

# Wentao Zhao

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## RESEARCH INTEREST

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- **Theories:** Stochastic Optimization, Multi-Agent Reinforcement Learning.
- **Applications:** Transportation, Logistics.

## EDUCATION

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**University of Southern California**

**Los Angeles, US**

**Ph.D. in Industrial Engineering**

Sept. 2022 – Now

- Courses: Linear Programming, Stochastic Optimization, Discrete Optimization.

**Columbia University**

**New York, US**

**M.S. in Industrial Engineering & Operations Research**

Sept. 2020 – Dec. 2021

- Courses: 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

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### 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 3<sup>rd</sup> round review at Transportation Research Part C: Emerging Technology, 2021).

## RESEARCH EXPERIENCES

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**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**

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**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**

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