

# JIANHAO MA

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## RESEARCH INTERESTS

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Continuous optimization; machine learning theory

## EMPLOYMENT

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### Postdoctoral researcher

*June 2025 - Now*

Department of Statistics and Data Science, University of Pennsylvania

Supervisor: Prof. Yuxin Chen

## EDUCATION

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### University of Michigan, Ann Arbor

*January 2021 - May 2025*

Ph.D. in Industrial and Operational 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

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- 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

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### 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/WORKING PAPERS

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1. Implicit Regularization of Infinitesimally-perturbed Gradient Descent Toward Low-dimensional Solutions [link]  
Jianhao Ma, Geyu Liang, Salar Fattahi

## PUBLICATIONS

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(\*: equal contribution)

1. Can Learning Be Explained By Local Optimality In Low-rank Matrix Recovery?  
Jianhao Ma, Salar Fattahi  
to appear in the **Mathematics of Operations Research**, 2025 [link]  
**INFORMS Junior Faculty Interest Group Paper Competition – Second Place**
2. 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]
3. Convergence of Gradient Descent with Small Initialization for Unregularized Matrix Completion  
Jianhao Ma, Salar Fattahi  
**Conference on Learning Theory (COLT)**, 2024 [link]
4. Robust Sparse Mean Estimation via Incremental Learning  
Jianhao Ma, Rui Ray Chen, Yinghui He, Salar Fattahi, Wei Hu  
**International Conference on Learning Representations (ICLR) Workshop on Bridging the Gap Between Practice and Theory in Deep Learning**, 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  
**Advances in Neural Information Processing Systems (NeurIPS) Workshop on Optimization for Machine Learning**, 2021 [link]

## INVITED TALK/PRESENTATION

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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  
“Robust Sparse Mean Estimation 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**

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### **Organizer**

Session chair: INFORMS Annual Meeting 2021, 2022, 2024

### **Reviewer**

**Journal:** IEEE Transactions on Information Theory, IEEE Transactions on Signal Processing.

**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.