Wenqian Jiang

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Research Interests

I am interested in finding better designs for optimized smart grid operation and a more sustainable energy system by leveraging multidisciplinary methods from optimization, economics, computer science, and operations research. Currently, I'm working on carbon-aware supply-demand coordination and robust sample-oriented mechanisms design facing uncertainties in power systems.

Education

The Chinese University of Hong Kong, Shenzhen (CUHKSZ) Shenzhen, China
Ph.D., Computer and Information Engineering Supervisor: Prof. Chenye Wu GPA:3.91/4.0 *Jul. 2024*
Dissertation Title: "Sample-Oriented Operation for Effective Modern Power Grid".

Huazhong University of Science and Technology (HUST) Wuhan, China
M.E., New Energy Science and Engineering Supervisor: Prof. Ye Yuan GPA:3.7/4.0 *Jun. 2021*

MINES ParisTech Paris, France
M.S., Clean and Renewable Energy Thesis Supervisor: Prof. George Caralis GPA:3.7/4.0 *Jun. 2021*

North China Electric Power University (NCEPU) Baoding, China
B.E., Automation (Control and Computer Engineering) GPA:4.05/4.3 *Jun. 2018*

Appointments

WISPO Lab, University of Wisconsin-Madison (UW-Madison) Madison, US
Research Associate, Electrical and Computer Engineering Supervisor: Prof. Line Roald *Aug. 2024 – Present*

Project 1: Computing for computational decarbonization of societal infrastructures at mesoscales
supported by the NSF Expeditions in Computing of US

- Develop the new field of computational decarbonization, which focuses on optimizing and reducing the lifecycle carbon emissions of complex computing and societal infrastructure systems.
- My contribution is to optimize flexible electricity consumption in AI data centers, enhancing both environmental sustainability and grid operational efficiency.

Project 2: Exploiting spatio-temporal interdependency between electrochemical manufacturing and power grid to optimize flexibility and sustainability
supported by the NSF FM-Future Manufacturing of US

- Conduct fundamental computational and experimental research to design new and flexible electrochemical technologies that best integrate with the power grid and with chemical supply chains.
- My contribution is to strategically integrated and optimized electrochemical processes (e.g., hydrogen production, battery storage) within electricity markets and power system operations to minimize operational costs (or maximize arbitrage profits) and enhance grid stability by leveraging their inherent flexibility.

Shenzhen Institute of Artificial Intelligence and Robotics for Society Shenzhen, China
Intern Researcher *Sept. 2021 – Aug. 2023*

Project: Convex hull pricing and the associated market monitoring mechanism design for the wholesale electricity market considering the non-convex power generation cost
supported by the National Natural Science Foundation of China

- Model non-convex generation cost (e.g., start-up cost) and design efficient methods for computing convex hull prices in the electricity market.
- My contribution is to investigate how to involve the non-convex generation cost for better electricity market design and design efficient methods to compute convex hull prices.

HUST-Wuxi Research Institute Wuxi, China
Intern Researcher *Jul. 2019 – Aug. 2020*

Project: Key technologies for machine learning and health prediction of IOT manufacturing big data
supported by the Primary Research and Development Plan of Jiangsu Province in China

- Develop advanced machine learning methods for anomaly detection and remaining useful life prediction mechanisms for industrial time series data.
- My contribution is to develop a novel anomaly detection approach based on generative adversarial networks that is trained exclusively on majority-class samples. Minority-class samples are subsequently identified through evaluating the discrepancy compared to majority-class samples.

Selected Honors and Awards

- Excellent Science & Technology Academic Paper, 2024 Shenzhen 4th Excellent Science & Technology Academic Paper Selection *Dec. 2024*
- Dean's List of School of Science and Engineering, CUHKSZ *Dec. 2023*
- Outstanding Master Graduate, HUST *Jun. 2021*
- Outstanding Graduate of Hebei Province (TOP 5% in all students of Hebei province) *Jun. 2018*
- Principal's Scholarship (TOP 0.1% in all students of NCEPU) *Oct. 2017*
- Excellent Student Cadre of Hebei Province (TOP 1% in all students of Hebei province) *2017*
- National Scholarship (TOP 0.8% in all students of NCEPU) *Oct. 2015*

Research Publications

Preprints

[P1] **Jiang, W.**, Rangarajan, A., & Roald, L. (2025). Consumer-based Carbon Costs: Integrating Consumer Carbon Preferences in Electricity Markets (submitted, under first round revision).

