

XIN CHEN

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Research Interests

- Sustainable power and energy system operation, control, and planning;
- Learning, optimization, and control of human-cyber-physical systems (smart grids and smart cities);
- Distributed optimization and control of networked multi-agent systems;
- Model-free feedback optimization and control (zeroth-order method and reinforcement learning);
- Online learning and human-in-the-loop control; • (Distributionally) robust optimization.

Education

Sep 2017 - Mar 2022 (expected)	Harvard University , School of Engineering and Applied Sciences Ph.D. in Electrical Engineering (Advisor: Prof. Na (Lina) Li) Thesis: <i>Distributed and data-driven decision-making for sustainable power systems</i>
Sep 2018 - Jul 2019	Harvard University Center for the Environment Harvard Graduate Consortium Program on Energy and Environment
Sep 2015 - Jul 2017	Tsinghua University , Department of Electrical Engineering Master of Science in Electrical Engineering
Sep 2012 - Jul 2015	Tsinghua University , School of Economics and Management Bachelor of Science in Economics
Sep 2011 - Jul 2015	Tsinghua University , Department of Engineering Physics Bachelor of Science in Engineering Physics (Energy Experimental Class)

Selected Awards

Dec 2021	Outstanding Student Paper Award , in IEEE 60 th Conference on Decision and Control (CDC)
Apr 2019	Award of Distinction in Teaching, Harvard University
Aug 2018	Best Student Paper Award Finalist (one of two), in IEEE 2 nd Conference on Control Technology and Applications (CCTA)
May 2017	Excellent Master Graduate , Tsinghua University
May 2017	Outstanding Master Thesis Award, Tsinghua University
Jun 2016	Best Conference Paper Award , in 2016 IEEE PES General Meeting
Nov 2010	1 st Prize, National Chemistry Olympiad Competition, Jiangxi Province, China

Research Experience

May 2021 - Aug 2021	Research Intern (Mentor: Dr. Xiaofan Wu) Siemens Technology, Autonomous System and Control Research Group, NJ, USA Project: <i>Dynamic power system model building and calibration using PMU data.</i>
Jan 2019 - Nov 2020	Collaboration with ThinkEco Inc., USA (Founder/CTO: Dr. Jun Shimada) Project: <i>Real-time learning, selection, and control in residential demand response.</i>

Sep 2017 - Nov 2018 Collaboration with National Renewable Energy Laboratory (NREL), USA
(Mentors: Dr. Emiliano Dall’Anese and Dr. Andrey Bernstein)
ARPA-E NODES Project: *Real-time optimization and control of next-generation distribution infrastructure.*

Teaching Experience

2019 Fall Teaching Fellow for Course “ES 155: Systems and Control (Instructor: Prof. Na Li)”, SEAS, Harvard University. (Student Evaluation Score 5.0/5.0)

2018 Fall Teaching Fellow for Course “ES 155: Systems and Control (Instructor: Prof. Na Li)”, SEAS, Harvard University. (**Harvard Award of Distinction in Teaching**)

Student Advising

- Yutong Nie, undergraduate, Zhejiang University (co-advised with Prof. Na Li)
Topic: *User learning and selection via contextual multi-armed bandits for residential demand response.*
- Darell Hwang and Victor Qin, undergraduates, Harvard University (co-advised with Prof. Na Li)
Topic: *Online trajectory tracking with predictions and practical implementation on two-wheel robots.*

Professional Services

• Conference Committee and Organizer:

2022 Technical program committee for 13th ACM International Conference on Future Energy Systems (ACM e-Energy 2022).

2021 Co-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:** Automatica, IEEE Transactions on Automatic Control, IEEE Transactions on Smart Grid, IEEE Transactions on Power Systems, IEEE Transactions on Sustainable Energy, IET Generation, Transmission & Distribution, CSEE Journal of Power and Energy Systems, Systems & Control Letters, IEEE Control Systems Letters, International Journal of Electrical Power & Energy Systems, etc.

