Wentao Zhao

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RESEARCH INTEREST

- **Theories:** stochastic and Robust Optimization, Machine Learning
- **Applications:** Transportation, Shared Mobility, Logistics

EDUCATION

Columbia University **New York, US**
M.S. in Industrial Engineering & Operations Research Sep 2020 - Dec 2021
- Courses: Linear Programming, Stochastic Optimization, Convex Optimization, Real Analysis

Zhejiang University **Hangzhou, CN**
B.S. in Mechanical Engineering Sep 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:
- W. 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.

Conference:
- ***W. Zhao,*** Yikang Hua, Xin Wang, Energy-sponge Electric Vehicle Sharing System Design, Transportation Research Board 2021 (Post).
- W. Hu, ***W. Zhao*** **(Presenter)**, et al, Reliability Analysis of Wind Turbine Blades Considering Lightning Strike, NAWEA/WindTech 2019 Conference (Presentation).

Papers Under Review
- ***W. Zhao,*** Yikang Hua, Xin Wang, Energy-sponge Electric Vehicle Sharing System Design (2020, submitted to Transportation Research Part C: Emerging Technology).

Working Papers
- ***W. Zhao,*** Yikang Hua, Xin Wang, Optimized Energy-Sponge Electric Vehicle Sharing System with Integration of Renewable Energy.
- ***W. Zhao,*** Xuan Di, An End-to-End Machine Learning Approach for Vehicle Sharing System Operations.

RESEARCH EXPERIENCES

Columbia University, School of Civil Engineering **New York, US**
Research Assistant Jun. 2021 – Dec. 2021
- Developed a learning-based approach for managing carpooling, order-vehicle matching, and idle vehicle relocation in the vehicle sharing system
- Proposed an adaptive matching strategy including the application of graph convolutional neural network with guided search algorithm and a training approach that ensembles imitation learning and evolutionary strategy

- Conducted a series of experiments and showed that the proposed method outperformed the traditional heuristic algorithm in terms of customer satisfaction and computation efficiency

University of Wisconsin-Madison, School of Industrial & System Engineering **Madison, US**
Remote Research Assistant Jul. 2020 – Mar. 2021

- Proposed a robust optimization model for scheduling charging and daily operations of electric vehicle sharing system with renewable energy integrated
- Designed a data-driven approach for dealing with renewable energy's temporal-spatial correlation and distribution uncertainty
- Proved that the budget-constrained adjustable robust optimization under correlated uncertainty can be linearized by adding auxiliary variables and extra constraints

University of Wisconsin-Madison, School of Industrial & System Engineering **Madison, US**
Research Assistant May 2019 – Jan. 2020

- Implemented a two-stage stochastic model to simulate the daily operation of the shared electric vehicle fleet and its interaction with the power grid
- Developed an optimization approach that incorporates the temporal-spatial uncertainty of passenger order demand
- Solved the model via the combination of the L-shape method and the sample average approximation method using Gurobi

Zhejiang University, School of Mechanical Engineering **Hangzhou, CN**
Research Assistant 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 framework with two optimization solvers: sequential quadratic programming and Bayesian optimization

SELECTED PROJECTS

NeurIPS 2021 Competition – Machine learning for Combinatorial Optimization **New York, US**
Team Leader Jun. 2021 – Oct. 2021

- Improved the branch-and-bound algorithm by replacing the heuristic branching policy with graph convolutional neural network
- 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**
Team Leader Jun. 2021 – Oct. 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 these training methods

WORKING EXPERIENCES

Bosch Power Tools (China) Co., Ltd. **Hangzhou, CN**
Intern Sep 2019 - Feb 2020

- Trailed Bosch power tool logistic data in Asian and east European regions
- Collected and analyzed product sales and consumer feedback data and wrote monthly reports

SKILLS AND INTERESTS

- **Computer Skills:** Python, C, Gurobi, Matlab, Latex