Zhenyi Wang

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Research Interests

Data Analytics in Demand Response, Trustworthy AI in Power Systems, and Smart Grid Security

Education

University of Macau — Aug. 2021 – June 2025
Ph.D. in Electrical and Computer Engineering, Supervisor: Prof. Hongcai Zhang — *Macao SAR, China*

KU Leuven — Aug. 2024 – Feb. 2025
Visiting Student Researcher in Electrical Engineering, Advisor: Prof. Geert Deconinck — *Leuven, Belgium*

Sichuan University — Sep. 2017 – July 2021
B.E. in Cybersecurity (GPA: 3.71/4.0), Advisor: Prof. Beibei Li — *Chengdu, China*

Publications

Preprint Papers

[1] Peipei Yu, **Zhenyi Wang**, Hongcai Zhang, and Yonghua Song, "Safe Reinforcement Learning for Power System Control: A Review," *arXiv preprint: 2407.00681.*

Journal Papers (with in press)

[1] **Zhenyi Wang**, Hongcai Zhang, Geert Deconinck, and Yonghua Song, "A Unified Model for Smart Meter Data Applications," **IEEE Transactions on Smart Grid**, vol. 16, no. 3, pp. 2451–2463, 2025. (JCR Q1, IF 8.6)

[2] **Zhenyi Wang**, Hongcai Zhang, Ruixiong Yang, and Yong Chen, "Improving Model Generalization for Short-Term Customer Load Forecasting with Causal Inference," **IEEE Transactions on Smart Grid**, vol. 16, no. 1, pp. 424–436, 2025. (JCR Q1, IF 8.6)

[3] **Zhenyi Wang**, and Hongcai Zhang, "Customized Load Profiles Synthesis for Electricity Customers Based on Conditional Diffusion Models," **IEEE Transactions on Smart Grid**, vol. 15, no. 4, pp. 4259–4270, 2024. (JCR Q1, IF 8.6)

[4] **Zhenyi Wang**, and Hongcai Zhang, "Customer Baseline Load Estimation for Virtual Power Plants in Demand Response: An Attention Mechanism-Based Generative Adversarial Networks Approach," **Applied Energy**, vol. 357, p. 122544, 2024. (JCR Q1, IF 10.1)

[5] **Zhenyi Wang**, Peipei Yu, and Hongcai Zhang, "Privacy-Preserving Regulation Capacity Evaluation for HVAC Systems in Heterogeneous Buildings Based on Federated Learning and Transfer Learning," **IEEE Transactions on Smart Grid**, vol. 14, no. 5, pp. 3535–3549, 2023. (JCR Q1, IF 8.6)

[6] Yiding Wang, **Zhenyi Wang**, Chenghao Li, Yilin Zhang, and Haizhou Wang, "Online Social Network Individual Depression Detection using A Multitask Heterogenous Modality Fusion Approach," **Information Sciences**, vol. 609, pp. 727–749, 2022. (JCR Q1, IF 8.1)

Conference Papers

[1] **Zhenyi Wang**, Hongcai Zhang, Baorong Zhou, Wenmeng Zhao, and Tian Mao, "When Pre-Training Model Meets Smart Meter Data Applications: A Preliminary Trial of General Way," *2024 IEEE Power & Energy Society General Meeting (PESGM)*, Seattle, WA, USA, 2024, pp. 1–5.

[2] **Zhenyi Wang**, and Hongcai Zhang, "Consumer Baseline Load Estimation in Demand Response: A Generative Adversarial Networks Approach," *2022 IEEE 6th Conference on Energy Internet and Energy System Integration (EI2)*, Chengdu, China, 2022, pp. 1723–1728. (**Best Paper Award**)

[3] Yiding Wang, **Zhenyi Wang**, Chenghao Li, Yilin Zhang, and Haizhou Wang, "A Multimodal Feature Fusion-Based Method for Individual Depression Detection on Sina Weibo," *2020 IEEE 39th International Performance Computing and Communications Conference (IPCCC)*, Austin, TX, USA, 2020, pp. 1–8.