• **Reviewer for Conferences:** IEEE Conference on Decision and Control, IEEE Conference on Control Technology and Applications, IEEE International Conference on SmartGridComm, IEEE PES General Meeting, Learning for Dynamics and Control (L4DC) Conference, European Control Conference, American Control Conference, etc.

Patents

- [1] US Patent US2017/0070044A1. Robust restoration method for active distribution network. W. Wu, ..., **X. Chen**, et al. Publication date: Mar/9/2017.
- [2] Chinese Patent CN106169750B. A method for calculating total supply capability of active distribution network based on second-order cone relaxation. W. Wu, ..., **X. Chen**, et al. Granted date: Oct/19/2018.
- [3] Chinese Patent CN106099984B. A data-driven method for evaluating the capacity of distributed generation in active distribution network. W. Wu, ..., **X. Chen**, et al. Granted date: Oct/19/2018.
- [4] Chinese Patent CN105140917B. Robust restoration method for active distribution network under uncertainty. W. Wu, ..., **X. Chen**, et al. Granted date: May/10/2017.

Chapter in Book

- [1] **Xin Chen** and Wenchuan Wu, “Network Reconfiguration and Restoration Control for Active Distribution Networks,” chapter in *Active Distribution Network Analysis, Operation and Control* (in Chinese), Science Press, China, Sept. 2016.

Publications

• Preprints

- [P4] **Xin Chen**, Jorge I. Poveda, and Na Li, “Fully Distributed Model-Free Optimal Voltage Control Based on P-PDZD and Dynamic Average Consensus,” Working Paper.
- [P3] **Xin Chen**, Jorge I. Poveda, and Na Li, “Model-Free Feedback Constrained Optimization via Projected Primal-Dual Zeroth-Order Dynamics,” Working Paper.
- [P2] **Xin Chen**, Yujie Tang, and Na Li, “Improve Single-Point Zeroth-Order Optimization Using High-Pass and Low-Pass Filters,” *Arxiv Preprint*, arXiv:2111.01701, 2021. [PDF]
- [P1] **Xin Chen**, Guannan Qu, Yujie Tang, Steven Low, Na Li “Reinforcement Learning for Decision-Making and Control in Power Systems: Tutorial, Review, and Vision,” *Arxiv Preprint*, arXiv:2102.01168, 2021. [PDF] (under review of *IEEE Transactions on Smart Grid*)

• Journal Articles

- [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**, 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.
- [J7] **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.
- [J6] **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.
- [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, and Chenhui Lin, “Data-driven DG Capacity Assessment Method for Active Distribution Networks,” *IEEE Transactions on Power Systems*, vol. 32, no. 5, pp. 3946-3957, 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.

• Conference Papers

- [C6] **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)**
- [C5] **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.
- [C4] **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.
- [C3] 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)*, Vancouver, Canada, 2019.
- [C2] **Xin Chen**, Changhong Zhao, and Na Li, “Distributed Automatic Load-Frequency Control with Optimality in Power Systems,” *2nd 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)**

Invited Talks

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| Dec 2021 | 60th Conference on Decision and Control (CDC), Austin, Texas, USA
<i>Safe model-free optimal voltage control via continuous-time zeroth-order methods.</i> |
| Oct 2021 | 2021 INFORMS Annual Meeting, Anaheim, California, USA
<i>Model-free optimal voltage control in distribution systems.</i> |
| Jun 2021 | Siemens Technology, Autonomous System and Control Research Group, NJ, USA
<i>Real-time feedback optimal voltage control.</i> |
| Dec 2020 | 59th Conference on Decision and Control (CDC), Jeju Island, Korea
<i>Online residential demand response via contextual multi-armed bandit.</i> |
| Jul 2020 | 2020 American Control Conference (ACC), Denver, USA
<i>Exponential stability of primal-dual gradient dynamics with non-strong convexity.</i> |
| Aug 2018 | 2nd IEEE Conference on Control Technology and Applications, Copenhagen, Denmark
<i>Distributed automatic load-frequency control with optimality in power systems.</i> |
| Jul 2016 | 2016 IEEE PES General Meeting, Boston, USA
<i>Robust restoration approach for active distribution network based on scenario techniques.</i> |