

Runyu (Cathy) Zhang

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Education

Harvard University

Ph.D. in Applied Mathematics

John A. Paulson School of Engineering and Applied Sciences

Advisor: Na Li Committee: David Parkes, Lucas B. Janson, Dale Schuurmans

Cambridge, MA

Sept. 2019 – Present

Peking University

B.Sc. in Scientific and Engineering Computing

School of Mathematical Sciences Department

Beijing, China

Sept. 2015 – July 2019

Other Academic Experiences

Salesforce Research

Research Intern

Advisor: Yu Bai

Palo Alto, CA

June 2022 – September 2022

University of California, Los Angeles

Student Researcher

Advisor: Deanna Needell

Los Angeles, CA

June 2018 – September 2018

Research Interests

Areas: Control Theory, Reinforcement Learning, Multi-agent Systems, Distributed Control, Game Theory

Topics: Distributed/decentralized control for multi-agent network systems, multi-agent reinforcement learning, Risk-sensitive reinforcement learning, Online adaptive control.

Awards, Honors, and Scholarships

Finalist of the Two Sigma Diversity PhD Fellowship (1 of 8)

2022

Certificates of Distinction and Excellence in Teaching

2020

Derek Bok Center for Teaching and Learning, Harvard University

Elite Undergraduate Training Program

2016-2019

School of Mathematical Sciences, Peking University

Publications

Journal Publications

Y. Li*, Y. Tang*, **R. Zhang**, and N. Li, "Distributed Reinforcement Learning for Decentralized Linear Quadratic Control: A Derivative-Free Policy Optimization Approach," *IEEE Transactions on Automatic Control (TAC)*, 2022.

Peer-Reviewed Conference Proceedings

R. Zhang, Y. Zhang, R. Konda, B. Ferguson, J. Marden, and N. Li, "Markov Games with Decoupled Dynamics: Price of Anarchy and Sample Complexity," in *the 62nd IEEE Conference on Decision and Control (CDC)*, 2023.

Y. Zhang, **R. Zhang**, Y. Gu, and N. Li, "Multi-agent Reinforcement Learning with Reward Delays," in *Learning for Dynamics and Control Conference (LADC)*, 2023.

R. Zhang, W. Li, and N. Li, "On the Optimal Control of Network LQR with Spatially-exponential Decaying Structure," in *American Control Conference (ACC)*, 2023.

R. Zhang, Y. Zheng, W. Li, and N. Li, "On the Relationship of Optimal State Feedback and Disturbance Response Controllers," in *the 22nd World Congress of the International Federation of Automatic Control (IFAC)*, 2023.

R. Zhang*, Q. Liu*, H. Wang, C. Xiong, N. Li, and Y. Bai, "Policy Optimization for Markov Games: Unified Framework and Faster Convergence," in *Advances in Neural Information Processing Systems (NeurIPS)*, 2022.

R. Zhang, J. Mei, B. Dai, D. Schuurmans, and N. Li, "On the Global Convergence Rates of Decentralized Softmax Gradient Play in Markov Potential Games," in *Advances in Neural Information Processing Systems (NeurIPS)*, 2022.

R. Zhang, Z. Ren, and N. Li, "Gradient Play in Stochastic Games: Stationary Points and Local Geometry," in *the 25th International Symposium on Mathematical Theory of Networks and Systems (MTNS)*, 2022.

R. Zhang, Y. Li, and N. Li, "On the Regret Analysis of Online LQR Control with Predictions," in *American Control Conference (ACC)*, 2021.

Workshop Papers

M. Gao, J. Haddock, D. Molitor, D. Needell, E. Sadvnik, T. Will, and **R. Zhang**, "Neural Nonnegative Matrix Factorization for Hierarchical Multilayer Topic Modeling," in *IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, 2019.

Pre-Prints and Working Papers

R. Zhang, Y. Hu, and N. Li, "Regularized Robust MDPs and Risk-Sensitive MDPs: Equivalence, Policy Gradient, and Sample Complexity," *arXiv preprint arXiv:2306.11626*, 2023.

Teaching Experience

ES155: Systems and Control

Fall 2020

Engineering and Applied Sciences — Harvard University
Section Leader

Invited Talks

Optimal Control of Spatially Exponential Decaying Linear Quadratic Regulator (Upcoming) 2023
The Institute for Operations Research and the Management Sciences (INFORMS)

Optimal Control of Spatially Exponential Decaying Linear Quadratic Regulator 2023
American Control Conference (ACC)

Gradient Play in Stochastic Games: Stationary Points and Local Geometry 2022
International Symposium on Mathematical Theory of Networks and Systems (MTNS)

On the Effect of log-barrier Regularization in Decentralized Softmax Gradient Play in Multiagent Systems 2022
International Conference on Continuous Optimization (ICCOPT)

On the Regret Analysis of Online LQR Control with Predictions 2021
American Control Conference (ACC)

Professional Services

Reviewer for Artificial Intelligence and Statistics (AISTATS), IEEE Trans. Automatic Control (TAC), Automatica, IEEE Intelligent Systems, Systems and Control Letters, Dynamic Games and Applications (DGAA).