Yuyang Ma

Email: yuyangm@usc.edu
Mobile: +1 (470) 457-9866

Research Interests

Data-driven decision-making under uncertainty with applications in logistics, mobility, and energy systems (facility location, inventory prepositioning, fleet sizing, pricing, and relocation). Methodology includes robust and stochastic optimization, and decomposition algorithms.

Education

University of Southern California — Los Angeles, CA
Ph.D. in Industrial and Systems Engineering — *Aug. 2023 – May 2028 (exp.)*
Advisor: Dr. Karmel S. Shehadeh.

Georgia Institute of Technology — Atlanta, GA
M.S. in Operations Research — *Aug. 2021 – Dec. 2022*
Coursework: Deterministic Optimization, Simulation, Mathematical Foundations of Machine Learning.

University of Pittsburgh — Pittsburgh, PA
B.S. in Industrial Engineering, Minor in Economics — *Aug. 2017 – May 2021*

Research Projects

Journal Article

[J1] **Y. Ma**, K. S. Shehadeh, M. Y. Tsang. Integrated planning of drone-based disaster relief: Facility location, inventory prepositioning, and fleet operations under uncertainty. *Transportation Science*, Articles in Advance, 2026. doi:10.1287/trsc.2025.0518

Working Paper

[W1] **Y. Ma**, K. S. Shehadeh. Distributionally robust deployment, pricing, and relocation of mobile EV-charging fleets under context- and price-dependent demand (working title). In preparation.

Research Experience and Projects

Integrated Planning of Drone-Based Disaster Relief — USC & Lehigh University
Ph.D. research; first-author paper in Transportation Science [J1] — *Jan. 2024 – Oct. 2026*

- Formulated a two-stage **robust optimization** model deciding facility locations, prepositioned inventory, fleet size, and drone assignments, with post-disaster delivery and reassignment as mixed-integer recourse.
- Modeled decision-dependent uncertainty: whether a drone works after the disaster depends on the facility it was assigned to, so pre-disaster assignments shape which disruptions the plan must withstand.
- Derived a K-adaptability approximation (K contingency plans) and solved it with **column-and-constraint generation (C&CG)** in Python/Gurobi, using a warm start, valid inequalities, and symmetry breaking.
- On 25-node instances, solved every case in about 1–2 minutes, within **0.37%** of the best solution found by exact nested C&CG, which hit the 2-hour limit at **6.9–12.8%** gaps under larger uncertainty budgets; scaled to 70 demand nodes, 8 sites, and 40 drones.
- In ablations on a 40-node instance, the full algorithm converged in **4–11 minutes** while the plain version stalled at **24–99%** gaps after 2 hours; the warm start alone cut solve time about **11**× (2,497 s → 224 s) at the smallest uncertainty budget.
- On the 2013 Lushan earthquake case (300 simulated scenarios per disruption regime), plans without drone reassignment had **8–510%** higher post-disaster cost than the proposed plans, and stochastic-programming plans **64–433%** higher, driven by **112–624%** more unmet demand.

Mobile EV-Charging Fleet Deployment, Pricing, and Relocation — USC
Ph.D. research; working paper [W1] — *2025 – Present*

- Formulating a three-stage **distributionally robust** model in which a mobile-charging operator sets fleet allocation and prices before demand is known, then rebalances vehicles and re-prices after observing it.
- Estimating scenario-specific demand from historical records as a function of price and context (weather, events, traffic), and hedging forecast error with mean–MAD ambiguity sets whose means shift with price.
- Proved the fixed-price relocation recourse reduces to a min-cost-flow LP; applied K-adaptability to pricing.
- Developing inexact C&CG with warm starts, symmetry reduction, and adaptive master-problem tolerances.

Reinforcement Learning for Mobile Charging Pricing and Dispatch USC
Course project *Fall 2026*

- Co-designed an hourly pricing → customer choice → dispatch Markov decision process for an operator running fixed charging stations and mobile charging vehicles, with a multinomial logit choice model fitted on 120 days of simulated history.
- The team's **PPO** policy, warm-started by behavior cloning, came within **7%** of the best profit among five scalable methods (including heuristics and rollout ADP) at fleet sizes 1–4, and within **1%** at four vehicles, on 256 held-out simulated days.
- My role: refined the fixed-premium pricing settings and ran preliminary experiments; the team is now extending PPO to learn pricing and dispatch jointly.

Multi-Step Engine Emission Forecasting Georgia Tech
Research project with Dr. Kamran Paynabar *Jun. 2022 – Feb. 2023*

- Built multi-step-ahead emission forecasts from engine sensor data for maintenance early warning, comparing **Transformer, GRU, and LSTM** models (PyTorch) with ARIMA/ARIMAX baselines.

Organ Transplant Acceptance Prediction Georgia Tech
Course project, Applications of Operations Research *Jan. 2022 – May 2022*

- Processed **3M+** U.S. transplant records spanning 20 years and trained a random forest for organ-offer acceptance with **10%** higher prediction accuracy than the model used by OPTN.

Teaching Experience

ISE 230: Introduction to Stochastic Models in Operations Research Lehigh University
Teaching Assistant *Fall 2024*

DSCI II 311: Optimization and Mathematical Foundations for Data Science Lehigh University
Teaching Assistant *Summer 2024*

ISE 121: Applied Engineering Statistics Lehigh University
Teaching Assistant *Spring 2024*

ISYE 8803: High-Dimensional Data Analytics Georgia Institute of Technology
Teaching Assistant *Fall 2022*

Honors and Awards

Gibson/Gottshall Fellowship (2025) and **Gottshall Fellowship** (2023), Lehigh University

Comprehensive Second Prize and **Dean's List** (2019), Sichuan University

Skills

Optimization: Mixed-integer programming; robust, distributionally robust, and stochastic optimization; K-adaptability; decomposition (C&CG, Benders, Lagrangian relaxation, ADMM); network flows

Programming & Solvers: Python (gurobipy, NumPy, pandas, SciPy, scikit-learn, PyTorch), SQL, R, MATLAB, Bash, Git; Gurobi, CPLEX, AMPL

Machine Learning: Time-series forecasting (Transformer, GRU, LSTM, ARIMA), tree ensembles, discrete choice models, MDPs and reinforcement learning (PPO), simulation-based policy evaluation

Languages: Mandarin (native), English (fluent)