The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Joint Pricing and Production: A Fusion of Machine Learning and Robust Optimization

by

Mr Qinshen TANG
Research Fellow
Institute of Operations Research and Analytics
National University of Singapore

Date: 26 August 2019 (Monday)
Time: 10:30am - 11:30am
Venue: M802, Li Ka Shing Tower
The Hong Kong Polytechnic University

(Conducted in English)

Abstract:

We integrate machine learning with distributionally robust optimization to address a two-period problem for the joint pricing and production of multiple items. First, we generalize the additive demand model to capture both cross-product and cross-period effects as well as the demand dependence across periods. Next, we apply K-means clustering to the demand residual mapping based on historical data and then construct a K-means ambiguity set on that residual while specifying only the mean, the support, and the mean absolute deviation. Finally, we investigate the joint pricing and production problem by proposing a K-means adaptive markdown policy and an affine recourse approximation; the latter allows us to reformulate the problem as an approximate but more tractable mixed-integer linear programming problem. Both the case study and our simulation demonstrate that, with only a few clusters, the K-means adaptive markdown policy and ambiguity set can increase expected profits as compared with the empirical model – when applied to most out-of-sample tests.

Bio:

TANG Qinshen is currently a research fellow at the Institute of Operations Research and Analytics, National University of Singapore, advised by Associate Professor Lucy Gongtao Chen and Professor Melvyn Sim. He received a Ph.D. in Analytics & Operations from National University of Singapore in 2019. His primary research interests involve target-based decision making under uncertainty and data-driven robust optimization with applications in supply chain management. He is also interested in applying cooperative and non-cooperative game theory in solving problems in the interface of operations management and marketing/economics. He has an Honourable Mention in both POMS-HK Student Paper Competition and POMS Supply Chain Management Student Paper Competition. He was also awarded Outstanding Graduate Student Teaching Award.

Please email to anne-ly.wong@polyu.edu.hk for enquiries.

All are welcome!