

## **NEW EXHIBITOR**

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**Sunday, October 6, 2013**

**SA**

## **NEW PRESENTATIONS**

### **■ SA39**

2 - Pareto Efficiency in Robust Optimization

Dan Iancu, Assistant Professor, Stanford University, 655 Knight Way, Stanford, CA, 94305, United States of America, [daniancu@stanford.edu](mailto:daniancu@stanford.edu), Nikos Trichakis

We formalize the concept of Pareto efficiency in the context of the robust optimization (RO) methodology. We characterize Pareto robustly optimal (PRO) solutions, and extend the RO framework by proposing methods to verify Pareto optimality and generate PRO solutions. Our approach requires solving problems that are of the same complexity as the nominal RO problems, and numerical experiments demonstrate the significant potential upside of PRO solutions compared with classical RO solutions.

3 - Euclidean Hub-and-Spoke Networks

John Carlsson, University of Minnesota, 111 Church St SE, Office 130C, Minneapolis, MN, 55455, United States of America, [jgc@umn.edu](mailto:jgc@umn.edu), Fan Jia

We consider the problem of designing an optimal hub-and-spoke network in Euclidean space: the "spokes" of the network are distributed continuously over a service region, and our objective is to determine the optimal number of hubs and their locations. We consider seven different backbone network topologies for connecting the hub nodes, namely the Steiner and minimum spanning trees, a TSP tour, a star network, a capacitated vehicle routing tour, a complete bipartite graph, and a complete graph.

4 - Optimal Choice for Appointment Scheduling Window under Patient No-show Behavior"

Nan Liu, Assistant Professor, Columbia University, New York, NY, 10032, United States of America, [nl2320@columbia.edu](mailto:nl2320@columbia.edu)

Observing that patients with longer appointment delays tend to have higher no-show rates, many providers put a limit on how far into the future that an appointment can be scheduled. We study how such choices of appointment windows affect a provider's operational efficiency. We consider two models. The first one assumes patients are homogeneous. The second model faces two types of patients differing in no-show and arrival rates, and the provider can use patient type-specific appointment windows.

### **■ SA63**

4 - Data-fusion in Solar Energy Prediction: An Overview and Modification of Perez Model

Heng Su, Georgia Tech, Atlanta GA, United States of America, [hsu31@gatech.edu](mailto:hsu31@gatech.edu)

This paper presents the investigation of soft tissue expansion process for biomedical devices development and bio-

manufacturing. The objective of the investigation is to describe the expansion as a manufacturing process with sufficient specifications, such that the process is reproducible within a given tolerance. This paper examines how collagen-based, soft tissue responds to mechanical deformation and the effects of different process parameters.

## **NEW SESSION CHAIR**

### **■ SA17**

Sechan Oh, IBM Research Almaden, San Jose, CA 95120, United States of America, [seoh@us.ibm.com](mailto:seoh@us.ibm.com)

## **SB**

## **NEW PRESENTATIONS**

### **■ SB10**

2 - A Prescription for Budget Woes at Gracious University Hospital

Karen Hicklin, North Carolina State University, 111 Lampe Drive, Raleigh, NC, United States of America, [kthickli@ncsu.edu](mailto:kthickli@ncsu.edu), Anita Vila-Parrish, Julie Ivy

This case has been used in a multitude of settings including an Industrial Engineering summer camp, a Stochastic Processes course (undergraduate), a Quality Engineering course (undergraduate), and with a health care company. The strength of this case is its diverse course applications. In the stochastic processes course the case can focus on understanding variability and uncertainty while in the quality engineering the focus can be on data collection, analysis, and process mapping. The students have enjoyed the case in all of the settings described above. The environment is typically one of controlled chaos as the student teams rush around the room fulfilling patient orders. The competition between teams keeps students motivated throughout the simulation rounds.

3 - Lolly's Restaurant

Steven Harrod, Assistant Professor, University of Dayton, 1143 Ashburton Dr., Dayton, OH, 45459, United States of America, [sharrod1@udayton.edu](mailto:sharrod1@udayton.edu)

Lolly's Restaurant is a short, entry level case study for students new to the method of case teaching. The case considers new product development, in this example adding a dinner service to a small, short order restaurant. Operations planning is central to the projections of performance and profitability of the new service. The quantitative aspects of the problem introduce students to service process flows, queuing, and issues of variability in processes. Students must evaluate the business policies and accounts of the restaurant to determine the supporting cost data. The case requires little or no previous Operations Management training, although there are opportunities for more advanced discussions in the case.

4 - Eastman Tritan

Gal Raz, Associate Professor, University of Virginia, Darden Business School, 100 Darden Blvd., Charlottesville, VA, 22903, United States of America, [Razg@arden.virginia.edu](mailto:Razg@arden.virginia.edu), Allison Elias, Tim Kraft

The case was taught in the spring of 2013 for the first time in both the first-year full-time MBA core operations course with 5 sections and over 300 students and the second year full time MBA supply-chain elective with 2 sections and over 100 students.

