BO ZHOU

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EMPLOYMENT

Postdoctoral Research Fellow *September 2022 - Present*
Department of Industrial and Operations Engineering
University of Michigan, Ann Arbor, United States
- Faculty co-advisors: Prof. Siqian Shen and Prof. Ruiwei Jiang

EDUCATION

Ph.D., Electrical Engineering *June 2022*
Huazhong University of Science and Technology, Wuhan, China
- Advisors: Prof. Jinyu Wen and Prof. Xiaomeng Ai
- Dissertation title: "Power System Flexible Operation by Using Continuous-Time Optimization Theory"

B.S., Electrical Engineering and Automation *June 2017*
Huazhong University of Science and Technology, Wuhan, China

RESEARCH AREAS

Theories: Integer programming, robust optimization, convex/non-convex optimization, machine learning

Applications: Power systems, green energy, energy storage, energy market

HONORS AND AWARDS

- **Frontrunner 5000 top article**, Institute of Scientific and Technical Information of China, 2023
- University of Michigan Postdoctoral Association Conference Award, University of Michigan, 2023
- **Outstanding Graduate**, Huazhong University of Science and Technology, 2022
- **National Scholarship for Postgraduate**, Ministry of Education, China, 2020
- Excellent Oral Presentation, China Electrotechnical Society, 2020
- Excellent Paper Award, iSPEC 2019, IEEE Power & Energy Society, 2019

PUBLICATIONS

Refereed Journal Papers

[J19] Menglin Zhang, Sheng Cai, Yunyun Xie, **Bo Zhou**, Weiye Zheng, Qiuwei Wu, Jinyu Wen, "Supply resilience constrained scheduling of MERs for distribution system restoration: A stochastic model and FW-PH algorithm," ***IEEE Transactions on Smart Grid***, early access. [Link]

[J18] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Frequency stability-constrained unit commitment: Tight approximation using Bernstein polynomials," ***IEEE Transactions on Power Systems***, 39(04), 5907-5919, 2024. [Link] [arXiv]

[J17] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Kun Li, Wei Yao, Zhe Chen, Jinyu Wen, "Function-space optimization to coordinate multi-energy storage across the integrated electricity and natural gas system," ***International Journal of Electrical Power & Energy System***, 2023(151), 109181, 2023. [Link]

[J16] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Yipu Zhang, Wei Yao, Zhe Chen, Jinyu Wen, "Partial-dimensional correlation-aided convex-hull uncertainty set for robust unit commitment," ***IEEE Transactions on Power Systems***, 38(03), 2434-2446, 2023. [Link]

[J15] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Shichang Cui, Wei Yao, Zhe Chen, Jinyu Wen, "Storage right-based hybrid discrete-time and continuous-time flexibility trading between energy storage station and renewable power plants," ***IEEE Transactions on Sustainable Energy***, 14(01), 465-481, 2023. [Link]

[J14] Menglin Zhang, Qiuwei Wu, Jinyu Wen, **Bo Zhou**, Qingyue Guan, Jin Tan, Zhongwei Lin, Fang Fang, "Day-ahead stochastic scheduling of integrated electricity and heat system considering reserve provision by large-scale heat pumps," ***Applied Energy***, 307, 118143, 2022. [Link]

[J13] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Wei Yao, Jinyu Wen, "Flexibility-enhanced continuous-time scheduling of power system under wind uncertainties," ***IEEE Transactions on Sustainable Energy***, 12(04), 2306-2320, 2021. [Link]

[J12] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Chengxiang Yang, Wei Yao, Jinyu Wen, "Dynamic Var reserve-constrained coordinated scheduling of LCC-HVDC receiving-end system considering contingencies and wind uncertainties," ***IEEE Transactions on Sustainable Energy***, 12(01), 469-481, 2021. [Link]

[J11] Kun Li, Xiaomeng Ai, Jiakun Fang, **Bo Zhou**, Lingling Le, Jinyu Wen, "Coordination of macro base stations for 5G network with user clustering," ***Sensors***, 21(16), 5501, 2021. [Link]

[J10] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Menglin Zhang, Wei Yao, Zhe Chen, Jinyu Wen, "Linear network model for integrated power and gas distribution systems with bidirectional energy conversion," ***IET Renewable Power Generation***, 14(17), 3284-3291, 2020. [Link]

