D I S S E R T A T I O N P R O P O S A L

Mehmet Aydemir

“Essays in Time Sensitive Service Operations”

Friday, December 7, 2018
2:00 pm
Tepper Quad 5219

This thesis explores three problems in service operations where timeliness of the service provided has an impact on the overall system performance. The first chapter tackles the need for efficient screening policies at border security checkpoints facing various threats. The second chapter analyzes information sharing in the on-demand platforms such as Uber Grubhub etc. The last chapter discusses the incorporation of ride-sharing platforms into Emergency Medical Services.

Security screening systems aim to identify malevolent people and illicit goods. But screening operations may also result in long wait times at checkpoints. Selecting appropriate screening procedures thus creates a trade-off between efficiency and risk. This is complicated by the heterogeneity of screening jobs (which pose various threat levels) and the strategic behaviors of human agents (who may renege prior to screening if perceived risk levels are too high). In the first chapter we apply a speed-quality trade-off perspective to security operations. It extends the speed-quality trade-off literature to a multi-class setting with heterogeneous and strategic agents. From a practical standpoint, it supports tactical decision-making for dynamically selecting screening procedures, and strategic decision-making for designing pre-screening profiling programs.

Motivated by the recent popularity of emerging service models based on on-demand platforms, such as Uber and GrubHub, in the second chapter we investigate different forms of sharing delay information in such systems as a means of managing congestion and improving users' experience. We models such systems as two-sided queues and we consider the effect of providing different levels of delay information (different precision) to each side of the queue on the strategic users' balking/joining decisions and the system profitability. We allow for heterogeneous users, i.e., users react differently in response to different information types provided by the platform manager.

The growth of ride-sharing systems provide new opportunities for broader urban operations; one particular opportunity lies in leveraging the ubiquitous ride-sharing fleets to supplement EMS – which operate with limited fleets in a highly time-sensitive environment. Specifically, for low-priority calls ride sharing systems can substitute the EMS and transport patients to the desired medical facility. For more severe and life threatening calls, rider sharing systems can bring life-saving equipment such as Automated External Defibrillators (AEDs) to the scene in a timely manner to complement the EMS fleets. In collaboration with University of Pittsburgh Department of Emergency Medicine and the Pittsburgh Bureau of EMS, we aim to study opportunities to improve the operations of EMS systems, given historical performance and ride-sharing capabilities.