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.