Operations Workshop 9/21/2021

Presenter: Linwei Xin

Title: Multi-Item Online Order Fulfillment in a Two-Layer Network

Abstract:

The boom of e-commerce in the globe in recent years has expedited the expansion of fulfillment infrastructures by e-retailers. While e-retailers are building more and more mini-warehouses close to end customers to offer faster delivery service than ever, the associated fulfillment costs have skyrocketed. In this paper, we study a real-time fulfillment problem in a two-layer RDC-FDC distribution network that has been implemented in practice by major e-retailers. In such a network, the upper layer contains larger regional distribution centers (RDCs) and the lower layer contains smaller front distribution centers (FDCs). We consider multi-item orders and allow order split: an order can be split and fulfilled from multiple warehouses at an additional cost. The objective is to minimize the fulfillment costs. We study real-time fulfillment algorithms with performance guarantees in both settings with and without demand forecasts.

This is joint work with Yanyang (Alex) Zhao (Chicago Booth) and Xinshang Wang (Alibaba).

Bio:

Linwei Xin is an assistant professor of Operations Management at Booth School of Business, University of Chicago. His primary research is on inventory and supply chain management: designing models and algorithms for organizations to effectively "match supply to demand" in various contexts with uncertainty. His research on stochastic inventory theory by using asymptotic analysis has been recognized with several INFORMS paper competition awards, including the Applied Probability Society Best Publication Award (2019), First Place in the George E. Nicholson Student Paper Competition (2015), Second Place in the Junior Faculty Interest Group Paper Competition (2015), and a finalist in the Manufacturing and Service Operations Management Student Paper Competition (2014). His work with JD.com on dispatching algorithms for robots in intelligent warehouses was recognized as a finalist for the INFORMS 2021 Franz Edelman Award, with an estimate of billions of dollars in savings. His other honors include winning a National Science Foundation grant as a principal investigator. His research has been published in journals such as Operations Research and Management Science. He currently teaches MBA and PhD courses at the University of Chicago.