Koukova, Nevena MC68
Koul, Saroj SB43, WC11
Kou, Steven SA49, SA53, TD53, WB53
Kouvelis, Panos SA46, SB07, TA45, TC29, WD43
Kovach, Jamison WC67
Koyuncu, Nurcin MC49
Kraft, Tim MA57
Krahl, Dave MB14
Kramer, Wade TD21
Krass, Dmitry SB67, SD67, TC67
Kratz, Jason MC25
Kratzke, Thomas MD31
Kremer, Gul MD09
Kremer, Mirko SA44
Kress, Moshe SC30, MB03
Krikke, Harold SC52
Krishnamoorthy, Bala MD38
Krishnamoorthy, Srinivas SB62
Krishnamurthy, Ananth SB16, WB22, WB64, WC64
Krishnamurthy, Rajesh SB43
Krishnamurthy, Viji SB16
Krishnan, Harish MD07, WC08
Krishnan, Vish SA41, MC48, TA41, WA41
Kristjansson, Bjarni MC14, TD24
Krivov, Georgy TA42
Kroc, Lukas SC22
Krokhmal, Pavlo TB53, WD24
Kronek, Louis-Philippe WB13
Kroon, Leo MD60
Kros, John WD03
Kuang, Lei WD15
Kubat, Peter MC25
Kucik, Paul WC30
Kucukyavuz, Simge SA55, TC38, TD38
Kucukyazici, Beste MB47
Kuechle, Graciela SC48
Kuester, Jochen WA20
Kuhl, Michael SD31, TA49
Kuhn, Harold W. TA03
Kulkarni, Ankur MD40, TA40
Kulkarni, Deepak MA64
Kulkarni, Gauri SD68
Kulkarni, Vidyadhar MA33, MC55, MD27
Kulturel-Konak, Sadan SB55
Kumakura, Hiroshi WB68
Kumar, Anand TC54
Kumar, Anuj WC51
Kumara, Soundar SA28, MD18
Kumar, Chetan SC51
Kumar, Ram MA51
Kumar, Sanjay SD43
Kumar, Sunil SC39, TA16, TB23
Kumar, Tarun SA11, WD15
Kumin, Hillel IS-T
Kundakcioglu, Erhun MD42
Kundu, Debasis SD09
Kung, Mabel T. TA01
Kunnumkal, Sumit SA59, MB28, MC28, TA28
Kuo, April MC56
Kuo, Chia-Wei WD62
Kuosmanen, Timo WB12
Kuppa, Shankara MD60, TB65
Kurita, Osamu WD63
Kurt, Murat MD34
Kurushima, Aiko SA22
Kuruzovich, Jason TC06
Kurz, Mary Beth IS-M, IS-T, TC25
Kusiak, Andrew SA67
Kutanoglu, Erhan TD67
Kuthiala, Suneil MB60
Kuyumcu, Ahmet SC62, WC62
Kvam, Paul WB17
Kwak, Doh-Soon MB17
Kwak, Jin Kyung SB16, MA45
Kwak, N.K. WC29
Kwan, Cheuk Lam WB56
Kwasnica, Anthony MA06
Kwon, Changhyun MC05, MD05, WA62
Kwon, Dharma MC45, WA19
Kwon, Roy SA24, SA38, WB38
Kwon, YoungOk SD12

L

La-ornual, Dolchai TA20, WA19
La, Richard TD59
Laborie, Philippe MB22
Labov, Simon TB13
Lada, Emily MA49
Ladanyi, Laszlo SA26, MD26
Laflamme-Sanders, Alexandra TC13
LaGanga, Linda MC65, WA21
Laguna, Manuel TC25
Lai, Guoming MA07, TA08
Lai, Jennifer WD15
Lai, Richard TC08
Lam, Henry MB27
Lam, Marco SA16
Lam, S.S. WA36
Laird, Carl TC34
Lamberson, P. J. WD06
Lambert, Bruno MA09
Lambrecht, Marc SD65
Lamine, Amine MD66
Lammoglia, Nelson WB05
Lan, Hai SA49
Lan, Yingjie SA62, SD49, MC49, TB28, WC59
Lan, Guanghui TB50, TC24, WC40
Landon, Bruce TD33
Landon, Joshua MB09
Landram, Frank TB25
Lane, David WA03
Langer MD, Mark TA47
Lang, Karl Reiner SD02, MD53
Langmead, Christopher MC21
Lanigan, Danielle WD35
Lapre, Michael SD48
Larco Martinelli, José Antonio SD63
Lariviere, Martin A. MC22
Lariviere, Martin WB08
Larsen, Allan SA58
Larsen, Dan MC26
Larsen, Erik R. WB22
Larson, Richard SA35, SB03, SD32, SD47, MA03, TC34
LaScola Needy, Kim SD52
Lasdon, Leon SC42, WC19
Laskey, Kathryn WB30
Lasry, Arielle TD34
Lau, Lap TA39
Laudy, David SA10
Laufer, Raphael MC26
Lavieri, Mariel MB47
Lawley, Mark SC34, MA33, MA34, WC47, WD47
Lawphongpanich, Siriphong MA05, MB05, MC64
Lawrence, F. Barry WA16
Lawrence, Richard TC13
Lawrence, Stephen MC65, WA21
Leachman, Rob MB45, SA16
Lebkowski, Piotr SA31
LeBlanc, Larry J. TA66
Lecluyse, Christophe TB61
Lederer, Phillip MA08
Leder, Kevin MB27
Lederman, Roger SC59
Lee, Adrian TA31
Lee, Albert MA13
Lee, Calvin WC16
Lee, Chang Hwan SA43, SD29
Lee, Chang Won SD29, WC29
Lee, Chi-Guhn MA62, WD66
Lee, Chris P. SA47, MC34
Lee, Chung-Yee MA65
Lee, Donald TD45
Lee, Donald SB33
Lee, Dong-Hee MC09
Lee, Eva SA09, SB21, SD25, MA32, MC50, MD42, MD50, TA33, TC47
Lee, Hau L. TD42
Lee, Ho Woo WD54
Lee, Hsiao-Hui MB16, MC47, MD33, TC65
Lee, Hyoung-Gon TC22
Lee, Hyoung-Yong IS-M
Lee, Jeongsik MA41
Lee, Jon WA26
Lee, Jong-IL IS-M
Lee, Joongsup (Jay) SC17
Lee, Joowon WC01
Lee, Juhnyoung TC15
Lee, Jung-hee SA46
Lee, Jun-Yeon WD65
Lee, Kangbok TA22
Lee, Kibaek SD29
Lee, Kwang-Sub TD49
Lee, Loo Hay SC49, WB14, WB59
Lee, Lorraine WC51
Lee, Misuk TA58
Lee, Moonsu WC11
Lee, Sang Hee WA36
Lee, Sang WD06
Lee, Se Won WD54
Lee, Seok GIi WB22
Lee, Seunghak MD21
Lee, Seungho MD25
Lee, Sook-Ran SD15
Lee, Soonhui WC59
Lee, Soonhui MB56
Lee, Sungwoo WD45
Lee, Sungwook WC01
Lee, Thiam MD28
Lee, Thomas TB01
Lee, Yen-Ming SA22
Lee, Yongheon MA10
Lee, Young WA18
Lee, Youngho MA55
Lee, Yu-Ching SB58
Lehman, Toby TC15
Leemis, Lawrence SA22
Leeuwaarden, Johan SA23, SD27, TB55
Lei, Lei TA46
Lei, Yong TD09
Leinart, James Andrew SD30
Leiva, Carola MD61
Lejeune, Miguel WA05
Lenox, Michael SD41
Leon, Linda SA35, TB66
Leon, McGinnis WC22
Lera, Fernando TA64, TC63
Lesaja, Goran WA40
Leskelä, Riikka-Leena WC06
Lesmes Palacios, Diana
Leung, Janny WB60
Leung, Joseph Y-T. SB08
Leung, Joseph TA22
Leung, Siu-Tang (Tim) SA53, TC53
Leus, Roel WC31
Leuthold, Florian MD10, TA10
Levchuk, Georgiy WB03
Levesque, Moren SC48
Levi, Retsef SA39, SB46, MA40, MD28, WC59
Levin, Asaf SB39
Levine, Brian SA64
Levine, Marc MA33
Levinson, David WD63
Levin, Tanya SD62, TA28
Levin, Yuri SB59, SD62, TA28
Levitt, Tod WB30
Levran, Alon SB19
Levy, Joshua WC36
Lewis, Brian TA43
Lewis, Herbert WB01, WD29
Lewis, Mark MD23, TA65
Lewis, Susan MD17
Lewis, Taryn TA57
Lewkowicz, Amir TA21
Ley-Borras, Roberto TD20
Leyffer, Sven SB38, SC50, TD26
Leyton-Brown, Kevin TC39, TD06, WB06
Li, Chen TB17
Li, Chendong MB22
Li, Cuihong TA07, TC44
Li, Fei IS-M
Li, Feng TB67, WB56
Li, Feng WC12
Li, Gang SA55, TC60, WC31
Li, Gang SB24
Li, Haibing SB08
Li, Hao TD55
Li, Hongmin WA62
Li, Hongyan TD11
Li, Hua WB11
Li, Jian TA45
Li, Jing SC13
Li, Jing TA13
Li, Jr-Shin WB59
Li, Kate SA45, SC62, WA14
Li, Kunpeng MD41
Li, Lan SA54

Li, Le SA59
Li, Lin TB17
Li, Michael Z.F. TB60
Li, Mingyu WC37
Li, Peng MC28, WD59
Li, Pingke WC18
Li, Qian TD26
Li, Qiuping MA68
Li, Shan WA09
Li, Shan MB45
Li, Shanling TD15, WA08
Li, Wei (Mike) SA31
Li, Wei MD08
Li, Wenkai SD56
Li, Xiaojun TA12
Li, Xiaopeng SB61, TB65
Li, Xinxin TB01
Li, Xinxin MA51
Li, Xiu WD12
Li, Xiugang MC61
Li, Xun IS-T
Li, Yanzhi SB63
Li, Ying MB65
Li, Zhaolin MB43
Li, Zhiguo SC09, WA09
Liang, Faming WC09
Liang, Hai Qi SC15
Liang, Liping WD43
Liang, Zhe SC58
Lian, Zhaotong WB22
Liao, Bo-Jiun SC49
Liao, Haitao SA18, SB18, TB17
Liao, Lingrui SA46
Liao, Xiaoli WA11
Liberatore, Federico MD67
Liberatore, Matthew SB48
Lichtendahl, Casey SA20, TC20
Lichtman, Allan SA29
Liers, Frauke SA38
Liesiö, Juuso SD20
Lim, Andrew TD54, WC59, WD59
Lim, Churlzu TB38, WB50, WC60
Lim, Gino SB47, MD24, TA33, TC33, WB52
Lim, Heonsang IS-T
Lim, Hwan WC29
Lim, Hyun-Min SD15
Lim, Lui Cheng SD11
Lim, Michael SC67, SD44
Lim, Yun Fong MA62, TD65, WA64
Lin, Anhua SD10, WC50
Lin, Cary TC31
Lin, Che-Chun TC31
Lin, Chia-Chang SA54
Lin, Ching-feng TD13
Lin, Chin-I MB47
Lin, Chuen-Horng SC21
Lin, Dung-Ying MC64, WA61
Lin, Feng WD47
Lin, Feng IS-T
Lin, Gene SB64
Lin, Hui MB55
Lin, Ji MA33, WC47
Lin, Kyle MD54
Lin, Len TC31
Lin, Li TA31
Lin, Mingfeng TC06, TD51
Lin, Neng-Pai SA33
Lin, Oliver WA36
Lin, Qiuying WC12
Lin, Sandy SC32
Lin, Wei-Hua SA56
Lin, Wuqin MC34, WB08
Lin, Yen-Hung SD61
Lin, Yi-Chin MA09
Lin, Zhangxi TA01
Linares, Pedro WB10, WD19
Linderman, Kevin SB48
Linderoth, Jeff MA50, MC24, MC24, SA40, SB38, SC50
Linderoth, Jeffrey MC24, WD50
Lindsey, Scott WA41
Linetsky, Vadim SC24, TD53, TD53
Lingaya, Norbert MB58
Linkov, Igor MC43, WC67
Linninger, Andreas WC26
Linton, Jonathan MB52
Lippman, Steven MC45, WA19
Lipson, Hod WB57
Lipson, Marc MD08
List, Barry MB29
Littig, Steve WC47
Liu, Andrew WA10
Liu, Chang-Chia WA13
Liu, Changzheng TC64
Liu, De SD68
Liu, Guangwu SA49, TB49
Liu, Guoquan(George) SC16
Liu, Hanli SA12
Liu, Henry SB61, TA61
Liu, Heping WC49
Liu, Hongchao SA56
Liu, Huaijun WC44
Liu, Jian SD17
Liu, Jiangxia SD43
Liu, Jingchen MC23
Liu, Ke TD61
Liu, Kun MA48
Liu, Liming WC66
Liu, Liqiang WB64
Liu, Lucy Q. MD41
Liu, Michelle Xiang IS-T
Liu, Ming WA53
Liu, Nan MA33
Liu, Qian MB62
Liu, RuiHua WC55
Liu, Shuguang TC44
Liu, Simon SB54
Liu, Sirui TD61
Liu, Tie TB67, WC12
Liu, Tieming MA44, TC54, WA44
Liu, Weini SA51
Liu, Xiangrong TA05
Liu, Xiao Xi SC15
Liu, Xin MC55
Liu, Xiong TD12
Liu, Yifan SD25
Liu, Yimin SB31
Liu, Ying SC51
Liu, Yong MB54
Liu, Yue TB67, WD56
Liu, Yunan SC21
Liu, Yunchuan SB68
Liu, Zhe TC05
Liu, Zhen WA45
Liu, Zhen TB22, TC23
Liu, Zhixin MD37, WC46
Liu, Zugang WB63
Ljubic, Ivana SB55, SC55
Llewellyn, Donna WC35
Lo, Hong K SA56
Lobel, Ilan MA59, TD05
Lobel, Ruben MD28
Lobo, Ben SB30
Lobo, Miguel SD28, TB62
Loch, Christoph SC41, SD45, MC48
Lodree, Emmett SB44
Loeb, Martin MA54
Loerch, Andrew TB29, WB30
Loewenstein, George TB51
Logendran, Rasaratnam SA56
Lökketangen, Arne SB25
Lombardi, Michele SB22
Long, Dou WC55
Long, Elisa WB34
Loon Ching, Tang SD15
Lopes, Leonardo B. SA40, SD26, MC42
Lopes, Tony M. T. SB22
Lopez, Francisco WA12
Löschel, Andreas WB10
Lotlikar, Rohit WA65
Lotz, Dan MB31
Lotze, Thomas SA09
Lougee-Heimer, Robin SA26
Lou, Yingyan MA05
Loutfi, Zeina SA07
Lovell, David MC58, TD61, WA57
Lowalekar, Harshal MC03
Lowe, Timothy WC31
Lownes, Nicholas MD61
Lowsky, David SB33
Lowther, Marcus TD58
Loxton, Ryan SA10
Lu, Cherie IS-T
Lu, Mengshi WA44
Lu, Xiaoyong
Lu, Xuan SD61
Lu, Ye MC53, TC07
Lu, Yihao MC52, MD52
Lu, Yingdong SC15, MB39, WA65, WC45
Lu, Zhaosong WC09, WD40
Lucas, Cormac SA14
Lucas, James M. SC09
Lucia, Angelo WB26
Luedtke, James SD40, WA07
Lunagomez, Simon SA01
Luo, Kai TD32
Luo, Li TB60
Luo, Xiaodong WD63
Luoma, Tuija TB18
Lus, Betul WC48
Luss, Hanan MA55
Luss, Ronny TC51
Lustig, Irv TA43
Lutters, Wayne WA51
Lutz, Heather WD42
Lutz, Mark WB37
Luxhöj, James T.
Lv, Hairong SA13
Lyandres, Evgeny TA45
Lyandres, Olga TA33

M

M V, Mahesh MD44
Ma, Huafan SD44
Ma, Huaiyu TB31
Ma, Jun MD26
Ma, Yao MB45
Ma, Yu MB68
Ma, Zhongming MC12
Mabert, Vincent WD42
Macal, Charles MB49
Macario, Alex TD33
MacCarthy, Bart SC62
MacCormack, Alan TB41
MacCormack, John TC10
Macdonald, John WD56
MacDonald, Leo MD15, TC62
MacEachern, Steven IS-M
MacGregor Smith, James TB61, WA50
MacKenzie, Cameron SD03
Mackin, Patrick TC20
Mackulak, Gerald TA18
Maculan, Nelson WC18
Madan, Ritesh TB28
Maddah, Bacel SB07, MC62
Madhuranthakam, Chandramouli WA28, WC26
Madrigal, Marcelino TA10
Madsen, Peter SA48
Maeng, Joo Yol WC07
Magazine, Michael SC33
Magazine, Mike SD33, TB46
Magdon-Ismail, Malik MA25, MB12
Maghsoodloo, Saeed WC49
Maglaras, Costis TB62
Magnanti, Thomas TD03
Magos, Dimitrios SB22
Mahajan, Ashutosh MB50, TD26
Maharjan, Binod WB55
Mahdian, Mohammad MA39, TC39, WA39
Maheshwary, Sid MD50
Mahini, Hamid MD39
Mahmassani, Hani MC05
Mahoney, Dan TD30
Maia, Carlos Andrey WC44
Maillart, Lisa SB18, SD09, MB47, MD34, MD34, TC17, WB09
Maji, Avijit SA63
Majig, MendAmar WB67
Majumdar, Debapriyo WA65
Mak, Ho-Yin SC67, MA44
Makarychev, Konstantin TB39, TD39
Makarychev, Yury TB39, TD39
Malamateniou, Flora TB21
Malave, Cesar WC32, WD20
Malcherek, Dominik WA60
Malekian, Azarakhsh WB39
Malik, Madhur SD53

Malladi, Sasidhar MD52
Mallampati, Dasaradh SC21
Mallet, Dan TB28
Mallik, Suman TC16
Malmborg, Charles WB64
Malmedy, Vincent TC05
Malmgren, Dean WC34
Malone, John TC47
Maltenfort, A.J. TC19
Malter, Daniel WA36
Malvankar, Monali WD34
Maly, Kurt MC12
Manary, Matthew P. MB32
Mancilla, Camilo MA42, TA22
Mandelbaum, Avishai SA27
Mandoiu, Ion MB21
Mane, Muharrem WD18
Man, Hong MB13, WB13
Mani, Ankur IS-T
Manikas, Andrew WB65
Manitz, Michael WA23, WC44
Mankoff, Jennifer WC19
Manni, Emanuele TD63
Mannor, Shie SB40, SC39, MC27
Manso, Gustavo SD41
Mantin, Benny TA58, TB58
Maranas, Costas TA42
Marcolini, Michael WC57
Marcotte, Patrice MC59, MC67
Marcotte, Suzanne MC56
Marcus, Ben SB62, TC62
Marcus, Steven SD49
Marden, Jason TB22
Mares, Vladimir MC06, MC06
Margot, Francois SB38, MC24, MC50, WA26
Margulici, JD TA61
Marianov, Vladimir SD67, TC67, WD11
Marinescu, Radu MA22
Mark, Brian L. TB55
Markham, Ina MC35
Marklein, Bob TA24
Marla, Lavanya SD64
Marlin, David MD30
Maroti, Gabor MD60
Marquard, Jenna WA47, WD52
Marron, Steve IS-T
Marsden, James R. MB02
Marsden, James MC02
Marston, Sean MD51
Marszewska, Joanna TA22
Martel, Alain SD11
Martel, Jean-Marc WC14
Martell, David MA11
Martinez de Albeniz, Victor SC07, MC08, TB08, TD62
Martinez, Alfonso Pedraza WA52
Martinez, Gabriela SC40
Martinez, Oscar IS-M
Martinez-Torres, Dayna WB47
Martin, Kipp MD26
Martin, Pinar SA52
Martin, Ross WB21
Martin, Silas MA47
Martonosi, Susan SB35, SD30, MD54, WA55
Martz, Douglas TC21
Marzban, Shehab SA66
Masarotto, Guido TA09
Mas, Francisco SC65
Masi, Denise TB55
Mason, Jennifer SD34
Mason, Scott MA30, MB63, TB33, WB03
Mason, Wayne SC60
Massell, Paul SC18
Massey, William SC23
Masuda, Yasushi SA59
Mata, Jose WA30
Mathaisel, Dennis SC62
Matheson, Jim SA20, SC19, TA19
Mathews, Scott TD08
Mathiassen, Lars WC51
Mathk, Aditya V. SA12
Matis, Timothy MB55, WB55
Matisziw, Timothy MA61
Matsuura, Kanta MA54
Mattfeld, Dirk TC63, WB25, WB49
Matthews, Deanna WC19
Mattila, Ville WA03
Mattingley, Jacob SD26
Mattsson, Lars-Göran MA61
Mauskopf, Josephine MA47
Maxwell, Daniel SA30
Mayernik, George TA30
Mayorga, Maria MD23, TC25, WD35
Mayzlin, Dina TB01
Mazouz, A. Kader WD41
Mazvancheryl, Sanal TA12
Mazzuchi, Thomas MB09
McCardle, Kevin MC20, MC45
McClosky, Benjamin SC01
McComb, Sara A. WB20
McConky, Katie SD31
McCord, Alan MC16
McCormack, Kevin SA54, TC44
McCormick, S. Thomas MD07
McCoy, Jessica TC47
McCue, Colleen SD13
McCulloch, Charles E. SB33
McCullough, Jeffrey TD21
McDaniel, Chip MC32
McDermott, Capt. Joseph TC09
McDill, Marc SC11
McDonald, Mark IS-T
McElreath, Mark TC25
McGarraghy, Sean IS-M
McGill, Jeff SD62, TA28
McGill, William MC54
McGlinchey, Beth TB13
McGuire, Patricia SC32
McInnes, Keith TD33
McInvale, Howard D. IS-T
McKinzie, Kaye MB30
McLay, Laura SC03, TC35
McLean, Brian TB02
McShane, Blake TA68
Means, Stephanie WD36
Measure, Edward MD30
Medal, Hugh MC26
Medina-Borja, Alexandra IS-T
Medina, Lourdes A. SC56
Medvedev, Paul MD21
Meentemeyer, Ross SB11
Meeraus, Alex SD42
Mehra, Amit SB02
Mehrotra, Mili TC45, WA07
Mehrotra, Sanjay SB24, MC40, TA33, TB40, TC50
Mehrotra, Vijay MB65, MC35, MD16, TC18
Mehta, Peeyush WD16
Mehta, Sameep MD12
Mei, Peng WA51
Mei, Yajun SA12
Meisel, Stephan WB25
Mejia, Gonzalo TD22
Melachrinoudis, Emanuel TC56
Melillo, Jerry WB10
Melkote, Shreyes TD17
Meller, Russell TB33, TD64, WC64
Melo, Wendel WC18
Melouk, Sharif SB44
Melville, Prem SC12, TC13
Menachof, David SA63
Mendelson, Haim MC07, TC59
Méndez-Dìaz, Isabel SA59
Méndez, Germçn TD49
Mendez, Mayra WD20
Mendoza, Alvaro
Mendoza, Miguel Gonzçlez
Mendoza, Rafael SC24, TD53
Menezes, Fernanda WD61
Menezes, Mozart SB67, SC67, MC67, TD32
Menon, Nirup WC21
Menor, Larry SA15
Menoyo, Jaime WA52
Mercier, Anne TB58
Merrick, Jason SB20, SC03, TC17
Mersereau, Adam SC28, TD15
Merugu, Srujana MA12
Mes, Martijn WD24
Mestry, Siddharth SA42
Metan, Gokhan WA62
Mete, Huseyin WC18
Meterelliyoz, Melike SD49
Methapatara, Chinnatat MB26
Metivier, Chris MC30
Metzger, Michael SB03
Meyer Goldstein, Susan SA15
Meyer, Arnoud WA08
Meyer, Jeff SC47
Meyer, Robert MC47, WD33
Meyers, Carol WC37
M'Hallah, Rym WD67
Mhasavekar, Pavan
Michalek, Diana WC03
Michalek, Jeremy SC42, SD41, TB68, TC11, WA26
Middelkoop, Timothy MA26, WA25
Midthun, Kjetil WD36
Miettinen, Kaisa MB42
Mifflin, Tom SC31
Mihaila, Cristina SC15
Mihm, Jurgen SB41, TB41
Miki, Hideo SA59
Milano, Michela SB22
Milford, James MA20
Miller, Andrew SD38, MC24, MD50
Miller, Erik TA24
Miller, George SA33
Miller-Hooks, Elise MC56, TC61, TD56
Miller, James SB11
Miller, Janis MB48
Miller, Lisa TA24
Miller, Luke TD01
Miller, Naomi SC40
Miller, Nicholas TA04
Miller, Tan MD02
Millhiser, Will MD35
Mills, Michael SD34
Milner, Joseph SA08
Min, Dae-Kee SD15
Min, Daiki MC65
Min, Hokey TC56
Min, Yun-Hong WD61
Min, Jo MD52, SC53, TA35
Mingo, Santiago SB54
Minguez, Roberto WD10
Minner, Stefan MA52, TD32, WB32, WD65
Minoux, Michel SC38
Miranda Bront, Juan Jose SA59
Mirchandani, Pitu SB56, MB61, TA52, TD61
Mirchandani, Prakash SA55
Mirrokni, Vahab SC25, MA39, MD39, WB39
Mishra, Ajay WB46
Mishra, Nishant TC59
Mitchell, Gary MC35, WC31
Mitchell, John TC50, WB40
Mitchelson, Carl MB58
Mithas, Sunil WA36
Mitra, Amit WC68
Mitra, Gautam WC53
Mitra, Saby SC02
Mittal, Neha SB56
Mittal, Shashi SA39
Mittelmann, Hans WA50
Mittenthal, John SA16, WC28, WD11
Mitttelmann, Hans MB24
Miyazawa, Hajime WC11
Mlakar, Joseph SB30, SC20
Moallemi, Ciamac SD28, WC23
Moayer, Sorousha WC34
Mobius, Markus MA39
Moe, Wendy SD68, TA68
Moe, Wendy TB01
Moeini, Nadereh SB19
Moghaddam, Kamran SB18
Mohammed, Jaby TB35
Mohan, Nancy WB12
Mohr, Shirley TC37
Moinzadeh, Kamran TA45
Moitra, Soumyo D. MD55
Mojsilovic, Aleksandra SC15
Molyboha, Anton TB53
Montanari, Andrea WC23
Monteiro, Renato WC40
Montgomery, Alan SC68
Montgomery, Miranda IS-M
Montgomery, Willie WB03
Montibeller, Gilberto SB20, TC43
Mookerjee, Vijay MA51, TC45
Moon, Hyejung MC18
Moon, Jeonghwa WC26
Moon, Sangkil TB15
Moon, Seung Ki WB22

