The Hong Kong University of Science and Technology

Dept of Information Systems, Business Statistics and Operations Management
Dept of Industrial Engineering & Decision Analytics
Joint Seminar Announcement

Replacing What Could Be Repaired: A Structural Analysis of Two-Stage Diagnostic Decisions in Managing Shared-Bike Returns

by

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Date : **13 August 2025 (Wednesday)**
Time : **10:30 – 11:45 AM**
Venue : **Classroom 1014, 1/F, LSK Business Building**

Abstract:
Bike-sharing platforms face significant challenges from high maintenance costs, driven by heavy usage and inefficiencies in diagnostic decision-making. Using task-level data from a leading bike-sharing platform, we develop a structural estimation model to analyze two-stage diagnostic decisions made by inspectors (stage 1) and workers (stage 2). These decisions are modeled as a strategic interaction governed by a Bayesian Nash Equilibrium (BNE). To address the computational complexity of Maximum Likelihood Estimation with BNE constraints, we employ machine learning to approximate BNE. We identify systematic overtreatment tendencies among inspectors and workers, resulting in a higher false positive rate than that under the firm's optimal decisions and thus inflating maintenance costs. Our counterfactual analyses show that higher part costs, reducing workers' piece-rate wages, adopting structured job matching, and prioritizing worker training can substantially reduce costs. Transitioning from a two-stage to a one-stage process lowers diagnostic accuracy and increases costs, although optimizing wages narrows this gap. This framework provides actionable insights for mitigating inefficiencies in multi-agent diagnostic decision systems and is generalizable to other credence goods industries, such as heavy equipment maintenance and healthcare, where diagnostic errors have significant financial, operational, and health implications.

Bio: Guangwen (Crystal) Kong is an Associate Professor of Statistics, Operations & Data Science at Temple University's Fox School of Business. She received her Ph.D. Degree in Operations Management at the University of Southern California in 2013 and was a faculty of the University of Minnesota's Department of Industrial & Systems Engineering.

Dr. Kong's research investigates how information and incentives shape behavior and operational decisions in sharing-economy, on-demand platforms, service operations, and supply chains. Her research appears in Management Science, Manufacturing & Service Operations Management, and Production & Operations Management and has received field-leading honors such as the 2022 Management Science Best Paper in Operations Management Award, the 2021 M&SOM Service SIG Best Paper Award, and the 2021 DSI Best Problem-Driven Analytical Research Paper Award, etc.. She serves as an associate editor of M&SOM, Naval Logistics Research and Service Science. She's currently the vice president of POMS College of Behavioral Operations Management and secretary/treasurer of INFORMS Service Science Section.

All interested are welcome!
Enquiries: Dept of ISOM