

JIAXIANG LI

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APPOINTMENTS

Meta Platforms, Inc.
AI Research Scientist

Sunnyvale, CA
Aug 2025–Now

University of Minnesota

Postdoctoral Associate, Department of Electrical and Computer Engineering
Mentor: Mingyi Hong and Shuzhong Zhang

Minneapolis, MN
Jan 2024–Aug 2025

EDUCATION

University of California, Davis

Ph.D. in Applied Mathematics, GPA: 3.97/4.00
Advisor: Shiqian Ma and Krishnakumar Balasubramanian

Davis, CA
Sept 2018–Dec 2023

Zhejiang University

B.S. in Mathematics, GPA: 3.88/4.00

Hangzhou, China
Sept 2014–July 2018

RESEARCH INTEREST

My research lies at the intersection of applied mathematics, optimization theory, and artificial intelligence, with a focus on developing principled algorithms that advance both **theoretical foundations** and **practical applications** in modern machine learning. Specifically, I work on:

- Algorithm design for gradient-based, gradient-free (zeroth-order), and primal–dual methods for large-scale nonconvex optimization, including problems on Riemannian manifolds.
- Convergence theory for deterministic and stochastic minimax and bilevel optimization, with applications to machine learning and operations research.
- Distributed, decentralized and federated optimization algorithms for training large-scale AI systems.
- Theoretical foundations of reinforcement learning, especially policy-based methods, and their role in aligning large language models (LLMs).
- Efficient pre-training and fine-tuning methods for LLMs, bridging optimization principles with practical deployment.

FUNDINGS

- I am a **Co-PI** of NSF grant ECCS-2426064. Prof. Mingyi Hong is the PI.

HONORS AND AWARDS

- INFORMS Computing Society Prize 2024
- INFORMS Optimization Conference Travel Award 2024
- Graduate Student Fellowship at UC Davis 2018–2019, 2022–2023

PUBLICATIONS AND PREPRINTS (* MARKS CO-FIRST AUTHOR)

- [1] X. Zhang, C. Li, S. Zeng, **J. Li**, Z. Wang, S. Lu, A. Garcia, and M. Hong, “Reinforcement Learning in Inference Time: A Perspective from Successive Policy Iterations”, in *ICLR 2025 Workshop on Reasoning and Planning for Large Language Models*.
- [2] A. Glentis*, **J. Li***, A. Han, and M. Hong, “A minimalist optimizer design for llm pretraining”, *arXiv preprint arXiv:2506.16659*, 2025.
- [3] A. Glentis*, **J. Li***, Q. Shang*, A. Han, I. Tsaknakis, Q. Wei, and M. Hong, “Scalable parameter and memory efficient pretraining for llm: Recent algorithmic advances and benchmarking”, *arXiv preprint arXiv:2505.22922*, 2025.
- [4] C. He, **J. Li**, B. Jiang, S. Ma, and S. Zhang, “On relatively smooth optimization over riemannian manifolds”, *arXiv preprint arXiv:2508.03048 (Submitted to SIAM Journal on Optimization)*, 2025.
- [5] X. Jiang, **J. Li**, M. Hong, and S. Zhang, “A correspondence-driven approach for bilevel decision-making with nonconvex lower-level problems”, *arXiv preprint arXiv:2509.01148*, 2025.
- [6] C. Li, S. Zeng, Z. Liao, **J. Li**, D. Kang, A. Garcia, and M. Hong, “Joint reward and policy learning with demonstrations and human feedback improves alignment”, in *The Thirteenth International Conference on Learning Representations (ICLR, Spotlight)*, 2025.
- [7] **J. Li** and S. Ma, “Riemannian bilevel optimization”, *Journal of Machine Learning Research*, vol. 26, no. 18, pp. 1–44, 2025.
- [8] H. Nie, **J. Li**, and Z. Wen, “An augmented lagrangian value function method for lower-level constrained stochastic bilevel optimization”, *arXiv preprint arXiv:2509.24249*, 2025.
- [9] H. Wang, Z. Pan, C. He, **J. Li**, and B. Jiang, “Federated learning on riemannian manifolds: A gradient-free projection-based approach”, *arXiv preprint arXiv:2507.22855 (Submitted to IEEE Transactions on Automatic Control)*, 2025.
- [10] S. Wang, F. Zhang, **J. Li**, C. Du, C. Du, T. Pang, Z. Yang, M. Hong, and V. Y. Tan, “Muon outperforms adam in tail-end associative memory learning”, *arXiv preprint arXiv:2509.26030*, 2025.
- [11] S. Zeng, L. Viano, C. Li, **J. Li**, V. Cevher, M. Wulfmeier, S. Ermon, A. Garcia, and M. Hong, “Aligning large language models with human feedback: Mathematical foundations and algorithm design”, *Authorea Preprints*, 2025.
- [12] X. Zhang, C. Li, S. Zeng, **J. Li**, Z. Wang, K. Lin, S. Lu, A. Garcia, and M. Hong, “Aligning frozen llms by reinforcement learning: An iterative reweight-then-optimize approach”, *arXiv preprint arXiv:2506.17828*, 2025.
- [13] A. Han, **J. Li**, W. Huang, M. Hong, A. Takeda, P. Jawanpuria, and B. Mishra, “SLTrain: A sparse plus low-rank approach for parameter and memory efficient pretraining”, in *Thirty-Eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2024.
- [14] X. Jiang, **J. Li**, M. Hong, and S. Zhang, “Barrier function for bilevel optimization with coupled lower-level constraints: Formulation, approximation and algorithms”, *arXiv preprint arXiv:2410.10670 (Major revision in Mathematical Programming)*, 2024.
- [15] **J. Li**, K. Balasubramanian, and S. Ma, “Zeroth-order Riemannian averaging stochastic approximation algorithms”, *SIAM Journal on Optimization*, vol. 34, no. 4, pp. 3314–3341, 2024.
- [16] **J. Li**, X. Chen, S. Ma, and M. Hong, “Problem-Parameter-Free Decentralized Nonconvex Stochastic Optimization”, *Pacific Journal on Optimization (Accepted)*, *arXiv:2402.08821*, 2024.
- [17] **J. Li**, S. Ma, and T. Srivastava, “A riemannian alternating direction method of multipliers”, *Mathematics of Operations Research*, 2024.
- [18] **J. Li**, S. Zeng, H.-T. Wai, C. Li, A. Garcia, and M. Hong, “Getting More Juice Out of the SFT Data: Reward Learning from Human Demonstration Improves SFT for LLM Alignment”, in *Thirty-Eighth Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2024.
- [19] X. Zhang, S. Zeng, **J. Li**, K. Lin, and M. Hong, “Policy optimization can be memory-efficient: LLM Alignment Through Successive Policy Re-weighting (SPR)”, in *NeurIPS 2024 Workshop on Fine-Tuning in Modern Machine Learning: Principles and Scalability*, 2024.
- [20] Y. Zhang*, P. Li*, J. Hong*, **J. Li***, Y. Zhang, W. Zheng, P.-Y. Chen, J. D. Lee, W. Yin, M. Hong, Z. Wang, S. Liu, and T. Chen, “Revisiting Zeroth-Order Optimization for Memory-Efficient LLM Fine-Tuning: A Benchmark”, in *Proceedings of the 41st International Conference on Machine Learning (ICML)*, vol. 235, PMLR, 2024, pp. 59 173–59 190.