Moon, Yongma MC08, TC01
Moore, David TB48
Moore, Greg WB40
Moore, James TA31
Morabito, Reinaldo WD67
Morales, Juan Miguel TD10, WD10
Morales, Juan TC60
Morales, Sofia WD49
Mora-Vargas, Jaime
Morecroft, John TD43
Moreno Centeno, Erick MD22, WC14
Moreno, Eduardo MB11
Moreno, Lorenza WD61
Morford, Craig SB31
Morgan, Kara MA19
Morin, Thomas L. MD50
Morita, Hiroshi WB29
Moritz, Brent SA44
Morley, Tom WB66
Morrice, Doug SC49
Morrison, David WA55
Morrison, Erica Layne SC32
Morrison, Julia TC12
Morris, Richard WB09
Morton, Alec MB19
Morton, David MD40, TA25, TB40, WB35
Moshman, Jack WC04
Mosier, Russell TC19
Moslener, Ulf WB10
Motwani, J. WD51
Mouffe, Mélodie TC05
Moukrim, Aziz MD66
Moura, Arnaldo Vieira SB22
Mourão, M C,ndida SC01
Moura, Pedro SC55
Mourtos, Ioannis SB22
Moussawi, Lama MC62
Mousseau, Vincent TD01
Mowry, Bradley TB13
Moya, Hiram WD08
Moyer, Laurel TB13
Moyer, Nathan MD38
Moynihan, Richard WC30
Mu, Yinping WC43
Muchinsky, Andrea TB19
Muckstadt, John MB07, TB07, TC07
Muhammad, Yousaf Shad WD55
Muharremoglu, Alp SC07
Mukherhee, Sayan SA01
Mukherjee, Avijit TC57
Mukherjee, Avijit TD57
Mukherjee, Dr. Avijit TC57
Mukherjee, Kanchan TD20
Mukherjee, Kankana WC29
Mukherjee, Lopamudra WD26
Mukhopadhyay, Samar SD44, TD42, TD60
Mukhopadhyay, Tridas TD51
Muller, George TC47
Mullin, Theresa MA19
Mulrow, Edward WA04
Mulvey, John SA24, SB53
Munoz, Juan Carlos MC61, MD61
Munson, Todd TD26
Muogboh, Obinna WC28
Murali, Pavankumar MD56
Murat, Alper E. MC66, WC44, WD03
Murauskas, Gediminas WD13
Murguia, Erika TD65
Muriel, Ana MA01, MC52, MD52, TB29, WC48
Murphy, Daniel MD58, WA58
Murphy, Frederic MB10, WB62
Murphy, Jamie TD68
Murphy, Patrick TB04
Murphy, Susan TA34
Murray, Alan MA61, SB01
Murray, Chase TC30, WA44, WB61
Murray, Elizabeth SA35
Murray, Fiona MC39
Murray, Talisa MC29, TB29
Murray-Tuite, Pam MA61, TD61
Murray, Walter TC50, WB40
Murthi, B.P.S. MA68, TA68
Murthy, Ishwar SC02, TB38
Murynets, Ilona MB13
Musal, Rasim IS-T
Mustajoki, Jyri WC20
Muter, Ibrahim SA58, TD25
Muthukrishnan, S WA39
Muthulingam, Suresh SA45
Muthuraman, Kumar SC34, MA33, MA53, WB11, WC07, WC47, WD47, WD66
Muyldermans, Luc SC62, WB25, WD25
Myerson, Roger B. - Plenary M
Myers, Rodney MC31
Myers, Tim MA64
Myklebust, Jogeir WB11

N

Nachtmann, Heather MA30, TB33
Nadtochiy, Sergey WA53
Nagaoka, Sadao MC39
Nagarajan, Mahesh SB46, MA40, WC08
Nagarajan, Viswanath TA39
Nagarur, Nagendra WB24, WC41
Nagi, Rakesh SB16, SD31, TC30
Nagle, Joyce MC30
Nagurney, Anna MA61, TA63, TA63, TC61, WB63
Nahapetyan, Artyom TB65
Nahas, Nicholas IS-T
Naim, Mohamed WC41
Nair, Rahul TD56
Nair, Vijayan WB34
Najafi-Asadolahi, Sami WA59
Najafi, Mohammad WD54
Naji Azimi, Zahra WA25
Nakagawa, Yuji WC53
Nakata, Kazhide TC26
Nakata, Maho TC26
Nakonechnyi, Oleksandr TA53
Nakshin, Igor SB12
Namazifar, Mahdi SD38, MD50
Namboothiri, Rajeev MC56
Nam, Seong Hyun MA43
Nan, Lin TA08
Nanduri, Vishnu TD11
Naor, Assaf TB39
Naor, Seffi WB39
Naoum-Sawaya, Joe MC50
Naranpanawe, Sanjeewa MC25
Narasimhan, Sri SC02, TB38
Narayanan, Arunachalam WD28
Narayanan, Vishnu SD42
Narisetty, Amar MB50
Narr, Bradly MB33
Nascimento, Nelci WD61
Nasiry, Javad SB60
Nasser-Carvalho, Luiz Felipe TB43
Natarajan, Harihara Prasad MC62
Natarajan, Karthik SB40
Natarajarathinam, Malini WA16, WD28
Nateghi, Roshanak MB54
Nathanson, Brian SA34
Nault, Barrie R. SA31
Nau, Robert F. TD19
Nava, Eric SC61
Nazerzadeh, Hamid SC25, WA39, WB39
Nazzal, Dima MA63
Neale, John J. MB32
Nediak, Mikhail SB59, SD62, TA28
Nedich, Angelia MA59, TD05
Negoescu, Diana TC28
Nehme, David SA66
Nehme, Michael SD40, TA25
Neill, Daniel TB13, WC21
Nelson, Andrew MA48
Nelson, Barry L SA49, SC17, MC41, MD41, WA17, WA53, WC22
Nelson, John SC11
Nelson, Karl TB13
Nelson, Matthew TC33
Nemani, Ashish SB50, TC30
Nemati Proon, Sepehr MD34
Nematollahi, Eissa TC40
Nembhard, David A. TA22
Nembhard, Harriet MA09
Nembhard, Ingrid SA48
Nemhauser, George SD50, MA50, MB38, MB50, MD63
Nemirovski, Arkadi TB50
Nemoto, Toshio WB01
Nesselrode, Mark WD49
Nestler, Scott SB17
Netessine, Serguei SD46, MB08, MB16, MC07, MD45, MD57, TD44
Netherlands Railways, Edelman Reprise Sunday
Neve, Benjamin WD65
Neves, Maxstaley L. WC44
Newman, Alexandra MB11
Newton, Harry TC19
Neyra Belderrain, Mischel Carmen WA03
Nezamuddin, N. TB63
Ng, H. K. Tony SD09
Ng, ManWo WC63
Ngniatedema, Thomas WB36
Nguyen, Dung SB24
Ni, Hua SA32, WA38
Ni, Jun TB17
Niang, Ndeye SB09
Nickel, Stefan MA67
Niculescu, Marius WB36
Nie, Xiaofeng TA31
Nie, Marco MB05
Nielsen, Bo Friis WA23
Nielsen, Lars MA60, MD60
Nielsen, Thomas Bang WA23
Niemsakul, Jirawan SA28
Nieto, Javier SA64
Nieuwesteeg, Peter SB25, TB14, WD38
Niggley, Jason SA44
Nightingale, Deborah SD32
Nigmatulina, Karima SD47, MA03
Niho, Ken TD01
Niknam, Ahmad SA18
Nikoleav, Alexander TA31
Nikoleris, Tasos MD58
Ning, Maggie SD15
Ning, Xu MA27
Niranjan, Suman TB46
Nishihara, Michi TD01
Niu, Yuan MC02
Niziolek, Lisa MC65
Nocedal, Jorge TA05, TB14
Nof, Shimon IS-T
Nogales, Francisco WA05
Nohadani, Omid SB28
Noh, Hyunsoo WA61
Nonaka, Youichi SA31
Nooks, James SD63, WD44
Noonan, Kimberly MD58
Noonan, Patrick TC66, TD66
Norback, Judith WC35
Norde, Henk MB43
Norman, Bryan TD65
Norman, Catherine S. MA10
Norman, Joseph WB34
Norris, John B. SC51
North, Michael MB49
Noseworthy, Tom MC33
Nourazari, Sara IS-T
Novoa, Clara MD40
Nowak, Maciek TA56
Nowak, Matthias WB11
Noyan, Nilay MD44
Nozick, Linda SA64
Ntaimo, Lewis SA11, MC49, MD40, WC50, WD34
Nugent, Jeffrey SA35
Nunamaker, Tim MC42
Nunes, Ana Catarina SC01
Nunez, Manuel SC44, TB51
Nutov, Zeev MD39
Nuyens, Misja MC55
Nygreen, Bjorn MA56
Nystrom, Paul MB09

O

Oberstone, Joel WB66
Obreque, Carlos SD67
O'Brien, Frances TB43
O'Brien, Megan TD52, WD03
Ockenfels, Axel SD45
O'Connor, Debra WC28
Odegaard, Fredrik SA34, SB62
O'Dowd, Colm IS-M
Oeser, Nadine SB20
Ogard, Libby SA63
Oggioni, Giorgia WA10
Ogunnaike, Babatunde TB09
Oguntebi, Joy WB20
Oguz, Osman MA24
Oh, Hong Choon MA56
Oh, Jeongha MB02
Oh, Jungsuk WB36
Ohlmann, Jeffrey W. MD32
Ohlmann, Jeffrey TD63
Ohta, Naoki WB06
Oh, Wonseok TD15
Ojala, Domnic WB24
Ojha, Charu IS-M
Olafsson, Sigurdur WC49
Olaya, Yris WD49
O'Leary, Mike TD04
Olesen, Ole Bent WA12
Olinick, Eli MC25
Olivares, Marcelo TD45
Oliveira, Fernando MB10, TC62
Oliveira, Jorge SD32
Oliveira, Pedro MB48
Olivella, Jordi WC43
Oliver, Jim TD68
Olsen, Tava SB23, MA07, WD62
Olshevsky, Alex TD05
Olufsen, Mette SD25
Olusola, Okesola M. IS-M
Olvera-Cravioto, Mariana SB27, SC27
Omitaomu, Olufemi SB43
Omi, Yusuke WC29
Onal, Hayri SB11, MC63, WA11
Onal, Mehmet MC03
O'Neill, Richard MC10, MD06, TB10, WC10
Oncan, Temel WD11
Onculer, Ayse TA20
Onsel, Sule WD20
Oppen, Johan SB25
Oraiopoulos, Nektarios SA41, TD48
Orban, Dominique TB26, TC40
Ordonez, Fernando SD03, MC61, MD56, WC05
Ordoobadi, Sharon WC41
Oren, Shmuel MA10, MB06, MD06, WC10
Oriet, Leo SD63, WD44
Orlin, James SA39, SB46
Ormeci, Lerzan SD65, TD60
Ornitz, Scott WC18
Orozco Castro, Luis Antonio WB29
Ortiz-Pena, Hector TA30
Oruç, A. Yavuz TA67
Osadchiy, Nikolay SB59, TC08
Osborn, John SD47
Oskoorouchi, Mohammad TC50
Osorio, Carlos SA64
Ostlund, John TB13
Ostrowski, James MA50, MC24
O'Sullivan, Michael SC20
O'Sullivan, Terrence WD52
Othman, Abraham SA29, MA25
Otter, Thomas IS-M
Ottino, Julio WC34
Otto, Kevin WA28, WC67
Ou, Jihong WB16
Ouyang, Yanfeng SB61, SC67, SD61, MC63, TB65, WB42
Ouzia, Hacene SC38
Ovchinnikov, Anton MB62
Ovchinnnikov, Anton TA62
Oveisgharan, Shayan MD39
Ovenden, Nick SC10
Owen, Jonathan MD41
Owens, Douglas WB34
Ozaltin, Osman Y. WA34
Ozaydin, Ozay WC14
Ozbay, Kaan TB61
Ozcam, Burcu WC28
Ozcan, Ozan WB41
Ozcebe, Osman Ilhami MC44
Ozdaglar, Asu MA59, MB59, MC53, TD05
Ozdemir, Deniz MB52, WA43
Ozdemir, Oznur MA52
Ozdemir, Zafer MD51
Ozekici, Suleyman SA18, SA43, MB09, TC01
Ozelkan, Ertunga WC60
Ozen, Ulas MB43, TB68
Ozer, Ozalp MA45, MD46, TD46
Ozkan, Gulru SA48
Ozluk, Ozgur MB65
Ozonat, Kivanc SA13
Ozpeynirci, Ozgur TA67
Özpeynirci, Selin MB63
Ozsen, Leyla MD67
Öztoprak, Figen WD18
Ozturk, Murat Hakan IS-M
Ozturkoglu, Yucel TD28

P

Paasi, Jaakko TB18
Pac, Mehmet TB22
Pacciarelli, Dario WD60
Pacella, Annette MC43, WA28
Pachamanova, Dessislava TB29
Padilla, Michael MA25
Padman, Rema WA47, WC21
Padman, Rema MA09
Pagé, Jean-François TB58
Pahl, Julia WB14
Pahwa, Ankit WA09
Paias, Ana SA55
Pal, Manabendra Nath SA63
Pal, Martin WA39, WC38
Palma, Cristian SC11
Palmer, Kirsten TB13
Palmer, Nathan WD11
Palocsay, Susan MC35, WB01
Palsule-Desai, Omkar WD01
Paltsev, Sergey WB10
Pan, Fei WB05
Pan, Feng SB16, WB03
Pan, Feng WC37
Pan, Jingming WD68
Pan, Xiajun Amy TD63
Panchamgam, Kiran IS-M
Pandelis, Dimitrios SA46
Pandit, Vinayaka WD15
Pangburn, Michael TC62, WD21
Pang, Gu WB25, WD25
Pang, Guodong SA23
Pang, Jong-Shi TD40, WB40
Pang, Zhan TB60, WB11
Pant, Gautam MC12, MC12
Papageorgiou, Dimitri TA30
Papin, Jason MA21
Pardalos, Panos TA53, TB42, WA13
Pardalos, Panos MD11, MD24, MD42, TB42, TD55, WA13, WA13, WA25, WB09
Parija, Gyana SA11, MD12, WA65, WD15
Parimi, Vishnu TC51
Park, Andrew TC35
Park, Beomsoo SD28
Park, Chiwoo WA09
Park, Daniel TC34
Park, Gigyoung MA55
Park, Haechurl
Park, Jae-sung SD18
Park, Jin-Kyu MD02
Park, Jongheung SD29
Park, Jong-In
Park, Junhyuk WB25
Park, Junsik MC61
Park, Kun Soo SA53, WD53
Park, Kwangtae SD18, SD29, WB29
Park, Myung-Ju WD61
Park, Namkyu MA15
Park, Seungwook SD29
Park, Young-Hoon SC68
Parker, Chris TC01
Parker, Geoffrey TC41
Parker, Nathan MC63
Parker, Rodney WD62
Parlakturk, Ali MC07
Parlar, Mahmut SB45, WC66
Parlier, Greg IS-M
Parlour, Christine SC59
Parnell, Gregory SB20, TC19
Parnell, Rosemary TB52
Paroz, Sandrine SD22
Parra Peóa, Javier WC24
Parreno, Josefa SC65
Parrilo, Pablo SB28
Parr, Scott MC43
Parry, Mark MB51
Parvin, Hoda TC18
Pasaniuc, Bogdan MB21
Paschalidis, Yannis MA27, WB57
Pasek, Zbigniew J. SA16, WB32
Pasia, Joseph MB34
Pasiliao, Eduardo WA03
Pastor, Rafael WC43
Pasupathy, Raghu SA65, SD23
Pataki, Gabor MA38, MD38
Patanaporn, Patrica SA28
Patankar, Jay WC68
Paté-Cornell, Elisabeth TA19, WB19, WC30
Patek, Stephen IS-M
Paternina-Arboleda, Carlos WB16, WB60
Pathak, Praveen SC51
Patrick, Jonathan MD22
Paul, Anthony MD10
Paul, Jomon Aliyas TA67
Pavlov, Valery SD45
Pavur, Robert SC18
Payette, Raymond TD66
Paynabar, Kamran IS-M
Payton, Fay Cobb WB47
Paz, Alexander MD64
Pazour, Jen TB33, WC64
Pedrick, Perk TD31
Peeta, Srinivas MB61, MB61
Pekec, Sasa MC06, WA35
Pekgun-Cakmak, Pelin SA21
Pekoz, Erol SD07
Peltokorpi, Antti WC47
Pena, Javier SB42, WA05
Pendus, Cezar SC12
Peng, Fan SB61, SD61, TB65
Peng, Grace MC57
Peng, H Steve SC43
Peng, Jiming WA50, WD26
Peng, Peng MB67
Peng, Xianhua SA49, SA53, TD53, WB53
Pennock, David WC39
Penny, Steven WC56
Pentico, Dave TD16
Pentland, Alex
Penuel, John MA42
Pepper, Jason SC64
Perakis, Georgia SA39, MA59, MD28, WB57
Perdikaki, Olga SD08
Pereira, Marianela MB11
Pereira, Mario MD11
Peremans, Herbert TB61
Pérez-Arriaga, Ignacio WB10
Perez, Eduardo WD34
Perez, Hugo WC33
Perlich, Claudia MA12
Perry, David SA08, SB45
Perry, Marcus B. SD30, TA17
Perry, Ohad SA27
Pesant, Gilles SC22, SD22
Pessoa, Artur MA50, SA28, SD42, WA50
Petering, Matthew SD56
Petersen, Hans MA47
Petersen, Jon SC58
Petersen, Niels Christian WA12
Peterson, Ben WC28
Petroski, Joseph SC11
Petrova, Elina WD51
Petrushin, Valery SA54, WA68
Pfetsch, Marc E. MB24, SD22
Phan, Tuan MA39
Phelan, Micheal IS-M
Phillips, Aaron MB55
Phillips, David IS-T
Phillips, Fred IS-M
Phillips, Grace IS-T

