



## Operations Research and Engineering Management Seminar Series

### Research Seminar

### On a Fair and Risk-averse Urban Air Mobility Resource Allocation Problem Under Demand and Capacity Uncertainties



**Dr. Weijun Xie**

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**Friday, September 8th  
11:00am - 12:15pm  
Caruth 383**

**Abstract:** Urban Air Mobility (UAM) is an emerging air transportation mode to alleviate the ground traffic burden and achieve zero direct aviation emissions. Due to the potential economic scaling effects, the UAM traffic flow is expected to increase dramatically once implemented, and its market can be substantially large. To be prepared for the era of UAM, we study the Fair and Risk-averse Urban Air Mobility resource allocation model (FairUAM) under passenger demand and airspace capacity uncertainties for fair, safe, and efficient aircraft operations. FairUAM is a two-stage model, where the first stage is the aircraft resource allocation, and the second stage is to fairly and efficiently assign the

ground and airspace delays to each aircraft provided the realization of random airspace capacities and passenger demand. We show that FairUAM is NP-hard even when there is no delay assignment decision or no aircraft allocation decision. Thus, we recast FairUAM as a mixed-integer linear program (MILP) and explore model properties and strengthen the model formulation by developing multiple families of valid inequalities. The stronger formulation allows us to develop a customized exact decomposition algorithm with both Benders and L-shaped cuts, which significantly outperforms the off-the-shelf solvers. Finally, we numerically demonstrate the effectiveness of the proposed method and draw managerial insights when applying FairUAM to a real-world network.

**Biography:** Dr. Weijun Xie is the Coca-Cola Foundation Early Career Professor and Assistant Professor in the H. Milton Stewart School of Industrial and Systems Engineering at Georgia Tech. Before joining ISyE, he was an Assistant Professor at the Grado Department of Industrial and Systems Engineering, Virginia Tech, from August 2017 to July 2022. Dr. Xie obtained his Ph.D. in Operations Research at the Georgia Institute of Technology in August 2017. His research interests are theory and applications of stochastic, discrete, and convex optimization. His works have received multiple awards, including the 2022 New Investigator Award from the Virginia Space Grant Consortium (NASA), the 2021 NSF CAREER Award, Winner of the 2020 INFORMS Young Researchers Paper Prize, Runner-up of Dupacova-Prekopa Best Student Paper Prize in Stochastic Programming at the ICSP 2019, Third Place in Junior Faculty Interest Group Paper Competition at INFORMS 2018, Honorable Mention in George Nicholson Student Paper Competition at INFORMS 2017. He currently serves as Associate Editor of Mathematical Programming and the Journal of Global Optimization.