- [21] **J. Li**, K. Balasubramanian, and S. Ma, “Stochastic Zeroth-order Riemannian Derivative Estimation and Optimization”, *Mathematics of Operations Research*, vol. 48, no. 2, pp. 1183–1211, 2023.
- [22] **J. Li** and S. Ma, “Federated Learning on Riemannian Manifolds”, *Appl. Set-Valued Anal. Optim.* 5 (2023), 213–232, 2023.

TEACHING

- **Lecturer** at University of Minnesota
 - EE5239 Introduction to Nonlinear Optimization (Jointly teaching with Prof. Mingyi Hong)
- **Teaching Assistant** at UC Davis
 - MAT 127 Real Analysis
 - MAT 168 Optimization
 - MAT 170 Math in Data Science
 - MAT 21 ABCD Calculus Series
 - MAT 17 ABC Calculus for Biology Series

TALKS

- ICCOPT, session speaker July 2025
Topic: A Riemannian ADMM
- INFORMS Annual meeting, session speaker October 2024
Topic: A Riemannian ADMM
- INFORMS Optimization Society Conference, session speaker March 2024
Topic: Zeroth order moving average methods on manifolds
- INFORMS Optimization Society Conference, session speaker March 2022
Topic: Zeroth order optimization on Riemannian manifolds
- Modeling and Optimization: Theory and Applications (MOPTA), session speaker August 2021
Topic: Zeroth order optimization on Riemannian manifolds
- SIAM Conference on Optimization, session speaker July 2021
Topic: Zeroth order optimization on Riemannian manifolds

ACADEMIC SERVICES

- Journal Reviewer
INFORMS Journal on Computing, Information and Inference: A Journal of the IMA, Journal of Machine Learning Research, Computational Optimization and Applications, Journal of Scientific Computing, Journal of Global Optimization
- Conference Reviewer
AISTATS (2021, 2022, 2023), ICML (2022, 2024, 2025), NeurIPS (2023, 2024, 2025), ICLR (2023, 2024), AAAI (2024)

INTERNSHIP EXPERIENCE

Amazon.com, Inc. Seattle, WA
Applied Scientist Intern June 2023–Sept 2023

- Amazon Prime Science ML Team
- Built customer-prime service engagement history aggregation model with 1.2% offline evaluation gain
- Developed data pipeline for engagement history features using Pyspark and AWS services
- Built customer-prime service engagement trajectory model using seq2seq modeling and Attention networks

Meta Platforms, Inc. Menlo Park, CA
Software Engineer Intern, Machine Learning June 2022–Sept 2022

- Ads Core Machine Learning ENG Team
- Built reinforcement learning based Slate-Q long-term value optimization for Ads recommender in Facebook
- Designed large-scale data pipeline and managed data from industry-level databases using SQL and Hadoop Hive
- Initiated and conduct large-scale deep Q-networks training in PyTorch