Phillips, Lawrence SC19, WC30
Phillips, Mark TA47
Philpott, Andy MC11, TC10
Phumchusri, Naragain SC65, TC16
Pibernik, Richard MC22, WC65
Pickering, Larry MC33
Pidgeon, Edward MD56
Pieper, Heiko TC59
Pierce, Lamar WA14
Pierre-Louis, Peguy TB40
Pierskall, William P. SA03
Pierson, Margaret WA43
Pigatti, Alexandre WD61
Pince, Cerag MC46
Pineda, Salvador WD10
Pinedo, Mike SD37, TA22, TC22, WB23
Pinker, Edieal MB16, MC47, TC65
Pintor, Jesus M. TC63
Pinzon, Luis WD35
Pivovaroff, Michael TB13
Plç-Aragonés, Lluìs Miquel WD55
Plambeck, Erica TC46
Planes, F MD42
Plateau, Marie-Christine SD42
Plummer, John SC42
Poggi de Aragão, Marcus V. S. MA24, WD61
Pogorelsky, Neil SC60
Pohl, Edward SD30, MA30, TC30, WB03
Pohl, Edward TB33
Pohl, Letitia TD64
Polack-Johnson, Bruce SB48
Polak, George TA53
Pòlik, Imre TC26
Pollock, Stephen TB47
Polyak, Roman TA05
Ponce-Cueto, E va SB52
Pope, Scott SD25
Pope, Shawn TB58
Popescu, Andreea TC16
Popescu, Dana TB08
Popescu, George WC18
Popescu, Ioana SB59, SB60, TA16
Popescu, Ioana MD62
Popham, John WB48
Popken, Dr Doug MA30
Popkowski Leszczyc, Peter MC06, TA06, WA06
Popova, Elmira IS-M
Poranki, Srikanth WC41
Poropudas, Jirka WB19
Porteus, Evan WB08
Porto, Oscar WD61
Posner, Marc E. WB07
Post, David TA58
Post, Joseph MD58, WA58
Potthoff, Daniel MA60, MD60
Potts, Chris SB36
Poulymenopoulou, Mikaela TB21
Poupart, Pascal SA25
Pourakbar, Morteza MD45
Pourmohammadi, Hamid SA63
Pousi, Jouni MC19
Pòvoa, Ana MB48
Powell, Adam C. SA47
Powell, Stephen TA66
Powell, Warren SB49, SC30, MA37, MB13, MB34, MC11, MD11, TA60, TB24, TC28, WD23
Prabhu, Vimalanand TD34
Prabhu, Vittal SC56
Prakash, Shiva SD32
Pranzo, Marco WD60
Prasad, Domnyck SA24
Prasad, Srinivas TA12
Preckel, Paul V. WB11
Precup, Doina MC27
Prestemon, Jeffrey SA11, MA11
Prete, Joe WC56
Prevost, Thomas MB11
Price, Carter TC21
Price, Nathan TA42
Priebe, Carey WD38
Prieto, Diana TD47
Primbs, James MA53
Prina, Jose SA10
Prinz, Astrid WB37
Pritchard, Geoffrey MC11
Proano, Ruben WD34
Procaccia, Ariel WC05
Proctor, Larry TA43
Prokopyev, Oleg SC50, MA42, WC50
Prokopyev, Oleg WA34
Provan, Scott SA30
Provan, Scott MD30
Provost, Foster WC13, WD12
Pruessner, Armin SC26
Prybutok, Victor SD18
Przasnyski, Zbigniew SA35
Przytycka, Teresa MA21
Pufall, Andreas WA32
Puha, Amber TA23
Puhalskii, Anatolii SB27
Pujari, Nikhil WB67
Punkka, Antti TC20
Purohit, Alisha IS-T
Purohit, Debu MA68
Purohit, Devavrat SB68
Puro, Lauri WC06
Puterman, Martin SB62, MB47, TB34
Puterman, Martin MA33, MB33, TA62, TB34, TC33
Putz, Peter SC55
Pyster, Art MC43

Q

Qi, Howard WA01
Qi, Xiangtong SA60, TD07
Qi, Yunwei MB26
Qian, Fei TD58
Qian, Peter MC18, WC09
Qian, Zhen (Sean) MC05
Qiang, Qiang MA61, TA63, TC61
Qiao, Wenxin
Qin, Hong SD18
Qiu, Chun WA06
Qiu, Dingxi WB09
Qiu, Donglei TA06
Qiu, Minmin WD63
Qiu, Robin SB15, SB15
Qu, Shelly SC34
Qu, Zhe SC02
Quadrifoglio, Luca MC61
Quan, Eugene MD54
Quasem, Mohammed WD22
Queenan, Carrie TA62, WC21
Queyranne, Maurice MA40, MD33
Quimper, Claude-Guy SC22
Quinonez-Rico, Eduardo SA42
Quiring, Steven MB54

R

Rabinovich, Elliot SC08
Racer, Michael MC31, SC35, SD35
Radchenko, Peter SB12
Radcliff, Tiffany TC33
Rader, David SD24
Radovanovic, Ana MC23
Radwan, Essam TA52
Raffensperger, John MC11, WA66
Rafinejad, Dariush MA57
Raghavan, S. SA55, SB55, SC55, SD63, TC24
Raghavarao, Damaraju WA17
Raghuram, G. TB65
Rahamim, Shmuel MD05
Raha, Somik TA19
Rahmandad, Hazhir WA28, WD41
Rahman, Md. Ashfaque-Ur MC66
Rahman, Mohammad MA02, MC01
Rahmani, Morvarid IS-T
Raiconi, Andrea SD55
Rail, Sudhendu TB15
Rainwater, Chase MB67, MD67
Raith, Michael MA08
Raivio, Tuomas WA03
Raj, Ashish SC38
Rajagopalan, Hari TA67
Rajagopalan, Neethi MA57
Rajagopalan, Sampath (Raj) SB07
Rajagopal, Ram WD39
Rajagopa, Ravishankar MA17, TD17
Rajan, Uday SC59
Rajapakshe, Tharanga WA07
Rajaram, Kumar MB47
Rakas, Jasenka MD58, TC57, WA57
Ralph, Danny MB10
Ralph, H. Charles SD43
Ralphs, Ted SA50, SC50, MB50, MD26, TA38, TC38, TD26
Ram, Vishwa WD25
Ramachandran, Karthik SA41, SD20, WA45, WA48
Ramadani Williams, Almira WB58
Ramadurai, Gitakrishnan SC61, WC63
Ramakrisharao, A. SB09
Ramamoorthy, Kris WC55
Ramamurthy, Randeep SB34
Raman, Ananth SC46, TC08
Ramanan, Kavita TA23, TB23, TD23
Ramanathan, Usha SC62
Raman, Roopa WA21, WC51
Ramaprasad, Jui MB02
Ramaswami, V SB12
Ramaya, Krishnan WB33
Ramdas, Kamalini SB57, SC41, MD08
Ramezanpour, Abolfazl MB39
Ramirez Nafarrate, Adrian WD33
Ramirez, Diana IS-T
Ramirez-Marquez, Jose SB55
Rana, Rupal TC62
Randall, Taylor SD45, TD45
Randhawa, Ramandeep SC23, SD27, MB23, TA16, TB23, WB23
Rangan, Sudarsan MB43
Rangarajan, Bharath WD62
Rangaraj, Narayan TB65
Ranjan, Roopesh TD19
Ranjithan, Ranji SD54
Ransbotham, Sam SC02, WB21
Ransom, John MD60
Rao, Brijesh SA16
Rao, H. Raghav WA36
Rao, Ram MA68, TA68
Rao, Uday SD33, TB46, TB46
Rardin, Ronald L. MC15, TA47, TB33, WB11
Rasekh, Lila WD22
Rashid, Louiqa TB52, WA06, WD59
Raskina, Olga MA06, TD38
Ratchford, Brian MA68, MC68
Rathinam, Sivakumar WB55
Ratliff, Richard MC59
Ratnarajah, Thanujan WD41
Ratner, Bruce TD12
Rattakorn, Panaya SA12
Rau, Pradeep TA12
Rausch, Mitchell TB17
Rauner, Marion MB34
Ravichandran, N. MC03
Ravindran, A. Ravi SC56, MA43
Ravindran, Kiron SD51
Ravi, R. SB39, TC56, WB38
Rawski, Martin SD65
Ray, Bonnie WA20
Ray, Saibal WD68
Ray, Saikat MA27
Ray, Saswati TB13
Ray, Subhash WC29
Re, Christopher MD49
Rebennack, Steffen MD11, WA13
Recck, George SC36
Rector, Ralph SC32
Reddy, Anupama WB13
Reddy, Chandan SC12
Reed, Josh SA23, SB27
Reese, Josh SB47
Reese, Shane SC36

Rees, Jackie MD51
Reeves, Kingsley SA33, WB41
Regis, Rommel WB67
Regnier, Eva SB03
Rego, Cesar SD24, MB64, WC53
Rehbock, Volker SA10
Rei, Walter MC56, TC64
Reibstein, David TA41
Reich, Daniel SA40
Reilly, John WB10
Reiman, Marty WC45
Reindl, Matthias WB49
Reindorp, Matthew IS-T
Reinertsen, Harald WD67
Reining, Robert WC30
Reinsch, Lamar SA02
Reis, Marcelo WD61, WD61
Reitter, Norman SC31
Remy, Sekou TB18
Ren, Changrui SC65, WA18
Ren, Justin SD07, MA16, MB16, TC41
Ren, Liling TD58
Rengarajan, Balaji WC23
Rennen, Gijs MD17
Repenning, Nelson MC41
Resende, Mauricio TD29
Resnick, Paul SD59
Restrepo, Mateo SC47
Restrepo, Natali WD19
Restuccia, Joe SD07
Reuter, Matt WA30
Reveley, Mary WD58
Reveliotis, Spyros MC27
Reyes-Gonzalez, Leonardo MC39
Reyes, Pedro TC32
Rezvani, Ali SB19, MD44, TB54
Rhee, Byong-Duk SA43, SD29
Rhim, Hosun SD29, WC29
Richard, Jean-Philippe SD42, MA22, MB38, MB50
Richels, Richard TA11, TB02
Richtarik, Peter WD38
Richter, Anke SB34, SD34, WD31
Ricks, Wendell WD58
Riddell, Sarah WA67, WC37
Rigdon, Matthew MC05, MD05, WA62
Rigdon, Steve SA29
Rikun, Alexander TC23
Rios, Luis WB50
Rios, Ricardo TB10
Rios, Roger MA67
Ristock, Herbert MC16
Ritchey, Nathan TA04
Ritchken, Peter MC08
Rivera, Daniel E. TA34
Robbins, Matthew (JD) SB34
Robbins, Tom MB65
Roberts, Mark MB47, MC20, MD34, WA34, WB47
Roberts, Seth IS-M
Roberts, Stephen SD34
Robinson, Anne SD01
Robinson, Lawrence W. WA33, WD46
Robinson, Lucy SA01
Robinson, Stewart TA49
Robyn, Dorothy WB02
Rocco S., Claudio M. SB55
Rocha, Patricio TD11
Rocha, Roger MA24
Roch, Sebastien WD39
Roden, Sven SC20
Roderick, Kevin MA30
Rodriguez Martin, Inmaculada SC55
Rodriguez, Betzabe MB46
Roehrig, Charles SA33
Roels, Guillaume TB59
Roels, Guillaume TA18, TD62
Roemer, Thomas MD07
Roet-Green, Ricky TB16
Rogerie, Jerome MB22
Rogers, David TA53
Rogers, Luke SC11
Rogerson, Ellen TC35
Rogerson, Peter SD61
Rogers, Scott TD10
Roise, Joseph SD11
Rom, Walter TD22
Romanko, Oleksandr SB24
Romeijn, Edwin SB50, MB67, MC03, MD67, TB34, TB47, TD07, WA38
Romero Morales, Dolores SA67
Romero, Ruben WC10
Römo, Frode WD36
Rong, Ying MD45, WC46
Ronnqvist, Mikael SD11
Roodbergen, Kees Jan SD63, TD64
Roongrat, Chatabush WB49
Roontiva, Auttawut WB09
Roorda, Matthew TB56
Roos, Kees TD40, WA40
Roos, Pontus SA34
Root, Sarah MD65, TB33, WD25
Rosales, Claudia TB46
Rosehart, William TA10, TC10
Rose, Joyce SC60
Rose, Marc TB57, WC58
Rosenberger, Jay MD50, WB49
Rosenblatt, Eric TC31
Rosenschein, Jeff WC05
Rosenthal, Stephen MB48
Rosenzweig, Eve SD07
Rose, Robert IS-T
Rosic, Heidrun MC43
Rosling, Kaj WB65
Rosoff, Heather SD03
Ross, Kevin MD16, WB15
Ross, Lainie SB33
Rosset, Saharon TC13
Rossetti, Manuel MC26
Rossi, Fabrizio MA50
Rossi, Giuseppe SB31
Ross, Sheldon M. SA22
Roth, Aleda MB48, MC43
Rothblum, Uriel G. MB03
Rothkopf, Michael H. MD06
Rothkopf, Michael MA06
Rothrock, Ling SA66
Roubos, Dennis SA25
Rouse, Paul WB29
Rouse, William SD32
Roy, Abhik WB68
Roy, Asim TC20
Roy, Debjit WC64
Roy, Sambuddha WA65
Royset, Johannes SC30, TB40, WB35
Royster, David SB29
Roytburg, Eugene SA54, WA68
Ru, Jun MC01
Ruangpattana, Suriya WB11
Ruan, Shiling IS-M, WD49
Ruben, Robert TD65
Rubenstein, Albert TC48
Rubio, Enrique MB11
Rudi, Nils SA07, WD16
Ruggiero, John WB12, WC15
Ruggiero, Tony WB62
Ruiz Ramos, Cristhian TC49, WB29
Ruiz, Enar SC65
Ruiz, Juan SD42
Ruiz, Natalia MD64
Rumoro, Dino TC32
Rump, Christopher M WB54
Runger, George SC09, MD18
Rungtusanatham, M. Johnny SC08, MC43, WA43
Ruokokoski, Mirko TD28
Ruotsalainen, Henri MB42
Rupasinghe, Thashika TC25
Rus, Daniela WB57
Rush, Melodie SB14
Rusmevichientong, Paat SB46, SC28, MD28
Rusnak, John TB41
Russell, Giles SA63
Russell, Robert TD15
Rust, John MA28
Ruszczynski, Andrzej SC40, MC40, TB53
Ruth, R. Jean TA48
Rutz, Oliver SD68
Ryabchenko, Valeriy TA53
Ryan, Jennifer SA51, MC01, TB45, WB15
Ryan, Sarah MD52
Ryder, Geoff WB15
Ryu, Jonghyun WA17
Ryu, Young MD12
Ryzhov, Ilya SC30, TC28

S

Saar-Tsechansky, Maytal MB12, WC13
Saavedra-Antolinez, Ivan WB60
Sabbaghi, Navid MA45, WB42
Saberi, Amin MB39, WA39, WC23
Sabharwal, Ashish SC22, MB22
Sachdeo, Rajesh MD47
Sadeh, Norman WB06
Sadhale, Shrideep WA25
Sadighian, Ali MC59
Sagara, Nobusumi WC66
Saghafian, Soroush TB45
Saghiri, Soroosh WC42
Saglam, Mehmet SA53
Sahai, Amit TC39
Sahajpal, Ritvik IS-T
Saharidis, George SA64, WC26
Sahin, Guvenc SA58, TD25
Sahinidis, Nick MA22, TA42, WA26, WB50
Sahin, Ozge MB62, WA59
Sahoo, Nachiketa MA12
Sahu, Subrat TD13
Saibal, Ray SB52, TD15
Sainathan, Arvind MD33, WD32
Sajedi, Homayoon IS-M
Sajjadi, Seyed Reza SA43
Saka, Behlul TB33
Saka, Gorkem MD34
Salam, A WB51
Salamone, Patricia WC30
Salari, Ehsan TB47
Salari, Majid TD28
Salavatipour, Mohammad Reza MD39, TD39
Salazar Gonzalez, Juan Jose SC55
Salehirad, Neda MB33
Saleh, Khaled SC41
Salganik, Matthew MA39
Salman, F. Sibel SD65, MC03, WA52
Salmeron, Javier WB35
Salmon, Tim TB06
Salo, Ahti SD20, MB19, TC20, WC20
Saltzman, Matthew MA67, MD26, TD26
Saltzman, Robert MB65
Salvador, Fabrizio WA43
Samaddar, Subhashish WC62
Samanta, Sutapa WB28
Sambhoos, Kedar TA67, WB03
Sami, Rahul SD59
Samii, Amir-Behzad MC22, WC65
Samorani, Michele TC25
Samorodnitksy, Gennady TB23
Sampson, Scott SA15, SA15, SB15, SC08
Samuelson, Doug TC47, TD31, WA04, WB04, WC04, WC52
Sancak, Emre MC03
Sanchez, Matilde WC33, WD44
Sçnchez, Rodrìguez WD55
Sandholm, Tuomas SA29, SB42, SB42, MB01, MD29, WB06, WC05
Sandholm, Tuomas SB42
Sandikci, Burhaneddin MB47, MD34, MD47
Sandoh, Hiroaki TC62
Sands, Laura IS-T
Sanford, Chris MD60
Sanhueza, Albornoz WD55
Saniga, Erwin SC09
Sankaranarayanan, Karthik WB22
Sankaran, Vinodh TC25
Sanli, Tugrul TA24
Sansom, Stephanie TD34
Santamaria, Natalia MA06, WA35
Santander-Mercado, Alcides SA09
Santani, Darshan TB63
Santiago, Leonardo P. SC48, TD41, WC44

Santibanez, Pablo TB34
Santner, Thomas MC18
Santoni, Matthew WB30
Santoro, Joe TD43
Santos, Francisco Javie WB10
Sappington, David WC08
Sapra, Amar MC03, MC44, WD32
Saraf, Nilesh SD51
Saranathan, Krishnan SD58
Sargut, Zeynep TB65
Sarin, Subhash SA31
Sarkar, Avijit TD35
Sarkar, Saswati MA27, TD59
Sarkar, Sumit MA12
Sarmento, Luis SC12
Sartenaer, Annick SB38
Sarver, Emily MA56
Sarykalin, Sergey WA29
Sasaki, Mihiro WC11
Satish Kumar, Vinay IS-M
Satoh, Yasufumi WB06
Sauma, Enzo TC11, WC10
Saunders, Michael WB40
Saure, Antoine TB34
Saure, Denis SC07, SC28
Sauter, David MD30
Savachkin, Alex TD47
Savard, Gilles MC59
Savaskan, Canan SA52, SB52
Savelsbergh, Martin SD50, MD63, TA56, TB47, TD47
Savin, Sergei MC34, MD33
Savva, Nicos MD33
Sawik, Tadeusz TA22, WB44
Saxena, Anureet SB38
Saydam, Cem TA67
Sayedi, Amin MD39
Scandolo, Giacomo MC53
Scaparra, Paola MD67
Scarsini, Marco WB05
Scavarda, Annibal SA15
Schaefer, Andrew MB47, MD34, MD65, WA34, WB47
Schäfer, Simon SD64, WA60
Schaller, Jeffrey WC24
Schaub, Cornelius SB20
Scheffran, Jurgen MC63
Scheiber, Christian WB22
Scheinker, Eugen WB15
Scheller-Wolf, Alan SB45, TA07, TC22, TD46, WB22, WB46, WD59
Scherrer, Christina SB01, TB35
Scheuren, Fritz WA04
Schickinger, Thomas SC58, TA26
Schilling, Martin SB20, SC19, MB19
Schlechte, Thomas MC67, TC60, WD60
Schleyer, Marc WA64, WD28
Schlikenmaier, Herbert TC48
Schlosser, Adam WB10
Schmeiser, Bruce WC49
Schmid, Eberhard MC52
Schmidt, Brian WC30
Schmidt, Chuck WD65
Schmidt, Glen WD01
Schmitt, Amanda MA44
Schmitz-Wiehenbrauk, Daniela SD08
Schneider, Helmut WB33
Schneider, Jeff TB13
Schoenmeyr, Tor TB07
Scholz, Sebastian SC54
Schönberger, Jörn MB66
Schott, Elizabeth SA42
Schrater, Paul TD51
Schreibmann, Eduard TB47
Schroeder, Roger SB48
Schultze, Ingrid MD60
Schultz, Martin MC43
Schultz, Ruediger MB40, MC40
Schultz, Ximena MB11
Schulz, Andreas S. SA39, SB39
Schuster, Edmund W. TC22
Schutten, Marco SC16
Schütz, Peter WA42, WD55
Scioletti, Mike SA30
Scott, Alex TD68
Scott, Frank TC32
Seal, Kala SA35
Sebastian, Hans-Juergen MA46
Secomandi, Nicola SB59, MC08, WB46
Seering, Warren WA28, WC67
Seetharaman, P.B. (Seethu) MB68, WB68
Seidmann, Abraham MD03
Seiford, Lawrence M. WB12
Seijo, Roberto WC32
Sellmann, Meinolf MA22
Selman, Bart SC22, MB22
Selmic, Milica WA63
Selot, Ajay WB26
Semal, Pierre SC21
Semet, Frédéric MD66
Sen, Alper WB32
Sen, Arun MB06
Sengupta, Kaushik WC03
Sen, Suvrajeet SD40, MB26, TD38
Senturk, Deniz TB31
Seo, Minseok TD54
Sepulveda, José MA26
Serban, Nicoleta TB18
Seref, Onur MD42
Serel, Dogan TD42
Serra, Daniel WD11
Serraino, Gaia WA29
Seshadri, Anand IS-T
Seshadri, Sridhar TB08, TC08, WC07
Seth, Anupam TA56
Sethi, Suresh MB44, TB44, WA01, WB53, WC43, WC65
Setser, Scott MC60
Sewell, Edward SA29, SB34, TC22, WD34
Sexton, Thomas WB01
Seyedshohadaie, S. Reza IS-T
Seyller, Thomas TA19
Seymour, Lisa MB31
Sforza, Antonio MC56
Shafti, Farhad TB18
Shahabuddin, Syed WB13
Shah, Devavrat MB39, WC23
Shah, Nilay SD34, MA47, MD34
Shah, Rachna SD07
Shah, Shital TC32
Shaikhet, Gennady SA27
Shakkottai, Sanjay SC39, WC23
Shakkottai, Srinivas SC39
Shanbhag, Uday MA28, TA40, TC50, TD05, WB40, WD34
Shang, Jennifer WA67
Shang, Kevin MD45
Shang, Richard MD53
Shang, Yanfen WB17
Shan, Jun MD02
Shanno, Dave MB06, WA35
Shanthikumar, J. George WC59, WD59
Shao, Bing SC65
Shao, Jin Yan SD21, TD49, WB18
Shao, Jing MD07
Shapiro, Alex SB37, TB50
Shapiro, Martin TD33
Shapovalov, Maxim TA42
Sharda, Ramesh WC15
Sharkey, Thomas SB50
Sharma, Dushyant SD55, WB50
Sharma, Kamana MA24
Sharma, Mayank MB39, WA65
Sharma, Shrutivandana TD59
Sharp, Philip R. TB02
Sharpe, Michael TA33
Shaw, III, Charles H. MB31
Shaw, Paul MB22
Shechter, Steven MB47, MC20, TC17
Sheffi, Yossi MA45, WB42
Sheikh, Saad MB21, TB42, WB50
Sheng, Huan-Yuan MD26
Sheng, Olivia MC12
Shen, Guoqiang IS-M
Sheng, Victor S. WD12
Shen, Haipeng MB65, MC16, TB18
Shen, Max SB44, SB50, SC67, MA44, MB45, MC28, MD28, MD57, WC46
Shen, Siqian TA50
Shen, Wenjing SB46
Shen, Yanfang SD23
Shen, Yu-Chu MD54
Shenoy, Prakash P. TD20
Shepardson, Dylan WB37
Sherali, Hanif MC38, WA38
Sherman, Lisa TB64
Sherry, Lance SC64, MD58, TA57
Sheth, Amit WA15
Shi, Cong SB46
Shi, Fengbo IS-M
Shi, Jan WD09, WD17
Shi, Jianjun SD17, MD18
Shi, Jing SC34, WB37
Shi, Junmin WA32
Shi, Lan SB02
Shi, Leyuan MC47, TD37, WC66, WD33
Shi, Min WD01
Shi, Ruixia WC65
Shi, Xiaoning WB05
Shiau, Ching-Shin SD41, TB68, TC11
Shibata, Takashi TD01
Shichijo, Naohiro SB54
Shihata, Alison F. MB32
Shih, Hsu-Shih WD42
Shikama, Tomoko TD01
Shiller, Ben MB02
Shimshak, Daniel IS-T
Shin, Hyo-duk WB08
Shin, Hyun SA68
Shin, Wan-Seon SD15
Shirkey, Richard MD30
Shittu, Ekundayo TC11
Shlakhter, Oleksandr WD66
Shmatov, Kyrylo WA62
Shmoys, David MD28
Shmueli, Galit SA09, SB12, TB37, WC13
Shneer, Vsevolod MC23
Shockley, Jeff MB48
Shoemaker, Christine WB67
Short, Erika WC34
Short, Jeffrey TB56
Shortle, John F. SC64, SD49
Shortle, John TB55
Short, Walter MA20, WA11
Shou, Biying WC43
Shrestha, Prabodh WA51
Shreve, Steven E. MA23
Shrimali, Gireesh SC02, SC39
Shrivatsava, Abhishek MD17, TB12
Shroff, Ness MA27
Shu, Jun SC17, MB01, TC55
Shu, Yan SC58
Shu, Lianjie MC17
Shugan, Steven MD62, TC15
Shukla, Aviral SD44
Shulman, Herbert MD55
Shulman, Jeff SB52
Shuman, Larry SC50, TC61
Shumsky, Robert SA62, MB16, MD62, TD62
Shum, Stephen MB62
Shunko, Masha TD46, WA46
Shwartz, Adam SA22, TA23
Shwartz, Larisa WB36
Shwartz, Mike SD07
Shylo, Oleg WA25
Sibdari, Soheil MC41
Sickles, Edward WC17
Siddarth, Sivaramakrishna SD51
Siddiqui, Afzal SC10
Siegel, Micah MB45
Siegel, Stuart TC11
Siemsen, Enno SB41, TD48
Sievenpiper, Crispian SC09
Siikonen, Marja-Liisa TD28, WC25
Siirola, John SB26
Silinskaia, Daria SC68
Silva, Julio TC32
Silva, Thiago Augusto TD41
Silver, Harris MA47
Simchi-Levi, David MB08, MC53, TB44, TC07

