Wentao Zhao

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RESEARCH INTEREST

- **Theories:** Discrete Optimization, Stochastic Optimization, Machine Learning.
- **Applications:** Transportation, Logistics.

EDUCATION

Columbia University **New York, US**
M.S. in Industrial Engineering & Operations Research Sept. 2020 – Dec. 2021

- Courses: Optimization Models and Methods, Discrete Optimization, Mathematical Analysis I & II, Convex Optimization, Machine Learning, Reinforcement Learning.

Zhejiang University **Hangzhou, China**
B.S. in Mechanical Engineering Sept. 2016 - May 2020

- Courses: Control Algorithms, Data Structures, Numerical Methods in Engineering.

University of Wisconsin-Madison **Madison, US**
Visiting Student in Industrial & Systems Engineering Jan. 2019 - May 2019

- Courses: Stochastic Processes, Simulation Modeling and Analysis, Decision Analysis.

Awards: Advanced Honor Class of Engineering Education (Honor Program of Engineering College), Zhejiang Provincial Government Scholarship (10%), Research Special Scholarship (selected excellent research student).

PUBLICATIONS

Journal:

- Weifei Hu, **W. Zhao**, et al., Design Optimization of Composite Wind Turbine Blades Considering Tortuous Lightning Strike and Non-Proportional Multi-Axial Fatigue Damage. *Engineering Optimization* (2019): 1-19 (doi).

Conference:

- **Wentao Zhao**, Yikang Hua, Xin Wang, Energy-sponge Service in Electric Vehicle Sharing System, Transportation Research Board 2021 (poster).
- Weifei Hu, **Wentao Zhao (Presenter)**, et al, Reliability Analysis of Wind Turbine Blades Considering Lightning Strike, NAWEA/WindTech 2019 Conference (presentation), (doi).

Papers Under Review

- **Wentao Zhao**, Yikang Hua, Xin Wang, Energy-Sponge Electric Vehicle Sharing System Design (under 3rd round review at Transportation Research Part C: Emerging Technology, 2021).

Working Papers

- **Wentao Zhao**, Yikang Hua, Xin Wang, Optimized Energy-Sponge Electric Vehicle Sharing System with Integration of Renewable Energy.
- **Wentao Zhao**, Xuan Di, A Learn-Based Approach for Order-Pooling and Order-Dispatching in a Large-Scale Ride-Sharing System.

RESEARCH EXPERIENCES

Columbia University, School of Civil Engineering **New York, US**
Advisor: Prof. Sharon Di Jun. 2021 – Dec. 2021

- Proposed a learning-based approach that embedded the residual gated graph convolutional neural network model into a local search algorithm to learn the matching policy in the ride-sharing system;
- Designed a novel training method that ensembles imitation learning and evolutionary strategy; Trained the model to imitate the Blossom algorithm first and self-evolute by interacting with the environment;

- Developed a ride-sharing simulation environment leveraging the historical taxi data in New York for testing different management strategies;
- Conducted a series of numerical experiments and showed that the proposed method outperformed the traditional heuristic algorithm regarding customer satisfaction and computation efficiency.

University of Wisconsin-Madison, School of Industrial & System Engineering **Madison, US**
Advisor: Prof. Xin Wang Jul. 2020 – Jan. 2021

- Proposed a robust and stochastic optimization model for a spatially distributed electric vehicle fleet with renewable energy integrated to serve as a backup reservation interfacing with transportation and power grid system;
- Developed a data-driven approach for constructing uncertainty set in robust optimization to deal with the temporal-spatial correlation in uncertain renewable energy generation and avoid over-conservative;
- Proved that the above robust and stochastic optimization model under correlated uncertainty could be linearized by adding auxiliary variables and extra constraints.

University of Wisconsin-Madison, School of Industrial & System Engineering **Madison, US**
Advisor: Prof. Xin Wang May 2019 – Jan. 2020

- Established a profit-driven planning framework for electric vehicle sharing system to optimize its strategies in energy bidding, serving customers, charging, and relocation;
- Implemented a two-stage stochastic model for electric vehicle sharing management incorporating the uncertainty of customer demand in spatiality, temporality, and quantity;
- Built and solved the stochastic model via Sample Average Approximation method using Python and Gurobi; Conducted a case study in Austin to demonstrate the managerial insights.

Zhejiang University, School of Mechanical Engineering **Hangzhou, China**
Advisor: Prof. Weifei Hu Sept. 2018 – Apr. 2019

- Modeled both the lightning strike dielectric breakdown failure and multi-axial fatigue failure mechanisms for the structural design of composite wind turbine blades;
- Proposed a design optimization framework that integrates realistic lightning strike electrostatic and fatigue analyses for designing reliable and economical composite wind turbine blades;
- Conducted a case study of the structural design optimization of a 5 MW composite wind turbine blade using the above optimization framework written by MATLAB.

SELECTED PROJECTS

NeurIPS 2021 Competition – Machine Learning for Combinatorial Optimization **New York, US**
Advisor: Prof. Shipra Agrawal Jun. 2021 – Oct. 2021

- Improved the branch-and-bound algorithm by replacing the heuristic branching policy with a sophisticatedly trained graph convolutional neural network model;
- Designed and built a Singularity container for running and evaluating algorithms on the high-performance computing cluster.

Amazon Last-Mile Routing Research Challenge **New York, US**
Advisor: Prof. Sharon Di Apr. 2021 – Jul. 2021

- Realized an attention model in the Transformer architecture for route optimization problems under realistically sized problem instances;
- Trained the model via reinforcement learning and imitation learning; Conducted experiments to compare different training methods.

SKILLS AND INTERESTS

- **Computer Skills:** Python, C, Gurobi, MATLAB, Latex
- **Languages:** Mandarin (native), English (fluent)