

## Submodular Dispatching

**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 or vehicle 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.

Joint work with ISyE OR PhD student Ignacio Erazo.



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**SPEAKER BIO** - Alejandro Toriello is Associate Professor of Industrial and Systems Engineering (ISyE) at Georgia Tech, where he also obtained his BS and PhD in 2003 and 2010, respectively. Prior to joining the ISyE faculty, he was Assistant Professor of Industrial and Systems Engineering at USC. His research interests include supply chains and logistics, recently focusing on ecommerce and the last mile, and mathematical optimization, particularly discrete and/or dynamic models. He is the 2023 President of the INFORMS TSL Society and serves on the editorial boards of Transportation Science and Transportation Research Part B. Alejandro is an NSF CAREER award winner and a former participant in the NAE Frontiers of Engineering symposium.