ISi-M Interactive Session, Monday (12:30-1:30) ***IS-T Interactive Session, Tuesday (12:30-1:30)***

Simcoe, Tim MA41
Sim, Jaehun WB22
Sim, Melvyn SA19, SB40, WA64
Simmons Ivy, Julie MC45, TD33, WB47
Simms, Leon MC26
Simon, Jay SD19
Simons, Dirk WA67
Simpson, Gladys IS-T
Simpson, Timothy TD13
Simsir, Fuat MD22
Singer, Gonen WD32
Singer, Sara J. SC54
Singhal, Vinod SA45,MA08
Singh, Chanan MB54
Singh, Harpreet MA51, MB02, TD16
Singh, Mohit TA39, WC38
Singh, Moninder SC15
Singh, Rajendra WC51
Singh, Sanjeet WD29
Singh, Shilpy TA62
Singh, Shweta MA68
Singh, Vikas WD26
Singley, Kevin WD15
Singpurwalla, Nozer MA18
Sinha, Amitabh TA08
Sinha, Amitabh MB56
Sinha, Kingshuk WB21
Sioshansi, Ramteen MA10
Sircar, Ronnie SC24, TC53
Siriruk, Pavee IS-M
Sir, Mustafa TB47
Sisikoglu, Esra WC66
Sittivijan, Peerapol MB26, WB60
Sivaramakrishnan, Kartik SA28, TC50
Skibbe, Adam SB11
Skolicki, Zbigniew SD54
Slatten, Richard SB32
Sledge, PhD, Nate WA31
Slikker, Marco MB43
Sloan, Thomas SC52, SD09
Slotnick, Susan TD22
Slowinski, Roman TD01
Smalley, Hannah MA32, TC47, TD47
Smeers, Yves MB10, WA10
Smets, Erik MA47
Smilowitz, Karen MB56, MD57, TA56, WC52
Smirnoff, Yuri WD34
Smirti, Megan WB31
Smith, Alice E. WC11, WC49
Smith, Barton MD49
Smith, Brian TB33
Smith, Chris TC19
Smith, Cole SD38, MC38, MD42, TA25, TA50, TB38
Smith, Eric TB52
Smith, Gary SA30
Smith, J. Cole MA42, MD24, TB34, WA38
Smith, James MC20, WA19
Smith, Joe TB13
Smith, John TC19
Smith, L. Douglas WB49
Smith, Michael MA02, MA51, MD01
Smith, Olivia MA56
Smith, Robert SD23, WB50, WC66
Smith, Stephen SD46
Smith, Steven SD34, MD34
Smith-Daniels, Dwight WC31
Smith-Daniels, Vicki WB33, WC31
Smriglio, Stefano MA50
Sniedovich, Moshe TD25
Sniekers, Daphne MC33
Snir, Eli TD21, WB42, WC48
Snyder, Lawrence V. MA44, MA44, MB67, MD45, TD67, WC46
Snyder, Stephanie SB11
So, Anthony TB39
Sobel, Matthew MA08
Sochats, Ken SC50, TC61
Sofer, Ariela SD01
Sohoni, Milind SB57, SB58, WC07
Sokol, Joel SB36, SC36, WB33
Sokolov, Andrei WB10
Solak, Senay SA58, SB01, TC58, TD58
Solomon, Marius TC56
Solveling, Gustaf SC58
Somani, Kamalesh TA60, TB65
Sommer, Svenja SC41, SD48
Son, Young-Jun SB56, MC49, MD25
Sondheimer, Norman TB13
Soner, Mete WA01
Song, Dr. Lixia TC57
Song, Huaming WD43
Song, Jeannette TA45, TD07, WC45
Song, Miao MB08, MC53
Song, Yuyue WA16
Song, Zhe SA67
Soni, Soujanya SA11, WA65
Sonmez, Erkut WB46
Sonmez, Volkan MC44
Sontag, Eduardo MC42
Sonuc, Sibel Bilge WA38
Soofi, Ehsan MB09
Sorensen, Stephen TD34
Sorenson, Olav MC48
Soriano, Patrick SC47
Sormaz, Dusan MD22
Sorochuk, Craig TB60
Sorokach, Michael WD58
Soroush, Hossein WD64
Sorsa, Janne TD28, WC25
Sosa, Manuel TB41, TD48
So, Samuel SB33
So, Stella TA52
Sosic, Greys TC45, WC08
Sotkiewicz, Paul M. MD06
Sotomayor, Luz Rocio WA53
Sougstad, Ryan SA51, SC66
Soumis, François SC58
Soun, Yengfa SA54
Southerland, Jason TD30
Souza, Cid Carvalho de SB22
Souza, Gilvan "Gil" TA29, TB29
Souza, Gilvan WD46
Sox, Charles MB43, WB28, WD11
Soyer, Refik MB09, TA12, TC17
Soylu, Ahu SB10
Soylu, Banu WC14
Sozer, Sevin SD10
Spaeth, Sebastian WA48
Sparling, Steven TD30
Spearman, Mark MB63
Speck, Doug TB13
Spengler, Thomas S. MA52, MC52
Spivey, Michael SB35
Spouge, John MA21
Sprintson, Alex MB54, TD55, WA55
Squillante, Mark MB39, SC15, WA65
Sridhar, Dr. Banavar MA64, TC57, TC57
Sridhar, Karthik MC68
Srihari, Rohini SC12
Srinivasan, Mandyam TD22
Sriskandarajah, Chelliah MA51, MC25, TA46, TC45, WA07
Srivastava, Rajendra MD68
Srivastava, Rajesh MD41
Srivathsan, Sandeep ISI-M
Sroufe, Robert TD16
Srour, F. Jordan IS-M
St. Charles, Meaghan MA47
Staats, Brad SC54
Staats, Richard MD43, WA67
Stachura, Max WC51
Stadje, Mitja SC24
Stadje, Wolfgang SB45
Standridge, PhD, Charles MC66
Stanford, Robert E. MD03
Stanworth, James TC68
Staum, Jeremy SA49, SC17, WA17, WA53
Stavrianos, Michael SC32
Stavrulaki, Euthemia WB32
Stecke, Kathryn E. MB44, TD60
Stefanidis, Kostas TA57
Steffes, Erin MA68, MA68
Steffy, Dan MC24
Steiger, Natalie MA49
Steiglitz, Kenneth TC39
Steinborn, Jenny MA52
Stein, Cliff IS-T
Stein, William MB65
Stepanov, Alexander TB61
Stephens, Jerry SA63
Stephens, Paul MB60
Sterle, Claudio MC56
Stern, Steven SC41
Stevens, Scott MC35
Stewart, Jeff MC11
Stewart, Timothy TB13
Stier-Moses, Nicolas SC07, SC59, MA59
Sting, Fabian TC44
Stoddard, Steven MB31
Stoikov, Sasha SA53
Stojkovic, Goran MA58
Stolletz, Raik WA23
Stolyar, Alexander MC55, TC23
Stonebraker, Jeffrey MA19
Stone, Lawrence SB32, TD31
Storer, Robert MA42, TA22
Stotz, Adam SD31
Stowe, Justin MA56
Stoyan, Stephen WB38
Street, Nick MC13, MD13
Streit, Rosalvo TC49
Strickland, Dawn TC35
Strijbosch, Leo WD32
Strijnev, Andrei MA68
Strong, Ray TA43, TB18
Struben, Jeroen SB61, TA48
Strum, David P. MC33
Stumbo, Bill SB15
Stump, Gary TD13
Su, Che-Lin MA28
Su, Ping TC44
Su, Qin SD18
Su, Xuanming SD16, MA16, MB62, MD46, TD62
Subramaniam, Chandrasekar SC51, MC02
Subramanian, Dharmashankar TC11, WA20
Subramanian, Ravi SA45, SC52, MC52
Suciu, Dan MD49
Sudit, David TC30
Sudit, Moises SD31, WB03
Suedel, Burton MC43
Suedel, Burton WC67
Sueyoshi, Toshiyuki WC29
Sugimoto, Ieyasu WB07
Suharko, Arief MA65
Suhl, Leena MB50
Suhl, Uwe MB50
Suh, Minsuh TD60
Sui, Yi TD67
Sujin, Kim WA17
Sukchotrat, Thuntee TB12
Sullivan, Felicia SB01
Sullivan, Sandra TA33
Sultana, Rudy WA55
Sumiyama, Allan WD41
Sun, Daewon MC01, TB45
Sun, David TB10
Sun, Haibin WD10
Sun, Jiong TC46
Sun, Junjie TD11
Sun, Li MB63
Sun, Peng TD07, WA19, WD47
Sun, Yang WD45
Sun, Yanling IS-T
Sun, Yi SC51
Sun, Yuqing SB27
Sundaramoorthi, Duraikannan WB49
Sundararajan, Arun SD59
Sundararajan, Mukund MA39
Sundaresan, Shankar TC62
Süral, Haldun WC54
Suresh, Nallan C. TD44
Surtherland, John MA15
Surti, Chirag WD01
Susarla, Anjana SB02, SD51, MB02
Su, Shin-Shyu SC49
Sutério, Ricardo WA03
Suthers, Patrick TA42
Sutton, Warren WA12, WB12
Suzuki, Atsuo SB67, WC11
Sviridenko, Maxim TD39
Swain, Michael MB60

Swaminathan, Jayashankar SD08, MC07
Swamy, Surya MA20, TA66
Swann, Julie SB34, SC65, TC16, TC34, TC35, TC52
Swanton, Christopher WA43
Sweeney, Dennis TA53
Sweeney, James TB02
Sweeney, Richard MD10
Swelbar, Bill TB04
Swinney, Robert MB08, WB08
Sycara, Katia MA07
Szechtman, Roberto SC30, MB03, TB40
Szmerekovsky, Joseph MD35, TB44, WB33

T

Taaffe, Kevin SD47
Taboada, Heidi WC54
Tafzzoli, Ali MA49
Taghipour, Sharareh SA18
Tajbakhsh, M. Mahdi SB67, TC67
Takashima, Ryuta SC10
Takeda, Akiko SB53
Takouda, Matthias MC56
Talbi, El-ghazali MD66
Talebian, Masoud MD28, TA59
Talreja, Rishi SA23, SD21
Tan, Burcu TC41, WC42
Tan, Jian SB27
Tan, Li WA16, WC36
Tan, Tom MC07
Tan, Wei MC18
Tan, Yong MB02, MD01
Tanaka, Katsuaki WB24
Tancrez, Jean Sebastien SC21
Tang, Chris SD08, MC45, WA19, WA46
Tang, Hao WB12
Tang, Jung-Mu WD15
Tang, Kaizhi TD12
Tang, Kwei WB05, WB45
Tang, Shensheng TB55
Tang, Victor W. SB15, WA28, WC67
Tang, Wenjie SA07
Tang, Yu MD02
Tanguner, Ferda TD60
Tanner, Matthew MD40
Tanrisever, Fehmi SB48
Tao, Hua MC45
Tao, Zhijie MC22
Tardif, Valerie MC29, TB46, TD46
Tarhan, Bora MA65
Tarr, Peri MA66, WA20
Tarun, Prashant TD13
Tarverdyan, Ruzanna SB01
Tas, Duygu SA58
Taseli, Aysun
Taskin, Selda SB44
Taskin, Zeki Caner TB34, WA38, WB46
Taslim, Cenny TC42
Tasora, Alessandro WA40
Tate, Derrick WB11
Tauvel, Claire TB50
Tavares, Gabriel SC38, SD50, MA14
Tawarmalani, Mohit SD42, MA22, WA26
Tayi, Giri SC02
Taylor Jr, Henry Louis TB32
Taylor, Christine TC58
Taylor, G. Don TD64
Taylor, Richard MC15, TA15
Taylor, Terry SC45
Taymaz, Imdat MD22
Tayur, Sridhar MA49, TB46, TD46
Tayur, Sridhar WD59
Teale, David SC32
Tebbens, Duintjer SC20
Teich, Jeffrey WC06
Tekiner, Hatice SA10, SB18
Tekin, Eylem TB45, WD42
Telang, Rahul MA54, MD01, WC51
Temel, Melih WB03
Temiyasathit, Chivalai SA12
Teneketzis, Demosthenis TD59
Teng, Suyan SC49
Teng, Yu WD31
Teodorovic, Dusan WA63
Tepel, Richard WC30
Tereyagoglu, Necati TD62
Terlaky, Tamas SB24, TC40, WC40
Terwiesch, Christian SC08, SC41, MB16, MC34, MC48, TA41, TD15, TD45
Tesfatsion, Leigh TD11
Testik, Murat Caner MC44
Tetzloff, Isaac WC57
Tezcan, Tolga SA27, MB23, MD16, TC23
Thapalia, Biju Kumar MB40
Thapa, Mukund TC03
Theisen, Kacie SB31
Theofanis, Sotiris SA64, SB56, WC24
Theokary, Carol MB16
Thiele, Aurelie SA24, SC53, TB59, WA62
Third, Noah TD18
Thirumalai, Sriram WB21
Thistlethwaite, J. Richard SB33
Thomas III, Joseph IS-T
Thomas, Barrett TA56, TD63
Thomas, Bex TB31
Thomas, Doug SA40, SD45, WD16
Thomas, Douglas MA11
Thomas, Lyn SD53
Thomas, Ted MC30
Thomas, Valerie MC46
Thompson, Adam MB33
Thompson, Charles TC48
Thompson, Craig TB33
Thompson, David R.M. TD06, WB06
Thompson, Gary MD15
Thompson, Kimberly M. SC20
Thompson, Steven SC15
Thompson, Terrance SC64
Thompson, Terry TA57, TD58, WB31, WC57
Thore, Sten SB01
Thorp, Katie TC09, TC09
Thota, Sweta SA45
Tian, Chunhua TC15, WB56, WC12
Tian, Jun SA02
Tian, Yamei SD13
Tian, Zhigang (Will) SB18
Tian, Zhong Jun WD43
Tibben-Lembke, Ronald WA37, WC34
Tichenor, Charley WD51
Tiedemann, Peter SD22
Tien, Shin-Lai MC58, TD57
Tilson, David TB21
Tilson, Vera MD33, TB21, TB44
Timmer, Douglas TA17
Tinsley, Cathy SB03
Tipi, Horia SD50
Tirat-Gefen, Yosef IS-T
Tirupati, Devanath WD01
Tits, Andre TC40
Tiwana, Amrit SC66
Tiwari, Alok TD40
Tjader, Youxu WA67
Todd, Michael J. TC26, TC50
Tofts, Chris MC15, TA15
Toh, Kim-Chuan TC26
Toint, Philippe L. TC05
Tokar-Erdermir, Elif MA67, WA63
Tokdar, Surya MC45
Tokou, Helene TD50
Toktay, Beril MC46
Toledo, Bejamìn WB60
Tolentino-PeÒa, Radhamés TA49
Tomala, Tristan WB05
Tomanos, Dimitri TC05
Tomasgard, Asgeir WA42, WB11, WD36, WD55
Tomberlin, David WA11
Tomecek, Pascal WD62
Tomlin, Brian MA44
Tomlin, John SC25, MC62
Tong, Dehui SA08, TC67
Ton, Zeynep SC46, SD08
Topaloglu, Huseyin SA59, SB23, SC47, SD62, MB28, MB28, MC28, TA28
Topcu, Ilker WC14
Toptal, Aysegul IS-M, TC62
Torkki, Paulus WC47
Torres-Garcia, Wandaliz WD12
Torres, Jacob SD54, MB54, MC54
Torres, Marcelo TC55
Toso, Eli WD67
Toth, Paolo TD28, WA25
Toth, Sandor SB11, SC11
Toubia, Olivier SC68, SD41
Tourillon, Dominique MB58
Tovey, Craig WB37
Townsend, Janell D. MD68
Towsley, Don TC23
Toyasaki, Fuminori WC05
Toy, Ayhan Ozgur WD67
Tracey, Graham SA32
Tragler, Gernot MA34
Tramontani, Andrea TD28
Transchel, Sandra TD32
Tran, Thuhang MB15
Tran, Tuan MA31
Trapp, Andrew WC50
Trapp, Natalya TD46
Trevino, Gerardo MA38
Triantis, Kostas MC62
Tripathy, Anshuman SA41
Trivedi, Minakshi MC68
Trkman, Peter SA54, TC44
Troland, Ole Christian SC10
Troyer, Kevin WD25
Trusov, Michael SD68
Tsai, Chih-Yang WA16
Tsai, Pei-Fang TD16
Tsai, Yi-Chun TA65
Tseng, Shu-Mei SD13
Tsitsiklis, John SC28, MA45, TB47, TD05, WB42
Tsoutis, Tom TB30
Tstelin, Ilia SA20
Tsui, Kwok-Leung SA12, MA09, MA34, MC17
Tsung, Fugee SB15, SB17, SD15, TA09, WB17
Tsurkov, Vladimir IS-T
Tu, Yiliu (Paul) SA31
Tucker, Anita SA48, SC54, WD33
Tumlinson, Justin WB20
Tunasar, Cenk IS-T
Tunca, Tunay WB08
Tuncel, Altug SA12
Tunc, Huseyin WA32
Tural, Mustafa MA38, MD38
Turan, Fikret K. SD52
Turbelin, Clément MA09
Turcic, Danko MC08
Turcotte, David SB01
Turkay, Metin MD42
Turkcan, Ayten MA33
Turko, Timofey TA53
Turner, Jeanine SA02
Turner, John WD59
Turner, Jonathan MB56
Turner, Thomas SC31
Türsel Eliiyi, Deniz
Tursun, Deniz WA11
Tursun, Umit MC63, WD06
Turton, Michael TC68
Tustin, Jeff MA30
Tutuncu, Reha TC26
Tuv, Eugene SC09
Tuzhilin, Alexander SD12, MC37
Tuzun Aksu, Dilek SA58
Twilley, Robert R. MB20
Tyagi, Rajesh WC15
Tyagi, Rajesh TC16
Tyldesley, Scott MB47, TB34
Tzur, Michal SB19

U

Ucar, Hatice WC44
Uchoa, Eduardo SA28, MA50, WD61
Uckun, Canan SC28, TB62
Uggen, Kristin WD55
Ugray, Zsolt SC42
Uhan, Nelson SB39, SB50
Uichanco, Joline SB40
Ukkusuri, Satish SC61, MD64, TB63, WC63
Ulengin, Fusun WD20
Ulku, Muhammed Ali MB56
Ulrich, Karl SC41
Ulu, Canan MC20
Ulusal, Elif SD38, MB42
Ulusoy, Gunduz SD18
Ume, Charles MC18
Umyarov, Akhmed SD12
Uney Yuksektepe, Fadime MD42
Ungar, Lyle SC12
Unlu, Yasin TB33
Unnikrishnan, Avinash MC64, MD64, TA64, WC63
Urban, Tim SD65
Urban, Timothy TD15
Uribe, Andres TD47
Uribe, Lyzett WC33, WC33
Ursulenko, Oleksii MA42
Uryasev, Stan TA53, TB08, WA29
Usher, John SB18
Usowicz, Thad IS-M
Uster, Halit SA52, MA52, MA57, MB55, MD32, MD67
Uthman, Basim WA13, WB09
Utkan, Fehime WD36
Utschig, Tris WC35
Uygur, Alper WA67
Uzsoy, Reha TB45, TD67
Uzunangelov, Vladislav TD34
Uzun, Evin SA47

