Yufan Zhang

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Employment

University of California San Diego Jan. 2023 - present
Postdoctoral Researcher
Department of Electrical and Computer Engineering

Education

Shanghai Jiao Tong University Sep 2017 - Jun 2022
Ph.D. in Electrical Engineering

Technical University of Denmark 2020 - 2022
Joint training Ph.D. student

Chongqing University Sep 2013 - Jun 2017
Bachelor in Electrical Engineering

Fellowship

- SJTU Outstanding Doctoral Graduate Development Fellowship 2022

Awards and Scholarship

- Rising Stars in Cyber-Physical Systems, The University of Virginia 2024
- Top Articles in Outstanding S&T Journals of China 2022
- Frontrunner 5000 Paper in China 2022
- SJTU Outstanding Ph.D. Graduate 2022
- SJTU Outstanding Ph.D. Student Scholarship 2020
- Best Conference Paper, IEEE Power & Energy Society General Meeting 2020
- SJTU Sieyuan Electrics Co. Scholarship 2019
- CQU Outstanding Undergraduate 2017
- Undergraduate National Scholarship, Chinese Ministry of Education 2016
- CQU Freshmen Scholarship 2013

Publications

Current h-index: 9 (Google Scholar)

Submitted

[S1] **Y. Zhang**, M. Jia, H. Wen, Y. Bian, and Y. Shi, "Toward value-oriented renewable energy forecasting: An iterative learning approach," 2023, *Submitted to IEEE Transactions on Smart Grid*. [Online]. Available: https://arxiv.org/pdf/2309.00803.pdf.

[S2] **Y. Zhang**, H. Wen, Y. Bian, and Y. Shi, "Deriving loss function for value-oriented renewable energy forecasting," 2023, *Submitted to Power Systems Computation Conference*. [Online]. Available: https://arxiv.org/pdf/2310.00571.pdf.

[S3] **Y. Zhang**, H. Wen, Y. Bian, and Y. Shi, "Improving sequential market clearing via value-oriented renewable energy forecasting," 2024, *Submitted to IEEE Transactions on Power Systems*. [Online]. Available: https://arxiv.org/abs/2405.09004.

[S4] **Y. Zhang**, H. Wen, T. Feng, and Y. Chen, "Targeted demand response: Formulation, lmp implications, and fast algorithms," 2022, *Submitted to Appled Energy*. [Online]. Available: https://arxiv.org/pdf/2211.14806.pdf.

Journal Publications

[J1] **Y. Zhang**, S. Dey, and Y. Shi, "Optimal vehicle charging in bilevel power-traffic networks via charging demand function," *IEEE Transactions on Smart Grid*, 2023. [Online]. Available: https://arxiv.org/pdf/2304.11284.pdf.

[J2] **Y. Zhang**, H. Wen, and Q. Wu, "A contextual bandit approach for value-oriented prediction interval forecasting," *IEEE Transactions on Smart Grid*, 2023. [Online]. Available: https://arxiv.org/pdf/2210.04152.pdf.

[J3] **Y. Zhang**, H. Wen, Q. Wu, and Q. Ai, "Optimal adaptive prediction intervals for electricity load forecasting in distribution systems via reinforcement learning," *IEEE Transactions on Smart Grid*, 2022. [Online]. Available: https://arxiv.org/pdf/2205.08698.pdf.

[J4] **Y. Zhang**, Q. Ai, and Z. Li, "Grouping of dynamic electricity consumption behaviour: An f-divergence based hierarchical clustering model," *IET Generation, Transmission & Distribution*, vol. 15, no. 22, pp. 3164–3175, 2021. [Online]. Available: https://ietresearch.onlinelibrary.wiley.com/doi/full/10.1049/gtd2.12248.

[J5] **Y. Zhang**, Q. Wu, Q. Ai, and J. P. Catalão, "Closed-loop aggregated baseline load estimation using contextual bandit with policy gradient," *IEEE Transactions on Smart Grid*, vol. 13, no. 1, pp. 243–254, 2021. [Online]. Available: https://web.fe.up.pt/~catalao/9536962.pdf.

[J6] **Y. Zhang**, Q. Ai, and Z. Li, "Admm-based distributed response quantity estimation: A probabilistic perspective," *IET Generation, Transmission & Distribution*, vol. 14, no. 26, pp. 6594–6602, 2020. [Online]. Available: https://ietresearch.onlinelibrary.wiley.com/doi/full/10.1049/iet-gtd.2020.1380.

[J7] **Y. Zhang**, Q. Ai, Z. Li, *et al.*, "Data augmentation strategy for small sample short-term load forecasting of distribution transformer," *International Transactions on Electrical Energy Systems*, vol. 30, no. 7, e12209, 2020. [Online]. Available: https://onlinelibrary.wiley.com/doi/abs/10.1002/2050-7038.12209.

[J8] **Y. Zhang**, Q. Ai, H. Wang, Z. Li, and K. Huang, "Bi-level distributed day-ahead schedule for islanded multi-microgrids in a carbon trading market," *Electric power systems research*, vol. 186, p. 106 412, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/abs/pii/S0378779620302182.

[J9] **Y. Zhang**, Q. Ai, H. Wang, Z. Li, and X. Zhou, "Energy theft detection in an edge data center using threshold-based abnormality detector," *International Journal of Electrical Power & Energy Systems*, vol. 121, p. 106 162, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/abs/pii/S0142061519322768.