[J9] **Bo Zhou**, Jiakun Fang, Xiaomeng Ai, Wei Yao, Zhe Chen, Jinyu Wen, "Pyramidal approximation for power flow and optimal power flow," ***IET Generation, Transmission & Distribution***, 14(18), 3774-3782, 2020. [Link]

[J8] Menglin Zhang, Jiakun Fang, Xiaomeng Ai, **Bo Zhou**, Wei Yao, Qiuwei Wu, Jinyu Wen, "Partition-combine uncertainty set for robust unit commitment," ***IEEE Transactions on Power Systems***, 35(04), 3266-3269, 2020. [Link]

[J7] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Wei Yao, Wenping Zuo, Zhe Chen, Jinyu Wen, "Data-adaptive robust unit commitment in the hybrid AC-DC power system," ***Applied Energy***, 254, 113784, 2019. [Link]

[J6] Kun Li, Jiakun Fang, Xiaomeng Ai, **Bo Zhou**, Wei Yao, Jinyu Wen, "Energy management model of large-scale 5G macro base stations network considering the coordinated optimization of communication equipment and standard equipment," *Proceedings of the CSEE (in Chinese)*, 43(14), 5391-5403, 2023. [Link]

[J5] Jinyu Wen, **Bo Zhou**, Lishen Wei, "Preliminary study on an energy storage grid for future power system in China," *Power System Protection and Control (in Chinese)*, 50(07), 1-10, 2022. (**F5000** article) [Link]

[J4] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Wei Yao, Jinyu Wen, "Continuous-time modeling based robust unit commitment considering beyond-the-resolution wind power uncertainty," *Transactions of China Electrotechnical Society (in Chinese)*, 36(07), 1456-1467, 2021. [Link]

[J3] Jianbo Xin, Chengxiang Yang, Zhan Shu, **Bo Zhou**, Wei Yao, Yanhong Chen, Jinyu Wen, "Identification of critical lines in AC-DC hybrid large power grid based on steady-state security region," *Power System Protection and Control (in Chinese)*, 48(06), 165-172, 2020. [Link]

[J2] Bingyu Sang, Liangzhong Yao, Mingyang Li, Xiaomeng Ai, **Bo Zhou**, Jinyu Wen "Research on energy storage system planning of DC grid with large-scale wind power integration," *Power System Protection and Control (in Chinese)*, 48(05), 86-94, 2020. [Link]

[J1] **Bo Zhou**, Minggang Song, Jiawei Huang, Xiaomeng Ai, Wei Yao, Jinyu Wen, "Configuration optimization method of multifunctional hybrid energy storage for regional power line fault," *Automation of Electric Power System (in Chinese)*, 43(08), 25-34, 2019. [Link]

Refereed Conference Proceedings in Machine Learning

[M1] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Learning to Solve Bilevel Programs with Binary Tender," in *Proceedings of the 12th International Conference on Learning Representation (**ICLR 2024**)*, Vienna, Austria, May, 2024. [Link] [arXiv]

Refereed Conference Proceedings in Power and Control

[C5] Yanru Guo, **Bo Zhou**, Ruiwei Jiang, Siqian Shen, Xi (Jessie) Yang, "Distributionally Robust Resource Allocation with Trust-aided Parametric Information Fusion," accepted for *the 63rd IEEE Conference on Decision and Control (**CDC 2024**)*, Milan, Italy, December 2024. [arXiv]

[C4] Wenjia Shen, **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Sequential Charging Station Location Optimization under Uncertain Charging Behavior and User Growth," accepted for *the 63rd IEEE Conference on Decision and Control (**CDC 2024**)*, Milan, Italy, December 2024. [arXiv]

[C3] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Differential-Algebraic Equation-Constrained Frequency-Secured Stochastic Unit Commitment," in *Proceedings of 2023 IEEE Power & Energy Society General Meeting (**PESGM 2023**)*, Orlando, United States, July 2023. [Link]