This was the first time at Darden where a case was introduced to 7 different sections at the same time. Eastman management representatives who are featured in the case visited Darden that day and took part in the case discussions. This was used for the videos developed that can now be used in conjunction with the case. The student feedback on the case both in the first year and the second year has been very positive and was mentioned as one of the highlights of the course.

■ **SB14**

2 - Learning in Combinatorial Optimization: How and What to Explore?

Denis Saure, University of Pittsburgh, Pittsburgh, United States of America, [dsaure@pitt.edu](mailto:dsaure@pitt.edu), Sajad Modaresi, Juan Pablo Vielma  
We study sequential combinatorial optimization under model uncertainty. We show that for balancing the implied exploration vs exploitation trade-off it is critical to resolve the issue of what information to collect and how to do so. Our answer to these questions lies in solving an adjunct formulation, which looks for the cheapest solution-based optimality guarantee. We develop fundamental limit on performance, and develop an efficient policy implementable in real-time.

3 - A Fully Sequential Elimination Procedure for Indifference-Zone Ranking and Selection with Tight Bounds on Probability of Correct Selection

Peter Frazier, Assistant Professor, Cornell University, School of ORIE, Rhodes Hall, Ithaca, NY, United States of America, [pf98@cornell.edu](mailto:pf98@cornell.edu)

Existing procedures for indifference-zone (IZ) ranking and selection have loose bounds on probability of correct selection, leading them to sample more than necessary. We present BIZ (Bayes-inspired Indifference Zone), the first sequential elimination IZ procedure with tight bounds on worst-case preference-zone probability of correct selection. Tight bounds allow the procedure to produce solutions with less sampling effort.

4 - Mutual Information Based Matching for Causal Inference on Observational Data

Alexander Nikolaev, Assistant Professor, University at Buffalo (SUNY), 312 Bell Hall, Buffalo, NY, 14260-2050, United States of America, [anikolaev@buffalo.edu](mailto:anikolaev@buffalo.edu), Lei Sun

An optimization-driven approach is presented for making causal inference with observational data. Comparing units non-randomly exposed to treatment against those unexposed, the paper motivates algorithms that work to minimize the mutual information (MI) between the covariate vectors of compared units and the treatment variable. This approach is model-free, flexible and accurate. Optimality conditions are derived by treating non-linearity in the MI function. Computational results are reported.

■ **SB33**

2 - Solving the Railway Yard Operation Problem: Greedy Heuristics, Integer Programming Models, and Waiting Time  
Hai Wang, PhD candidate, Massachusetts Institute of Technology, 2D, 550 Memorial Drive, Cambridge, MA, 02139, United States of America, [haiwang@mit.edu](mailto:haiwang@mit.edu), Jiangang Jin, Maokai Lin

3 - Optimizing the Operational Plan in Railway Classification Yard by Combining Genetic Algorithm and Sub-period Rolling  
Wenliang Zhou, Central South University, School of Traffic and Transportation, China, [zwl\\_0631@csu.edu.cn](mailto:zwl_0631@csu.edu.cn), Lianbo Deng, Zhao Zhou

4 - A Solution Approach for Railway Classification Yard  
Setareh Borjian, Massachusetts Institute of Technology, 60 Wadsworth Street, Cambridge, Ma, 02142, United States of America, [sborjian@mit.edu](mailto:sborjian@mit.edu), Krishna Selvam

**LATE CANCELLATIONS**

■ **SB02**

2 - Extensions to AMPL for Optimisation under Uncertainty  
Gautam Mitra,

■ **SB27**

1 - Using Virtualization Technologies to Enable a Mobile IaaS System for Tactical Edge Data Analytics  
Albert Barreto

■ **SB71**

3 - Impact of Aircraft Arrival Processes on Airport Capacity and Delay  
Abdullah Karaman

**REVISED PRESENTATION**

■ **SB57**

2 - Group-Buying under Strategic Consumers  
We study a revenue management problem in which a retailer operates a "group-buy" mechanism under strategic customers. At the beginning of the selling season, the retailer announces a regular price and a lower "group buy" coupon price. The low price becomes available as soon as a threshold number of consumers subscribe to the coupon. We analyze the subgame played among consumers and show that they follow a threshold-type purchasing rule in equilibrium. Then, through a numerical study, we calculate the retailer's expected revenues under our proposed mechanism and compare it with other benchmarks.  
Navaporn Surasvadi

