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The journal is pleased to publish the abstracts of the six finalists of the 2016 Manufacturing and Service Operations Management Society's student paper competition.

The 2016 prize committee was chaired by Sameer Hasija (INSEAD), Nicos Savva (London Business School), and Tolga Tezcan (London Business School). The other committee members were: Philipp Afeche, Vishal Agrawal, Aydin Alptekinoglu, Dimitrios Antritsos, Nilay Argon, Mazhar Arikian, Alessandro Arlotto, Arash Asadpour, Atalay Atasu, Nitin Bakshi, Gah-Yi Ban, Opher Baron, Robert Batt, Elena Belavina, Omar Besbes, Kostas Bimpikis, Robert Bray, Carri Chan, Xin Chen, Ying-Ju Chen, Soo-Haeng Cho, So Yeon Chun, Florin Ciocan, Sarang Deo, Lingxiu Dong, Santiago Gallino, Srinagesh Gavirneni, Manu Goyal, Shuangchi He, Jonathan Helm, Ming Hu, Dan Iancu, Foad Iravani, Srikanth Jagabathula, Nitish Jain, Yash Kanoria, Fikri Karaesmen, Diwas KC, Saravanan Kesavan, Bora Keskin, Sang Kim, Song-Hee Kim, Pascale Krama, Mirko Kremer, Harish Krishnan, Mumin Kurtulus, Guoming Lai, Cuihong Li, Jun Li, Lauren Lu, James Luedtke, Victor Martinez de Albinez, Mili Mehrotra, Alex Mills, Toni Moreno, Nektarios Oraopoulos, Anton Ovchinnikov, Yiangos Papanastasiou, Chris Parker, Rodney Parker, Ali Parlakturk, Alfonso Pedraza Martinez, Ramandeep Randhawa, Paat Rusmevichientong, Chris Ryan, Soroush Saghafian, Ozge Sahin, Burhaneddin Sandikci, Nicola Secomandi, Stephen Shechter, Pengyi Shi, Amitabh Sinha, Milind Sohoni, Brad Staats, Alireza Tahbaz-Salehi, Nicos Trichakis, Owen Wu, Wenqiang Xiao, Nan Yang, Fuqiang Zhang, Jiawei Zhang, Yao Zhao, Karen Zheng, Yong-Pin Zhou, and Leon Zhu.

The 2016 prize winners are as follows:

First Prize (joint winners):

Online Decision-Making with High-Dimensional Covariates
Hamsa Bastani, Stanford University

Economies of Scale and Scope in Hospitals
Michael Freeman, University of Cambridge

Finalists (in alphabetical order according to the author's last name):

Strategic Open Routing in Service Networks
Andrew E. Frazelle, Duke University

Real-Time Optimization of Personalized Assortments
Negin Golrezaei, University of Southern California

Using Patient-Centric Quality Information to Unlock Hidden Health Care Capabilities
Guihua Wang, University of Michigan

Buyer Intermediation in Supplier Finance
Weiming Zhu, University of Navarra

Online Decision-Making with High-Dimensional Covariates

Hamsa Bastani

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Advisor: Mohsen Bayati, Stanford University

Big data has enabled decision-makers to tailor decisions at the individual level in a variety of domains such as personalized medicine and online advertising. This involves learning a model of decision rewards conditional on individual-specific covariates. In many practical settings, these covariates are high-dimensional; however, typically only a small subset of the observed features are predictive of a decision's success. We formulate this problem as a multiarmed bandit with high-dimensional covariates, and present a new efficient bandit algorithm based on the LASSO estimator. Our regret analysis establishes that our algorithm achieves near-optimal performance in comparison to an oracle that knows all the problem parameters. The key step in our analysis is proving a new oracle inequality that guarantees the convergence of the LASSO estimator despite the non-i.i.d. data induced by the bandit policy. Furthermore, we illustrate the practical relevance of our algorithm by evaluating it on a real-world clinical problem of warfarin dosing. A patient's optimal warfarin dosage depends on the patient's genetic profile and medical records; incorrect initial dosage may result in adverse consequences such as stroke or bleeding. We show that our algorithm outperforms existing bandit methods as well as physicians to correctly dose a majority of patients.