[C2] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Wei Yao, Jinyu Wen, "Continuous-trajectory robust unit commitment considering beyond-the-resolution uncertainty," in *Proceedings of the 2020 IEEE Power & Energy Society General Meeting (**PESGM 2020**)*, Montreal, Canada, August 2020. [Link]

[C1] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Chengxiang Yang, Ruitong Liu, Yingxuan Yang, Fangwei Duan, "Steady state security region considering post contingency cascaded DC commutation failure," in *Proceedings of the 2019 IEEE Sustainable Power and Energy Conference (iSPEC 2019)*, Beijing, China, November 2019. (Excellent Paper) [Link]

Papers under Revision/Review/Preparation

[R4] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Risk-Averse Safe Reinforcement Learning for Real-Time Economic Dispatch Considering Demand Response," in preparation.

[R3] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, "Bilevel Mixed-Integer Linear Program with Binary Tender: Investigation of Supermodularity and Submodularity," in preparation.

[R2] Xiaomeng Ai, Huang Zhou, Jun Zhou, **Bo Zhou** (corresponding), Shichang Cui, Jiakun Fang, Jinyu Wen, "Multi-Week Continuous-Time Scheduling of Integrated Electricity and Natural Gas System Against Long-Lasting Stressful Weather," ***Applied Energy***, under revision.

[R1] Menglin Zhang, Jian Gong, Xiaofei Wang, Qiuwei Wu, **Bo Zhou**, Fangxing Li, Jinyu Wen, "Coordinated Scheduling of Virtual Power Plants Driven by Unbalanced Distribution LMP," ***IEEE Transactions on Smart Grid***, under revision.

PRESENTATIONS

Invited Talks

[T5] "Sequential Charging Station Location Optimization under Uncertain Charging Behavior and User Growth," *2024 INFORMS Annual Meeting*, Seattle, United States, October, 2024.

[T4] "Power System Flexibility Trading through Bilevel Optimization," School of Electrical, Computer, and Biomedical Engineering, Southern Illinois University, Carbondale, United States, October, 2024.

[T3] "Risk-Averse Reinforcement Learning for Real-Time Economic Dispatch," *2024 INFORMS Annual Meeting*, Seattle, United States, October, 2023.

[T2] "Frequency Stability-Constrained Unit Commitment: Tight Approximation using Bernstein Polynomials," *2023 INFORMS Annual Meeting*, Phoenix, United States, October, 2023.

[T1] "Differential algebraic equation-constrained frequency-secured stochastic unit commitment," *SIAM Conference on Optimization (SIAM OP23)*, Seattle, United States, June, 2023.

Conference Presentations and Posters

[P5] "Learning to Solve Bilevel Programs with Binary Tender," *the 12th International Conference on Learning Representation (ICLR 2024)*, Vienna, Austria, May, 2024.

[P4] "Differential Algebraic Equation-constrained Frequency-secured Stochastic Unit Commitment," *2023 IEEE Power & Energy Society General Meeting*, Orlando, United States, July, 2023.

[P3] "Continuous-time modeling based robust unit commitment considering beyond-the-resolution wind power uncertainty," *the 9th Frontier Academic Forum of Electrical Engineering*, Xi'an, China, August, 2020 (Excellent Oral Presentation).

[P2] "Continuous-trajectory robust unit commitment considering beyond-the-resolution uncertainty," *2020 IEEE Power & Energy Society General Meeting*, Montreal, Canada, August, 2020.

[P1] "Steady state security region considering post contingency cascaded DC commutation failure," *2019 IEEE Sustainable Power and Energy Conference*, Beijing, China, November, 2019.

TEACHING

Mentoring

Department of Industrial and Operations Engineering, University of Michigan, Ann Arbor

- Wenjia Shen, visiting master's student from Nanjing University, Fall 2023 - present
  Main tasks: Advising Wenjia to prepare models and numerical results for her paper [C6] that was accepted to appear in the Proceedings of *the 63rd IEEE Conference on Decision and Control (CDC 2024)*.
- Yanru Guo, master's student (currently a PhD student at UMich), Fall 2022 - Spring 2024
  Main tasks: Helping Yanru with formulation setup and preparing instances for her paper that was presented as an invited talk "Trust-Aided Distributionally Robust Resource Allocation with Multi-Source Reference Information" in the *2023 INFORMS Annual Meeting*, and as her paper [C7] that was accepted to appear in the Proceedings of the *the 63rd IEEE Conference on Decision and Control (CDC 2024)*.