**SC**

**NEW PRESENTATIONS**

■ **SC10**

2 - VidoCo Demand Forecast Information Sharing Case  
Duygu Dagli, PhD Student, University of Texas at Dallas, Naveen Jindal School of Management, 800 West Campbell Road, Richardson, TX, 75080, United States of America, [dx115020@utdallas.edu](mailto:dx115020@utdallas.edu), Ozalp Ozer, Yanchong Zheng  
VidoCo Demand Forecast Information Sharing Case has been recently completed and has not been used in a classroom yet. However, the complementary computer simulation, the Forecast Information Sharing Game, has been used in undergraduate, MBA and executive MBA level courses at MIT, Stanford, and University of Texas at Dallas. The game successfully facilitated rich discussions. As students were able to put themselves in the shoes of both the downstream and upstream firms, they were able to diagnose the reasons for information asymmetry. They also came up with strategies, which would make them communicate demand forecasts truthfully or would make them trust the forecasts reported by the downstream firms.  
3 - Redesigning Pittsburgh Port Authority's Bus Transit System  
Ersin Korpeoglu, Carnegie Mellon University Tepper School of Business, 5000 Forbes Avenue, Pittsburgh, United States of America, [ekorpeog@andrew.cmu.edu](mailto:ekorpeog@andrew.cmu.edu), Fatma Kilinc-Karzan  
This case was used in teaching an undergraduate business elective course in Carnegie Mellon University, Tepper School of Business entitled "Mathematical Models for Consulting" during Fall 2012. The feedback from class was dominantly positive. Students showed strong enthusiasm for applying what they learned on a practical case and stated that they preferred working on practice problems rather than hypothetical questions. In addition to this, the authors are planning to use this case in upcoming elective MBA courses on operations as well.

4 - Markdown Management at Sports Unlimited  
Masoud Talebian, University of Newcastle, Callaghan, Australia, [Masoud.Talebian@newcastle.edu.au](mailto:Masoud.Talebian@newcastle.edu.au), Garrett van Ryzin  
The case study focuses on the analytical aspects of designing markdown policies. For this purpose, it describes a retail sporting

goods chain that operates nationally. Merchants (buyers) are responsible for buying items and setting initial prices. During the sales season, merchants evaluate items for possible markdowns and eventually mark them out-of-store so that they can be salvaged. Merchants currently rely on a price optimization tool, called PO, to manage markdowns. PO essentially identifies the items with low weekly sell-through rates as candidates for markdowns. Weekly sell-through is measured as the ratio of weekly sales to initial inventory. The firm's current policy is to target an initial markdown of 50%.

■ SC12

2 - Improving Christofides' Algorithm for the s-t Path TSP"  
Hyung-Chan An, Postdoctoral Fellow, EPFL, EPFL IC IIF THL1 INJ 130, Station 14, Lausanne, Switzerland, [hyung-chan.an@epfl.ch](mailto:hyung-chan.an@epfl.ch), Robert Kleinberg, David Shmoys  
We present a deterministic  $(1+\sqrt{5})/2$ -approximation algorithm for the s-t path TSP for an arbitrary metric. Given a symmetric metric cost on  $n$  vertices including two prespecified endpoints, the problem is to find a shortest Hamiltonian path between the two endpoints; Hoogeveen showed that the natural variant of Christofides' algorithm is a  $5/3$ -approximation algorithm for this problem, and this asymptotically tight bound in fact had been the best approximation ratio known until now. We modify this algorithm so that it chooses the initial spanning tree based on an optimal solution to the Held-Karp relaxation rather than a minimum spanning tree; we prove this simple but crucial modification leads to an improved approximation ratio, surpassing the 20-year-old barrier set by the natural Christofides' algorithm variant. Our algorithm also proves an upper bound of  $(1+\sqrt{5})/2$  on the integrality gap of the path-variant Held-Karp relaxation. The techniques devised in this paper can be applied to other optimization problems as well: these applications include improved approximation algorithms and improved LP integrality gap upper bounds for the prize-collecting s-t path problem and the unit-weight graphical metric s-t path TSP. We also provide a computational evaluation of the performance of our algorithm to complement the present results.

3 - The Simplex Method is Strongly Polynomial for Deterministic Markov Decision Processes"  
Ian Post, U of Waterloo, Waterloo, Canada, [ipost@uwaterloo.ca](mailto:ipost@uwaterloo.ca), Yinyu Ye

We prove that the simplex method with the highest gain/most-negative-reduced cost pivoting rule converges in strongly polynomial time for deterministic Markov decision processes (MDPs) regardless of the discount factor. For a deterministic MDP with  $n$  states and  $m$  actions, we prove the simplex method runs in  $O(n^3 m^2 \log^2 n)$  iterations if the discount factor is uniform and  $O(n^5 m^3 \log^2 n)$  iterations if each action has a distinct discount factor. Previously the simplex method was known to run in polynomial time only for discounted MDPs where the discount was bounded away from 1. Unlike in the discounted case, the algorithm does not greedily converge to the optimum, and we require a more complex measure of progress. We identify a set of layers in which the values of primal variables must lie and show that the simplex method always makes progress optimizing one layer, and when the upper layer is updated the algorithm makes a substantial amount of progress. In the case of nonuniform discounts, we define a polynomial number of "milestone" policies and we prove that, while the objective function may not improve substantially overall, the value of at least one dual variable is always making progress towards some milestone, and the algorithm will reach the next milestone in a polynomial number of steps.

4 - Semi-continuous Network Flow Problems  
Gustavo Angulo, Georgia Tech, Atlanta, GA, United States of America, [gangulo@gatech.edu](mailto:gangulo@gatech.edu), Shabbir Ahmed, Santanu Dey  
We consider semi-continuous network flow problems, that is, a class of network flow problems where some of the variables are restricted to be semi-continuous. We introduce the semi-continuous inflow set with variable upper bounds as a relaxation of general semi-continuous network flow problems. Two particular cases of this set are considered, for which we present complete descriptions of the convex hull in terms of linear inequalities and extended formulations. We consider a class of semi-continuous

transportation problems where inflow systems arise as substructures, for which we investigate complexity questions. Finally, we study the computational efficacy of the developed polyhedral results in solving randomly generated instances of semi-continuous transportation problems.