Economies of Scale and Scope in Hospitals

Michael Freeman

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Advisors: Nicos Savva, London Business School;
Stefan Scholtes, University of Cambridge

General hospitals across the world are becoming larger (i.e., admitting more patients each year) and more complex (i.e., offering wider portfolios of services to higher acuity patients with more diverse care needs). Although prior work has shown that increased volume is positively associated with patient outcomes, it is less clear how volume affects costs in these complex organizations. This paper investigates this relationship using panel data for 14 service lines comprising both elective and emergency admissions across 130 hospitals in the United Kingdom over a period of 9 years. Although we find significant economies of scale for both elective and emergency admissions, we also find evidence of negative spillovers across the two admission types, with increased elective volume at a hospital being associated with an increase in the cost of emergency care. Furthermore, for emergency admissions we find evidence of positive spillovers across service lines—increased emergency activity in one service

line is associated with lower costs of emergency care in other service lines. By contrast, we find no evidence of such spillovers across service lines for elective admissions. Our findings have implications for individual hospitals and for the organization of regional hospital systems. Specifically, at the hospital level our findings suggest that growth strategies that target elective patients may have unintended negative productivity implications for emergency services. At the regional level, our findings offer support for the reorganization of regional hospital systems toward general hospitals that focus on the provision of emergency care across a full range of services, complemented by high-volume clinics that focus on elective services in a single service line.

Strategic Open Routing in Service Networks

Andrew E. Frazelle

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Advisors: Alessandro Arlotto, Duke University;
Yehua Wei, Boston College

We study the behavior of strategic customers in an open-routing service network with multiple stations. When a customer enters the network, she is free to choose the sequence of stations that she visits, with the objective of minimizing her expected total system time. For the two-station game with deterministic service times, we prove that the game is supermodular. By applying the supermodularity result, we observe that strategic customers “herd”; i.e., in equilibrium all customers choose the same route. We then identify a broad class of learning rules—which include both fictitious play and Cournot best-response—that converges to herding in finite time. We also find that the herding behavior is prevalent in many other open-routing service networks, including those with stochastic service times and those with more than two stations.

Real-Time Optimization of Personalized Assortments

Negin Golrezaei

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Advisor: Hamid Nazerzadeh, University of Southern California

Motivated by the availability of real-time data on customer characteristics, we consider the problem of personalizing the assortment of products for each arriving customer. Using actual sales data from an online retailer, we demonstrate that personalization based on each customer's location can lead to over 10% improvements in revenue compared to a policy that treats all customers the same. We propose a family of index-based policies that effectively coordinate the

real-time assortment decisions with the back-end supply chain constraints. We allow the demand process to be arbitrary and prove that our algorithms achieve an optimal competitive ratio. In addition, we show that our algorithms perform even better if the demand is known to be stationary. Our approach is also flexible and can be combined with existing methods in the literature, resulting in a hybrid algorithm that brings out the advantages of other methods while maintaining the worst-case performance guarantees.

Using Patient-Centric Quality Information to Unlock Hidden Health Care Capabilities

Guihua Wang

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Advisors: Jun Li, University of Michigan;

Wallace J. Hopp, University of Michigan

This paper addresses the challenge of measuring medical provider quality in a manner that helps patients receive better care. Using mitral valve surgery as the clinical setting, we study the quality of 188 cardiac surgeons at 35 hospitals in New York State with respect to different quality metrics. We use a multi-level probit model to capture hospital and surgeon volume effects, as well as their specific effects, on patient outcomes while correcting for potential selection bias using distance-based instruments. Our analysis of the data highlights a wide variation in quality among these surgeons with some performing significantly better than the state average. We also observe that patients of different demographics and levels of acuity benefit differently from these elite surgeons.

Existing healthcare provider quality information, which is almost exclusively based on population averages, cannot detect differences in the surgeon effect for patients with different characteristics or medical conditions. Consequently, relying on such information may under- or over-state the benefit of seeking out an elite surgeon. We show that replacing population-average

information with patient-centric quality information, which calibrates outcome statistics by patient demographics and acuity, significantly enhances the ability of patients to choose the most appropriate surgeon. We estimate that the total societal benefits (i.e., sum of patients' utility) from using patient-centric information are comparable to those achievable by enabling the best surgeons to treat 10–40% more patients under population-average information, depending on the weights patients place on distance and waiting time as well as the quality metric used.

Buyer Intermediation in Supplier Finance

Weiming Zhu

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Advisor: Tunay I. Tunca, University of Maryland

Small suppliers often face challenges to obtain financing for their operations. Especially in developing economies, traditional financing methods can be very costly or unavailable to such suppliers. In order to reduce channel costs, in recent years large buyers started to implement their own financing methods that intermediate between suppliers and financing institutions. In this paper, we analyze the role and efficiency of buyer intermediation in supplier financing. Building a game-theoretical model, we show that buyer intermediated financing can significantly improve supply chain performance. Using data from a large Chinese online retailer and through structural regression estimation based on our theoretical analysis, we demonstrate that buyer intermediation induces lower interest rates and wholesale prices, increases order quantities, and boosts supplier borrowing. Our analysis also shows that the retailer systematically overestimates the consumer demand. Based on counterfactual analysis, we predict that the implementation of buyer intermediated financing for the online retailer in 2013 improved channel profits by 18.3%, yielding more than \$68 million projected savings.