

JIANHAO MA

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RESEARCH INTERESTS

AI for Optimization; Optimization for AI

EMPLOYMENT

Tenure-track Assistant Professor

July 2026 - Present

Department of Industrial Engineering, Tsinghua University

Postdoctoral researcher

June 2025 - June 2026

Department of Statistics and Data Science, University of Pennsylvania

Supervisor: Prof. Yuxin Chen

EDUCATION

University of Michigan, Ann Arbor

January 2021 - May 2025

Ph.D. in Industrial and Operations Engineering

Advisor: Prof. Salar Fattahi

Tsinghua University

September 2016 - June 2020

B.E. in Industrial Engineering and B.S. in Mathematics

University of California, Berkeley

January 2019 - August 2019

Exchange student in the Department of Statistics

AWARDS

- ProQuest Distinguished Dissertation Awards, University of Michigan *2026*
- Rackham Predoctoral Fellowship, University of Michigan *2024-2025*
- INFORMS Junior Faculty Interest Group Paper Competition – Second Place (as a coauthor) *2023*
- Katta Murty Prize for Best Research Paper on Optimization, IOE Department *2023*
- NeurIPS Scholar Award *2022*

EXPERIENCE

FAIR Labs, Meta

May 2024 - August 2024

Research scientist intern, hosted by Dr. Lin Xiao

IIIS, Tsinghua University

August 2020 - June 2021

Visiting student, hosted by Prof. Yuhao Wang

AI Lab, ByteDance

April 2020 - July 2020

Machine learning engineer intern in deep reinforcement learning lab

PREPRINTS

(α - β : author names are sorted alphabetically)

1. A lower bound for stepsize-based acceleration of gradient descent [link]
Jianhao Ma, Yuxin Chen

2. WSqD: A Horizon-Free Learning Rate Schedule for Large Model Training [link]
Jianhao Ma, Yuxin Chen
3. Towards Understanding the Power and Limits of the Muon Optimizer: A River-Valley Perspective [link]
Tianqi Shen, Jinji Yang, Runze Shi, Jianhao Ma, Jiaye Teng, Ziyi Ma
4. Understanding Quantization-Aware Training: Gradients at Quantized Weights Bias to the Low-Loss Basin [link]
Hanyang Li, Jianhao Ma, Ying Cui
5. Preconditioning Benefits of Spectral Orthogonalization in Muon [link]
Jianhao Ma, Yu Huang, Yuejie Chi, Yuxin Chen
6. Certifying Optimality in Nonconvex Robust PCA [link]
Pinxi Gong, Lexiao Lai, Jianhao Ma (α - β)
7. Quantization through Piecewise-Affine Regularization: Optimization and Statistical Guarantees [link]
Jianhao Ma, Lin Xiao
8. Implicit Regularization of Infinitesimally-perturbed Gradient Descent Toward Low-dimensional Solutions [link]
Jianhao Ma, Geyu Liang, Salar Fattahi
9. RANSAC Revisited: An Improved Algorithm for Robust Subspace Recovery under Adversarial and Noisy Corruptions [link]
Guixian Chen, Jianhao Ma, Salar Fattahi
10. LIBRA: Language Model Informed Bandit Recourse Algorithm for Personalized Treatment Planning [link]
Junyu Cao, Ruijiang Gao, Esmail Keyvanshokoo, Jianhao Ma (α - β)

PUBLICATIONS

(*: equal contribution)