5 - Non-stationary Stochastic Optimization  
Yonatan Gur, Columbia University, 3022 Broadway, New York, NY, 10027, United States of America, [ygur14@gsb.columbia.edu](mailto:ygur14@gsb.columbia.edu), Omar Besbes, Assaf Zeevi

We consider a non-stationary variant of a sequential stochastic optimization problem, where the underlying cost functions may change along the horizon. We propose a measure, termed variation budget, that controls the extent of said change, and study how restrictions on this budget impact achievable performance. We identify sharp conditions under which it is possible to achieve long-run-average optimality and more refined performance measures such as rate optimality that fully characterize the complexity of such problems. In doing so, we

also establish a strong connection between two rather disparate strands of literature: adversarial online convex optimization; and the more traditional stochastic approximation paradigm (couched in a non-stationary setting). This connection is the key to deriving well performing policies in the latter, by leveraging structure of optimal policies in the former. Finally, tight bounds on the minimax regret allow us to quantify the "price of non-stationarity," which mathematically captures the added complexity embedded in a temporally changing environment versus a stationary one.

■ SC16

2 - Stress on the Ward: Evidence of Safety Tipping Points in Hospitals  
We present an empirical study of occupancy-related safety tipping points for in-hospital mortality using discharge records of 82,280 patients across six high-mortality-risk conditions from 83 German hospitals. We estimate a mortality tipping point at an occupancy level of 92.5%. Among the 14.7% of patients in our sample who experienced occupancy above the tipping point, high occupancy accounted for 17% of the deaths. The existence of a safety tipping point has significant implications for hospital management. In our sample, flexible staffing achieves the same mortality reduction as rigid staffing at 60% of the cost, while pooling of near-by hospitals reduces the number of deaths due to high occupancy by 39.5%.  
Stefan Scholtes, Professor, University of Cambridge, Trumpington Street, Cambridge, United Kingdom, [s.scholtes@jbs.cam.ac.uk](mailto:s.scholtes@jbs.cam.ac.uk), Ludwig Kuntz, Roman Mennicken

3 - ICU Admission Control: An Empirical Study of Capacity Allocation and Patient Outcomes  
Abstract: We examine how congestion in the ICU can impact the care pathway of patients and, ultimately, patient outcomes. We develop a stylized model for ICU admission and use the insights gained to develop an empirical framework, in which instrumental variable approach is used to identify the effect of the endogenous admission decision. We estimate these models using a large data set from an integrated healthcare delivery system and discuss the results' substantial health and financial implications.  
Presenter: Song-Hee Kim, PhD Candidate, Columbia University, New York, NY, United States of America, [sk3116@columbia.edu](mailto:sk3116@columbia.edu), Carri Chan, Marcelo Olivares, Gabriel Escobar

4 - An Analytics Approach to Designing Clinical Trials for Cancer  
We propose an analytics approach to designing chemotherapy regimens, the leading treatment for advanced cancer. We develop statistical models to predict the survival and toxicity of new drug combinations. Using these models, we develop an optimization approach to select novel treatment regimens to test in clinical trials. For gastroesophageal cancer, we provide evidence that our decision aid could simultaneously improve patient survival and toxicity outcomes compared to current practice.  
Allison O'Hair, Lecturer, Massachusetts Institute of Technology, [akohair@mit.edu](mailto:akohair@mit.edu), John Silberholz, PhD Student, Massachusetts

Institute of Technology, [josilber@mit.edu](mailto:josilber@mit.edu), Dimitris Bertsimas, Stephen Relyea,

5 - Incentives' Effect in Influenza Vaccination Policy  
Dan Yamin, Department of Industrial Engineering and Management, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel; and Department of Epidemiology of Microbial Diseases, School of Public Health, and Yale University, 135 College St. 06511 CT. US, [Dan.yamin@yale.edu](mailto:Dan.yamin@yale.edu), Arieh Gavious

In the majority of developed countries, the level of influenza vaccination coverage in all age groups is suboptimal. Hence, the authorities offer different kinds of incentives for people to become vaccinated such as subsidizing vaccination or placing vaccination centers in malls to make the process more accessible. We built a theoretical epidemiological game model to find the optimal incentive for vaccination and the corresponding expected level of vaccination coverage. The model was supported by survey data from questionnaires regarding people's perceptions about

influenza and the vaccination against it. Result suggest that the optimal magnitude of the incentives should be greater when less contagious seasonal strains of influenza are involved and in regions where vaccination coverage is expected to be higher. The optimal incentive should be also greater for the nonelderly population rather than the elderly, and should rise as high as \$57 per vaccinated individual so that all children between the ages of six months and four years will be vaccinated.

