

Jiawei Zhang

Laboratory for Information & Decision Systems
Massachusetts Institute of Technology

Email: jwzhang@mit.edu
<https://jwzhang.netlify.app>

Education

The Chinese University of Hong Kong, Shenzhen, Shenzhen, China
Ph.D. in Computer and Information Engineering July 2021
Thesis title: Proximal Primal Dual Algorithms For Nonconvex Optimization
Advisor: Prof. Zhi-Quan (Tom) Luo

University of Science and Technology of China, Hefei, China
B.Sc. in Mathematics (Hua Loo-Keng Talent Program) June 2016

Research Interests

- Nonlinear and convex optimization: theory and algorithms
- Learning algorithms: robustness and generalization
- Data-driven decision-making under uncertainty
- New computational models for AI-driven platforms, sustainable energy systems, and signal processing

Professional Experience

Massachusetts Institute of Technology, Cambridge, MA
MIT Postdoctoral Fellow for Engineering Excellence 2023 – present
Advisor: Prof. Asuman Ozdaglar and Prof. Saurabh Amin
Postdoctoral Associate 2021 – 2023
Advisor: Prof. Asuman Ozdaglar

Analyze the generalization and robustness of data-driven problems. Design computationally tractable, statically efficient and robust algorithms for data-driven problems including offline reinforcement learning, constrained learning, optimization with uncertainty, generative models and adversarial training.

The Chinese University of Hong Kong, Shenzhen, Shenzhen, China 2016 – 2021
Graduate Research Assistant
Advisor: Prof. Zhi-Quan (Tom) Luo

Designed efficient, scalable first-order algorithms for large-scale nonconvex, constrained optimization problems and minimax problems. Designed efficient and accurate training algorithms for small neural network training, overcoming the bad landscape of the loss function.

Tencent AI Lab, Shenzhen, China 2020 – 2021
Research Intern

Designed communication and computation efficient optimization algorithms for decentralized learning over multi-agent networks.

Honors and Awards

The MIT Postdoctoral Fellowship For Engineering Excellence, Massachusetts Institute of Technology, 2023

Presidential Award for Outstanding Doctoral Students, The Chinese University of Hong Kong, Shenzhen, 2021

PhD Fellowship, Shenzhen Research Institute of Big Data, 2020-2021

Presidential Award for Outstanding Doctoral Students, The Chinese University of Hong Kong, Shenzhen, 2021

Outstanding Teaching Assistant Award, The Chinese University of Hong Kong, Shenzhen, 2020

Academic Publications

Journal Articles (published or submitted)

“Decentralized Non-Convex Learning with Linearly Coupled Constraints,” **Jiawei Zhang**, Songyang Ge, Tsung-hui Chang, and Zhi-Quan Luo. *IEEE Transactions on Signal Processing*, June 2022.

“A Global Dual Error Bound and Its Application to the Analysis of Linearly Constrained Nonconvex Optimization,” **Jiawei Zhang** and Zhi-Quan Luo. *SIAM Journal on Optimization*, 2022.

“Distributed Stochastic Consensus Optimization With Momentum for Nonconvex Nonsmooth Problems,” Zhiguo Wang, **Jiawei Zhang**, Tsung-hui Chang, Jian Li, and Zhi-Quan Luo. *IEEE Transactions on Signal Processing*, Jul. 2021.

“A Proximal Alternating Direction Method of Multiplier for Linearly Constrained Nonconvex Minimization,” **Jiawei Zhang**, and Zhi-Quan Luo. *SIAM Journal on Optimization*, 2020.

Articles in Preparation

“A Unified Linear Programming Framework for Reward Learning with Offline Human Behavior and Feedback Data,” Kihyun Kim, **Jiawei Zhang**, Pablo Parrilo, Asuman Ozdaglar. Submitted to *Proceedings of the 41th International Conference on Machine Learning (ICML 2024)*.

“Advancing Tractability and Generalization for Smart “Predict-then-Optimize” via Stochastic Minimax Reformulation,” Saurabh Amin, Omar Bennouna, Asuman Ozdaglar, and **Jiawei Zhang**. 2023.

