

SHIXUAN ZHANG

CONTACT

Position: Postdoctoral Fellow, Institute for Computational and Experimental Research in Mathematics (ICERM)
Brown University
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EDUCATION

- Ph.D. in Operations Research, Georgia Institute of Technology, Atlanta, Georgia 2017–2022
Advisor: Andy Sun, Minor: Mathematics
- B.S. in Mathematics and Physics, Tsinghua University, Beijing, China 2013–2017

PUBLICATIONS AND PREPRINTS

1. Aravena, Ignacio, Daniel K. Molzahn, Shixuan Zhang, Cosmin G. Petra, Frank E. Curtis, Shenyinying Tu, Andreas Wächter et al. “Recent Developments in Security-Constrained AC Optimal Power Flow: Overview of Challenge 1 in the ARPA-E Grid Optimization Competition.” arXiv preprint arXiv:2206.07843 (2022).
2. Gholami, Amin, Kaizhao Sun, Shixuan Zhang, and Xu Andy Sun, “An ADMM-based Distributed Optimization Method for Solving Security-Constrained AC Optimal Power Flow.” arXiv preprint arXiv:2202.06787 (2022).
3. Zhang, Shixuan, and Xu Andy Sun. “On Distributionally Robust Multistage Convex Optimization: Data-driven Models and Performance.” arXiv preprint arXiv:2210.08433 (2022).
4. Zhang, Shixuan and Xu Andy Sun. “On Distributionally Robust Multistage Convex Optimization: New Algorithms and Complexity Analysis.” arXiv preprint arXiv:2010.06759 (2020).
5. Christian Fullner, Shixuan Zhang, Steffen Rebennack, Andy Sun, “Stochastic Dual Dynamic Integer Programming (SDDiP).” Encyclopedia of Optimization, Third Edition, edited by Panos Pardalos and Oleg Prokopyev, (2022).
6. Zhang, Shixuan and Xu Andy Sun. “Stochastic Dual Dynamic Programming for Multistage Stochastic Mixed-Integer Nonlinear Optimization.” Mathematical Programming (2022): 1-51. **Honorable Mention** for IOS Student Best Paper Prize 2021.
7. Zhang, Shixuan, Sheng Liu, Tianhu Deng, and Zuo-Jun Max Shen. “Transient-State Natural Gas Transmission in Gunbarrel Pipeline Networks.” INFORMS Journal on Computing (2020): 679-713.
8. Deng, Tianhu, Yong Liang, Shixuan Zhang, Jingze Ren, and Shuyi Zheng. “A Dynamic Programming Approach to Power Consumption Minimization in Gunbarrel Natural Gas Networks with Nonidentical Compressor Units.” INFORMS Journal on Computing 31, no. 3 (2019): 593-611.

HONORS AND AWARDS

- ICERM Institute Postdoctoral Fellowship 2022
- Honorable Mention for INFORMS Optimization Society Best Student Paper Prize 2021
- Prize winning team (GMI-GO) in the ARPA-E Grid Optimization Competition 2019 & 2021

RESEARCH PROJECTS

- **Sum-of-squares Certification via Low-rank Optimization** 2022–Present
Mentor: Prof. Greg Blekherman, Collaborator: Prof. Andy Sun
 - Study on finding sum of squares representation using low-rank method with global optimality guarantee

- Potential insights on general nonconvex optimization problems related to sums of squares
- **Data-driven Multistage Distributionally Robust Optimization** 2019–2022
 Advisor: Prof. Andy Sun
 - Study on algorithmic complexity and model performance comparison of multistage optimization
 - Application in energy system with renewable integration and inventory control problems
- **Grid Optimization Competition (Challenges 1 & 2)** 2018–2021
 Team Leader: Prof. Andy Sun, Teammates: Prof. Santanu Dey, Amin Gholami, Kaizhao Sun
 - ★ Our team placed **3rd** worldwide in Challenge 1 and 6th in Challenge 2
 - Based on real-world power grid operational data and sponsored by ARPA-E with multimillion prize
 - Progress on fast algorithms for security-constrained alternating current optimal power flow problems

TEACHING EXPERIENCE

- Teaching Assistant for Deterministic Optimization (ISYE6669) Fall 2017
- Teaching Assistant for Deterministic Optimization Online Course (ISYE6669OAN) Spring & Fall 2018

INVITED TALKS

1. Dual Dynamic Programming for Data-driven Distributionally Robust Multistage Convex Optimization, INFORMS Annual Meeting 2022
2. Dual Dynamic Programming for Data-driven Distributionally Robust Multistage Convex Optimization, International Conference on Continuous Optimization 2022
3. Dual Dynamic Programming for Data-driven Distributionally Robust Multistage Convex Optimization, INFORMS Optimization Society Meeting 2022
4. New Algorithms and Complexity Analysis for Distributionally Robust Multistage Convex Optimization, INFORMS Annual Meeting 2021
5. Iteration Complexity for Stochastic Dual Dynamic Programming Algorithms, SIAM Southeastern Atlantic Section Conference 2021
6. Complexity for Multistage Distributionally Robust Dual Dynamic Programming, SIAM Conference on Optimization 2021 (OP21)
7. Generalized Conjugacy Method for Nonconvex Stochastic Optimization in Power Systems, INFORMS Annual Meeting 2020
8. Stochastic Dual Dynamic Programming Algorithm for Multistage Stochastic Mixed-integer Nonlinear Optimization, MIP Workshop 2020
9. Stochastic Dual Dynamic Programming Algorithm for Nonconvex Multistage Optimization Problems, INFORMS Annual Meeting 2019
10. New Algorithms for Solving the Natural Gas Transient Scheduling Problem, IISE Annual Meeting 2019
11. A Minor Perspective on Rank Constrained Optimization, INFORMS Annual Meeting 2018

ACADEMIC SERVICES

1. Reviewer for *Mathematical Programming* and *Mathematical Programming Computation*
2. Reviewer for *SIAM Journal on Optimization*
3. Reviewer for *Operations Research* and *INFORMS Journal on Computing*
4. Reviewer for *IEEE Transactions on Power Systems* and *Transactions on Control of Network Systems*