

XIN CHEN

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Research Interests

Intersection of control, machine/reinforcement learning, and optimization for human-cyber-physical systems, with particular applications to smart power and energy systems; distributed algorithms; decarbonization.

Appointments

08/2023 –	Assistant Professor Texas A&M University, Department of Electrical and Computer Engineering
07/2022 – 06/2023	Postdoctoral Associate Massachusetts Institute of Technology, MIT Energy Initiative
02/2022 – 02/2023	Chief Research Scientist Singularity Energy, Inc., MA, US
02/2022 – 06/2022	Postdoctoral Fellow Harvard University, School of Engineering and Applied Sciences
05/2021 – 08/2021	Intern Researcher Siemens Technology, Autonomous System and Control Group, NJ, US

Education

09/2017 – 01/2022	Ph.D. in Electrical Engineering Harvard University, School of Engineering and Applied Sciences
09/2018 – 07/2019	Harvard Graduate Consortium Program on Energy and Environment Harvard University Center for the Environment
09/2015 – 07/2017	M.S. in Electrical Engineering Tsinghua University, Department of Electrical Engineering
09/2011 – 07/2015	B.S. in Engineering & B.S. in Economics Tsinghua University, Department of Engineering Physics (Energy Experimental Class) Tsinghua University, School of Economics and Management

Selected Honors and Awards

2023	IEEE PES Outstanding Doctoral Dissertation (one of four in 2020-2022), IEEE Power & Energy Society (PES)
2023	Best Research Award (one of two, out of over 100 participants), with the Grid Edge Grand Prize of \$5000, in IEEE PES Grid Edge Technologies Conference and Exposition 2023
2021	Outstanding Student Paper Award (one of three, out of over 1700 submitted papers), in the IEEE 60 th Conference on Decision and Control (CDC)
2019	Award of Distinction in Teaching , Harvard University
2018	Best Student Paper Award Finalist (one of two, out of over 500 submitted papers), in 2018 IEEE Conference on Control Technology and Applications (CCTA)

- 2017 **Outstanding Master Graduate**, Tsinghua University, Beijing, China
- 2017 **Outstanding Master Thesis Award**, Tsinghua University, Beijing, China
- 2016 **Best Conference Paper Award** (top 5% of over 1600 submitted papers), in 2016 IEEE Power & Energy Society (PES) General Meeting
- 2010 1st Prize in National Chemistry Olympiad Competition, Jiangxi Province, China

Professional Services

- **Conference Committee and Organizer:**

- 2023 Technical Program Committee for the workshop “Learning and Optimization for Power Distribution System Resilience” at the IEEE SmartGridComm 2023.
- 2023 Technical Program Committee for 14th ACM International Conference on Future Energy Systems (ACM e-Energy 2023).
- 2023 Chair for the session “Advanced Learning and Optimization for Carbon-neutral Electricity” in 2023 INFORMS Annual Meeting.
- 2022 Chair for the session “Stochastic Derivative-free Optimization” in 2022 International Conference on Continuous Optimization (ICCOPT).
- 2021 Chair for the session “Data-driven Optimization and Control for Power Systems” in 2021 INFORMS Annual Meeting.
- 2021 Assistant for the session “Adversarial Learning” in 3rd Learning for Dynamics & Control (L4DC) Conference.

- **Reviewer for Journals:** IEEE Transactions on Smart Grid, IEEE Transactions on Power Systems, IEEE Transactions on Control of Network Systems, Automatica, IEEE Transactions on Automatic Control, IEEE Transactions on Sustainable Energy, IET Generation Transmission & Distribution, IET Renewable Power Generation, Systems & Control Letters, International Journal of Electrical Power & Energy Systems, IEEE Control Systems Letters, etc.

- **Reviewer for Conferences:** IEEE Conference on Decision and Control, American Control Conference, International Conference on Machine Learning (ICML), Conference on Neural Information Processing Systems (NeurIPS), IEEE PES General Meeting, IEEE Conference on Control Technology and Applications, IEEE International Conference on SmartGridComm, Learning for Dynamics and Control (L4DC) Conference, European Control Conference, International Conference on Future Energy Systems (ACM e-Energy), etc.

Teaching

- 2019 Fall ES 155: Systems and Control, Teaching Fellow, Harvard University (Student Rating: 5.0/5.0)
- 2018 Fall ES 155: Systems and Control, Teaching Fellow, Harvard University (Student Rating: 4.9/5.0)

Student Advising

- 2022 Vera Zhou, undergraduate, Harvard University
Project: *Utility maximization and dynamic pricing for optimal demand response.*
- 2020 Yutong Nie, undergraduate, Zhejiang University (co-advised with Prof. Na Li)
Project: *Online user learning and selection via contextual multi-armed bandits.*

2019 Darell Hwang and Victor Qin, undergraduates, Harvard University (co-advised with Prof. Na Li)
Project: *Online trajectory tracking with predictions and implementation on two-wheel robots.*

Publications (Citations:900+, h-index:12, i-10 index:13, from Google Scholar in May 2023)

