Curriculum Vitae
Zehao Song

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Affiliation

Department of Civil and Environmental Engineering (CEE) & Northwestern University Transportation Center (NUTC), Northwestern University.

RESEARCH INTERESTS

- Methodologies: Sequential decision-making under uncertainty, distributionally robust optimization (DRO), distributed optimization, deep reinforcement learning (DRL).
- Applications: Coordinated operation of the urban transportation and energy systems for decarbonization and resilience enhancement, safety-guaranteed operation for time-varying spatial-temporal systems under uncertainty, urban facility service pricing.

RESEARCH DESCRIPTION

The urban transportation and energy system is undergoing an evolutionary transition toward a more intelligent and sustainable future. My research focuses on the safety-guaranteed operation for time-varying spatial-temporal systems with increasing uncertainty from demand-side integrated distributed energy resources (DERs), such as renewable energy resources (RESs), energy storage systems (ESSs), and electric vehicle (EVs) integration.

- *Uncertainty handling:* Improving the resilience of spatial-temporal system operation under multiple uncertainties such as stochastic user load demands and volatile renewable generation. My current research interest lies in data-driven methods such as **distributionally robust chance constraint (DRCC)** based approaches.
- *Distributed Operation:* Utilizing decentralized and distributed operation modes to **fully exploit the flexibility** of numerous DERs and encourage demand-side users to coordinate with the system-level operation.
- *Decarbonization:* Designing proper carbon emission obligation mechanisms and effective carbon emission reduction paradigms to promote **low-carbon operation of the urban transportation and energy system** based on the attributional and consequential **carbon accounting** methods.

EDUCATION

Northwestern University   Sept. 2025 — Jun. 2029 (Expected)
Ph.D. student in Civil Engineering, Transportation Systems Analysis & Planning Specialization
Tsinghua University   Sept. 2022 — Jun. 2025
Master of Science in Electrical Engineering
Provisional thesis title: "Low-Carbon Operation of Power Systems from System's and User's Perspective: Design, Analysis, and Experiment"
GPA: 3.81/4.00
Advisor: Prof. Yinliang Xu

Zhejiang University of Technology   Sept. 2018 — Jun. 2022
Bachelor of Engineering in Electrical Engineering and Automation (with honors)
Thesis title: "Coordinated Optimal Scheduling Management of Virtual Power Plants with Active Distribution Network"
GPA: 3.81/4.00
Advisor: Prof. Youbing Zhang

PUBLICATIONS

Journal paper
Published in English

- **Zehao Song**, Yinliang Xu, Lun Yang, Hongbin Sun. "Carbon-aware Peer to Peer Joint Energy and Reserve Trading Market for Prosumers considering Network Security Constraints and Uncertainty," *IEEE Internet of Things Journal*, vol. 11, no. 14, pp. 24467-24482, July 2024. DOI: 10.1109/JIOT.2024.3367361.

- Ruifeng Zhao*, **Zehao Song**[*], Yinliang Xu, Jiangang Lu, Wenxin Guo, Haobin Li. "Low-carbon demand response program for power systems considering uncertainty based on the data-driven distributionally robust chance constrained optimization," *IET Renewable Power Generation*, Early Access, Jun. 2024. DOI: 10.1049/rpg2.13021.

Remark. *Co-first author. ⋆Corresponding author.*

- Xiaodong Yang, **Zehao Song**, Jinyu Wen, Lijian Ding, Menglin Zhang, Qiuwei Wu, Shijie Cheng. "Network-Constrained Transactive Control for Multi-Microgrids-Based Distribution Networks With Soft Open Points," in *IEEE Transactions on Sustainable Energy*, vol. 14, no. 3, pp. 1769-1783, July 2023. DOI:10.1109/TSTE.2023.3246360.

  Remark. *The first author is the PostDoc that I collaborated with during my undergraduate studies.*

Published in Chinese

- **Zehao Song**, et al. "Low-carbon Scheduling Strategy of Distributed Energy Resources Based on Node Carbon Intensity for Distribution Networks," in *High Voltage Engineering*, (Engineering Index Citation), June, 2023, 49(06):2318-2328. DOI:10.13336/j.1003-6520.HVE.20230216.

PROJECTS

Urban power grid scheduling technique with large-scale electric vehicle integration research. *State Grid Corporation of China Scientific Project.*
Role: Participant   Jan. 2021 — Dec. 2022
Research on the interactive regulation of urban power grid and massive electric vehicles for group intelligent clustering and aggregation. *Supported by the Shenzhen Natural Science Foundation.*
Role: Main participant   Dec. 2023 — Dec. 2025
Key Technology and Application of Virtual Power Plant Construction and Scheduling for Urban Massive Flexible Resource Aggregation. *China Southern Power Grid Scientific Project. Received the Second-class prize of Shenzhen Scientific and Technological Progress.*
Role: Main participant   Jun. 2022 — Aug. 2023
Research on distributed energy resources aggregation and optimized scheduling technique of virtual power plant for decarbonization. *China Southern Power Grid Scientific Project.*
Role: Main participant   Jun. 2022 — Aug. 2023
Key Technology Research, Development and Application of Multi-Factor Integration Smart Energy Interconnection for Novel Power System. *State Grid Corporation of China Scientific Project.*
Role: Participant   Oct. 2022 — Dec. 2024
Cloud-Cluster-End coordinated virtual power plant optimal operation research. *China Southern Power Grid Scientific Project.*
Role: Participant   Nov. 2021 — Dec. 2022

TECHNIQUES

Programming: Matlab, Python, Gurobi, CPLEX, Java, YALMIP.   **Language:** English (TOEFL iBT 106/120).

AWARDS

As Graduate Student

- **Excellent Comprehensive Scholarship of Tsinghua University**   Tsinghua University, Nov. 2023
- **Best Poster Award in 2023 TBSI Retreat Conference**   Tsinghua University, July. 2023
- **Tsinghua University Academic Forum Oral Presentation Award**   Tsinghua University, May. 2023

As Undergraduate Student

- **Zhejiang Provincial Government Scholarship**   Education Department of Zhejiang Province, Dec. 2019
- **Outstanding Undergraduate Student**   Zhejiang University of Technology, Jun. 2022
- **Outstanding Student First Class Scholarship**   Zhejiang University of Technology, Nov. 2019
- **First Class Study Scholarship**   Zhejiang University of Technology, Nov. 2019
- **Best Paper Award of the Chinese Academy of Sciences Undergraduate Students' Summer School**

  Institue of Electrical Engineering, Chinese Academy of Sciences, July. 2021

Talks & Presentations

- "Network-Constrained Transactive Control for Multi-Microgrids-based Distribution Networks with Soft Open Points". At the 15th Guangdong-Hong Kong-Macao Great Bay Area Academic Forum in conjunction with the 706th Tsinghua University Academic Forum.   Tsinghua University, China, May. 2023.
- "Carbon-aware Peer to Peer Joint Energy and Reserve Trading Market for Prosumers considering Network Security Constraints and Uncertainty". At the 2024 IEEE Power and Energy Society General Meeting (2024 IEEE PES GM).   Seattle, Washington, USA, Jul. 2024.