[J10] **Y. Zhang**, Q. Ai, F. Xiao, R. Hao, and T. Lu, "Typical wind power scenario generation for multiple wind farms using conditional improved wasserstein generative adversarial network," *International Journal of Electrical Power & Energy Systems*, vol. 114, p. 105 388, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/abs/pii/S0142061519305010.

[J11] S. Yin, Q. Ai, Z. Li, **Y. Zhang**, and T. Lu, "Energy management for aggregate prosumers in a virtual power plant: A robust stackelberg game approach," *International Journal of Electrical Power & Energy Systems*, vol. 117, p. 105 605, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/abs/pii/S0142061519320125.

Conference Publications

[C1] X. He, J. Tian, **Y. Zhang**, H. Wen, and Y. Chen, "Fast constraint screening for multi-interval unit commitment," in *2023 62nd IEEE Conference on Decision and Control (CDC)*, IEEE, 2023, pp. 577–583. [Online]. Available: https://arxiv.org/pdf/2309.05894.pdf.

[C2] **Y. Zhang**, Y. Liu, Z. Yu, *et al.*, "Improving aggregated load forecasting using evidence accumulation k-shape clustering," in *2020 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2020, 1–5. 🏆Best Paper Award. [Online]. Available: https://ieeexplore.ieee.org/document/9281744?denied=.

Services and Activities

Reviewers:

- **Journal**: IEEE Transactions on Industrial Informatics, IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IET Renewable Power Generation, Applied Energy, Energy Reports, Sustainable Energy, Grids and Networks, Electric Power Systems Research, IEEE Open Access Journal of Power and Energy
- **Conference**: IEEE Power & Energy Society General Meeting, Power Systems Computation Conference

Professional Society Service:

- Co-organizer of Power & Energy Seminar Series at UC San Diego

Service Related to Diversity, Equity, Inclusion:

- Co-organizer for Workshop on "Let's Build a Wind Turbine" at Girl's Day Out.
- Member, Women in ECE (WeCe)

Selected Research Experience

Advanced forecasting methods with optimization in the loop.

- To improve the statistical performance of forecasts, formulated an optimization program at the training phase, involving decisions beyond the estimation of forecast model parameters.
- Proposed a closed-loop forecasting approach that builds on bandit theory, for linking forecasting with optimization.
- Achieved significant accuracy improvement for tasks such as aggregated baseline load estimation and prediction interval forecasting.

Value-oriented forecasting for reducing expected operation cost.

- To issue forecasts that result in low expected operation costs, the objective of training the forecast model is aligned with the decision objective.
- Theoretically derived a closed-form loss function for training, which exhibits a piecewise linear structure when applied to linear programs.
- The forecasting products trained under the proposed loss function can provide 0.2% $\sim$ 8% expected cost reduction.

Value-oriented forecasting for improving operation robustness while maintaining cost efficiency.

- To issue uncertainty quantifications that lead to low operation costs in robust optimization, the uncertainty set is forecasted in a value-oriented manner.
- Learned the policy for selecting the boundaries for uncertainty set with the objective of minimizing costs.
- The effectiveness of the approach was tested on a virtual power plant, leading to monthly savings of $10,000.

Teaching Experience

Courses

MAE 243: Electric Power Systems Modeling — UC San Diego
Guest lecturer — Fall quarter 2023

ECE 228: Machine Learning for Physical Applications — UC San Diego
Co-instructor — Spring quarter 2024

Supervision Experience

1. Jiajun Han, Value-oriented forecasting for risk-manageable operation. *M.Sc. student* — Fall quarter 2023
2. Yuexin Bian, Optimal arrival scheduling of electric vehicles. *Ph.D. student with UCSD* — Summer quarter 2023
3. Zhaoyu Li, Power-gas network equilibrium: a potential game perspective. *Ph.D. student with SJTU* — 2022

Teaching Training

1. Pathways to Scientific Teaching — Winter quarter 2024
2. Fundamental teaching workshop — Winter quarter 2024

Invited Talks and Presentation

Invited Talks

[T1] *Deriving closed-form loss function for value-oriented renewable energy forecasting*, University of California San Diego, 2024. Presented at Power & Energy Seminar Series. January, 2024.

[T2] *Optimal vehicle charging in bilevel power-traffic networks via charging demand function*, Columbia University, 2023. Hosted by Prof. Bolun Xu. April, 2023.

[T3] *Value-oriented forecasting for power systems*, University of California San Diego, 2023. Presented at Power & Energy Seminar Series. Februrary, 2023.

Conferences & Workshops

[T1] *Optimal vehicle charging in bilevel power-traffic networks via charging demand function*, 2023 INFORMS Annual Meeting, October 2023.

[T2] *Closed-loop aggregated load estimation*, 2023 IEEE Power & Energy Society General Meeting, July, 2023.

[T3] *Demand response model identification and forecasting with differentiable optimization neural network (optnet): A gradient-based approach*, 2023 IEEE Power & Energy Society General Meeting, July, 2023.

[T4] *Improving aggregated load forecasting using evidence accumulation k-shape clustering*, 2020 IEEE Power & Energy Society General Meeting, August, 2020.