Academic Services

Journal Reviewer

- IEEE Transactions on Smart Grid
- IEEE Transactions on Power Systems
- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Information Forensics and Security
- IEEE Transactions on Dependable and Secure Computing
- IEEE Transactions on Energy Markets, Policy and Regulation
- IEEE Transactions on Industry Applications
- IEEE Power Engineering Letters
- Journal of Modern Power Systems and Clean Energy
- Applied Soft Computing
- IET Smart Grid
- Sustainable Energy Technologies and Assessments
- Security and Communication Networks

Conference Reviewer

- IEEE Power & Energy Society General Meeting (PESGM 2024, 2025)
- IEEE Global Communications Conference (GLOBECOM 2024)
- Conference on Neural Information Processing Systems (NeurIPS 2024, 2025)
- International Conference on Learning Representations (ICLR 2025)
- International Conference on Machine Learning (ICML 2025)
- International Conference on Artificial Intelligence and Statistics (AISTATS 2025)
- IEEE Student Conference on Electric Machines and Systems (SCEMS 2024)

Conference Organization

- **Organizing Committee Member**, 2024 IEEE 7th Student Conference on Electric Machines and Systems (IEEE SCEMS 2024)

Research Projects

Non-Parametric Modeling and Safe Artificial Intelligence Technology for Urban Energy System Operation and Control 2023 – Present

Supported by Guangdong Power Grid - Zhuhai Power Supply Bureau

- Proposed a data-driven modeling method based on transfer learning for distribution networks, which improves the applicability of data-driven models in heterogeneous urban environments, achieving remote low-cost deployment of non-parametric models with limited data.

Multi-Energy System Coordination and Carbon Management in Low-carbon Park 2022 – Present

Supported by Macao Science and Technology Development Fund and Ministry of Science and Technology of China Joint Project

- Developed a multi-energy supply and demand forecasting algorithm package and has successfully deployed it on a low-carbon park in southwest China, which accurately predicts the generation of photovoltaic and wind power, as well as electricity load consumption of the park.

Key Technologies and Applications of Network-Load-Storage Interaction of Virtual Power Station in Smart City 2022 – 2024

Supported by Macao Science and Technology Development Fund

- Proposed a regulation capacity estimation framework based on federated learning, which realizes the accurate estimation of heterogeneous resources even with insufficient data while privacy-preserving.
- Developed a baseline load estimation tool, which has been successfully deployed on the cloud platform of real-world virtual power plants in China, and achieved an accuracy of over 90% in multiple practical cases.

Honors & Awards

- **Guangdong-Hong Kong-Macao Greater Bay Area (University of Macau) Taihu Scholarship** 2024
- **Best Paper Award**, 2022 IEEE 6th Conference on Energy Internet and Energy System Integration (EI2) 2022
- **First Prize**, 2021 Power Dispatching AI Application Competition, China Southern Power Grid 2021
- **Best Innovation Award**, 2021 Power Dispatching AI Application Competition, China Southern Power Grid 2021
- **Annual Comprehensive Scholarship**, Sichuan University 2019

Patent

[1] Peipei Yu, **Zhenyi Wang**, Hongxun Hui. Power Output Prediction Method, Device, Electronic Device and Storage Medium. *CN202210236289.1*.

Experience

Teaching Assistant Jan. 2023 – May 2023
ECEN7107 Data Analytics for Internet of Things, University of Macau *Macao SAR, China*
- Held weekly office hours, and graded assignments and exams.
- Taught lab sessions including 1) advanced data analysis; 2) deep learning applications in power systems.

Teaching Assistant Jan. 2022 – May 2022
ECEN4003 Energy Data Analytics, University of Macau *Macao SAR, China*
- Held weekly office hours, and graded assignments and exams.
- Taught lab sessions including the basics of data analysis, machine learning, and deep learning.

Research Intern Mar. 2022 – May 2022
Guangdong Grid Co, China Southern Power Grid *Guangzhou, China*
- Participated as a key member in the project about capacity evaluation in incentive-based demand response.

Research Assistant Mar. 2021 – Jun. 2021
Zhuhai UM Science and Technology Research Institute *Zhuhai, China*
- Participated in the project about offshore wind power, responsible for data processing and modeling.

Skills

Programming: C/C++, Python, Shell, Latex
Tool Kits: Git, Bash/Zsh, Docker, MySQL/MongoDB
Languages: Chinese (native), English (fluent)

References

Hongcai Zhang (Supervisor at University of Macau)
- Assistant Professor with the State Key Laboratory of Internet of Things for Smart City and Department of Electrical and Computer Engineering at University of Macau
- Email: hczhang@um.edu.mo

Yonghua Song (Ph.D. Committee Member at University of Macau)
- Rector of University of Macau; Director of State Key Laboratory of Internet of Things for Smart City; Chair Professor with Department of Electrical and Computer Engineering at University of Macau
- Fellow of the Royal Academy of Engineering; Member of the Academia Europaea; Fellow of IEEE
- Email: yhsong@um.edu.mo

Geert Deconinck (Visiting Advisor at KU Leuven)
- Professor with the Department of Electrical Engineering at KU Leuven
- Email: geert.deconinck@kuleuven.be

Beibei Li (Undergraduate Advisor at Sichuan University)
- Professor with the School of Cyber Science and Engineering at Sichuan University
- Email: libeibei@scu.edu.cn