## **REVISED PRESENTATION**

### **■ SC23**

3 - Flexible Leasing Contracts in a Sustainable Fleet Replacement Model

We study the fleet replacement problem taking into account the minimization of cost and risk, simultaneously, in a stochastic multi-period setting, using conditional value at risk. New engine vehicles are considered as an alternative solution to reduce fossil fuel consumption and greenhouse gas emission. We develop a model that considers the possibility of early termination of the leasing contracts using real options. We validate the results by a real world case study.

Fernando Oliveira

SC

## **LATE CANCELLATIONS**

### **■ SC42**

3 - Recovery Legislations versus Taxation/Subsidy Policies for Product Remanufacturing  
Shumail Mazahir

SD

## **NEW PRESENTATIONS**

### **■ SD12**

2 - Iterative Auction Design for Graphical Valuations  
Ozan Candogan, Duke University, Fuqua School of Business, Durham, NC, United States of America, [candogan@mit.edu](mailto:candogan@mit.edu), Pablo Parrilo, Asuman Ozdaglar

In this work, we develop new practical and efficient iterative auctions for multi-item settings that exhibit both value complementarity and substitutability. We obtain such auctions by focusing on a natural class of value functions that can be compactly represented by associating a value graph with the set of items the auctioneer sells. We start our analysis by establishing that when the underlying value graph is a tree (and satisfies an additional sign-consistency condition), a Walrasian equilibrium always exists, and an efficient allocation can be found by solving a linear programming formulation of the efficient allocation problem. However, when the underlying graph is not a tree, these results no longer hold. On the other hand, we also show that in

this case a more general pricing equilibrium always exists, and provide a stronger linear programming formulation that can be used to identify the efficient allocation for general graphical valuations. By considering iterative solutions of the aforementioned LP formulations, and complementing them with appropriate payment rules, we obtain iterative auction formats that implement the efficient outcome at an (ex-post perfect) equilibrium. These auctions terminate when a market clearance condition holds, and rely on a simple bidder-specific graphical pricing rule: the auctioneer offers a bidder-specific price for each item, and bidder-specific discounts/markups for pairs of items. Our results suggest when value functions of bidders exhibit some special structure, it is possible to systematically exploit this structure in order to develop simple efficient iterative auction formats.

3 - Data-driven Chance Constrained Stochastic Program  
Ruiwei Jiang, University of Florida, 411 Weil Hall, University of Florida, Gainesville, FL, 32611, United States of America, [ruijiang@ufl.edu](mailto:ruijiang@ufl.edu), Yongpei Guan

Chance constrained programming is an effective and convenient approach to control risk in decision making under uncertainty. However, due to unknown probability distributions of random parameters, the solution obtained from a chance constrained optimization problem can be biased. In addition, instead of knowing the true distributions of random parameters, in practice, only a series of historical data, which can be considered as samples taken from the true (while ambiguous) distribution, can be observed and stored. In this paper, we derive stochastic programs with data-driven chance constraints (DCCs) to tackle these problems and develop equivalent reformulations. For a given historical data set, we construct two types of confidence sets for the ambiguous distribution through nonparametric

statistical estimation of its moments and density functions, depending on the amount of available data. We then formulate DCCs from the perspective of robust feasibility, by allowing the ambiguous distribution to run adversely within its confidence set. After deriving equivalent reformulations, we provide exact and approximate solution approaches for stochastic programs with DCCs under both moment-based and density-based confidence sets. In addition, we derive the relationship between the conservatism of DCCs and the sample size of historical data, which shows quantitatively what we call the value of data.

4 - Robust Optimization in Data Rich Environments  
Nathan Kallus, PhD Student, Massachusetts Institute of Technology, 77 Massachusetts Ave, E40-149, Cambridge, MA, 02139, United States of America, [kallus@mit.edu](mailto:kallus@mit.edu), Vishal Gupta, Dimitris Bertsimas

The last decade has seen an explosion in the availability of data for operations research applications as part of the Big Data revolution. Motivated by this data-rich paradigm, we propose a novel schema for utilizing data to design uncertainty sets for robust optimization using statistical hypothesis tests. The approach is flexible and widely applicable, and robust optimization problems built from our new sets are computationally tractable, both theoretically and practically. Furthermore, optimal solutions to these problems enjoy a strong, finite-sample probabilistic guarantee. We also propose concrete guidelines for practitioners and illustrate our approach with applications in portfolio management and queueing. Computational evidence confirms that our data-driven sets significantly outperform conventional robust optimization techniques whenever data is available.

5 - Unbiased Estimation with Square Root Convergence for SDE Models

Chang-han Rhee, Stanford University, Stanford University, Stanford, CA, 94305, United States of America, [chrhee@stanford.edu](mailto:chrhee@stanford.edu), Peter Glynn

In many settings in which Monte Carlo methods are applied, there may be no known algorithm for exactly generating the random object for which an expectation is to be computed. Frequently, however, one can generate arbitrarily close approximations to the random object. We introduce a simple randomization idea for

creating unbiased estimators in such a setting based on a sequence of approximations. Applying this idea to computing expectations of path functionals associated with stochastic differential equations (SDEs), we construct finite-variance unbiased estimators with a "square root convergence rate" for a general class of multi-dimensional SDEs. We then identify the optimal randomization distribution. Numerical experiments with various path functionals of continuous-time processes that often arise in finance illustrate the effectiveness of our new approach.

