

# BO ZHOU

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## EMPLOYMENT

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**University of Michigan, Ann Arbor, United States**

*September 2022 - Present*

Research Fellow, Department of Industrial and Operations Engineering

Mentor: Siqian Shen, Ruiwei Jiang

## EDUCATION

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**Huazhong University of Science and Technology, Wuhan, China**

*September 2017 - June 2022*

Ph.D. in Electrical Engineering

Thesis: “Power System Flexible Operation by Using Continuous-Time Optimization Theory”

Supervisor: Jinyu Wen, Xiaomeng Ai

**Huazhong University of Science and Technology, Wuhan, China**

*September 2013 - June 2017*

B.S. in Electrical Engineering and Automation

## RESEARCH AREAS

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**Theories:** Continuous-time optimization, robust optimization, bilevel optimization, machine learning

**Applications:** Flexibility & resilience, power/energy system, energy storage, power market, energy bank

## HONORS AND AWARDS

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- Best Student Paper Award, ACPEE 2024, Hong Kong Society of Mechanical Engineers, 2024
- Frontrunner 5000 top article, Institute of Scientific and Technical Information of China, 2023
- UMPDA Conference Award, University of Michigan, 2023

Awards recieved as a PhD student:

- 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

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### Papers under Review/Revision

- [R3] Xiaomeng Ai, Huang Zhou, Jun Zhou, **Bo Zhou**, Shichang Cui, Jiakun Fang, Jinyu Wen, “Multi-Week Continuous-Time Scheduling of Integrated Electricity and Natural Gas System Against Long-Lasting Stressful Weather,” submitted, 2024.
- [R2] 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,” submitted, 2024.
- [R1] 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*, under revision.

## Refereed Journal Papers

- [J17] **Bo Zhou**, Ruiwei Jiang, Siqian Shen, “Frequency-Secured Unit Commitment: Tight Approximation using Bernstein Polynomials,” *IEEE Transactions on Power Systems*, 39(04), 5907-5919, 2024. [[Link](#)] [[arXiv](#)]
- [J16] **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](#)]
- [J15] **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](#)]
- [J14] **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](#)]
- [J13] 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](#)]
- [J12] 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 top article) [[Link](#)]
- [J11] 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](#)]
- [J10] **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](#)]
- [J9] **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](#)]
- [J8] **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](#)]
- [J7] 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](#)]
- [J6] **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](#)]
- [J5] **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](#)]
- [J4] 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](#)]
- [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] **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](#)]

- [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

- [C8] 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.
- [C7] 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.
- [C6] **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](#)]
- [C5] Yuyang Tang, Hongbo Dou, Liang Chen, Shengjie Chen, Caixia Kou, Xiaomeng Ai, **Bo Zhou**, “A Dynamic Pyramidal Relaxation Method of AC OPF,” in *Proceedings of the 9th Asia Conference on Power and Electrical Engineering (ACPEE 2024)*, Shanghai, China, April, 2024. (Best Student Paper) [[Link](#)]
- [C4] **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](#)]
- [C3] **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](#)]
- [C2] **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](#)]
- [C1] **Bo Zhou**, Xiaomeng Ai, Jiakun Fang, Jinyu Wen, Jianhua Yang, “Mixed-integer second-order cone programming taking appropriate approximation for the unit commitment in hybrid ACDC grid,” in *Proceedings of the 6th International Conference on Renewable Power Generation (IET RPG 2017)*, Wuhan, China, October 2017. [[Link](#)]

### RESEARCH EXPERIENCE

#### 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 Power Grid

Funded by State Grid Henan Electric Power Company

Aug. 2016 - Dec. 2017

#### Key Technologies of Distributed Renewable Energy Power Generation Clustering and Consumption

Funded by National Key R&D Program of China

Jul. 2016 - Jun. 2019

## PRESENTATIONS

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### Invited Talks

- [T3] “Risk-Averse Reinforcement Learning for Real-Time Economic Dispatch,” 2023 INFORMS Annual Meeting, Phoenix, 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, U.S., June 2023.

### Conference Presentations

- [P6] “Learning to Solve Bilevel Programs with Binary Tender,” the 12th International Conference on Learning Representation (ICLR 2024), Vienna, Austria, May, 2024.
- [P5] “Differential Algebraic Equation-constrained Frequency-secured Stochastic Unit Commitment,” 2023 IEEE Power & Energy Society General Meeting, Orlando, United States, July 2023.
- [P4] “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).
- [P3] “Continuous-trajectory robust unit commitment considering beyond-the-resolution uncertainty,” 2020 IEEE Power & Energy Society General Meeting, Montreal, Canada, August 2020.
- [P2] “Steady state security region considering post contingency cascaded DC commutation failure,” 2019 IEEE Sustainable Power and Energy Conference, Beijing, China, November 2019.
- [P1] “Mixed-integer second-order cone programming taking appropriate approximation for the unit commitment in hybrid ACDC grid,” the 6th International Conference on Renewable Power Generation, Wuhan, China, October 2017.

## MEMBERSHIP AND SERVICES

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### Professional Membership

- Society for Industrial and Applied Mathematics (SIAM), Member, 2023 - present
- Institute for Operations Research and the Management Sciences (INFORMS), Member, 2022 - present
- Institute of Electrical and Electronics Engineers (IEEE), Member, 2019 - present

### Reviewer Experience

- Reviewer:
  - INFORMS Journal on Computing
  - IIEE Transactions
  - IEEE Transactions on Energy Markets, Policy and Regulation
  - IEEE Transactions on Smart Grid
  - IEEE Transactions on Power Systems
  - Applied Energy
  - CSEE Journal of Power and Energy Systems
  - IET Generation, Transmission & Distribution
  - International Journal of Electrical and Computer Engineering Systems
  - IEEE Power & Energy Society General Meeting 2020-2024