“The Power of Duality Principle in Offline Average-Reward Reinforcement Learning,” Asuman Ozdaglar*, Sarath Pattathil*, **Jiawei Zhang***, and Kaiqing Zhang*. *Proceedings of the 40th International Conference on Machine Learning (ICML 2023), Workshop on Duality for Modern Machine Learning*, 2023. (*Indicates equal contribution.)

“Smoothed-SGDmax: A Stability-Inspired Algorithm to Improve Adversarial Generalization,” Jiancong Xiao*, **Jiawei Zhang***, Zhi-Quan Luo, and Asuman Ozdaglar. *36th Conference on Neural Information Processing Systems (NeurIPS 2022), ML Safety Workshop*, 2022. (*Indicates equal contribution.)

“On the Iteration Complexity of Smoothed Proximal ALM for Nonconvex Optimization Problem with Convex Constraints,” **Jiawei Zhang**, Wenqiang Pu, and Zhi-Quan Luo. *arXiv preprint arXiv:2207.06304*, 2022.

Refereed Conference Proceedings

“Stochastic Smoothed Gradient Descent Ascent for Federated Minimax Optimization,” Wei Shen, Minhui Huang, **Jiawei Zhang**, and Cong Shen. *Proceedings of The 27th International Conference on Artificial Intelligence and Statistics (AISTATS 2024)*, Valencia, Spain, May 2024.

“Linearly Constrained Bilevel Optimization: A Smoothed Implicit Gradient Approach,” Prashant Khanduri, Ioannis Tsaknakis, Yihua Zhang, Jia Liu, Sijia Liu, **Jiawei Zhang**, and Mingyi Hong. *Proceedings of the 40th International Conference on Machine Learning (ICML 2023)*, Honolulu, Hawaii, Jul. 2023.

“Revisiting the Linear-Programming Framework for Offline RL with General Function Approximation,” Asuman Ozdaglar*, Sarath Pattathil*, **Jiawei Zhang***, and Kaiqing Zhang*. *Proceedings of the 40th International Conference on Machine Learning (ICML 2023)*, Honolulu, Hawaii, Jul. 2023. (*Indicates equal contribution. Jiawei Zhang is the corresponding author.)

“What is a Good Metric to Study Generalization of Minimax Learners?” Asuman Ozdaglar*, Sarath Pattathil*, **Jiawei Zhang***, and Kaiqing Zhang*. *Advances in Neural Information Processing Systems 35 (NeurIPS 2022)*, New Orleans, LA, Nov. 2022. (*Indicates equal contribution. Jiawei Zhang is the corresponding author.)

“When Expressivity Meets Trainability: Fewer than n Neurons Can Work,” **Jiawei Zhang**, Yushun Zhang, Mingyi Hong, Ruoyu Sun, and Zhi-Quan Luo. *Advances in Neural Information Processing Systems 34 (NeurIPS 2021)*, Virtual Conference, Dec. 2021.

“Communication Efficient Primal-Dual Algorithm for Nonconvex Nonsmooth Distributed Optimization,” with Congliang Chen, **Jiawei Zhang**, Li Shen, Peilin Zhao, and Zhi-Quan Luo. *Proceedings of The 24th International Conference on Artificial Intelligence and Statistics (AISTATS 2021)*, Virtual Conference, Apr. 2021.

“A Single-Loop Smoothed Gradient Descent-Ascent Algorithm for Nonconvex-Concave Min-Max Problems,” **Jiawei Zhang**, Peijun Xiao, Ruoyu Sun, and Zhi-Quan Luo. *Advances in Neural Information Processing Systems 33 (NeurIPS 2020)*, Virtual Conference, Dec. 2020.

“A Proximal Dual Consensus Method for Linearly Coupled Multi-Agent Non-Convex Optimization,” **Jiawei Zhang**, Songyang Ge, Tsung-hui Chang, and Zhi-Quan Luo. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Barcelona, Spain, May 2020.