V

Vaidyanathan, Bala SA54
Vaidyanathan, Ramnath MA16, MB46, TA16
Vaidya, Naveen WB34
Vairaktarakis, George SB08, MA35, MB35, TA46, WB54
Vakhutinsky, Andrew TC55
Valascho, Daniel WB30
Valdes, Leon TA08
Valdivia, Juan Alejandro WB60
Valente, Christian SA14
Valenzuela, Jorge SD10
Valero, Camilo SA64
Valetto, Giuseppe WB20
Valian, Haleh MC53
Valimaki, Juuso WB06
Vallario, Robert TB11
Valles-Rosales, Delia SA42
van Ackere, Ann WB22
Van Alstine, Lizzy TD68
van de Vrande, Vareska MA48
van de Velde, Steef IS-M
van Delft, Christian TD32
van den Berg, Ewout WD40
van Den Briel, Menkes SD22
van den Heuvel, Wilco TD07
van der Heijden, Matthieu SC16
van der Rhee, Bo WD01
van der Wal, Jan TD33
van der Weij, Wemke WD54
Van Dijk, Nico TD33
Van Dinther, Clemens WA64, WD28
Van Duyne, Richard TA33
Van Dyke, Carl MB60
van Dyken, Jennifer MA67
Van Eikema Hommes, Qi WC48
Van Hoeve, Willem-Jan SC22, WC28
van Houtum, Geert-Jan TD46
Van Mieghem, Jan SC23, MB23
Van Ooijen, Henny WB54
Van Orden, Joseph WD01
van Oyen, Mark SA46, TB45, TC18, TD59
van Roy, Benjamin SD28, SD59, MA25, MA28
van Ryzin, Garrett SB60, MA45, MC59, TB28, WB08
van Stralen, Joost TD10
van Wassenhove, Luk SD48, WA08, WA52
van Woensel, Tom TB61
Vanajakumari, Manoj TA46
Vandaele, Nico SD21
Vande Vate, John H. WA52
Vanderbei, Robert MD24
Vane III, Russell R MC19, TD31
Vannelli, Anthony WD26
Vannoy, Sandra WB51
Varadarajan, Uday TB11
Vardaman, James TC04
Vargas, Luis G. MC33
Vargo, Erik WD58
Vasantharajan, Sriram SB25
Vassilacopoulos, George TB21
Vatsavai, Raju MD12
Vazacopoulos, Alkis SD50
Vazirani, Vijay SD39
Vazquez, Miguel WA10
Veatch, Michael MB28, TA65
Veeraraghavan, Senthil SC59, MA16, TA16, TB22, TD44, TD62, WB23
Vega, Ricardo MB11
Veinott, Jr., Arthur TB03
Veit, Daniel TD11
Vela, Adan TC58
Velasquez, Jesus SA64
Velenyi, Edit TD52, TD52
Veloso, Francisco MA48, MC39
Vengazhiyil, Roshan Josep MC17, TD17, WA17, WB17
Venkatachalapathi, N. SB09
Venkatasubramanian, Venkat SD44
Venkatraman, Srinivasan SD19
Ventura, Jose SA28
Vera, Jorge SD11, WC40
Vera, Juan SA38, WA05
Verbeke, Alain SC56
Verdini, William TA18
Veremyev, Alex TA53
Vergara, Frances TA67
Vergu, Elisabeta MA09
Verma, Dr. Rakesh SB43, WC11
Verma, Manish WB61
Verma, Piyush TB65
Verma, Rohit MA45, MD15
Vernik, Dinah MA68
Verter, Vedat MB47, MC67, WB61
Vialatte, Francois WC33
Vidal, Dider MD14
Vidic, Natasa TD65
Vieira Junior, Hélcio WA03
Vielma, Juan Pablo SC11, MA50, MB38
Vigerske, Stefan SC26, MB24
Viggiano, Elizabeth TB19
Vigil, Pilar MA14
Vila-Parrish, Ana MC45, TD33
Vilim, Petr MB22
Villalobos, Jorge MB61, TB64, WB60
Villalobos, Rene WD28
Villarreal, Bernardo WD45
Villarreal, Marìa Guadalupe WD44
Villas-Boas, Sofia SB68
Villaveces, José Luis WB29
Villegas Ramirez, Juan Guillermo WB29
Vinh Doan, Xuan SB28
Virdhagriswaran, Sankar TB15
Virine, Lev WC20
Virtanen, Kai MC19, WA03, WB19
Visoldilokpun, Siriwat MD50
Viswanathan, Siva SD68, TD51
Vlachou, Kleoniki MC58, WA57
Vlassis, Nikos SA25
Vliegen, Ingrid TC22, TD46
Vogel, Ulrich WC25
Vohra, Rakesh WB39
Von Hirschhausen, Christian MD10
von Krogh, Georg WA48
von Winterfeldt, Detluf SC20
Vossen, Thomas SD22, WD67
Voss, Stefan SA55, SD55, TD25, WB14
Vozdolska, Ralitza R. WB20
Vragov, Roumen SD02, MD53
Vulcano, Gustavo SA59, SB59, MC59, MD59

W

Wadalawala, Shehzad MD06
Wadecki, Adam TA44
Waechter, Andreas WA26
Wagman, Liad WB06
Wagner, Janet IS-T
Wagner, Joachim MB34
Wagner, Michael SC07
Wagneur, Edouard TA46
Wagstrom, Patrick SD66
Waguespack, David MA41
Wakolbinger, Tina MA01, WC05
Walczak, Darius SC28, WB62
Walden, Eric MD53
Waldfogel, Joel MB02
Walker, Cedric WC55
Walker, Russell SD53
Wallace, Stein W. MB40, MC63, TC64
Wallenius, Hannele WC06
Wallenius, Jyrki TC20, WC06
Waller, S. Travis SC61
Waller, Travis MC61, MC64, MD64, TA64, TB63, WA61, WC63
Wallin, Cynthia SC08
Wallin, Martin WA48
Walls, Lesley TB18
Wallsten, Thomas TB20
Walsh, John MC39
Walsh, Joseph TA33
Walsh, Susan SD36
Walther, Grit MA52, MC52
Wambach, Achim SA07
Wan, Hong MB18, MD17, TB49, WA17
Wan, Xiangwei MA53
Wang, Chen TC20
Wang, Chung-Hsiao SC53
Wang, Chung-Jui TB08
Wang, Danyi MD58
Wang, Haibo TB25
Wang, Haifeng MA62
Wang, Haixun MD49
Wang, Haiyan MA07
Wang, Haonan IS-T
Wang, Honggang WC49
Wang, Hongye IS-T
Wang, Hsueh-Ming IS-T
Wang, Hui WB44
Wang, Hui MB27, TA23
Wang, I-Chen WD45
Wang, Jiahui MD56
Wang, Jiamin SB67
Wang, Jianfeng SC64
Wang, Jianrui TC49
Wang, Jing MB13
Wang, Jingbo SA67
Wang, Juan SC64
Wang, Kaibo SB17, SD17, WB17
Wang, Lei TB46
Wang, Lei SD39
Wang, Letian WA08
Wang, Liangyan SD19
Wang, Lijuan SA56
Wang, Lili WC57, WD57
Wang, Lizhi SD10, MD52, WC50, WD21
Wang, Marshal SA38
Wang, Min MC34
Wang, Poshun TD04
Wang, Qiang WB59
Wang, Qilu SC18
Wang, Qinhua SC65
Wang, Qiong TB68, WC45
Wang, Shanshan TA07
Wang, Shengyong WA33
Wang, Shouqiang WD47
Wang, Sijian TC13
Wang, Siqun WA43
Wang, Ta-Wei MD51
Wang, Tianyang MC09
Wang, Tong WD16
Wang, Tung-Sheng TC68
Wang, Wei SC65, WA18, WD63
Wang, Wei SA40

Wang, Wei SC42
Wang, Wei WB13
Wang, Wen-Ya SC33
Wang, Xianzhi TD05
Wang, Xiao WB61
Wang, Xiaodong WB10
Wang, Xin SB08
Wang, Xin SD07, TA06
Wang, Xiong WB18
Wang, Xiongzhi SA42
Wang, Yan MA63
Wang, Yimin MA44, TA45
Wang, Ying SC62
Wang, Yitong SD19
Wang, Yu WD20
Wang, Yulan MB44, WC45
Wang, Yunzeng MC01, TC46
Wang, Yunzeng WA46
Wang, Yuqiang SA31
Wang, Zheng MB63, WD18
Wang, Zhong-Xian IS-T
Wang, Ziping TD60
Wang, Zizhuo WC46
Wanke, Craig TC58
Wan, Zhixi TA44, TB06
Ward, Amy SC27, MD16
Wardell III, Clarence WC05
Warden, Clyde TC68
Ward, Julie MA62
Ware, Keith WA66
Warsing, Donald TD67
Wasil, Ed MD19
Wasil, Edward TC21
Wasserkrug, Segev WA65
Watson, Jean-Paul SA26, SB26, TA50
Weaver, Sherry MC33
Weaver, Sherry TC66
Webb, William MD38
Weber, Bruce MA02, MD53
Weber, Charles SD48
Weber, Théophane WC33
Webster, Scott TD65
Wedel, Michel SC68
Weerasinghe, Ananda MD52
Wegener, Dorothea WA42
Wegryn, Glenn MD43
Weidlich, Anke TD11
Weigel, Annalisa TC04
Wei, Mingcheng WB16
Wein, Anne WB52
Wein, Lawrence M. Morse Lecture- T
Weintraub, Andres SC11, MB11
Weintraub, Benjamin WB17
Weintraub, Gabriel SC28, SD16, MA28, TD45
Weishaeupl, Monika MC43
Weiss, Armand TD31
Weissman, Sarah SB19
Wei, Ying WC42
Weldegiorgis, Yohannes SA56
Wellington, John F IS-T
Wells, Michael SB64, WA58
Wen, Aihong WB62
Wendel, Eric WC55
Wendell, Richard WC31
Weng, Shao-Jen TA18
Wen, Ue-Pyng SA34
Wen, Zaiwen Wen WA01
Werners, Brigitte SC63
Wernz, Christian WC05
West, David TC33
West, Michael SC64
Westbrooks, Kelly MC42
Westervelt, James SB11
Westwick, David TC10
Wettergren, Thomas WC34
Wexler, Tom MA39
Weyant, John TA11, TB02
Whang, Seungjin WB36
Whinston, Andrew SD02, SD51, SD68, MD01, WD31
Whitaker, Jonathan WA36
White, III, Chelsea C. MD63
White, Alan TC33
White, Denise SC33
White, K Preston TA49
White, Kevin WA51
White, Leroy TC43
White, Sheneeta TA18, WC15
Whitelaw, Casey SC12
Whitman, Peter MB10
Whitt, Ward SA23, SA27, SA53, SC21, SD21, MC16, WD53
Widdis, Dan MB30
Wiegele, Angelika SA38
Wieland, Dr. Frederick WB58
Wieland, Fred WC55
Wierman, Adam MC55, TB22
Wilck, Joseph WC25
Wilcox, Steven WD04
Wiley, James WA17
Wiley, Mark MC14
Wiley-Patton, Sonja WB33
Wilhelm, Wilbert TD38
Willemain, Thomas MA49
Willems, Sean P. MB32
Williams, Clay MA66, WA20, WB20
Williams, Damon SA46
Williams, Gerald TD18
Williams, Jonathan SB57, MD08
Williamson, Derek MA30
Willis, Henry SD03
Willis, John MC30
Wilmer, COL, USA, Michael WA31
Wilson, George WA67
Wilson, Ira TD33
Wilson, James SC17, SD49, MA49
Wilson, John TB60
Windle, Robert SB57
Winkelkotte, Tobias MA46
Winkler, Robert L. SA20, TD19
Winternitz, Luke TC40
Wirojanagud, Pornsarun TC65
Wirth, Andrew TD22
Wojtaszek, Daniel SD50
Wolcott, Michael MC32
Wolf, David TD13
Wolfers, Justin WC39
Wolpert, Robert SA01
Wolsey, Laurence WB38
Wolter, Kati SC50, SD22, MA24
Wong, Hartanto WC41
Wong, K.F. WD51
Wong, Sharon SC63
Woodaman, Ronald WB30
Woodard, Jason TB63
Wood, Bryan WC55
Wood, Kevin SA50, TA25, WB35
Woodruff, David SB25, TA50, WB14
Wood, Sam MA14
Woolley, Trisha TA63, TC61
Woon, Siew Fang SA10
Woosley, John WB33
Wooten, Russell TD31
Word, Jonathan MC20
Wortman, Martin MA18
Wortz, Jeremy WD13
Wright, Christopher TD62
Wright, Linda TA49
Wright, Margaret TC03
Wu, Andy TB60
Wu, C. F. Jeff MC18
Wu, Chi-Cheng WB68
Wu, Chih-Hang WD08
Wu, Chuni SD13
Wu, Cindie TC35
Wu, Cindie WB47
Wu, Di MB05
Wu, Diana SA44
Wu, Harris MC12
Wu, Jiang IS-M
Wu, Kan WC22
Wu, Owen TA08
Wu, Paul S.H. TC68, WA68
Wu, S. David MA65, SB49
Wu, Shengnan SC50, TC61
Wu, Teresa TA18, WC12
Wu, Tsung-Lin SA09
Wu, Xianyi SB08
Wu, Yaozhong SA41, SD45
Wu, Yong SD56
Wu, Zhengping WA59, WB16
Wysk, Richard A. SA66, SC56, TC49

X

Xanthopoulos, Petros WA13, WA13, WB09
Xi, Minge WC37
Xia, Cathy SB23, TB22, TC23
Xia, Li SD21, TD49, WB18
Xia, Lirong WC05
Xia, Mu SD51
Xia, Nan SB07
Xia, Yu MB15
Xia, Yusen SA60, TC59, TD07, WA45
Xiang, Ling WD54
Xiao, Feng MC05
Xiao, Wenqiang SC45, TC54
Xiao, Yan TC21
Xie, Bin WC44
Xie, Chi WA61
Xie, Jingui WC22
Xie, Junyi MD49
Xie, Kristine MD15
Xie, Lei SD46
Xie, Ming SD21, TD49, WB18
Xie, Qing SC18
Xie, Wei TA42
Xie, Wei MC28
Xie, Yanqing WD63
Xing, Dahai TC54
Xing, Ruben IS-T
Xing, Tao TA61
Xing, Wenxun WD18
Xiong, Hui SA67
Xiong, Jing MC58, MD58
Xiong, Wei SD47, WD47
Xiong, Zhihua WB18
Xiuli, He MB44
Xu, Feng MB09
Xu, Hong SD02
Xu, Huan SB40
Xu, Huiping IS-T
Xu, Jie MC41
Xu, Jinbo MC21
Xu, Jing Min SC15
Xu, Jinhui WD26
Xu, Kefeng SB57
Xu, Lu (Wendy) MD41
Xu, Mabel TD54
Xu, Shenghan SA43, WA16
Xu, Susan SC62, MC62, TC55, WA14
Xu, Xiaowei TB68
Xu, Yan MD26
Xu, Yaquan TB25
Xu, Yi WC08
Xu, Yi TA41
Xu, Zuobing SC12
Xue, Deyi SA31
Xuejing, Wu WB28
Xue, Liangjie MD25
Xue, Mei MB53
Xue, Min WD57
Xue, Zhengliang TD07

Y

Yadav, Prashant SA45, SB34, MC22, TC52, TD52, WC52, WC65
Yaesoubi, Reza SD34
Yagi, Kyoko SC10, WD53
Yahav, Inbal SA62, TB37, TC12, WA49, WD59
Yalabik, Baris WD21
Yamada, Yuji MA53
Yamanaka, Hideki MB15
Yamashita, Makoto TC26
Yamazaki, Kazutoshi MB13, WD23
Yan, Chung-Yih SA33
Yan, Houmin MA62
Yan, Keqi MD27
Yan, Shu WA53
Yan, Wenjuan WD53
Yan, Xiang SD59
Yan, Xinghao TC45, WB45
Yang, Catherine TA01
Yang, Chao-Lung IS-M
Yang, Fan MC05
Yang, Feng SC17
Yang, Fenghsu MC27

Yang, Hao TB22
Yang, Hong Suk SD29
Yang, Hui SB47, TD17, WC17
Yang, Jian SA60, TC59
Yang, Jian TC54
Yang, Jimmy MC62, SC25
Yang, Jun MD49
Yang, Kai IS-T
Yang, Kang-Hung MD56
Yang, Kum-Khiong MA62, TD65
Yang, Liu WD05
Yang, Nan TA07
Yang, Ning WB28
Yang, Qingyu SD17
Yang, Sanchieh Jay SD31
Yang, Sha WA06
Yang, Shitao TC54
Yang, Shu-Jung Sunny WB43
Yang, Song (Alex) MA08, MB08, TA59
Yang, Tyler TC31
Yang, Wei SD11
Yang, Xu WA66
Yang, Xu SC63
Yang, Yi TB49
Yang, Yingxia WC48
Yang, Yubao MA54
Yang, Zhibin MB08
Yang, Zhuo MC12
Yankovic, Natalia SA03, SD33
Yano, Candace SB44
Yao, David D. MD27
Yao, Tao MC08, TC01
Yao, Tao WB16
Yao, Vincent TC31
Yao, Zhishuang WB14
Yao, Zhuolun MD58
Yapicioglu, Haluk WC11
Yasai-Ardekani, Masoud MB09
Yashchin, Emmanuel WD23
Yassine, Ali MD07
Yates, Justin WB61
Yatsenko, Vitaliy WA13
Yauch, Charlene SB43
Yavuz, Mesut WB14
Yayla-Kullu, Muge MC07
Ye, Hengqing MD27
Ye, Nong WB09
Ye, Xugang WD38
Ye, Yinyu WC46
Ye, Yinyu SB40, TC01, TD56
Yelkenbicer, Alp Avni WC28
Yen, Ginger SC42
Yenigun, Husnu SA58
Yeniyurt, Sengun MD68
Yenson, Sarah TC57
Yetip, Nüket TA67
Yew, Bee IS-M
Yie, Ruben IS-T
Yih, Yuehwern MC65, WD55
Yildirim, Utku SC62, WC62
Yildiz, Hakan TC56
Yilmaz, Tuba TC34
Yim, Mark WB57
Yin, Dezhi MB51
Yin, Li TB32
Yin, Rui WA46
Yin, Shuya SB52
Yin, Wenjun SA13, SD21, TD49, WB18
Yin, Yafeng MA05, MB05, MC64
Yin, Yafeng MB13
Yin, Zigeng TD44
Ying, Fei WD49
Ying, Lei SC39, WC23
Yipeng, Liu TA51
Yokoo, Makoto WB06
Yolum, Pinar WD18
Yoo, Jin-Sung SD15
Yoo, John Jung-Woon SA28
Yoon, Donghun MD09
Yoon, Joon-Hui TA53
Yoon, Yoonjin WC56
Yoshise, Akiko WA40
Yoshizaki, Hugo TD25, WD28
You, Fengqi SC16
Young, Christina WC37
Young, James TC34
Young, Robert SB29
Youn, Jongwoun WB29
Yu, Dennis SA46, SB07
Yu, Haifeng WD61
Yu, Hsiu Ting TB20
Yu, Huizhen SA25
Yu, Jie TB67, WD56
Yu, Jing Rung WC67
Yu, Jiun-Yu WD47
Yu, Junfang SC21
Yu, Lian WC59
Yu, Man SA08
Yu, Philip S. MD49
Yu, Ru-Siou SA34
Yu, Wei WD01
Yu, Yimin TB07
Yu, Yugang WC64
Yue, Xiaohang TD42
Yuan, Ming SC13
Yue, Jinfeng MB15
Yuen, Ming WD62
Yuen-Reed, Gigi SA32, TC31
Yukish, Mike TD13
Yuksel-Ozkaya, Banu MC44
Yum, Bong-Jin IS-T
Yunes, Tallys TD46
Yung, Daniel TD45
Yunt, Mehmet WB26
Yushimito Del Valle, Wilfredo MD64