[P2] **Jiang, W.**, Huber, O., Ferris, M. C., & Roald, L. (2025). Can Carbon-Aware Electric Load Shifting Reduce Emissions? An Equilibrium-Based Analysis (submitted, under second round review).

[P3] **Jiang, W.**, & Roald, L. (2025). Multi-Period Electricity Market Clearing with Carbon Preferences and Allocation (submitted, under first round review).

Journal Papers

[J1] **Jiang, W.** & Roald, L. (2025). Greening the Grid: Electricity Market Clearing with Consumer-Based Carbon Cost. *Sustainable Energy, Grids and Networks* (early access).

[J2] Cui, J., **Jiang, W.**, & Wu, C. (2025). Pricing Mechanism Design for Future EV Charging Station with Hybrid Fixed and Mobile Charging Modes. *Applied Energy*, 380, 125033.

[J3] **Jiang, W.** & Wu, C. (2024). Optimal Electricity Procurement Enabled by Privacy-Preserving Samples. *IEEE Transactions on Energy Markets, Policy, and Regulation*, 2(3), 339-349.

[J4] Tian Z., Liu W., **Jiang W.**, & Wu C. (2024, **ESI Highly Cited Paper**). CNNs-Transformer Based Long-sequence Probabilistic Load Forecasting under Limited Data Sets. *Energy*, 293, 130666.

[J5] Liang J., **Jiang, W.**, Lu C., & Wu, C. (2024). Joint Chance-constrained Unit Commitment: Statistically Feasible Robust Optimization with Learning-to-Optimize Acceleration. *IEEE Transactions on Power Systems*, 39(5), 6508-6521.

[J6] **Jiang, W.**, Lu, C., & Wu, C. (2023). Robust Scheduling of Thermostatically Controlled Loads with Statistically Feasible Guarantees. *IEEE Transactions on Smart Grid*, 14(5), 3561-3572.

[J7] **Jiang, W.**, Huang, J., Xu, G. & Wu, C. (2023). Sample-Oriented Electricity Storage Sharing Mechanism Design with Performance Guarantees. *IEEE Transactions on Smart Grid*, 15(2), 2030-2043.

[J8] Huang, Q.*, **Jiang, W.***, Shi, J., Wu, C., Wang, D., & Han, Z. (2023). Federated Shift-Invariant Dictionary Learning Enabled Distributed User Profiling. *IEEE Transactions on Power Systems*, 39(2), 4164-4178. (* authors contributed equally)

[J9] Situ, Y., Chen, F., Zhang, X., Su, J., & **Jiang, W.** (2023). Risk Aware Decomposition of Online Scheduling for Large Flexible Consumers Considering the Age of Information. *Energy Reports*, 9, 409-418.

[J10] Lu, C., Gu, N., **Jiang, W.**, & Wu, C. (2023). Sample-Adaptive Robust Economic Dispatch with Statistically Feasible Guarantees. *IEEE Transactions on Power Systems*, 39(1), 779-793.

[J11] Lu, C., Liang, J., **Jiang, W.**, Teng, J., & Wu, C. (2023). High-resolution Probabilistic Load Forecasting: A Learning Ensemble Approach. *Journal of the Franklin Institute*, 360(6), 4272-4296.

[J12] Lu, C., **Jiang, W.**, & Wu, C. (2022). Effective End-to-End Learning Framework for Economic Dispatch. *IEEE Transactions on Network Science and Engineering*, 9(4), 2673-2683.

[J13] **Jiang, W.**, Hong, Y., Zhou, B., He, X., & Cheng, C. (2019). A GAN-based Anomaly Detection Approach for Imbalanced Industrial Time Series. *IEEE Access*, 7, 143608-143619.

Conference Papers

[C1] **Jiang, W.**, Liang, J., Lu, C. & Wu, C. (2023). Robust Online EV Charging Scheduling with Statistical Feasibility. In *Proceedings of the IEEE Conference on Decision and Control (CDC)*, pp. 5594-5599.

[C2] Tao, Z., **Jiang W.**, & Wu, C. (2023). Power Consumption Data Compression via Shift-invariant Dictionary Learning. In *Proceedings of the IEEE Conference on Energy Internet and Energy System Integration (EI2)*, pp. 2033-2038.

[C3] Liang J., Lu, C., **Jiang, W.**, & Wu, C. (2023). Few-shot Residential Load Forecasting Boosted by Learning to Ensemble. In *Proceedings of the IEEE Conference on Energy Internet and Energy System Integration (EI2)*, pp. 3398-3403.

