VANDERBILT UNIVERSITY ⅴ School of Engineering

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Seminar

Friday,

Feb. 4, 2021

12:00 pm – 1:00 pm

Via Zoom

"THE ROLE OF GOOD PREDICTIONS IN OPTIMIZING AIRLINE DISRUPTION MANAGEMENT: HOW MUCH IS 'GOOD ENOUGH'?"

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ABSTRACT

Air traffic disruptions result in flight delays, cancellations, passenger misconnections, creating high costs to aviation stakeholders. Airlines design recovery plans in response to past disruptions while preparing for future disruptions. However, future disruptions often can only be characterized partially and probabilistically. We propose a joint stochastic reactive and proactive approach to disruption management (SRPDM), which optimizes airline disruption recovery using partial and probabilistic forecasts of future congestion at hub airports. Ultimately, it aims to mitigate operating costs in spatio-temporal networks through more flexible and robust recovery. We show that leveraging such information can reduce expected recovery costs by 1% to 2%, compared to current state-of-the-art. To evaluate the value of such information, we introduce a novel theoretical lower bound based on penalized information-relaxations. Algorithmically, we formulate this as a tractable integer program, avoiding the need to enumerate prohibitively large state spaces that arise in full-scale airline networks. Our new performance bound demonstrates that when improvement is possible, the SDRPM bridges significantly higher gap than could have been estimated using a regret bound. This indicates that networked operations can strongly benefit from even limited information from partial and probabilistic forecasts of future disruptions, based on available demand and capacity information.

BIOGRAPHY

Lavanya Marla is an Assistant Professor in Industrial and Enterprise Systems Engineering at the University of Illinois at Urbana-Champaign. Her research interests are in robust and dynamic decision-making for large-scale networks subject to operating stochasticity; specifically, aviation planning, operations and pricing; logistics, emergency medical services, and shared transportation systems. Her research builds advanced resource allocation tools for these systems by integrating data-driven optimization, statistics, simulation and machine learning. Her work has been recognized through the prestigious Center for Advanced Study award from UIUC, a semi-finalist at the INFORMS Innovative Applications in Analytics Award, a best paper award at the International Conference for Research in Air Transportation, best student paper award from the INFORMS Aviation Applications Society, Honorable mention for the Anna Valicek award from AGIFORS, best presentation award from AGIFORS, INFORMS Transportation Science and Logistics' Society's Cross-regional grant, a Knowledge Discovery and Data Mining (KDD) Startup research award, and a Top-10 cited paper recognition from Transportation Research Part A. Her research is funded by grants from NSF, DHS, the US-India Educational Foundation's 21st Century Knowledge Initiative, the INFORMS Transportation and Logistics Society and multiple industry grants. Prior to the University of Illinois, she was a Systems Scientist with the Heinz College at Carnegie Mellon University. She earned her PhD in Transportation Systems from MIT and a Bachelors degree from IIT Madras.

ZOOM INFORMATION:

https://vanderbilt.zoom.us/j/96986569515?pwd=YlRGUDZ5aDdhcHBpZGluN2JsYWQzdz09

Meeting ID: 969 8656 9515
Passcode: 144340