DEPARTMENT of INDUSTRIAL ENGINEERING
UNIVERSITY of HOUSTON

FRIDAY SEMINAR SERIES
BROADEN HORIZONS | EXTEND MINDS

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Date: Friday Nov 4, 2022

Time: 1:00-1:50 PM CT

Location: Melcher Hall 180

Facility Location with Competition or Decision-dependent Uncertainty: Models, Algorithms and Extensions

Abstract: Facility location models are ubiquitously involved in modern transportation and logistics problems. We present recent results of two types of facility-location models that involve (i) competition and probabilistic customer choice or (ii) location-dependent uncertain demand with ambiguously known distribution. For (i), we study a Stackelberg game that admits a bilevel mixed-integer nonlinear program (MINLP) formulation, and derive an equivalent, single-level MINLP reformulation and exploit the problem structures to derive valid inequalities, based on submodularity and concave overestimation, respectively. We also study various model extensions by considering general facility setup costs, multiple competitors, as well as other types of decisions for planning facilities. We conduct numerical studies to demonstrate that the exact algorithm significantly accelerates the computation of CFLP on large-sized instances that have not been solved optimally or even heuristically by existing methods. For (ii), we represent moment information of stochastic demand as piecewise linear functions of location decisions, and then develop an exact mixed-integer linear programming reformulation of a decision-dependent distributionally robust optimization model. Our results draw attention to the need of considering various impacts of competition and location choices on customer demand during strategic facility planning.

Biography: Siqian Shen is an Associate Professor and Richard Wilson Faculty Scholar in the Department of Industrial and Operations Engineering at the University of Michigan. She also serves an Associate Director in the Michigan Institute for Computational Discovery & Engineering (MICDE). She obtained a B.S. degree from Tsinghua University in 2007 and Ph.D. from the University of Florida in 2011. Her theoretical research interests are in integer programming, stochastic/robust optimization, and network optimization. Applications include optimization and risk analysis of energy, healthcare, cloud computing, and transportation systems. She is a recipient of the IIE Pritsker Doctoral Dissertation Award, IBM Smarter Planet Innovation Faculty Award, and Department of Energy (DoE) Early Career Award. She has served in editorial boards of several journals including Transportation Science, Manufacturing & Service Operations Management, Service Science, IISE Transactions, Networks, INFORMS Journal on Computing, and European Journal of Operational Research.