

Industrial and Systems Engineering Seminar

Tractable Analysis of the Transient Behavior of Multi-Server Queues

Wednesday, January 29

3:15 PM – Refreshments before the Seminar

3:30 PM – Graduate Seminar

Mechanical Engineering Room 4125 A & B



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In this talk, we present an analytically tractable approach for studying the transient behavior of multi-server queues with heavy-tailed arrivals and service, which provides qualitative insights via closed form expressions and produces reasonably accurate predictions of transient waiting times. We model the queuing primitives via polyhedral uncertainty sets inspired by the limit laws of probability. These uncertainty sets are characterized by variability parameters that control the degree of conservatism of the models. Taking a worst case approach, we obtain closed form formulas for the waiting time in the transient domain that offer rich qualitative insights on the dependence of the waiting time as a function of fundamental quantities in the queuing system. We then carry out an average case analysis and break new ground by treating the variability parameters that bound the uncertainty set as random variables and propose to approximate the expected waiting time via averaging the worst case values. This approach achieves significant tractability by reducing the problem of transient analysis to a two dimensional integral. Our computational results suggest that the proposed methodology leads to accurate results relative to simulation for heavy traffic queues with various interarrival and service time distribution, heavy tail coefficients and number of servers.

Joint work with Dimitris Bertsimas and Nataly Youssef at MIT

Bio: Chaithanya's research is focused on problems of decision making under uncertainty in Operations Management (Mechanism Design, Queueing, Finance, etc.). His work deals with developing tractable models and associated algorithms. He received his BTech in computer Science from the Indian Institute of Technology, Chennai in 2008 and his Ph.D. in Operations Research from the Operations Research Center at MIT in 2013. He is currently part of the Managerial Economics and Decision Sciences group at Kellogg School of Management.