Z

Zaarour, Nizar TC56
Zabala, Paula SA59
Zabarankin, Michael WB67
Zabih, Ramin SC38
Zabinsky, Zelda SC31, SC42, SD23, WC18
Zach, Lorna WD52
Zadimoghaddam, Morteza MD39
Zafari, Babak WB54
Zakeri, Golbon MC11
Zanarini, Alessandro SC22
Zangeneh, Shabnam WB52
Zantek, Paul SB17
Zapata, Cheryl SD25
Zapata, Elizabeth WD49
Zarama Urdaneta, Roberto SA67, TC49, WB05, WB29, WB60, WD35
Zareipour, Hamid TC10
Zaric, Greg MD47, WD34
Zarkin, Gary SD34
Zarnich, Bob MA31
Zayas-Caban, Teresa MC57
Zayas-Castro, Jose SA09, SC34, MB34, WB47
Zecchina, Riccardo MB39
Zechman, Emily SD54, MB54, MC54
Zeevi, Assaf SB23, SC07, SD27, MC16, TA28, TB28, TB62, TC18
Zeid, Abe MD09
Zeigler, Bernard MB25
Zeiler, Irmgard SA03, MA34,
Zelikovsky, Alex MB21, MC42
Zeltyn, Sergey WA65
Zeng, Bo MA33, TA38, WA33
Zeng, Li WC17
Zenios, Stefanos SB33, TD33, TD45
Zenobia, Brent SD48
Zerom, Dawit TB21
Zhai, Shumin MD49
Zhang, Bin WB18
Zhang, Bo SA55
Zhang, Dan SA60, TD15
Zhang, Dongsong WA51
Zhang, Feng SC09
Zhang, Fuqiang MA16, MD46, WB45
Zhang, Guangming TA56
Zhang, Guoxing WA01, WD53
Zhang, Han MB51, WA51
Zhang, Hang SD17, WB09
Zhang, Hao TC13
Zhang, Hao WC08
Zhang, Hao TB67, WB56
Zhang, Hao MC47, WD33
Zhang, Hongbo TD49
Zhang, Hong-chao WB11
Zhang, Hongtao WC08, WD16
Zhang, Hongzhong IS-M
Zhang, Hui MD47
Zhang, Jan MA56
Zhang, Jiang TB44
Zhang, Jiawei TC45, WC46
Zhang, Jicong WA13, WB09
Zhang, Jicong WB09
Zhang, Jie TC41
Zhang, Jiheng MB26, TB23, TD23
Zhang, Jin WD06
Zhang, Jingyu MA47
Zhang, John MC02, WD31
Zhang, John TA41
Zhang, Julie TA51
Zhang, Jun MB53, WC08
Zhang, Jun SC43
Zhang, Kaifu SA07
Zhang, Kuilin WA25
Zhang, Lei (Oddo) SC47
Zhang, Lei SA61, MB05
Zhang, Lele TD22
Zhang, Li WB64, WC12
Zhang, Libin WC26
Zhang, Lihui MC64
Zhang, Lin WD24
Zhang, Liqing MC03
Zhang, Michael TD60
Zhang, Michael MC05
Zhang, Muhong MC38
Zhang, Nianbing MC22
Zhang, Qin MB68
Zhang, Qingyu TC54
Zhang, Ranran MC42
Zhang, Rui IS-M
Zhang, Shu TC12, WA06
Zhang, Shu TB37, WC13
Zhang, Shu WC54
Zhang, Shuzhong TC45, WC46
Zhang, Ti SA64
Zhang, Ting WC49
Zhang, Weini MC42
Zhang, Xi TD17
Zhang, Xin WC53
Zhang, Yang TA56
Zhang, Ying SD31
Zhang, Yu WA57, WB55
Zhang, Yuanlin MB22
Zhang, Yue MC67
Zhang, Zhaoning WC57, WD57
Zhang, Zhe George SB63, SC21
Zhao, Christy TA38
Zhao, Chuck TC23
Zhao, Hairong SB08
Zhao, Hui TC45, WA33, WB05, WB45
Zhao, Lei MB34
Zhao, Ming SD38, MA38, MB38, TA38
Zhao, Ning WB22
Zhao, Qianchuan SB49, SC49
Zhao, Wenhui WB07
Zhao, Wenjuan SD56
Zhao, Xia. TB51
Zhao, Xiaobo WC22
Zhao, Xuan SC48
Zhao, Xuying MC01, TB45
Zhao, Yao SC40, MB45, WC45
Zhao, Zhenying WB43
Zhdanov, Dmitry TB51
Zheltova, Ludmila SD09
Zheng, Hong WA61
Zheng, Ning SC13
Zheng, Pearl Q. MB20
Zheng, Qipeng Phil MA05
Zheng, Rong SD12
Zheng, Yanchong MD46
Zhong, Weiya TA46
Zhou, Deming WC68
Zhou, Enlu SD49
Zhou, Jia MA09
Zhou, Jianer WB42
Zhou, Jieyun WD10
Zhou, Jing WD68
Zhou, Junyi WB37
Zhou, Qiang SB17
Zhou, Rong TB15
Zhou, Ruoyi SB15, TA43, TB18
Zhou, Sean MC22, MD45, TD07, TD16
Zhou, Shiyu SB17, SC09, WA09, WC17, WD09
Zhou, Wenjun SA67
Zhou, Xian SB08
Zhou, Xuesong MC64, TA61
Zhou, Yilu TA12
Zhou, Yongpin MC16, MD16, TA45
Zhou, Zhi WD50

Zhou, Zhili MD56, TA38, TC38
Zhu, Endong WA60
Zhu, Ji TC13
Zhu, Kaijie MD02
Zhu, Kangyuan IS-M
Zhu, Mengxiao TC04
Zhu, Mu TC13
Zhu, Shanjiang WD63
Zhu, Wenge TA41
Zhu, Xiaowei (Linda) TD42
Zhu, Xiaowei WB44
Zhu, Xiaoyan WC54
Zhu, Yada TB17, WC37
Zhu, Yi-Rong SD42, WA50
Zhu, Yuntao WC37
Zhu, Yunxia MA51, WD51
Zhu Wansha, Adam WA59
Zhuang, Jun MD54
Zhuang, Pin MB43
Zhuang, Weifen TB60
Zinchenko, Yuriy TA47, TC40, WC40
Zipkin, Paul TA45
Zitzewitz, Eric WC39
Zivny, Stanislav SB22
Ziya, Serhan SA47, SB60, MA33, WB23
Znamensky, Andrei TD25
Zou, Changliang TA09
Zubair, Mohammed MC12
Zuidwijk, Rob SC52, TC54
Zuluaga, Luis WA05
Zwart, Bert TB23, TD23, WC22

Sunday, 8:00am - 9:30am

SA01 New Methods in Environmental and Economic Statistics
SA02 Technology Acceptance, Usage, and Firm Competitive Advantage
SA03 Threats to Life and Limb
SA07 Behavioral Issues in OM
SA08 Inventory and Capacity Topics
SA09 Joint Session QSR/HAS: Quality and Statistical Decision Making in Healthcare Applications I
SA10 Optimization in Power Systems
SA11 Forestry I: Wildfire Management
SA12 Joint Session DM/CS: Mining Highly Complicated Data Sets
SA13 Data Mining in Business Analysis
SA14 Software Demonstration
SA15 Empirical Foundations for Service Science
SA16 Supply Chain Optimization I
SA17 Recent Operations Research/Management Science Papers
SA18 Reliability I
SA19 Axiomatic Foundations of Risk Analysis
SA20 Decision Models and Multiple Attributes
SA21 2008 Dantzig Dissertation Award Finalists
SA22 Applied Probability
SA23 Many-Server Queueing Systems
SA24 Portfolio Management
SA25 Approximate Dynamic Programming
SA26 Open-Source Cutting Planes and Heuristics
SA27 Asymptotic Analysis of Queueing Systems and Applications
SA28 Integer Progamming Applications
SA29 Applying OR Techniques to Politics
SA30 Military Modeling, Operations Research, and Decision Analysis I
SA31 Flexible Manufacturing Systems
SA32 Public Sector Operations Research and Analytics
SA33 Strategic Planning in Healthcare I
SA34 Tools and Systems in Healthcare
SA35 Innovative Uses of Technology in the OR/MS Classroom
SA37 Tutorial: Retail Category Management and Assortment Planning
SA38 Progress in Models and Algorithms for Discrete Optimization Problems
SA39 Approximation Algorithms
SA40 Joint Session Optimization/Stochastic Programming /CS: Monte Carlo Sampling Strategies for Stochastic Optimization
SA41 Behavioral Issues in Management of Product Development Projects
SA42 Combinatorial Optimization
SA43 Inventory in Supply Chain Management
SA44 Behavioral Operations Models
SA45 Empirical Research in Environmental Operations
SA46 Flexible Capacity Investment Decisions under Demand Uncertainty
SA47 Stochastic Models in Health Care
SA48 Joint Session TMS/OS: KLIC: Team and Organizational Learning and Knowledge Management
SA49 Joint Session SIM/Financial Eng: Recent Advances in Financial Simulation
SA50 Network Robustness and Interdiction
SA51 Research Advances in the IT/IS and Service Science I
SA52 Reverse Supply Chain Design
SA53 Student Paper Competition
SA54 Decision-Making, Planning, and Organizational Behaviour
SA55 Joint Session TELCOM/CS: Network Design
SA56 Intelligent Transportation Systems
SA57 Airlines Competition Modeling and Analysis
SA58 Robust/Dynamic Optimization in Aviation
SA59 Revenue Management under Customer Choice Behavior
SA60 Competitive Models in Revenue Management
SA61 Network Pricing and Equilibria
SA62 Teaching Revenue Management: New Cases
SA63 Freight Transporation
SA64 Optimal Scheduling in Transportation
SA65 JFIG Paper Competition I
SA66 Modeling Systems and Languages
SA67 Data Mining I
SA68 The Wisdom of Crowds: Applications of Online Trading Markets in Marketing Research

Sunday, 11:00am -12:30pm

SB01 Joint Session Minority Issues/Location Analysis/PPP: Public-Sector Facility Location
SB02 Incentives and Contract Design in IS
SB03 Joint Session Homeland/Humanitarian: Hurricanes and Decision Makers
SB07 Product Line and Capacity Strategies
SB08 New Trends in Scheduling
SB09 QSR International Session
SB10 Pollution Control
SB11 Forestry II: Sustaining Urban Forests
SB12 Data Mining for Streaming and Networked Data
SB13 Panel Discussion: Challenges Facing Data & Text Miners in 2008 and Beyond
SB14 Software Demonstration
SB15 Panel Discussion: Services Definition and First Principles
SB16 Supply Chain Optimization II
SB17 Joint Session QSR/CS: Monitoring and Diagnosis of Complex Engineering Systems
SB18 Reliability II
SB19 Advances in Decision Support Systems I
SB20 Improving MCDA Practice
SB21 2008 Dantzig Dissertation Award Finalists
SB22 CP/OR Interface I
SB23 Revenue Management Applications
SB24 Numerical Optimization and Financial Applications
SB25 Making use of Multiple Solutions for MIPs
SB26 Optimization Frameworks
SB27 Heavy Traffic, Large Deviations and Power Laws
SB28 Robust Optimization and its Applications
SB29 Tutorial: Project MINDSET: High School Mathematics and Operations Research
SB30 Military Modeling, Operations Research, and Decision Analysis II
SB31 OR Applications in the Automotive Industry
SB32 Searching for Distressed Persons I
SB33 Health Policy Analysis
SB34 Joint Session HAS/Homeland/Humanitarian: Infectious Diseases and Humanitarian Crises
SB35 Improving Upon the Traditional OR Course
SB36 Sports Management
SB37 Tutorial: Solving Chance-Constrained Stochastic Programs
SB38 MIP Methodologies for Non-Convex Optimization
SB39 Approximation Schemes
SB40 Applications of Robust Optimization
SB41 Incentives in New Product Development
SB42 Computational Game Theory
SB43 Disruptions Mitigation
SB44 Supply Chain Decisions Under Risk
SB45 Managing Supply Chains of Perishable Goods
SB46 Selected Topics in Inventory Management - Algorithms and Structural Results
SB47 Joint Session Health Care/QSR: Optimization Tools for Improving Medical Diagnosis
SB48 Products, Processes and Innovation
SB49 Efficient Simulation and Optimization I
SB50 Advances in Network Programming

SB51 Research Advances in the IT/IS and Service Science II
SB52 Product Returns and Acquisition
SB53 Statistical Techniques in Financial Services
SB54 Joint Session OS/TM: Location
SB55 Joint Session TELCOM/CS: Network Facility Location Problems
SB56 Joint Session TSL/RM: Inland Ports and Container Terminals I
SB57 Airline Schedule Reliability
SB58 Joint Session AAP/Scheduling in Servive/Sloan: Robustness and Airline Planning - Lessons From and For the Airline Industry
SB59 Revenue Management with Incentives
SB60 Dynamic Pricing
SB61 Uncertainty and Infrastructure
SB62 Revenue Management and Pricing
SB63 Inventory Logistics
SB64 Joint Session TSL/AAS: Economic Analysis and Valuation Methods for Aviation
SB65 JFIG Paper Competition II
SB66 Processes and Policies
SB67 Location Models and Algorithms
SB68 Marketing Channels

Sunday, 1:30pm - 3:00pm

SC01 Joint Session Minority Issues/Optim: Clustering and Partitioning
SC02 Contemporary Issues in IT Infrastructure Design
SC03 New Challenges and Metrics in Homeland Security
SC07 New Perspectives in Inventory Management and Assortment Planning
SC08 Innovative Empirical Methodologies
SC09 IIE Transactions Sponsored Session
SC10 Real Options in the Energy Sector
SC11 Forestry III: Harvest Scheduling
SC12 Data and Text Mining: Theory and Practice
SC13 Joint Session DM/CS: Recent Advances in Data Mining and Machine Learning
SC14 Software Demonstration
SC15 Service Systems: Theory, Design, and Applications
SC16 Supply Chain Optimization III
SC17 Joint Session QSR/Simulation Society
SC18 Statistics and Quality Control
SC19 Decision Analysis and Strategy Development
SC20 DA Practice Award Finalists
SC21 Queueing Models I
SC22 Solution Counting
SC23 Joint Session AP/Minority Issues: Asymptotic Analysis of Stochastic Systems
SC24 Computational Issues in Mathematical Finance
SC25 Computational Advertising
SC26 Using COIN-OR via GAMS
SC27 Stability, Approximation, and Control of Queueing Systems
SC28 Dynamic Optimization for Revenue Management
SC30 Search and Detection
SC31 Defense Logistics
SC32 Use of Simulation Modeling in the U.S. Federal Tax Administration and Analysis
SC33 Healthcare Flow: Uncertainty In Clinics
SC34 Planning and Scheduling Issues in Primary Care
SC35 Ninth Annual INFORMS Case Competition - Finalists #1 and #2
SC36 O.R. in SpORts
SC37 Tutorial: Using Operations Research to Reduce Delays for Health Care
SC38 Pseudo-Boolean Optimization in Memory of Peter L. Hammer
SC39 Incentives and Networks
SC40 Risk-Averse Optimization
SC41 Empirical and Experimental Research on Managing Innovation
SC42 Advances in Global Optimization
SC43 Effective Supply Chain Design Under Disruptions
SC44 Disruptions Modeling
SC45 Cooperation, Competition and Supply Chain Contracts
SC46 Retail Supply Chain Management I
SC47 Emergency Services
SC48 Entrepreneurship and Decision Making
SC49 Efficient Simulation and Optimization II
SC50 Computational Optimization Theory and Software
SC51 Empirical Investigations in Electronic Commerce
SC52 The Impacts of Environmental Legislation
SC53 Investment and Hedging Strategies
SC54 Joint Session OS/TM: Learning and Performance
SC55 Joint Session TELCOM/CS: Network Design Issues
SC56 Inland Ports and Container Terminals II
SC57 Nicholson Student Paper Prize Competition I
SC58 Aircraft Scheduling
SC59 Intersection of Queueing/Service Systems with Revenue Management
SC60 Panel Discussion: Rails to the Capital Presentations
SC61 Dynamic Traffic Assignment Models and Algorithms
SC62 Forecasting Applications
SC63 Logistics and Distribution
SC64 Joint Session TSL/AAS: Airport Arrival and Departure Management
SC65 Service Industry I
SC66 IT Valuation and Portfolio Management
SC67 Uncertainty and Flexibility in Facility Location
SC68 Technologies and Advanced Methods for Explaining and Predicting Choices and Preferences

Sunday, 4:30pm - 6:00pm

SD01 Joint Session WORMS/To The Memory of Richard Rosenthal: An Interactive Panel/Mentoring Session in Honor of Rick Rosenthal
SD02 Information Systems
SD03 Risk and Decision Analysis Studies at the USC-DHS Center for Risk and Economic Analysis of Terrorist Events (CREATE)
SD07 Utilizing Secondary Empirical Data in Operations and Supply Chain Management
SD08 Managing Retail Operations
SD09 Quality, Statistics and Reliability in Naval Research Logistics
SD10 Electricity Market Prices, Uncertainty and Risk
SD11 Forestry IV: Harvest Systems
SD12 Recommender Systems and Personalization
SD13 Data and Text Mining Applications in Finance, CRM and Security
SD14 Software Demonstration
SD15 Service Quality
SD16 Service Operations Economics
SD17 Advanced Multivariate Statistical Process Monitoring
SD18 Quality Management
SD19 Decisions and Risk Perceptions Involving Ambiguity, Health, Safety, and Savings
SD20 Flexibility and Uncertainty in R&D
SD21 Queueing Models II
SD22 Hybrid Methods
SD23 Joint Session AP/ Simulation: Analysis of Simulation
SD24 Joint Session CS/INFORM-ED: Recommendations of the INFORMS Computing Society Education Committee
SD25 Computing in Biomedical Applications
SD26 Open Optimization Modeling Systems
SD27 Queueing Models: Some Asymptotics Insights
SD28 Dynamic Optimization for Finance Applications
SD29 Industry Application in Korea
SD30 Human Network Analysis: Social Networks in Systems of Systems

SD31 OR, Simulation, and Information Fusion Applied to Cyber Security
SD32 Challenges and Opportunities in Modeling and Optimization for Healthcare Delivery
SD33 Healthcare Flow: Uncertainty In Hospitals
SD34 Healthcare Applications for Decision-Makers
SD35 Ninth Annual INFORMS Case Competition - Finalists #3 and #4
SD36 Software Demonstration
SD37 Tutorial: Total Quality Management to Operational Risk in Manufacturing and Service
SD38 Advances in Discrete Optimization
SD39 The Computation of Equilibria in Markets and Games
SD40 Joint Session Optimization/Stochastic Programming /CS: Algorithms for Stochastic Integer Programming
SD41 Four Perspectives on Innovation Strategy
SD42 Convexification in Global Optimization
SD43 Information Sharing and Disruptions Management
SD44 Robust Supply Chain Design Under Disruptions
SD45 Social Preferences in Supply Chains
SD46 Retail Supply Chain Management II
SD47 Quantitative Models for Healthcare Emergency Preparedness
SD48 Joint Session TMS/OS: KLIC: Influence of Structure (Team, Goals, and Technology) on Learning
SD49 Efficient Simulation and Optimization III
SD50 New Heuristics in MIP
SD51 Social Network
SD52 Case Studies in Closed-Loop Supply Chains
SD53 Consumer Lending and Credit Risks
SD54 Evolutionary Computation for Managing Infrastructure Risk
SD55 Joint Session TELCOM/CS: Routing in Telecommunications
SD56 Inland Ports and Container Terminals III
SD57 Nicholson Student Paper Prize Competition, II
SD58 Panel Discussion: An Uncertain Future: Where Will Fuel Prices Go and How Can OR Help the Airline Industry Respond?
SD59 Reputation and Recommendation Systems
SD60 Rails to the Capital Discussion
SD61 Uncertainty and Traveler Information in Traffic Networks
SD62 Cargo Revenue Management
SD63 Logistics with Technology or Ergonomics
SD64 Joint Session TSL/AAS: Integer Programming Models for Novel Airline Scheduling Problems
SD65 Service Industry II
SD66 Teams and Socio-Technical Dynamics
SD67 Network Location
SD68 Internet Search and Advertising

Monday, 8:00am - 9:30am

MA01 INFORMS - Opportunities to Shape the Future (Panel Discussion)
MA02 Empirical Research in Information Systems & Economics
MA03 Joint Session Homeland/Humanitarian: Preparedness for Pandemic Influenza
MA05 Methods and Models for Congestion Pricing I
MA06 Auctions Theory - Moving Forward: In Honor of Mike Rothkopf
MA07 Models of Strategic Customers
MA08 Finance-Operations Management Interfaces
MA09 Joint Session QSR/CS: Statistical Monitoring for Healthcare Quality
MA10 Managing Risk in Competitive Electricity Markets
MA11 Forestry V: Wildfire and Pest Management
MA12 Predictive Modeling for Business Intelligence
MA13 Joint Session DM/CS: Data Mining Methods and Applications
MA14 Software Demonstration
MA15 Panel Discussion: Service Science Curriculum Development Responding to Educational Goals and Field Demands
MA16 Information Asymmetry and Customer Behavior
MA17 Joint Session QSR/DM: Statistical Data Mining Techniques for Process Monitoring
MA18 Joint Session QSR/CS: Decision Theoretic Approaches for Quality and Reliability Assessment
MA19 Building Decision Analysis Approaches at FDA
MA20 Joint Session DA/ENRE: Green Decision Analysis
MA21 Joint Session Computational Biology/CS: Optimization Problems in Complex Biological Systems
MA22 CP/OR interface II
MA23 The Applied Probability Society Markov Lecture
MA24 Joint Session CS/ Optimization/Discrete Optimization: Cutting Planes
MA25 Computational Intelligence in Financial and Prediction Markets
MA26 Open Source Trends
MA27 Applied Probability and Optimization in Wireless Sensor Networks
MA28 Dynamic Oligopoly Models
MA29 NSF Grants - The Inside Scoop
MA30 Defense Supply Chain Analysis I
MA31 Activity Detection for Counter Insurgency / Counter Terrorism
MA32 Daniel H. Wagner Prize Competition
MA33 Capacity Planning and Scheduling in Health Care
MA34 OR, Infectious Diseases, and Public Policy
MA35 Panel Discussion: Teaching Modern Project Management - Tactical Issues
MA37 Tutorial: Optimal Learning
MA38 Methods in Integer Programming
MA39 Algorithmic and Economic Aspects of Social Networks
MA40 Stochastic Optimization of Inventory Management, Revenue Management and Healthcare Management
MA41 Innovation Networks
MA42 Global Optimization Problems Arising in Networks and Graphs
MA43 Mitigating the Risk of Outsourcing
MA44 Risk Management in Supply Chain
MA45 Topics on Sales Channel and Supplier Management
MA46 Supply Chain Execution by Integrated Optimization-Negotiation Approaches
MA47 Cost-Effectiveness of Healthcare Interventions
MA48 KLIC: Origin, Diffusion and Management of Knowledge for Competitive Advantage
MA49 Using Simulation for Solving Difficult Problems
MA50 Computational Integer Programming I
MA51 Diffusion in Social Networks
MA52 Remanufacturing Operations
MA53 Advances in Finance Engineering
MA54 Models for Managing Cybersecurity Risk
MA55 Joint Session TELCOM/CS: Telecommunications Network Design
MA56 Maritime Transportation & Routing
MA57 Green Supply Chain Management
MA58 Topics in Aviation OR
MA59 Pricing and Learning in Competitive Networks
MA60 Student Rail Research Paper Contest
MA61 Transportation Network Vulnerability and Performance Assessment
MA62 Pricing for Goods and Services
MA63 Material Handling in Wafer Fabrication
MA64 Joint Session TSL/AAS: Optimization Models for Enroute Air Traffic
MA65 Strategic Planning
MA66 Architecture and Governance
MA67 Location Models
MA68 Issues in Customer Relationship Management

