Abstract

Motivated by applications in e-commerce, we propose the submodular dispatching problem: A set of orders with different release times must be processed or dispatched by a single server in batches, and batch dispatch times are submodular, representing economies of scale. The objective is to minimize the makespan, the time at which all orders have been dispatched. Two particular use cases for the model arise in distribution systems in same-day delivery and stocking and picking systems in warehouses. The model is strongly NP-hard even in simple cases, and we discuss various approaches for heuristic optimization, including FIFO solutions and solutions derived from a column-generation mixed-integer program. We also discuss computational results from our motivating applications in same-day delivery and warehousing.

Bio

Alejandro Toriello is Associate Professor of Industrial and Systems Engineering (ISyE) at Georgia Tech, where he currently holds the Leo and Louise Benatar Early Career Professorship. Alejandro develops models and methods for decision support in supply chain management, logistics and transportation, and conducts theoretical and computational research in related mathematical optimization topics. He is currently on the editorial board of Transportation Science and TRB, is a recipient of an NSF CAREER award, and is an NAE Frontiers of Engineering alum. Alejandro is a two-time Georgia Tech ISyE graduate, BSIE 2003 and PhD IE 2010.