“Scalable Gaussian Process Using Inexact ADMM for Big Data,” Yue Xu, Feng Yin, **Jiawei Zhang**, Wenjun Xu, Shuguang Cui, and Zhi-Quan Luo. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brighton, UK, May 2019.

“Learning Word Vectors with Linear Constraints: A Matrix Factorization Approach,” Wenye Li, **Jiawei Zhang**, Jianjun Zhou, and Laizhong Cui. *Proceedings of the Twenty-Seventh International Joint Conference on Artificial Intelligence (IJCAI-18)*, Stockholm, Sweden, Jul. 2018.

Selected Presentations

Structured Decision-Making under Uncertainty: Optimization and Generalization under Constraints
On-going Job Talk, Department of Computer Sciences, University of Wisconsin-Madison, Madison, WI, Mar. 2024.

Improving Efficiency of Offline Reinforcement Learning via Error Bound Analysis
Invited Talk in Young Researchers Workshop–2023, Cornell University, Ithaca, NY, Oct. 2023.

On Computational and Statistical Challenges of Solving Nonconvex Minimax Optimization Problems
SIAM Conference on Optimization 2023, Seattle, WA, May 2023.
Invited Seminar Series, Georgia Institute of Technology, Atlanta, GA, Apr. 2023.
Epstein Department Seminar, University of Southern California, Los Angeles, CA, Oct. 2022.

Revisiting the Linear-Programming Framework for Offline RL with General Function Approximation
CISS 2023, Johns Hopkins University, Baltimore, MD, Mar. 2023.

What is a Good Metric to Study Generalization of Minimax Learners?
NeurIPS 2022, New Orleans, LA, Nov. 2022.
MLOPT Idea Seminar, University of Wisconsin-Madison, Madison, WI, Jul. 2022.
ICCOPT 2022, Lehigh University, Bethlehem, PA, Jul. 2022.

Proximal-Primal-Dual Algorithms for Nonconvex Optimization Problems
INFORMS Annual Meeting, Indianapolis, IN, Oct. 2022.

Proximal-Primal-Dual Algorithms for Nonconvex Optimization Problems and Landscape Analysis for Narrow Neural Network
Tsinghua IIIS Seminar on Foundations of Data Science, Tsinghua University, Beijing, China, Apr. 2022.

When Expressivity Meets Trainability: Fewer than n Neurons Can Work
NeurIPS 2021, Virtual conference, Dec. 2021.

Communication Efficient Primal-Dual Algorithm for Nonconvex Nonsmooth Distributed Optimization
AISTATS 2021, Virtual conference, Apr. 2021.

A Single-Loop Smoothed Gradient Descent-Ascent Algorithm for Nonconvex-Concave Min-Max Problems
NeurIPS 2020, Virtual conference, Dec. 2020.

Services

Referee for Journals: *SIAM Journal on Optimization (SIOPT)*, *IEEE Transactions on Signal Processing (IEEE TSP)*, *IEEE Transactions on Control of Network Systems (IEEE TCNS)*, *Mathematics of Operations Research (MOR)*, *Journal of Scientific Computing (JSC)*

Referee for Conferences: *Conference on Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), Artificial Intelligence and Statistics Conference (AISTATS)*

References

Professor Zhi-Quan (Tom) Luo

Affiliation:

Professor, School of Science and Engineering, The Chinese University of Hong Kong, Shenzhen

Address:

2001 Longxiang Boulevard,
Longgang District,
Shenzhen 518172, China

Email: luoqz@cuhk.edu.cn

Phone: +86 0755-84273616

Professor Asuman Ozdaglar

Affiliation:

Professor, Electrical Engineering and Computer Science, Massachusetts Institute of Technology

Address:

Primary 38-403 & LIDS 32-D630,
77 Massachusetts Avenue,
Cambridge, MA 02139

Email: rmwright@mit.edu

Phone: +1 617-253-4607/+1 617-324-0058

Professor Saurabh Amin

Affiliation:

Professor, Civil and Environmental Engineering, Massachusetts Institute of Technology

Address:

Room 1-241,
77 Massachusetts Avenue,
Cambridge, MA 02139

Email: amins@mit.edu

Phone: +1 617-253-8003