• **Preprints:**

- [P3] **Xin Chen**, Hungpo Chao, Wenbo Shi, and Na Li, “Towards Carbon-Free Electricity: A Comprehensive Flow-Based Framework for Power Grid Carbon Accounting and Decarbonization”, Working Paper.
- [P2] **Xin Chen**, Jorge I. Poveda, and Na Li, “Continuous-Time Zeroth-Order Dynamics with Projection Maps: Model-Free Feedback Optimization with Safety Guarantees”, arXiv:2303.06858, 2023. (Submitted to IEEE Transactions on Automatic Control) “
- [P1] **Xin Chen**, Jorge I. Poveda, and Na Li, “Model-Free Feedback Constrained Optimization via Projected Zeroth-Order Dynamics”, arXiv:2206.11123, 2022.

• **Journal Articles:**

- [J10] **Xin Chen**, Guannan Qu, Yujie Tang, Steven Low, and Na Li “Reinforcement Learning for Selective Key Applications in Power Systems: Recent Advances and Future Challenges,” IEEE Transactions on Smart Grid, vol. 13, no. 4, pp. 2935-2958, July 2022.
- [J9] **Xin Chen**, Yingying Li, Jun Shimada, and Na Li, “Online Learning and Distributed Control for Residential Demand Response,” IEEE Transactions on Smart Grid, vol. 12, no. 6, pp. 4843-4853, Nov. 2021.
- [J8] **Xin Chen**, Yutong Nie, and Na Li, “Online Residential Demand Response via Contextual Multi-Armed Bandits,” IEEE Control Systems Letters, vol. 5, no. 2, pp. 433-438, Apr. 2021.
- [J7] **Xin Chen**, and Na Li, “Leveraging Two-Stage Adaptive Robust Optimization for Power Flexibility Aggregation,” IEEE Transactions on Smart Grid, vol. 12, no. 5, pp. 3954-3965, Sept. 2021.
- [J6] **Xin Chen**, Changhong Zhao, and Na Li, “Distributed Automatic Load Frequency Control with Optimality in Power Systems,” IEEE Transactions on Control of Network Systems, vol. 8, no. 1, pp. 307-318, Mar. 2021.
- [J5] **Xin Chen**, Emiliano Dall’Anese, Changhong Zhao, and Na Li, “Aggregate Power Flexibility in Unbalanced Distribution Systems,” IEEE Transactions on Smart Grid, vol. 11, no. 1, pp. 258-269, Jan. 2020.
- [J4] **Xin Chen**, Wenchuan Wu, and Boming Zhang, “Robust Capacity Assessment of Distributed Generation in Unbalanced Distribution Networks Incorporating ANM Techniques,” IEEE Transactions on Sustainable Energy, vol. 9, no. 2, pp. 651-663, Apr. 2018.
- [J3] Chenhui Lin, Wenchuan Wu, **Xin Chen**, and Weiye Zheng, “Decentralized Dynamic Economic Dispatch for Integrated Transmission and Active Distribution Networks Using Multi-parametric Programming,” IEEE Transactions on Smart Grid, vol. 9, no. 5, pp. 4983-4993, Sept. 2018.
- [J2] **Xin Chen**, Wenchuan Wu, Boming Zhang, Chenhui Lin, “Data-driven DG Capacity Assessment Method for Active Distribution Networks,” IEEE Transactions on Power Systems, vol. 32, no. 5, pp. 46-57, Sept. 2017.
- [J1] **Xin Chen**, Wenchuan Wu, and Boming Zhang, “Robust Restoration Method for Active Distribution Networks,” IEEE Transactions on Power Systems, vol. 31, no. 5, pp. 4005-4015, Sept. 2016.

- **Machine Learning Conference Publications:**

- [C7] **Xin Chen**, Yujie Tang, and Na Li, “Improve Single-Point Zeroth-Order Optimization Using High-Pass and Low-Pass Filters”, 39th International Conference on Machine Learning (ICML), Baltimore, MD, USA, 2022.
- [C6] Yingying Li, **Xin Chen**, and Na Li, “Online Optimal Control with Linear Dynamics and Predictions: Algorithms and Regret Analysis”, 33rd Conference on Neural Information Processing Systems (NeurIPS), Canada, 2019.

- **Power & Control Conference Publications:**

- [C5] **Xin Chen**, Jorge I. Poveda, and Na Li, “Safe Model-Free Optimal Voltage Control via Continuous-Time Zeroth-Order Methods,” 60th IEEE Conference on Decision and Control (CDC), Austin, Texas, USA, 2021. (**Outstanding Student Paper Award**)
- [C4] **Xin Chen**, Yutong Nie, and Na Li, “Online Residential Demand Response via Contextual Multi-Armed Bandits,” 59th IEEE Conference on Decision and Control (CDC), Jeju Island, Korea, 2020.
- [C3] **Xin Chen**, and Na Li, “Exponential Stability of Primal-Dual Gradient Dynamics with Non-Strong Convexity,” 2020 American Control Conference (ACC), Denver, USA, pp. 1612-1618, 2020.
- [C2] **Xin Chen**, Changhong Zhao, and Na Li, “Distributed Automatic Load-Frequency Control with Optimality in Power Systems,” 2018 IEEE Conference on Control Technology and Applications (CCTA), Copenhagen, Denmark, pp. 24-31, 2018. (**Best Student Paper Award Finalist**)
- [C1] **Xin Chen**, Wenchuan Wu, and Boming Zhang, “A Robust Approach for Active Distribution Network Restoration Based on Scenario Techniques Considering Load and DG Uncertainties,” IEEE Power and Energy Society General Meeting (PESGM), Boston, MA, USA, 2016. (**Best Conference Paper Award**)