[C4] **Jiang, W.**, Cao, S., & Wu, C. (2022). LMP Prediction with Incomplete Information. In *Proceedings of the IEEE Power & Energy Society General Meeting (PESGM)*, pp. 1-5.

[C5] Chen, X., Wu, C., & **Jiang, W.** (2022). Load Prediction under Accelerated Urbanization. In *Proceedings of the IEEE Workshop on the Electronic Grid (eGRID)*, pp. 1-5.

[C6] Wang, H., **Jiang, W.**, & Wu, C. (2022). Is eLMP Harder to Predict than LMP? In *Proceedings of the IEEE Sustainable Power and Energy Conference (iSPEC)*, pp. 1-5.

[C7] Liang, J., **Jiang, W.**, & Wu, C. (2022). Effective Carbon Tax Learning via Cap and Trade. In *Proceedings of the IEEE International Electrical and Energy Conference (CIEEC)*, pp. 4326-4331.

[C8] Xu, G., Shi, J., **Jiang, W.**, Wu, C., Wang, D., & Han, Z. (2022). A Two-Stage Emission Mismatch Penalty Game to Facilitate Carbon and Electricity Market Interaction. In *Proceedings of the IEEE Conference on Energy Internet and Energy System Integration (EI2)*, pp. 2838-2843.

Book Chapters

Jiang, W., Shi, J., & Wu, C. (2025). Statistically Feasible Robust Power System Operation. In *Power and Energy Resources: Modelling and Optimization*, pp. 1-21. Singapore: Springer Nature Singapore.

Invited Talks and Presentations

[1] Greening the Grid: Carbon-Aware Electricity Consumption, invited talk at Energy and Natural Resource Management Section, Annual POMS Conference, 2026 (scheduled for presentation).

[2] Electricity Markets with Consumer-Defined Carbon Costs: A New Paradigm for Greening the Grid, invited talk at Optimization of Power Systems Section, INFORMS Annual Meeting, 2025.

[3] Greening the Grid: A New Market Clearing Model with Consumer-based Carbon Costs, invited talk at Power Systems Laboratory, ETH Zurich, 2025.

[4] Carbon-Sensitive Load Management: A Game-Theoretic Exploration, poster presentation at Grid Science Winter School and Conference, Los Alamos National Laboratory, 2025.

[5] Optimal Electricity Procurement Enabled by Privacy-Preserving Samples, oral presentation at SDS Doctoral & Postdoctoral Academic Forum, CUHKSZ, 2024.

[6] Statistical Feasibility in Power Systems, invited talk at the Department of Industrial Engineering and Management, Peking University, 2023.

[7] Sample Adaptive Operation for the Modern Power Grid, oral presentation at Doctoral Research Conference, CUHKSZ, 2023.

Teaching and Mentoring Experience

Teaching Assistant

- Assisted in teaching 8 undergraduate and graduate courses with different class sizes from 9 to 69, including ENE3050 Electrical Power Systems, CIE6006 Data Analytics, CIE6010 Optimization Theory and Algorithms, CIE6115 Advanced Topics in Energy Systems, and CIE6126 Performance Analysis of Computer and Communication Systems, CUHKSZ, 2021-2023.
- Conducted weekly one-hour tutorials and office hours for undergraduate students and held four two-hour tutorials with weekly office hours for graduate students; additionally mentored students on course projects.

Mentoring Students

- Mentored 3 undergraduates and 6 graduates in Energy Analytical Insights Lab at CUHKSZ (2021-2023) and the Alavarado sustainability scholars in WISPO Lab at UW-Madison (2024-Present).
- Guided students in identifying and defining problems, deriving theoretical insights, and interpreting numerical results, which led to the successful completion of publications.

Scientific Community Activities

- Reviewer for journals: *IEEE Transactions on Smart Grid*, *IEEE Transactions on Sustainable Energy*, *Applied Energy*, *Electric Power Systems Research*, *International Journal of Electrical Power and Energy Systems*, *Results in Engineering*, *CAAI Transactions on Intelligence Technology*, etc.
- Reviewer for conferences: *Power Systems Computation Conference*, *EAI International Conference on Smart Grid and Innovative Frontiers in Telecommunications*, *IEEE International Conference on Smart Grid Communications*, *IEEE Conference on Energy Internet and Energy System Integration*, etc.