#### LATE CANCELLATIONS

##### ■ SD34

Ghost Model in Simulation based Optimization  
Felsa Vazquez Abad

##### ■ SD35

4 - Which Physicians Are More Likely To Be Reviewed Online By Patients?  
Haijing Hao

##### ■ SD38

4 - Extracting Sentiments from Financial Text  
Brikesh Raj Upreti

**Monday, October 7, 2013**

#### MA

#### REVISED PRESENTATION

##### ■ MA29

Introducing Julia - a New Open Source Technical Programming Language  
Julia is a new open source technical programming language that is scalable, high-performance, and open source. Julia is fast, approaching and often matching the performance of C/C++, easy to learn, and designed for distributed computation. This session will demonstrate some of the special capabilities of Julia and give you the tools you need to get started using this exciting technical computing language.

Michael Bean, [mbean@forio.com](mailto:mbean@forio.com)

##### ■ MA44

3 - Capacity Investment with Demand Learning  
How should a profit-maximizing firm adjust its capacity for a product with a finite life cycle when the market information is incomplete but can be learned? We characterize the firm's optimal policy about when and by how much to adjust the capacity in a multi-period model. We also propose simple data-driven heuristics, show the asymptotic convergence, and characterize the convergence rate. We finally illustrate the benefit of demand learning using data of Ford Focus.

#### MB

#### LATE CANCELLATIONS

##### ■ MB17

1 - Risks in Lean Service  
Seoung Dae Kim

##### ■ MB20

2 - Value of Flexibility in Oil and Gas Projects: The Case of Deferral Option  
Babak Jafarizadeh

##### ■ MB24

3 - Prudent Pricing for Sequential Sales  
Xiaowei Xu

##### ■ MB27

1 - Narrative Analysis in Support of a Rapid Fielding Process  
Michael Jaye

#### REVISIONS

##### ■ MB56

3 - Monitoring a Dynamic Network  
Bahareh Azarnoush, Student, Arizona State University, Tempe, AZ, 85281, United States of America, [bazarnou@asu.edu](mailto:bazarnou@asu.edu), George Runger, Jennifer Bekki, Kamran Paynabar  
Networks can naturally model many real world phenomena. Although the static modeling of networks has been the focus of much research, the intrinsic dynamics of real world phenomena is an important aspect and needs further attention. This in turn calls for the need of monitoring the dynamics of networks. This work presents an approach to this problem.

#### MONDAY INTERACTIVE SESSION

#### LATE CANCELLATIONS

25 - Transactive Memory Systems: Information Sharing and its Effect on Team Performance  
Courtney Williamson

34 - Berth Allocation Problem under Stochastic Nature  
Evrin Ursavas

#### MC

#### REVISIONS

##### ■ MC34

Updated Abstract

2 - On the Inadequacy of Var-based Risk Management: VaR, CVaR, and Nonlinear Interactions

We examine the role of VaR-constraints in managing financial risk accumulated by risk-seeking traders. This risk can be either finite or unbounded depending on the asset distributions. In either instance, VaR thresholds are seen to be inadequate in guarding against financial ruin.

4 - Robust Dependence Modeling for High-dimensional Covariance Matrices

Estimating dispersion matrices is a fundamental step for many applications, but classical sample covariance estimates are very sensitive to outliers. We propose a new robust covariance estimator using the regular vine structure and robust partial correlation estimators. We demonstrate the effectiveness of such estimator in the active asset allocation application.

#### LATE CANCELLATIONS

##### ■ MC17

2 - Warranty Pricing with Product Failures and Forward Looking Consumers: An Empirical Approach  
Jingqi Wang

##### ■ MC27

1 - How to (Can You?) Influence a Population's Attitude with a Single Whisper  
Robert Burks

##### ■ MC38

1 - Multi-objective Optimization for a Novel Batch Scheduling Problem  
Jun Pei

##### ■ MC69

2 - When do People Prefer Less Decision Alternatives?  
Jae-Hyeon Ahn

#### MD

#### Revision

##### ■ MD59

2 - The Environmental Impact of In-house and Outsourced Remanufacturing

Lan Wang, Student, University of Florida, University of Florida, STZ 355B, Gainesville, FL, 32611-7169, United States of America, [lan.wang@warrington.ufl.edu](mailto:lan.wang@warrington.ufl.edu), Gangshu Cai, Andy Tsay, Asoo Vakharia

In recent years, the reverse logistics channel design has gained importance due to the increased awareness and emphasis on green supply chains. To make the strategic decision, a firm should consider the consumers' physiological on remanufactured product and the cannibalization of remanufactured product on new product. We investigate the decision drivers of remanufacturing strategies: remanufacture in-house or outsource to a third party, considering two input factors-the difference in the cost efficiency between two strategies and heterogeneous preference of the consumers on new/remanufactured products. We analyze the impact of recycling level under two strategies, which make the recycle rate an endogenous decision variable. In addition, we compare the environmental impact and social welfare of these two strategies.