Chapter in Book

- [B1] **Xin Chen**, Wenchuan Wu, “Network Reconfiguration and Restoration for Active Distribution Networks,” Chapter in Active Distribution Network Analysis, Operation and Control, Science Press, China, 2016.

Patents

- [P6] US Patent 18/102,408, An apparatus and method for optimizing carbon utilization in a power grid. **Xin Chen**, Wenbo Shi, and Na Li. 2023.
- [P5] US Provisional Patent 63/368663. Grid carbon flow and decarbonization decision-making. **Xin Chen** and Wenbo Shi. 2022.
- [P4] US Patent US2017/0070044A1. Robust restoration method for active distribution network. Wenchuan Wu, ..., **Xin Chen**, et al. Publication date: Mar/9/2017.
- [P3] Chinese Patent CN106169750B. A method for calculating total supply capability of active distribution network based on second-order cone relaxation. Wenchuan Wu, ..., **Xin Chen**, et al. Granted date: Oct/19/2018.
- [P2] Chinese Patent CN106099984B. A data-driven method for evaluating the capacity of distributed generation in active distribution network. Wenchuan Wu, ..., **Xin Chen**, et al. Granted date: Oct/19/2018.
- [P1] Chinese Patent CN105140917B. Robust restoration method for active distribution network under uncertainty. Wenchuan Wu, ..., **Xin Chen**, et al. Granted date: May/10/2017.

Invited Talks

10/2023 2023 INFORMS Annual Meeting, Phoenix, AZ, US
Carbon-aware optimal power flow

07/2023 2023 IEEE PES General Meeting, Orlando, FL, US
Distributed data-driven decision-making for sustainable power systems

04/2023 2023 IEEE PES Grid Edge Technologies Conference and Exposition, San Diego, CA, US
Distributed data-driven decision-making for sustainable power systems

03/2023 University of Pennsylvania, Department of Electrical and Systems Engineering
Scalable data-driven decision-making for smart autonomous power and energy systems

01/2023 Rutgers University, Department of Industrial and Systems Engineering
Scalable data-driven decision-making for smart autonomous power and energy systems

01/2023 Purdue University, Elmore Family School of Electrical and Computer Engineering
Scalable data-driven decision-making for smart autonomous power and energy systems

12/2022 Texas A&M University, Department of Electrical and Computer Engineering
Scalable data-driven decision-making for smart autonomous power and energy systems

12/2022 Iowa State University, Department of Electrical and Computer Engineering
Scalable data-driven decision-making for smart autonomous power and energy systems

10/2022 2022 INFORMS Annual Meeting, Indianapolis, IN, US
Reinforcement learning for decision-making and control in power systems

10/2022 New York Scientific Data Summit (NYSDS) 2022, US
Online learning and distributed control for residential demand response

07/2022 International Conference on Continuous Optimization (ICCOPT) 2022, Bethlehem, PA, US
Leverage high-pass and low-pass filters to improve single-point zeroth-order optimization

07/2022 39th International Conference on Machine Learning (ICML), Baltimore, MD, USA
Improve single-point zeroth-order optimization using high-pass and low-pass filters

07/2022 2022 IEEE PES General Meeting, Denver, CO, US
Tutorial: Distributed model-free optimal voltage control

03/2022 Center for Intelligent and Networked Systems, Tsinghua University, China
Model-free control and optimization using zeroth-order methods

03/2022 SEAS Research Showcase - Lightning Talks, Harvard University, MA, US
The future of smart power and energy system

12/2021 60th Conference on Decision and Control (CDC), Austin, Texas, US
Safe model-free optimal voltage control via continuous-time zeroth-order methods

10/2021 2021 INFORMS Annual Meeting, Anaheim, California, US
Model-free optimal voltage control in distribution systems

06/2021 Siemens Technology, Autonomous System and Control Research Group, NJ, US
Real-time feedback optimal voltage control

12/2020 59th Conference on Decision and Control (CDC), Jeju Island, Korea
Online residential demand response via contextual multi-armed bandit

07/2020 2020 American Control Conference (ACC), Denver, CO, US
Exponential stability of primal-dual gradient dynamics with non-strong convexity

08/2018 2nd IEEE Conference on Control Technology and Applications, Copenhagen, Denmark
Distributed automatic load-frequency control with optimality in power systems

07/2016 2016 IEEE PES General Meeting, Boston, MA, US
Robust restoration approach for active distribution network based on scenario techniques