

SHAOCONG MA

CONTACT INFORMATION

Name: Shaocong Ma

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EDUCATION

PhD in Electrical and Computer Engineering University of Utah	Sep. 2019-Jun. 2024 GPA:4.0/4.0
M.A. in Statistics University of California, Santa Barbara	Sep. 2017-Jun. 2019 GPA: 3.9/4.0
B.S. in Statistics Sichuan University	Sep. 2013-Jun. 2017 GPA: 3.6/4.0

RESEARCH INTERESTS

Optimization & Reinforcement Learning Theory

Driven by real-world challenges, my research is centered on developing efficient optimization and decision-making algorithms applied in diverse fields such as Large Language Models (LLMs) and Reinforcement Learning (RL) problems. More specifically, I prioritize creating data-efficient and environment-robust algorithms that are substantiated with theoretical guarantees.

AI4Science

I am also passionate about designing machine learning systems for scientific computing tasks, especially the physics-informed machine learning problem. My efforts in operator learning and neural PDE solvers aim to integrate deep learning seamlessly with established (and often non-differentiable) solvers, and more importantly, to maintain their efficiency and generalization ability in out-of-distribution regimes.

PUBLICATIONS

Shaocong Ma, James Diffenderfer, Bhavya Kailkhura, and Yi Zhou. Deep learning of PDE Correction and Mesh Adaption without Automatic Differentiation. Machine Learning 2025.

Shaocong Ma, and Heng Huang. Revisiting Zeroth-Order Optimization: Minimum-Variance Two-Point Estimators and Directionally Aligned Perturbations. ICLR 2025.

Yi Zhou, Shaocong Ma. Stochastic Optimization Methods for Policy Evaluation in Reinforcement Learning. Foundations and Trends® in Optimization 2024.

Shaocong Ma, Ziyi Chen, Shaofeng Zou, Yi Zhou. Decentralized Robust V-Learning for Solving Markov Games with Model Uncertainty. Journal of Machine Learning Research (JMLR) 2023.

Shaocong Ma, James Diffenderfer, Bhavya Kailkhura, and Yi Zhou. End-to-End Mesh Optimization of a Hybrid Deep Learning Black-Box PDE Solver. NeurIPS 2023 (ML4PS Workshop).

Ziyi Chen, Shaocong Ma, Yi Zhou. Finding Correlated Equilibrium of Constrained Markov Game: A Primal-Dual Approach. NeurIPS 2022.

Shaocong Ma, Ziyi Chen, Yi Zhou, Kaiyi Ji, Yingbin Liang. Data Sampling Affects the Complexity of Online SGD over Dependent Data. UAI 2022.

Ziyi Chen, Shaocong Ma, Yi Zhou. Accelerated Proximal Alternating Gradient-Descent-Ascent for Nonconvex Minimax Machine Learning. IEEE ISIT 2022.

Ziyi Chen, Shaocong Ma, Yi Zhou. Sample Efficient Stochastic Policy Extragradient Algorithm for Zero-Sum Markov Game. ICLR 2022.

Shaocong Ma, Ziyi Chen, Yi Zhou, Shaofeng Zou. Greedy-GQ with Variance Reduction: Finite-time Analysis and Improved Complexity. ICLR 2021.

Shaocong Ma, Yi Zhou, Shaofeng Zou. Variance-Reduced Off-Policy TDC Learning: Non-Asymptotic Convergence Analysis. NeurIPS 2020.

Shaocong Ma, Yi Zhou. Understanding the Impact of Model Incoherence on Convergence of Incremental SGD with Random Reshuffle. ICML 2020.

RESEARCH EXPERIENCES

Postdoctoral Researcher Jun. 2024-Present

The University of Maryland Institute for Advanced Computer Studies (UMIACS)

PI: Professor Heng Huang

- Lead a research team on developing novel optimization and reinforcement learning algorithms with a focus on improving efficiency and robustness in large-scale applications including Large Language Models (LLMs), Diffusion Model, and Agent System.
- Mentor undergraduate/graduate students on various machine learning projects, fostering a collaborative research environment.

Research Intern (AI4Science) May. 2022-Aug. 2022

Lawrence Livermore National Security, LLC

Mentors: James Diffenderfer, Bhavya Kailkhura

- Designed a hybrid model incorporating Physics-Informed Graph Neural Network and External Black-Box PDE Solvers, successfully addressing non-differentiability challenges in fluid flow predictions.

AWARDED PROPOSALS

LLM-Guided Exploration in Reinforcement Learning: Enhancing Efficiency and Decision-Making

\$5000, July. 2024-July. 2025

OpenAI's Researcher Access Program

PRESENTATIONS & INVITED TALKS

- Efficient and Resilient Algorithms for Stochastic Optimization & Reinforcement Learning** Apr. 2024
University of Utah
- Bridging Practical Needs and Theoretical Analysis of Machine Learning Algorithms** Nov. 2023
Mohamed bin Zayed University of Artificial Intelligence (MBZUAI)
- Towards Understanding Reinforcement Learning from Optimization Perspectives** Nov. 2021
Baidu USA

PROFESSIONAL SERVICES

Conference Reviewer:

- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)
- Advances in Neural Information Processing Systems (NeurIPS)
- IEEE International Conference on Big Data (IEEE BigData)
- International Joint Conference on Artificial Intelligence (IJCAI)
- Conference on Uncertainty in Artificial Intelligence (UAI)
- AAAI Conference on Artificial Intelligence (AAAI)
- International Conference on Artificial Intelligence and Statistics (AISTATS)

Journal Reviewer:

- Transactions on Machine Learning Research (TMLR)
- IEEE Transactions on Signal Processing
- Numerical Algorithms
- IEEE Transactions on Emerging Topics in Computational Intelligence (TETCI)
- European Journal of Control

Workshop Reviewer:

- ICLR 2024 Blogpost

TEACHING EXPERIENCES

Teaching Assistant at UC Santa Barbara:

- PSTATE 5A: Statistics
- PSTATE 5LS: Statistics for Life Science
- PSTAT 109: Statistics for Economics
- PSTAT 175: Survival Analysis
- PSTAT 172: Actuarial Statistics

Teaching Assistant at University of Utah:

- ECE 3500: Fundamentals of Signals and Systems

SKILLS

Programming:

Python, R, Lua, C++

Frontend Development (HTML, CSS, JavaScript, React.js, Vue.js, Bootstrap)

Backend Technologies (Node.js, Django)

Database Management (SQL)

Git

Machine Learning:

Machine Learning Framework (PyTorch, TensorFlow, Keras)

Scientific Computing (NumPy, SciPy, Pandas)

Pretraining/Fine-tuning LLMs

Prompt Engineering

Parallel Computing with MPI

Language:

Chinese, English

Soft Skills:

Project Management

Technical Writing

Presentation Skills

Collaborative Research