#### **LATE CANCELLATIONS**

##### **■ MD62**

Reliability Mapping of Remanufactured Products  
Wilkistar Otieno

##### **■ MD68**

3 - Optimal Investment Time in Mining Projects under Uncertainty and Competition  
Leonardo Santiago

**Tuesday, November 15, 2011**

#### **TA**

#### **LATE CANCELLATIONS**

##### **■ TA50**

4 - Simulation-based Optimization: An Application to Generation Expansion Planning  
Mike Rodgers

#### **NEW PRESENTER**

##### **■ TA07**

1 - Forecasting and Staffing Call Centers with Multiple Uncertain Arrival Streams  
Han Ye

#### **NEW SESSION CHAIR**

##### **■ TA06**

Tachun Lin, Assistant Professor, Cameron University, 2800 W Gore Blvd, Lawton OK 73505, United States of America, [tlin@cameron.edu](mailto:tlin@cameron.edu)

##### **■ TA50**

Marissa Hummon, National Renewable Energy Laboratory, 15013 Denver West Parkway, Golden, CO, 80401, United States of America, [Marissa.Hummon@nrel.gov](mailto:Marissa.Hummon@nrel.gov)

#### **TB**

#### **NEW PRESENTATION**

##### **■ TB42**

4 - Inventory Monitoring in Micro-retailing  
We develop a procedure for predicting out-of-stock products in a retail store using only point of sale transaction data, without inventory levels or in-bound delivery data. We postulate a Hidden Markov Model (HMM) incorporating inventory status and purchase behavior. The procedure is validated with data from micro-retailers in Mexico.  
Margaret Aksoy-Pierson, Dartmouth College, Tuck School of Business, Hanover, NH, United States of America, [mpierson@dartmouth.edu](mailto:mpierson@dartmouth.edu), Juan Chaneton, Garrett van Ryzin

#### **LATE CANCELLATIONS**

##### **■ TB01**

2 - Enhanced Indexation Based on Second-Order Stochastic Dominance  
Gautam Mitra

##### **■ TB27**

1 - Operations Research and Network Science forming a Modern, Emerging Conception of Information  
David Arney

##### **■ TB33**

1 - Optimal Search under Evolving Uncertainty  
Jesse Pietz

##### **■ TB69**

2 - The Impact of Subjective and Objective Fit on Brand Extension Success  
Irene Nahm

#### **NEW SESSION CHAIR**

##### **■ TB27**

William Fox, Naval Postgraduate School, 589 Dyer Road, Room 214, Monterey, CA, 93943, United States of America, [wfox@nps.edu](mailto:wfox@nps.edu)

#### **TUESDAY INTERACTIVE SESSION**

#### **NEW PRESENTATION**

44 - A Link-based Approach for Evaluating Accessibility to Emergency Services in a Transportation Network  
The authors utilize network science, location science and transportation-based accessibility principles to create a new performance measure to help decision-makers evaluate the relative importance of each link in a roadway network with respect to its system-wide contribution to emergency service accessibility under link disruption scenarios. The measure accounts for the spatial distribution of important / critical nodes, the topology of the road network, geographical topography and the characteristics of the road network such as road types, capacities, volumes and travel speeds. The authors demonstrate their methodology using geographic information system (GIS) mapping and travel-demand modeling software with an actual state travel demand model and road network.

David Novak, University of Vermont, Burlington, VT, United States of America, [dnovak@bsad.uvm.edu](mailto:dnovak@bsad.uvm.edu), Jim Sullivan

#### **LATE CANCELLATIONS**

42 - Estimating New HIV-infections and Analyzing Strategies for HIV-prevention  
Chaitra Gopalappa

#### **TC**

#### **NEW SESSION CHAIR**

##### **■ TC52**

Justin Goodson, Saint Louis University, 3674 Lindell Blvd., St. Louis, MO, 63128, United States of America, [goodson@slu.edu](mailto:goodson@slu.edu)

#### **TD**

#### **LATE CANCELLATION**

##### **■ TD38**

Supply Chain with Competing Retailers  
Ruo Du

##### **■ TD54**

Utilizing Multiple Wireless Roadside Sensors at Intersections  
David Kim

**WA**

**SESSION MOVED FROM WC06**

■ **WA05**  
2 - Shape Constrained Estimation of Value Functions in Dynamic Programming  
Mohammad Mousavi

■ **WA26**  
Data Driven Network Models  
Alexander Gutfring

**NEW PRESENTATIONS**

■ **WA29**  
8:45am-9:30pm  
**Creating Compelling Decision Support Tools and Dashboards**  
Chaitanya Sagar, CEO  
[cs@perceptive-analytics.com](mailto:cs@perceptive-analytics.com)  
As important as a decision-support tool is the design of the tool, the ability to make the tool communicate with the executive decision maker and give the power to run what-if analyses can amplify the tool's actual and perceived utility. This tutorial helps you be awesome at creating clinching decision support tools.

