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Robust Resource Allocation under Uncertainty for Transportation Systems

Abstract: Transportation scheduling and routing problems, with their inherent complexity and large-scale nature, are ideal candidates for the application of optimization techniques. Conventional models, however, include simplifying assumptions, such as deterministic model inputs - guaranteeing that such solutions are vulnerable to inherent real-world uncertainty. In this talk, I address the fundamental question of building robust solutions, that is, solutions which (i) are less fragile to disruption, (ii) are easier to repair if needed, (iii) optimize the realized, rather than planned, problem objective.

Approaches towards robustness adopt a proactive stance towards future uncertainty, and anticipate potential disruptions in the planning stage. We will discuss generally-applicable modeling paradigms of robust planning, their applicability to mobility networks; and present new extended models which improve solution quality and tractability. Drawing on experience from multiple applications, we will discuss insights about the relationships between the robust models with data and robustness metrics, and solution differences between these paradigms. We also present algorithms which use, at their core, our extended models, and enable robust solution generation for large-scale network-based resource allocation at the planning stage as well as in a dynamic, real-time, setting.

Biosketch: Lavanya Marla is a Systems Scientist with the iLab's Mobility Analytics group in the Heinz College at Carnegie Mellon University; and holds a PhD in Transportation Systems from the Massachusetts Institute of Technology. She develops models and algorithms for large-scale transportation and logistics systems, using tools from optimization, statistics, simulation, simulation-optimization and other computational techniques. Her research interests include robust resource allocation for large-scale systems, real-time dynamic re-planning, decision-making under uncertainty, and multi-agent systems; with applications in airline, logistics, emergency management and shared transportation systems. She is a Co-PI on the recently awarded USDOT award for a University Transportation Center at CMU. Her experience has involved collaborations with IBM Research, UPS, NASA, various airlines and consulting companies



Le mercredi 8 février 2012, 10h45, pavillon Aisenstadt, salle 5340

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