Monday, 11:00am - 12:30pm

MB01 Equilibria in eBusiness
MB02 Joint Session IS/CS:Digital Goods and Markets: Emerging Models and New Frontiers II
MB03 Current Research in Homeland Security and Counterterrorism: Reports from the Daniel Rose Technion-Yale Initiative and the NPS-JIEDDO Program
MB05 Methods and Models for Congestion Pricing II
MB06 Mike Rothkopf's Influence on Research in Auctions and Beyond
MB07 MSOM Fellows Presentation
MB08 Game Theory Applications to the Interface between Finance, Operations, and Risk Management
MB09 Bayesian Reliability Modeling and Uncertainty Analysis
MB10 Energy Security and Risk Management
MB11 Applications of Operations Research in the Mining Industry
MB12 Novel Methodologies for Capturing and using Data to Model and Measure Behavior
MB13 Bayesian Approaches in Data Mining
MB14 Software Demonstration
MB15 Measurement and Metrics in Service Science
MB16 Manufacturing
MB17 Novel Quality Control Strategies to Improve Process Efficiency
MB18 QSR Best Student Paper Award Session
MB19 Panel Discussion: Portfolio Decision Analysis
MB20 Environmental Decision Analysis
MB21 Joint Session Computational Biology/CS: Population Genetics
MB22 Constraints and Search
MB23 Asymptotic Analysis of Queueing Systems
MB24 Recent Advances in Integer Programming
MB25 AI and Computing in Counterterrorism
MB26 Research Projects That Use Open Source Software
MB27 Algorithmic Large Deviations and Sharp Approximations
MB28 Approximate Dynamic Programming Applications
MB29 Communicating Your Research to the News Media
MB30 Defense Supply Chain Analysis II
MB31 Joint Session Practice/MAS: Force Management/Personnel Readiness
MB32 Daniel H. Wagner Prize Competition
MB33 Optimization in Healthcare and Medicine
MB34 Applications in Disease Management
MB35 Panel Discussion: Teaching Modern Project Management - Strategic Issues
MB37 Tutorial: Is It Really Safe to Fly?
MB38 Mixed-integer Programming: Strong Formulations and Cuts
MB39 Message-passing Algorithms and Network Optimizaiton
MB40 Stochastic Programming Models in Operations Management
MB41 Collaboration Challenges in NPD
MB42 Joint Session OPTIM/HAS: Medical Decision Making
MB43 Information Sharing for Managing Disruptions
MB44 Risk-Informed Pricing and Sourcing
MB45 Biopharmaceutical Supply Chain Optimization
MB46 Product Variety Management
MB47 OR Models for Disease Management
MB48 Service Innovation
MB49 Tutorial on Agent-based Modeling and Simulation
MB50 Computational Integer Programming II
MB51 Online Trust and Electronic Commerce
MB52 Pricing and Contracting in Closed-Loop Supply Chains
MB53 Banking Operations
MB54 Modeling of Interdependent Power and Networking Infrastructure Systems
MB55 Wireless Networking
MB56 Decision Making in Freight Transportation
MB57 Green Supply Chains and Operational Excellence
MB58 OR for Airlines at AD OPT
MB59 Revenue Management: Competition and Coordination
MB60 Generating & Evaluating Railroad Hazardous Materials Routings
MB61 Advances in Dynamic Network Problems
MB62 Behavioral Models in Pricing
MB63 Production and Manufacturing
MB64 Routing and Logistics
MB65 Recent Developments in Call Center Staff Planning and Scheduling
MB66 Real-time Algorithms for Plan Adaptation
MB67 Network Design Models
MB68 Retailing

Monday, 12:30pm - 1:30pm

Interactive Session

Monday, 1:30pm - 3:00pm

MC01 Purchasing Behavior and Competition in Online Retailing
MC02 Information Technology Evaluation, Impact, and Virtualization
MC03 Lot-size Problems in Inventory Management
MC05 Models and Methods for Congestion Pricing III
MC06 Auction Theory: In Honor of Mike Rothkopf
MC07 Product Variety Management
MC08 Real Option Applications in Operations Management
MC09 Joint Session QSR/CS: Decision Trees and Their Applications
MC10 Modeling Energy Markets at USDOE/FERC/USEPA
MC11 Joint Session ENRE/CS: Stochastic Optimization in Energy Systems
MC12 Web and Network Mining
MC13 Data Mining Competition I
MC14 Software Demonstration
MC15 Advances in Service Science
MC16 Advances in Call Center Workforce Management
MC17 Journal of Quality Technology
MC18 Joint Session QSR/CS: Recent Advances in Design, Analysis and Modeling of Computer Experiments
MC19 Game Theory and Decision Analysis: Alternative Approaches
MC20 Dynamic Programming Applications
MC21 Joint Session Computational Biology/CS: Protein Structure
MC22 Contracts and Policies in Supply Chain Management
MC23 Queueing Systems with Heavy Tails
MC24 Joint Session CS/ Optimization: Computational Integer Programming
MC25 Joint Session CS/TELCOM: Network Design and Optimization
MC26 Open-Source Solutions for Real-World Problems
MC27 Some New Developments in Markov Decision Processes and Approximate Dynamic Programming
MC28 Adaptive Inventory Control
MC29 Panel Discussion: The Industry Job Search
MC30 Modeling and Simulation - Assessing and Enhancing Capabilities
MC31 Navy Workforce Management
MC32 Daniel H. Wagner Prize Competition
MC33 Surgical Planning
MC34 Innovations in the Modeling of Health Care
MC35 Teaching Project Management and Management Science
MC37 Tutorial: Personalization and Recommender Systems
MC38 Discrete Optimization: Theory and Algorithms
MC39 KLIC: Knowledge Networks and the Emergence of New Technologies (Sloan Session)
MC40 Stochastic Dominance And Applications
MC41 New Product Development
MC42 Joint Session CS/HAS: OR Applications in Metabolic and Regulatory Networks
MC43 Disruptions Risks in Various Industries
MC44 Supply Chain Management of Perishable Items
MC45 Supply Chain Management
MC46 The After-Market Supply Chain

MC47 2008 Pierskalla Prize Finalists
MC48 Joint Session TMS/NPD: Discussion Panel: Meet the Editors and Ask Them Questions
MC49 Dynamic Data Driven Adaptive Multi-scale Simulation (DDDAMS)
MC50 Computational Integer Programming III
MC51 Joint Session IS/CS: Digital Goods and Markets: Emerging Models and New Frontiers I
MC52 Coordination in Closed-Loop Supply Chains
MC53 Optimal Trading and Portfolio Management
MC54 Modeling and Managing Security Risk for Complex Systems
MC55 Resource Allocation in Radio and Wireless Networks
MC56 Freight Transportation Models
MC57 Panel Discussion: Funding Opportunities from the Government Agencies
MC58 Joint Session AAS/TSL: Aviation System Performance Analysis I
MC59 New Frontiers in Pricing and Revenue Management
MC60 Railyard Simulation and Tools for Crew Assignments
MC61 Public Transit I
MC62 Revenue Management Applications
MC63 Transportation Logistics and Energy Supply Chain
MC64 Transportation Network Design
MC65 Joint Session Scheduling in SI/HAS: Scheduling in Health Care Delivery Systems
MC66 Dynamic Routing and Logistics under Real-Time ITS Information
MC67 Location and Allocation Analysis - Research and Industrial Applications
MC68 Optimal Advertising and Pricing for Information Goods

Monday, 4:30pm - 6:00pm

MD01 Peer-to-Peer Networks
MD02 Production Process in Supply Chain Management
MD03 Inventory Systems
MD05 Dynamic User Equilibrium
MD06 Energy Auctions: In Honor of Mike Rothkopf
MD07 On Timing in OM: Product Development, Supply Chain, and Product Allocation
MD08 Linkages Between Risk, Financial and Operational Performance
MD09 Joint Session QSR/CS: PHM, Sensors, RFID
MD10 Models and Methods in Energy Markets
MD11 Optimization Issues in Energy Systems
MD12 Applied Data Analysis and Optimization: Real Problems - Practical Solutions
MD13 Data Mining Competition II
MD14 Software Demonstration
MD15 Hospitality Services
MD16 Staffing and Routing in Call Centers
MD17 Design of Experiments: The Science and Art of Efficient Data Collection
MD18 Curriculum Development in QSR
MD19 Tutorial: Some Future Directions in Vehicle Routing Research
MD20 Decision Analysis Society Awards
MD21 Joint Session Computational Biology/CS: Sequence Analysis
MD22 Models and Application in Scheduling
MD23 Joint Session AP/Minority Issues: Queueing Systems
MD24 Computational Methods and Applications for Large-Scale Optimization Problems
MD25 Computational Decision and Behavioral Analysis
MD26 New Additions to Existing Projects in COIN-OR
MD27 Performance of Queueing Systems
MD28 Dynamic Revenue Management
MD29 Tutorial: Expressive Commerce and Its Application to Sourcing: Experiences from Conducting Over $40 Billion of Generalized Combinatorial Auctions
MD30 Modeling Military Systems
MD31 Searching for Distressed Persons II
MD32 Daniel H. Wagner Prize Competition
MD33 Matching Demand with Supply in Health Care
MD34 Applications of Markov Decision Processes (MDPs) in Healthcare
MD35 Teaching Project Management
MD37 Tutorial: Cooperative and Noncooperative Games for Capacity Planning and Scheduling
MD38 Integer Programming
MD39 Network Design
MD40 Stochastic Programming and Applications
MD41 Tools and Models for Product Development
MD42 Joint Session CS/HAS: Bioinformatics
MD43 OR and Strategy I
MD44 Risk Assessment
MD45 Inventory Management in Supply Chains
MD46 Information Sharing Models in Supply Chain Management
MD47 2008 Pierskalla Prize Finalists
MD48 Joint SessionTMS/NPD: TMS Distinguished Speaker: Carliss Baldwin (HBS)
MD49 Monte Carlo Methods in Information Management and Computer Interface Design
MD50 Computational Integer Programming IV
MD51 Policy Issues in Information Systems
MD52 New and Remanufactured Product Management
MD53 Trading & Technology in Markets
MD54 Joint Session Risk/DA/Homeland: Game Theory and Homeland Security
MD55 Security and Resilience in Telecommunications Networks
MD56 Freight Management
MD57 Panel Discussion: Early Career Tips for Tenure and Promotion
MD58 Joint Session AAS/TSL: Aviation System Performance Analysis II
MD59 Pricing Issues and Applications
MD60 Hot Topics in Rail OR
MD61 Public Transit II
MD62 Panel Discussion: Marketing Science and Revenue Management, Contrast and Commonality (Joint Session Pricing and Revenue Mang/ Marketing)
MD63 Sloan: Planning Problems in the Transportation Industries
MD64 Network Modeling and Information Provision
MD65 Sloan: Scheduling Challenges in the Healthcare Industry
MD66 Real-time Fleet Management Problems
MD67 Location Analysis
MD68 Sloan Industry Studies: Marketing New Technologies and Managing Brands in the Automotive Industry

Tuesday, 8:00am - 9:30am

TA01 Business Intelligence for eBusiness
TA03 Dantzig Memorial I
TA04 Panel Discussion: Should the Electoral College Stay, Be Reformed, or Be Abolished?
TA05 Nonlinear Programming: Algorithms and Applications
TA06 Auctions in Marketing - Bidding Strategy
TA07 Supplier Diversification
TA08 Research in the Finance-Operations Interface
TA09 Technometrics Journal Sponsored Session
TA10 Current Practices and Optimization Research for Integrating Electricity Markets: Energy and Transmission Issues I
TA11 Climate Change I: Integrated Assessment Models
TA12 Data Mining Applications in Business
TA13 Journal of Quality Technology: Data and Knowledge Engineering for Quality
TA14 Software Demonstration
TA15 Dynamics of Value Creation
TA16 Service Operations
TA17 SPC Methods for Autocorrelated Processes
TA18 Service Supply Chains
TA19 A Variety of Decision Analysis Research

TA20 Probability and Utility Elicitation
TA21 Panel Discussion: Health 2.0 - A Different Type of Health Care Reform
TA22 Scheduling I
TA23 Asymptotic Limit Theorems for Stochastic Networks
TA24 Retail Optimization in Merchandising and Marketing
TA25 Computational Issues in Large-scale Models of Conflict
TA26 Open Source Software for Optimization and Automatic Graph Drawing
TA28 Online Decision Making
TA29 Tutorial: Closed-loop Supply Chain Management
TA30 Raytheon Missile Defense Applications
TA31 OR, the Science of, Homeland Security
TA32 Daniel H. Wagner Prize Competition Awards
TA33 OR Applications in Healthcare Systems
TA34 Joint Session HAS/Minority Issues: Mathematical and Statistical Models for Mental Health
TA35 Internationalizing Experiences in Teaching and Learning
TA37 Tutorial: City Logistics: Advanced Urban Frieght Transportation Systems
TA38 Algorithms and Computing for Integer Programming
TA39 Network Design
TA40 Joint Session Optimization/Stochastic Programming /CS: Decomposition and Sampling Schemes for Stochastic Optimization and Game-theoretic Problems
TA41 Innovation and Technology Commercialization
TA42 Joint Session CS/HAS: Models and Algorithms for Computational Biology
TA43 OR and Strategy II
TA44 Supply Disruptions and Risks
TA45 Global Supply Chain Design with Integrated Operational Risk Management Strategies
TA46 Supply Chain Scheduling
TA47 Radiation Therapy Treatment Planning I
TA48 Product Development and Technologies
TA49 Advances in Simulation Output Analysis
TA50 Large-Scale Stochastic Optimization I
TA51 Emerging Topics in IS
TA52 Evacuation Planning
TA53 Optimization Approaches in Financial Applications
TA54 Protecting Critical Assets and Infrastructure
TA55 Queues in Random Environment
TA56 Sloan / Freight SIG 1
TA57 Joint Session AAS/QSR: Service Quality Improvements in Aviation Applications
TA58 Joint Session AAS/ RM: Airline Passenger Choice Models
TA59 Dynamic Pricing, Discount Management in Service Industry
TA60 Locomotive Optimization: The State of the Art
TA61 Sensor Location Modeling for ITS Applications
TA62 Joint Session RM/ED: Teaching Revenue Management (based on ITE special issue)
TA63 Transportation and Climate Change
TA64 Pricing and Network Models
TA65 Joint Session Workforce/APS: Control of Queueing Systems with Flexible Servers
TA66 Spreadsheet Risks, Errors & Compliance I
TA67 Facility Location Models I
TA68 Probability Models for Marketing Applications

Tuesday, 11:00 - 12:30pm

TB01 Online Word of Mouth
TB02 Doing Good with OR: Energy/Environment
TB03 Dantzig Memorial II
TB04 The Airline Industry: Convergence, Consolidation, Competition
TB05 Some Applications of Nonlinear Optimization
TB06 Buyer-Determined Procurement Auctions: Theory and Experiments
TB07 Stochastic Inventory Systems I
TB08 Portfolio and Risk Management Methods in an Operations Context
TB09 Quality, Statistics and Reliability in Nano-Manufacturing: Research Advances, Perspectives and Issues
TB10 Current Practices and Optimization Research for Integrating Electricity Markets: Energy and Transmission Issues II
TB11 Climate Change II: Energy Models - Applications and Future Decision-making Needs
TB12 Data Mining for Class Imbalance Problems
TB13 Joint Session DM/QSR/CS: Data Driven Methods of Risk Prediction and Mitigation
TB14 Software Demonstration
TB15 Research in Services
TB16 Information Sharing in Services
TB17 Prognostics and Maintenance Management I
TB18 Risk Management in Services
TB19 Intelligent DA for National Decisions
TB20 Elicitation and Communication of Subjective Probabilities
TB21 Operations/IS Issues in Ambulance to Emergency Room Handovers
TB22 Queueing Games: Pricing and Scheduling for Strategic Customers
TB23 Non-Euclidean State Spaces and Techniques
TB24 CS (Computing Society) Leading Edge Tutorial
TB25 Integer Programming and Applications
TB26 Open Source Software for Nonlinear Optimization
TB28 Data-Driven Revenue Management
TB29 Panel Discussion: The Academic Job Search
TB30 OR Applications in the United States Marine Corps
TB31 General Electric: Financial Analytics and OR Applications
TB32 Sloan Travel and Tourism Industry Center: Travel and Tourism for Economic Development
TB33 Innovation in Healthcare Logistics
TB34 OR in Cancer Care
TB35 On-line Education in OR/MS
TB37 Tutorial: Statistical Challenges in eCommerce: Modeling Dynamic and Networked Data
TB38 Integer Programming Theory and Applications
TB39 Semidefinite Programming and Applications
TB40 Optimization/Stochastic Programming/CS: Sampling Schemes and Stopping Rules in Stochastic Optimization
TB41 Product and Organizational Architectures
TB42 Joint Session CS/HAS: Optimization Techniques in Computational Biology and Systems Biology
TB43 Supporting Strategic Development - Contibutions from OR
TB44 RFID in Operations Management
TB45 Topics on Operational Flexibility
TB46 Optimization of Inventory in Supply Chains
TB47 Radiation Therapy Treatment Planning II
TB48 KLIC: Team and Organizational Learning and Knowledge Management
TB49 Simulation Optimization: Theory and Applications
TB50 Large-scale Stochastic Optimization II
TB51 Socioeconomic Aspects of Information Security
TB52 Panel Discussion: Disaster Preparedness and Response and Inter-Organizational Collaboration
TB53 Optimization under Risk
TB54 Cost and Performance Analysis in OR
TB55 Stochastic Models in Telecommunications
TB56 Information and Freight Trucking Operations
TB57 Performance Issues
TB58 Joint Session AAS/RM: Airline Pricing
TB59 Robust Pricing and Revenue Management
TB60 Revenue & Yield Management
TB61 Modeling and Control of Recurrent and Nonrecurrent Congestion
TB62 Revenue Management with Model Uncertainty and Model Approximations
TB63 Innovations in Traffic Routing Models
TB64 Network Infrastructure Management and Resource Allocation

TB65 Joint Session Scheduling in Service/RAS: Scheduling in Railroads
TB66 Spreadsheet Risks, Errors & Compliance II
TB67 Facility Location Models II
TB68 Modeling Channel and Product Decisions

Tuesday, 12:30pm - 1:30pm

Interactive Session

Tuesday, 1:30pm - 3:00pm

TC01 Portfolio and Risk Mangement
TC03 Dantzig Memorial III
TC04 Organization Theory
TC05 Trust-region Algorithms and Geometrical Problems
TC06 Auctions in the Wild: Field Studies
TC07 Stochastic Inventory Systems II
TC08 Understanding and Influencing Operations for Investment Decisions
TC09 Quality, Statistics and Reliability in Nanomanufacturing: Research/Funding Opportunities
TC10 Supply Function Models for Electricity Markets
TC11 Energy and the Environment
TC12 Data Mining and Pricing
TC13 Horizontal and Vertical Information Selection
TC14 Software Demonstration
TC15 Financial Modeling of Complex Service Systems
TC16 Operations Research in Media and Entertainment Industry
TC17 Prognostics and Maintenance Management II
TC18 Service Factory Design and Optimization
TC19 Military Decision Analysis
TC20 DA Arcade I
TC21 Healthcare Operations Management
TC22 Scheduling II
TC23 Stochastic Networks
TC24 ICS Winners
TC25 Metaheuristics
TC26 Open Source Software for Semidefinite Programming
TC28 Optimal Learning
TC29 Tutorial: Exploiting Opportunities at the Interfaces of Operations and Finance
TC30 Optimization in Military Applications: Resource Management and Course of Action
TC31 Mortgage and Housing Price Modeling
TC32 Sloan: Efficiency Improvement Initiatives in Supply Chain and Health Care
TC33 Operations Research Applications in Long-Term Care
TC34 OR in Public Health
TC35 Undergraduate Research Showcase
TC37 INFORMS Communities/Subdivisions Session on INFORMS Web Pages
TC38 Advances in Theory of Mixed Integer Programming
TC39 Networks, Game Theory, and Computation
TC40 IPMs for Linear Programming: Regularization and Constraint Reduction
TC41 Leveraging Methodologies, Resources, and Network Externalities to Achieve NPD Goals
TC42 Joint Session CS/HAS: Optimization in Computational Biology
TC43 Facilitated Decision Modelling for Strategic Decision Making
TC44 Supplier Strategies for Supply Chain Risk Management
TC45 Cooperation and Competition in Supply Chains
TC46 Capacity Management in Supply Chains
TC47 Joint Session HAS/OPTIM: Preparing for Public Health and Medical Emergencies I
TC48 Evaluation and Metrics of Knowledge Systems and Knowledge Management
TC49 Agent-based Modeling and Simulation
TC50 Decomposition and Nonsmooth Approaches for Conic Optimization
TC51 Data Mining Methods and Business Applications
TC52 Collaboration, Coordination, and Decentralized Decision Making in Disaster Response
TC53 Advances in Financial Engineering
TC54 Advance Studies in Supply Chain I
TC55 Telecommunications Services
TC56 Shipment Consolidation and Logistics Network Design
TC57 Joint Session AAS/TSL: Future Concepts in Air Traffic Management
TC58 Joint Session AAS/TSL: En Route Traffic Optimization
TC59 Topics on Revenue Management and Pricing
TC60 OR in Rail: Theory and Practice
TC61 Emergency Management
TC62 Pricing and Revenue Management I
TC63 Vehicle Routing
TC64 Advances in Network Design and Applications to Transportation
TC65 Planning and Control Models for Workforce Flexibility
TC66 Spreadsheet Issues & Applications in Education
TC67 Location Models with Stochastic Components
TC68 Issues in Chinese Consumer Behavior

Tuesday, 4:30pm - 6:00pm

TD01 Financial Engineering I
TD02 Doing Good with OR: Health Policy
TD03 Dantzig Memorial IV
TD04 Joint Session PPP/To the Memory of Rosenthal: Security Issues
TD05 Optimization Algorithms: Decomposition Methods and Distributed Implementations
TD06 Extending Auction Theory: Computational Perspectives
TD07 Pricing and Inventory Management
TD08 Business Engineering: Risk-averse Decision Making under Uncertainty
TD09 Joint Session QSR/CS: Multiresolution Analysis in Statistical Applications
TD10 Operations Research Models for Wind Power
TD11 Agent-based Modeling
TD12 Advanced Data Mining Techniques
TD13 Joint Session DM/CS: Data Exploration for Complex System Decision-Making
TD14 Software Demonstration
TD15 Problems in Private, Public and Online Services
TD16 Closed-loop Supply Chain Management
TD17 Novel Statistical Applications in Manufacturing
TD18 Service Innovation: Role of Technology Management
TD19 Probability Elicitation, Verification and Combination
TD20 DA Arcade II
TD21 Healthcare Quality and Measurement
TD22 Scheduling III
TD23 Multi-server Queueing Models in Heavy Traffic
TD24 Joint Session CS/Optimization/Stochastic Programming: Recent Advances on Formulating and Solving SP Models
TD25 Metaheuristics in Logistics and Transportation
TD26 Open Source Software for Optimization
TD28 Integer Programming
TD29 Tutorial: Metaheuristic Hybridization with GRASP
TD30 Joint Campaign Analysis
TD31 WINFORMS: Panel on Best Practices for INFORMS Chapters
TD32 Inventory Management
TD33 Optimization of Healthcare Delivery
TD34 Public Health Modeling at the Centers for Disease Control and Prevention
TD35 GIS in the OR/MS Business Curriculum
TD37 Tutorial: Simulation and Optimization
TD38 Mixed-Integer Programming Theory and Applications
TD39 Approximation Algorithms