School of Electrical and Electronic Engineering, Huazhong Uni. of Science and Technology, Wuhan, China

- Huang Zhou, PhD student, Fall 2022 - present
  Main tasks: Advising Huang in optimization theory, model formulation, coding, experiment design, and thesis writing during his undergraduate thesis titled "Continuous-time Unit Commitment Considering Interruptible Load" and helping him with model reformulation, algorithm design, and paper writing to expand the work as a journal paper [R1] that was submitted to *Applied Energy*.
- Kun Li, PhD student, Fall 2020 - Summer 2022
  Main tasks: Advising Kun in literature investigation and model formulation for his journal paper [J11] that was published in *Sensors* and assisting him with model improvement, instance preparation, and revision for his journal paper [J6] that was published in *Proceedings of the CSEE (in Chinese)*.

SERVICES

Peer Reviewer for Journals and Conferences

- *Machine Learning*:
  International Conference on Learning Representation 2025
- *Operations Research*:
  INFORMS Journal on Computing | IISE Transactions
- *Power and Energy*:
  IEEE Transactions on Power Systems | IET Generation, Transmission & Distribution
  IEEE Transactions on Smart Grid | CSEE Journal of Power and Energy Systems
  IEEE Transactions on Energy Markets, Policy and Regulation | Applied Energy
  IEEE Power & Energy Society General Meeting 2020 – 2024

PROFESSIONAL

Professional Affliations

- Society for Industrial and Applied Mathematics (SIAM), Member
- Institute for Operations Research and the Management Sciences (INFORMS), Member
- Institute of Electrical and Electronics Engineers (IEEE), Member

PROJECT EXPERIENCE

Project Participation

- Theories and Computational Algorithms for Optimizing Bilevel Mixed-Integer Nonlinear Programs
  Funded by U.S. Air Force Office of Scientific Research *Sep. 2023 - present*
- Extreme-Scale Stochastic Optimization via Learning-enhanced Decomposition and Parallelization
  Funded by U.S. Department of Energy *Sep. 2022 - Aug. 2023*
- Adaptive Extreme Scenario Method for Unit Commitment with Wind Power Ramp Event
  Funded by National Natural Science Foundation of China *Jan. 2018 - Dec. 2020*
- Robust Coordinated Planning of Energy Storage in Integrated Electricity and Natural Gas System
  Funded by National Natural Science Foundation of China *Jan. 2018 - Dec. 2020*
- Configuration Optimization and Control Strategy of Energy Storage Stations for the Power System
  Funded by State Grid Corporation of China *Jan. 2018 - Dec. 2019*
- Key Technologies in Characteristic Analysis and Security Defense for HVDC Receiving-End System
  Funded by State Grid Henan Electric Power Company *Aug. 2016 - Dec. 2017*

Proposal Writing

- Demand Response with Uncertainty and Bounded-Rationality
  Submitted to the Energy, Power, Control, and Networks Program of U.S. National Science Foundation
  Role: Helping the PI to prepare the initial draft including research descriptions and preliminary results.
- Theories and Computational Algorithms for Optimizing Bilevel Mixed-Integer Nonlinear Programs
  Funded by U.S. Air Force Office of Scientific Research
  Role: Helping the PI to prepare literature review and figures used in the proposal.

REFERENCES

Dr. Siqian Shen (Postdoc co-advisor)
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Professor of Industrial and Operations Engineering & NSF Program Director (Rotator)
University of Michigan, 1205 Beal Avenue, Ann Arbor, MI 48109, United States
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Dr. Ruiwei Jiang (Postdoc co-advisor)
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Associate Professor of Industrial and Operations Engineering
University of Michigan, 1205 Beal Avenue, Ann Arbor, MI 48109, United States
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Dr. Jinyu Wen (PhD advisor)
http://faculty.hust.edu.cn/wenjingyu/en/index.htm
Professor of Electrical and Electronic Engineering & Assistant President
Huazhong University of Science and Technology, 1037 Luoyu Road, Wuhan 430074, China
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