The Department of Civil and Environmental Engineering at the University of Houston presents...

CIVE 6111 Graduate Seminar

Joint Optimization of Budget Allocation and Maintenance Planning of Multi-Facility Transporation Infrastructure Systems

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2:45pm-3:45pm
Zoom: https://uh-edu-cougarnet.zoom.us/j/95702511696?pwd=VFIybkh4emhETHNITGV0dXRHS3pIZz09

Abstract

Transportation infrastructure, such as pavements and bridges, is critical to a nation's economy. A large number of transportation infrastructure is, however, underperforming and structurally deficient and must be repaired or reconstructed. Maintenance of deteriorating transportation infrastructure often requires multiple types/levels of actions with complex effects. Maintenance management becomes more intriguing when considering facilities at the network level, which represents more challenges on modeling interdependencies among various facilities. This research considers an integrated budget allocation and preventive maintenance optimization problem for multi-facility transportation infrastructure systems. We first develop a general integer programming formulation for the problem. To solve large-scale problems, we reformulate the problem and decompose it into multiple Markov decision process models. A priority-based two-stage method is developed to obtain optimal maintenance decisions. Computational studies are conducted to evaluate the performance of the proposed algorithms. Our results show that the proposed algorithms are efficient and effective in finding satisfactory maintenance decisions for multi-facility systems. We also investigate the properties of the optimal maintenance decisions and make several important observations, providing insightful decision guidance for real-world problems.

Bio

Dr. Yisha Xiang is the associate professor of Industrial Engineering at the University of Houston. Her current research and teaching interests involves data-driven decision-making under uncertainty and statistical machine learning. Her research has been funded by National Science Foundation, including a CAREER grant, and industry. She has published articles in refereed journals, such as INFORMS journal on computing, IISE Transactions, European Journal of Operational Research, and Naval Research Logistics. She was the recipient of the P.K. McElroy award, Stan Oftshun award, and Doug Ogden award for best papers at the Reliability and Maintainability Symposium. Dr. Xiang received her B.S. in Industrial Engineering from Nanjing University of Aero. & Astro., China, and M.S and Ph.D. in Industrial Engineering from University of Arkansas. She serves as an Associate Editor for IISE Transactions and IEEE Transactions Automation Science and Engineering. She also currently serves as the Chair-elect of the INFORMS Quality, Statistics, and Reliability Sector, and President-elect of the IISE Quality Control and Reliability Engineering Division. She is a member of IISE and INFORMS.