1. Sparse Mean Estimation in Adversarial Settings via Incremental Learning
Jianhao Ma, Rui Ray Chen, Yinghui He, Salar Fattahi, Wei Hu
Transactions on Machine Learning Research (TMLR), 2026 [link]
2. Can Learning Be Explained By Local Optimality In Low-rank Matrix Recovery?
Jianhao Ma, Salar Fattahi
Mathematics of Operations Research, 2025 [link]
INFORMS Junior Faculty Interest Group Paper Competition – Second Place
3. PARQ: Piecewise-Affine Regularized Quantization
Lisa Jin, Jianhao Ma, Zechun Liu, Andrey Gromov, Aaron Defazio, Lin Xiao
International Conference on Machine Learning (ICML), 2025 [link]
4. Convergence of Gradient Descent with Small Initialization for Unregularized Matrix Completion
Jianhao Ma, Salar Fattahi
Conference on Learning Theory (COLT), 2024 [link]
5. Global Convergence of Sub-gradient Method for Robust Matrix Recovery: Small Initialization, Noisy Measurements, and Over-parameterization
Jianhao Ma, Salar Fattahi
Journal of Machine Learning Research (JMLR), 2023 [link]

6. Behind the Scenes of Gradient Descent: A Trajectory Analysis via Basis Function Decomposition
Jianhao Ma, Lingjun Guo, Salar Fattahi
International Conference on Learning Representations (ICLR), 2023 [link]
7. Blessing of Nonconvexity in Deep Linear Models: Depth Flattens the Optimization Landscape Around the True Solution
Jianhao Ma, Salar Fattahi
Advances in Neural Information Processing Systems (NeurIPS), 2022 (**Spotlight**) [link]
Katta Murty Prize for Best Research Paper on Optimization
8. Towards Understanding Generalization via Decomposing Excess Risk Dynamics
Jiaye Teng*, Jianhao Ma*, Yang Yuan
International Conference on Learning Representations (ICLR), 2022 [link]
9. Sign-RIP: A Robust Restricted Isometry Property for Low-rank Matrix Recovery
Jianhao Ma, Salar Fattahi
NeurIPS Workshop on Optimization for Machine Learning, 2021 [link]

INVITED TALK/PRESENTATION

1. **Annual Conference on Learning Theory**, Edmonton, July 2024
“Convergence of Gradient Descent with Small Initialization for Unregularized Matrix Completion”
2. **Peking University**, Center for Machine Learning Research, Beijing, April 2024
“Robust Matrix Recovery through Nonconvex Optimization: Challenges and Promises”
3. **The Chinese University of Hong Kong**, SEEM Seminar Series, Hong Kong, April 2024
“Robust Matrix Recovery through Nonconvex Optimization: Challenges and Promises”
4. **INFORMS Optimization Society Conference**, Houston, TX, March 2024
“Convergence of Gradient Descent with Small Initialization for Unregularized Matrix Completion”
5. **INFORMS Annual Meeting**, Phoenix, AZ, October 2023
“Behind the Scenes of Gradient Descent: A Trajectory Analysis via Basis Function Decomposition”
6. **ICSA Applied Statistics Symposium**, Ann Arbor, MI, June 2023
“Sparse Mean Estimation in Adversarial Settings via Incremental Learning”
7. **INFORMS Annual Meeting**, Indianapolis, IN, October 2022
“Blessing of Nonconvexity in Deep Linear Models: Depth Flattens the Optimization Landscape Around the True Solution”
8. **INFORMS Optimization Society Conference**, Greenville, SC, March 2022
“Global Convergence of Sub-gradient Method for Robust Matrix Recovery: Small Initialization, Noisy Measurements, and Over-parameterization”
9. **INFORMS Annual Meeting**, Anaheim, CA, October 2021
“Sign-RIP: A Robust Restricted Isometry Property for Low-rank Matrix Recovery”
10. **MOPTA Conference**, Bethlehem, PA, August 2021
“Sign-RIP: A Robust Restricted Isometry Property for Low-rank Matrix Recovery”

ACTIVITIES/ACADEMIC SERVICE

Organizer

Session chair: INFORMS Annual Meeting 2021, 2022, 2024

Reviewer

Journal: IEEE Transactions on Information Theory, IEEE Transactions on Signal Processing, SIAM Journal on Optimization, SIAM Review, JMLR.

Conference: ICML, NeurIPS, ICLR, AISTATS, NeurIPS Workshop on Optimization for Machine Learning, ICLR Workshop on Bridging the Gap Between Practice and Theory in Deep Learning.