**SESSION CANCELLATIONS**

■ **WA07**  
Stochastic Programming in Financial Portfolio Management  
Chair: Chanaka Edirisinghe

**LATE CANCELLATIONS**

■ **WA04**  
Optimality Certificates in Mixed Integer Programming: From Branch and Bound to Cutting Planes  
Babak Moazzez

■ **WA07**  
1 - Stochastic Portfolio Optimization under Regime-based Firm Strength Scenarios  
Chanaka Edirisinghe  
2 – Using Options Market Data in Asset Liability Management  
Alan King

■ **WA18**  
1 - Analysis of an M/G/1 Batch Arrival Queue Subject to Disasters and Server Failures Under N-policy  
George Mytalis

■ **WA26**  
2 - Forming Effective Teams using Machine Learning and Optimization  
Alexandros Nathan

■ **WA34**  
2 - Applications of GIS, Mathematical and Simulation Models for Optimal Organ Allocation System  
Naoru Koizumi

**WB**

**LATE CANCELLATIONS**

■ **WB05**  
1 - Modeling Unwanted Inflation Key Factors to Forecast Inflation  
Tina Rezvani

■ **WB13**  
3 - Factors Influencing Collaboration Among Humanitarian Organizations: An Empirical Analysis  
Mohammad Moshtari

■ **WB22**  
1 - An Abdominal Surgery Scheduling Problem Considering Patient Condition  
Joonyup Eun

■ **WB35**  
5 - Topological Optimization on Artificial Neural Network with Application to Financial Data Forecasting  
Shiye He

■ **WB44**  
2 - Determining the Optimal Location for the Push-pull Boundary in a Supply Chain  
Kathleen Iacocca

■ **WB53**  
Transportation Network Design in Megaregions: Impact on Economic Development  
Mostafa Mollanejad

**NEW SESSION CHAIR**

■ **WB29**  
Erin Fahrenkopf, PhD Student, Carnegie Mellon University, 333 Morewood Ave, 7, Pittsburgh, PA, 15213, United States of America, [emckinne@andrew.cmu.edu](mailto:emckinne@andrew.cmu.edu)

**NEW PRESENTATION**

■ **WB51**  
3 - Estimating Dynamic Network O-D Patterns with Informed Drivers: Methodology and Large-Scale Network Application  
Hani Mahmassani, Professor, Northwestern University, Evanston, IL, United States of America, [masmah@northwestern.edu](mailto:masmah@northwestern.edu), Ali Zockaie Kheiraie, Ying Chen  
Drivers increasingly have access to real-time information but the proportion of those who rely on such information is unknown. We propose an optimization procedure to simultaneously estimate the time-dependent origin-destination trip tables for a large network along with the percentage of en-route users, given link-level traffic sensor data. The procedure is applied to the Chicago network.

**WC**

**NEW PRESENTATION**

**WC54**  
4 - Estimating Travel Time Variability: Distinguishing Between Variability and Uncertainty Due To Measurement Errors or Ignorance  
Hani Mahmassani, Professor, Northwestern University, Evanston, IL, United States of America, [masmah@northwestern.edu](mailto:masmah@northwestern.edu), Jiwon Kim  
This study presents a scenario-based approach to estimating travel time variability in a network, where the distribution of travel times is expressed as a mixture of scenario-specific component distributions with the scenario likelihoods as mixing weights. We consider cases where the component distributions and/or the scenario weights are unknown, letting the estimation results reflect both true variability and the uncertainty due to measurement errors or ignorance.

**LATE CANCELLATIONS**

■ **WC08**  
2 – Solution Approaches to the Load Leveling Appointment  
Azadeh Mobasher

■ **WC08**  
1 - Assessing the Value of Social Media Data for Biosurveillance  
Kristina Howard

■ **WC26**

5 – Modeling Dynamic Deployment in the Physical Internet-enabled Open Distribution Web  
Helia Sohrabi

■ **WC50**

4 - Optimal Invoice Factoring Strategy for Cash-constrained Manufacturers  
Chaocheng Gu

■ **WC51**

1 - Scheduling and Long-term Pricing of Electric Vehicle Charging in Parking Lots with Shared Resources  
Ajay Deshpande

■ **WC52**

3 - Period Vehicle Routing with Stochastic Service Requests  
Luis de al Torre

**WD**

**LATE CANCELLATIONS**

■ **WD22**

4 - Analyzing and Assessing Brain Functioning with Invariant Graph Connectivity Measures  
David Phillips

■ **WD43**

4 – An Experimental Study of Outsourcing Through Competition  
Ehsan Elahi

■ **WD64**

1 - Flexible Leasing Contracts in a Sustainable Fleet Replacement Model  
Amir Hossein Ansariipoor

■ **WD55**

2 - Dealing With the Wickedness of Strategy  
Peng Liu

**NEW SESSION CHAIR**

■ **WD22**

Elham Torabi, University of Cincinnati, 2900 Campus Green Drive, Cincinnati OH 45221, United States of America,  
torabiem@mail.uc.edu

■ **WD55**

Baris Carikci, TUBITAK, Kocaeli/ Gebze/TÜSSIDE, Istanbul, Turkey, [bcarikci@yahoo.com](mailto:bcarikci@yahoo.com)

**CORRECTED PRESENTER**

■ **WD37**

1 - Takashi Irohara, Professor, Sophia University, 7-1 Kioi-cho, Chiyoda-ku, Tokyo 102-8554, Japan, irohara@sophia.ac.jp