Data-Driven Algorithms for Complex Supply Chain Systems with Censored Demand

*Presented by:*

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With the advance of information technology, many firms can gather a variety of data with high volume and frequency. However, acquiring data is only the first step toward effective data-driven optimization on the underlying supply chain system. The most important step is to effectively integrate the data through the learning process (mining the data) in the decision-making process, and utilize the information extracted from data to improve the efficiency of the firm's supply chain operation. One of the major challenges encountered in these data-driven optimization problems lies in the learning and earning tradeoff where the observed data and the operational policies being implemented are inextricably linked and dependent.

In this colloquium, I will present my recent works on the design of efficient learning algorithms for supply chain problems that address the aforementioned issues. I will focus on two fundamental yet challenging stochastic inventory control problems: the inventory system with perishable products (with fixed lifetimes) and the lost-sales inventory system with positive lead times. The decision maker is assumed to have no information about the underlying demand distribution a priori and can only observe past realized sales (censored demand) data to optimize the system's performance on the fly. For each problem, we design a non-parametric learning algorithm that can converge to the optimal base-stock policy with a provably tight regret rate. The design and analysis of these algorithms overcome the limitations of standard data-driven optimization algorithms that result from complex system dynamics, inventory constraints, and prolonged impact on decision-making.

About the Speaker:  
Huanan (Robert) Zhang received his bachelor’s degree in Systems Engineering and Engineering Management from the Chinese University of Hong Kong. Currently, he is a Ph.D. candidate in the Department of Industrial and Operations Engineering at the University of Michigan. His research interests include design of online learning algorithms, approximation algorithms, and their applications in inventory and supply chain management, revenue management, and service operations.