TD40 Complementarity Problems: Theory and Applications I
TD41 Emerging Topics in NPD
TD42 Information Sharing and Forecasting in Supply Chain Management
TD43 Strategic Development Under Dynamic Complexity: Insights for Theory from Practice
TD44 Infrastructure Design for Risk Management
TD45 Empirical Research in Operations Economics
TD46 Collaborative Research with Industry in Operations Management
TD47 Joint Session HAS/OPTIM: Preparing for Public Health and Medical Emergencies II
TD48 Managing Knowledge-intensive Processes
TD49 Simulation and Application
TD50 Decomposition and Large Scale Optimization
TD51 Pricing and Resource Allocation
TD52 Role of Operational Research in Health Care and Development Assistance for Least Developed Countries: Insights and Panel Discussion
TD53 Credit Risk Modeling
TD54 Advance Studies in Supply Chain II
TD55 Networks & Graphs
TD56 Intelligent Map Segmentation and Transportation
TD57 Joint Session AAS/TSL: Equity and Fairness in Air Traffic Flow Management
TD58 Joint Session AAS/TSL: Stochastic Optimization in Aviation
TD59 Game Theory for Networks and Services
TD60 Dynamic Pricing Strategy
TD61 Decision and Operations for Evacuation
TD62 Revenue Management and Pricing Games
TD63 Clustering and Vehicle Routing
TD64 Advances in Warehouse Design I
TD65 Bucket Brigade Production Systems
TD66 Spreadsheet Possibilities: Best Practices & Future Directions
TD67 Network Design and Location Analysis for Supply Chain Management
TD68 Joint Session MK/Information Systems: Marketing Science and the Google Online Marketing Challenge

Wednesday, 8:00am - 9:30am

WA01 Financial Engineering II
WA03 Military Applications I
WA04 Joint Session PPP/Voting: Access and Accountability Issues in Presidential Elections
WA05 Optimization in Finance
WA06 Auctions in Marketing - Information
WA07 Scheduling For Competitive Advantage
WA08 Interface between Finance, Operations and Risk Management
WA09 Monitoring and Diagnosis Methods for Quality Control
WA10 Energy Models in a Carbon Constrained World
WA11 Environment and Energy I
WA12 DEA Applications & Theory
WA13 Joint Session DM/CS: Data Mining in Computational Neuroscience
WA14 Leasing Operations Management
WA15 Joint Session Service Science/CS: Creating Semantic Models for Service Science
WA16 Supply Chain Risk Management
WA17 Design and Analysis of Experiments
WA18 Joint Session Service Science/CS: Supply Chain Services in Web-2.0 Age —I
WA19 Real Options and Financial Decisions
WA20 Business Applications of Risk Analysis
WA21 Process Efficiency and Quality Improvement in Healthcare: The Role of Information Technology
WA23 Call Center Performance Models
WA24 Ant Colony Algorithms and Applications
WA25 Metaheuristics for Design Problems
WA26 Joint Session CS/OPT: MINLP Theory and Algorithms
WA28 Systems Analysis
WA29 Tutorial: VaR vs CVaR in Risk Management and Optimization
WA30 Military Operations Analysis for Force RESET Problems
WA31 Practical Analysis Tools for Public Policy Challenges
WA32 Inventory Management Under Stochastic Demand I
WA33 Modeling and Analysis of Healthcare Provider's Operations
WA34 Stochastic Programming in Healthcare
WA35 In Memoriam: Mike Rothkopf's Influence on OR Pedagogy
WA36 Information Systems I
WA37 Operations Research in Education I
WA38 Joint Session Optimization/CS: Recent Advances in Computational Integer Programming
WA39 Algorithms and Economics of the Internet
WA40 Complementarity Problems: Theory and Applications II
WA41 Innovation and Entrepreneurship I
WA42 Supply Chain Management I
WA43 Operations Management I
WA44 Product and Pricing Decision Under Disruptions Risk
WA45 Managing Supply Chain Uncertainties
WA46 Pricing Issues in Stochastic Supply Chains
WA47 Joint Session HAS/ DAS: Health Care Decision Aids
WA48 Collaborative Innovation
WA49 Stochastic Simulation Methodologies
WA50 Quadratic Assignment Problems
WA51 Virtual World and Virtual Community
WA52 Humanitarian Relief Logistics
WA53 Models and Analysis in Financial Engineering
WA55 Network Optimization
WA56 OR in Health Care and Non-profit Industries
WA57 Queuing Applications in Air Traffic Management
WA58 Safety and Performance: Now and NextGen
WA59 Traditional and Non-Traditional Revenue Management
WA60 Models for Rail Transportation
WA61 Dynamic Evacuation Planning and Operations Models
WA62 Inventory and Revenue Management
WA63 Stochastic Networks and Adaptive Routing
WA64 Advances in Warehouse Design II
WA65 Workforce Management Challenges in Global Services Delivery Organizations
WA66 Spreadsheet Applications in OM & OR
WA67 Decision Analysis I
WA68 Marketing I

Wednesday, 11:00am - 12:30pm

WB01 Politics & Voting
WB02 Doing Good with OR: Aviation Congestion
WB03 Military Applications II
WB04 Joint Session PPP/Homeland: Mass Egress and Evacuation
WB05 Game Theory I
WB06 Auctions and Mechanism Design
WB07 Optimization Issues in Operations Planning
WB08 Customer & Service Oriented Operations Models
WB09 Joint Session QSR/CS: Statistical Models and Analyses of Medical and Biological Data
WB10 Incorporating Sustainability Into Energy Modeling
WB11 Environment and Energy II
WB12 Development and Application of DEA Based Methods
WB13 Data Mining Methods
WB14 Production Planning
WB15 Modeling the Human Behavior in Services
WB16 Models and Analysis in Supply Chain Competition
WB17 Quality Control for Nanomanufacturing
WB18 Joint Session Service Science/CS: Supply Chain Services in Web-2.0 Age —II
WB19 Game-Theoretic Models
WB20 Team Processes for Effective Decision-Making
WB21 Health IT and Strategic Implications for Use by

Multiple Stakeholders
WB22 Queueing Models III
WB23 Control of Queueing Systems
WB24 Neural Network Approaches and Applications
WB25 Vehicle Routing I
WB26 Joint Session CS/OPT: Applications of Mixed Integer Nonlinear Programming in the Chemical Process Industry
WB28 Deliveries Applications in Logistics
WB29 Data Envelopment Analysis I
WB30 The Practice of OR Within the Joint IED Defeat Organization
WB31 Role Reversal: The Impact of Climate Change on Aviation
WB32 Inventory Management Under Stochastic Demand II
WB33 Strategic Planning in Healthcare II
WB34 Models of Chronic and Infectious Diseases
WB35 In Memoriam: Rick Rosenthal's Influence on OR Pedagogy
WB36 Information Systems II
WB37 OR Practice and Applications
WB38 Integer Programming and Applications
WB39 Algorithms for Online Advertising
WB40 Methods for Mathematical Programs with Complementarity Constraints, and for Related Problems
WB41 Innovation and Entrepreneurship II
WB42 Supply Chain Management II
WB43 Operations Management II
WB44 Design of Assembly Supply-Chain Configurations for Product Variety Management
WB45 Procurement and Supplier Selection
WB46 Optimization Models for Operations Planning
WB47 Treatment Optimization Models for Disease Management
WB48 Technology, Innovation and Entrepreneurship: Managing Knowledge and IT
WB49 Simulation-based Decision Making
WB50 Nonlinear Programming: Theory and Applications
WB51 Semantic Web Technologies, Electronic Mediated Environment and Services
WB52 Disaster Preparedness and Response
WB53 Modeling and Computation in Financial Engineering
WB54 Production Scheduling I
WB55 Flight Scheduling
WB56 Joint Session TSL/AAS: Topics in Aviation OR
WB57 Joint Session AAS/TSL: Autonomous Reconfigurability
WB58 Advanced Vehicle Systems and NextGen
WB59 Retail Revenue Management and Pricing
WB60 Transportation
WB61 Hazardous Materials Transportation
WB62 Modeling Competition in Pricing Optimization
WB63 Joint Session TSL/CS: Advances in Computing Network Equlibrium
WB64 Queuing Models in Warehousing Systems
WB65 Inventory Policy I
WB66 Advanced Spreadsheet Applications & Techniques
WB67 Continuous Optimization
WB68 Marketing II

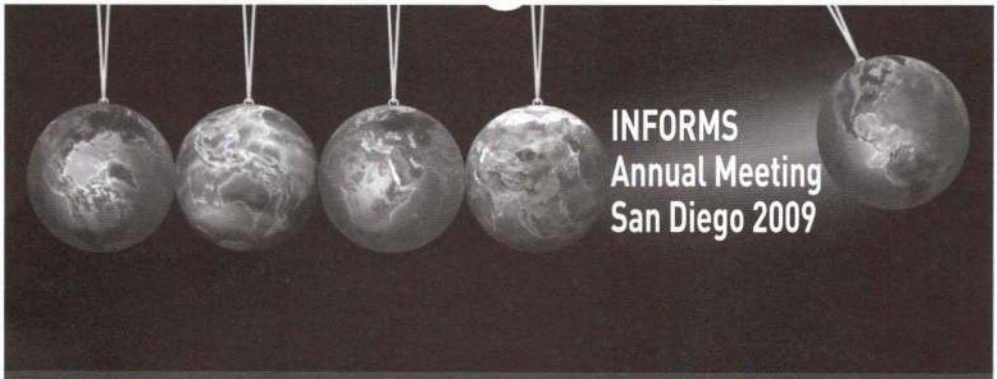
Wednesday, 1:30pm - 3:00pm

WC01 E-Business
WC03 Forecasting I
WC04 Joint Session PPP/Voting: Predicting and Winning Elections in the 21st Century
WC05 Game Theory II
WC06 Auctions
WC07 Supply Chain Models and Analysis
WC08 Information Economics in Supply Chains
WC09 Optimization Methods in Quality, Reliability and Statistics
WC10 Expansion Planning of Electricity Transmission in the New Environmental Era
WC11 Facilities Planning and Design
WC12 Data Mining II
WC13 Do You Have The Right Features and How Much Do You Trust Them?
WC14 Multicriteria Decision Making I
WC15 Productivity in Service Operations
WC16 Supply Chain Practice and Empirics
WC17 Joint Session QSR/HAS: Quality and Statistical Decision Making in Healthcare Applications II
WC18 Novel Optimization Techniques I
WC19 DA Arcade III
WC20 DA Arcade IV
WC21 Technology Impacts in Healthcare
WC22 Queueing Models IV
WC23 Stochastic Models and Methods for Networks
WC24 Genetic Algorithm Approaches to Scheduling
WC25 Vehicle Routing II
WC26 Joint Session CS/OPT: Applications of Mixed Integer Nonlinear Programming in the Chemical Process Industry - II
WC28 Logistics in Supply Chain
WC29 Data Envelopment Analysis II
WC30 Military and Homeland Security Applications of Portfolio Analysis
WC31 Project Management
WC32 Inventory Control I
WC33 Operations Research in Medicine and Bioinformatics
WC34 Novel Applications in OR I
WC35 Georgia Tech Communication Instruction for Undergraduate & Graduate Engineering Students
WC36 Stochastic Processes I
WC37 Homeland Security I
WC38 Approximation Algorithms for Routing and Scheduling
WC39 Prediction Markets
WC40 Advances in Complexity, Linear Programming, and Complementarity
WC41 Technology Mangement
WC42 Supply Chain Management III
WC43 Operations Management III
WC44 Manufacturing Systems I
WC45 Assemble-to-order Systems and Allocation Rules
WC46 Supply Chain Games
WC47 Process Improvement in the Hospitals
WC48 Flexibility Issues in Technology Management
WC49 Simulation and Optimization Methods
WC50 Mixed Integer Programming and Extensions
WC51 IT-enabled Process Transformation and Strategic Renewal in Healthcare Organizations
WC52 Joint Session Humanitarian/WORMS: Getting Involved in Community, Humanitarian, or Public Service Research (Panel)
WC53 Financial Optimization and Applications
WC54 Metaheuristics and Optimization
WC55 Air Traffic Control and Management
WC56 Joint Session TSL/AAS: Aircraft Rerouting Models
WC57 Enviromental and Safety Issues in Aviation
WC58 Assessing the Effectiveness of Aviation Capital Improvements
WC59 Learning and Distribution-free Methods in Revenue Management
WC60 Pricing and Revenue Management II
WC61 Facility Logistics
WC62 Revenue Management Applications in Hospitality Industry
WC63 Dynamic Network Equilibrium Models
WC64 Warehouse Automation
WC65 Inventory Policy II
WC66 Dynamic Programming I
WC67 Decision Analysis II
WC68 Marketing III

Wednesday, 4:30pm - 6:00pm

WD01 Marketing Interface I
WD03 Forecasting II
WD04 To the Memory of Richard Rosenthal: Notes from All Over
WD05 Game Theory III
WD06 Economics
WD08 Supply Chain Management IV
WD09 Panel Discussion: QSR Cluster Academic Directions
WD10 Financial Engineering in Energy Markets
WD11 Facility Location
WD12 Data Mining III
WD13 Data Mining Applications
WD14 Multicriteria Decision Making II
WD15 Global Delivery of Services
WD16 Strategies in Supply Chain Competition
WD17 Panel Dicussion: QSR Cluster Strategic Research Directions
WD18 Novel Optimization Techniques II
WD19 Decision Analysis III
WD20 Advances in Decision Support Systems II
WD21 Sustainable Operations
WD22 Computer Science Applications
WD23 Sequential Change Detection and Identification
WD24 Multi-agents Methods and Applications
WD25 Vehicle Routing III
WD26 Conic Optimization Approaches for Integer Programming Problems
WD28 Logistics
WD29 Data Envelopment Analysis III
WD31 Resource Allocation
WD32 Inventory Control II
WD33 Emergency Department Improvement in Healthcare
WD34 Resource Allocation and Scheduling in Healthcare
WD35 Operations Research in Education II
WD36 Stochastic Processes II
WD37 The Summer Program for Operations Research Technology at the National Security Agency
WD38 Efficient Algorithms for Linear Programming
WD39 Optimization and Graph-Theoretic Methods in Bioinformatics
WD40 Gradient-based Methods for Large-scale Convex Programming and Applications
WD41 Product Development
WD42 Supply Chain Management V
WD43 Operations Management IV
WD44 Manufacturing Systems II
WD45 Global Issues in Supply Chain
WD46 Unconventional Problems in Supply Chain Management
WD47 Models and Healthcare Systems
WD49 Decision Support Systems and Analysis
WD50 Algorithms for Uncertainty and Market Forces
WD51 Emerging Issues in MIS
WD52 Allocation and Planning for Emergency Resources
WD53 Models and Theories in Financial Engineering
WD54 Queueing Models V
WD55 Stochastic Processes III
WD56 OR in Transportation Operations
WD57 Air Space Design and Management
WD58 Modeling and Methods for Aviation Safety and Airspace Systems
WD59 Revenue Management in Service Industries
WD60 Rail Transportation
WD61 Transportation Planning I
WD62 Revenue Management in Supply Chain
WD63 Transportation Planning II
WD64 Transportation Networks
WD65 Inventory Models
WD66 Dynamic Programming II
WD67 Production Scheduling II
WD68 Marketing Interface II

the globe



technology

biotech

health care

environment

San Diego

October 11-14, 2009
San Diego Convention Center
and Hilton San Diego

ORGANIZING COMMITTEE

General Chair
Soheila Jorjani
California State University San Marcos
sjorjani@csusm.edu

Program Co-Chairs
Mohammad Oskoorouchi
California State University San Marcos
moskooro@csusm.edu

Carlton Scott
University of California Irvine
chscott@uci.edu

Invited Sessions Chair
Thomas Roemer
University of California San Diego
troemer@ucsd.edu

Tutorials Chair
Mohammad Oskoorouchi
California State University San Marcos
moskooro@csusm.edu

Sponsored Sessions Chair
Robert Aboolian
California State University San Marcos
raboolia@csusm.edu

Contributed Sessions Chair
Abdullah Dasci
York University
dasci@yorku.ca

Administrative Chair
Fred Rafaat
San Diego State University
fred.raafat@sdsu.edu

Arrangements Chair
Jefferey Guyse
Cal. State Polytechnic University-Pomona
jlguyse@csupomona.edu

Practice Program Chair
Ishpal Rekhi
Hewlett Packard
ishpal.rekhi@hp.com

The Leading Provider of Online Professional Development Courses in Statistics

statistics.com

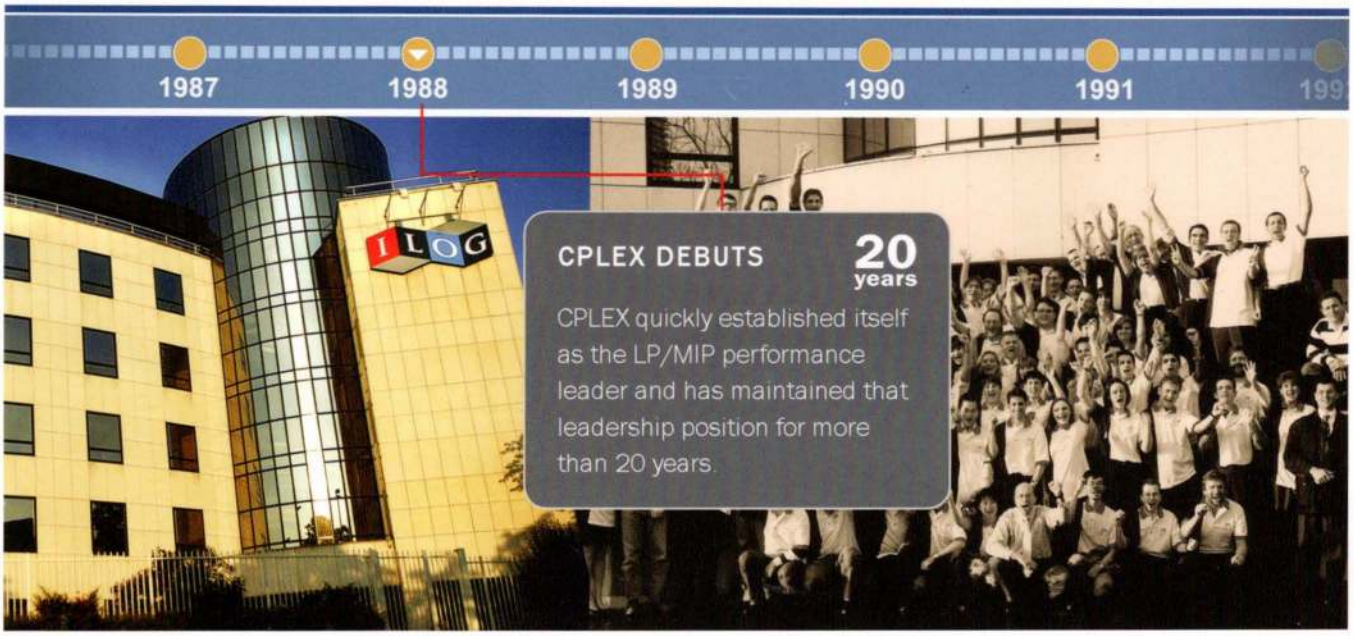
online courses

- Data Mining 1 (Supervised methods)
- Data Mining 2 (Unsupervised methods)
- Decision Trees
- Microarray Analysis in R
- Text Mining
- Natural Language Processing
- Cluster Analysis
- Time Series Forecasting
- Logistic Regression
- Missing Data Analysis
- Generalized Linear Models
- Bootstrap Methods
- ...MORE! Over 50 courses taught by leading experts

Courses last 3-5 weeks, take 10-15 hour hours per week and are offered year round. No set times when you must be online.

For a 20% course tuition discount, use the promo code INFORMS

Visit www.statistics.com for the calendar & complete course description.

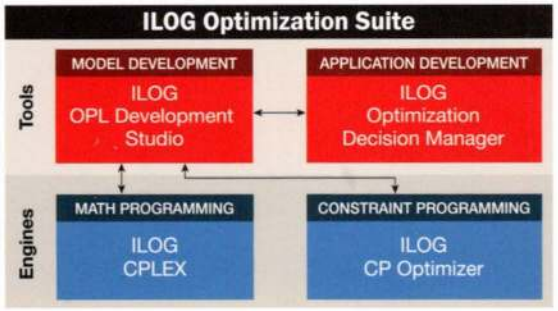


Follow the Leader

ILOG Optimization—Setting the Gold Standard

ILOG is a leader in the field of Operations Research and optimization. Since 1988, we have offered the world's most advanced optimization technologies for solving tough business and research problems. Our award-winning tools and engines speak for our high standards and belief in innovation. And we're always thinking of something new.

See for yourself why more than 1,000 universities use ILOG Optimization for research and teaching, and why more than 1,000 commercial customers, including over 160 of the Global 500, use ILOG Optimization in some of their most important planning and scheduling applications.



ILOG Optimization Suite

The ILOG Optimization Suite is a comprehensive collection of tools and engines for building interactive, custom planning and scheduling applications, for sale as standalone engines, or as development packages that have been assembled with your specific development objectives in mind.

Optimization Engines

- ILOG CPLEX® for mathematical programming
- ILOG CP Optimizer for constraint programming

Model & Application Development Tools

- ILOG OPL Development Studio for optimization modeling
- ILOG Optimization Decision Manager (ODM) for application development

Development Packages

- ILOG OPL-CPLEX-ODM Development System – Modeling and application development and deployment package for CPLEX and CP Optimizer
- ILOG OPL-CPLEX Development System – Modeling development and deployment package for CPLEX and CP Optimizer
- ILOG OPL-CPLEX Analyst Studio – An option for analysts who need to build and run CPLEX and/or CP Optimizer models exclusively from the OPL IDE

Enter the ILOG OPL-CPLEX Analyst Studio Challenge!

Follow the leader and experience ILOG's award-winning tools and engines at the INFORMS Annual Meeting, Washington, D.C. Visit ILOG booths 606 and 607 to get your 1GB USB drive with a free 6-month trial of ILOG OPL-CPLEX Analyst Studio while supplies last, and enter the "ILOG OPL-CPLEX Analyst Studio Challenge" to win a Lenovo® ThinkPad x300, a $350 USD Airline gift certificate or a $100 USD Society for Industrial and Applied Mathematics (SIAM) book gift certificate! "ILOG OPL-CPLEX Analyst Studio Challenge" official rules apply.

© 2008 ILOG, INC. All rights reserved. ILOG and ILOG logotype are registered trademarks of ILOG. All other brand, product and company names are the trademarks of their respective owners.