XIANG LI

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EDUCATION

Peking University, Beijing China *Sep. 2018 - Jul. 2023*
School of Mathematical Sciences
PhD.
Advisor: Prof. Zhihua Zhang

Peking University, Beijing China *Sep. 2014 - Jul. 2018*
School of Mathematical Sciences
B.S.
Main degree: Statistics / Dual degree: Economics

RESEARCH INTERESTS

- Optimization: Develop provably optimal methods for (non-)convex and stochastic optimization.
- Statistics: Propose practical methods for structural estimation and online statistical inference, and deepen theoretical understanding of the interaction between optimization and sampling.
- Sequential Decision Making: Develop computationally efficient online algorithms that balance the exploration-exploitation trade-off in problems such as bandit or reinforcement learning.
- Trustworthy Machine Learning: Understand the trade-offs between communication efficiency, accuracy, privacy, robustness, and fairness, and design efficient algorithms with provable guarantees for large-scale problems.

EXPERIENCE

- Aug. 2023 - Now, Post-doctoral researcher at University of Pennsylvania, working with Prof. Qi Long and Prof. Weijie Su.
- Feb. 2022 - Feb. 2023, Visiting Phd. student in Department of Statistical Science at University of Toronto, work with Prof. Qiang Sun.
- 28 Jun. - 10 Jul. 2020, The Machine Learning Summer Schools by the Max Planck Institute for Intelligent Systems, Tübingen, Germany (MLSS 2020, virtual).
- Jun. 2018 - Nov. 2018, Intern at Face ++ (Megvii), Algorithm Group, work with Shuchang Zhou.
- Mar. 2018 - May. 2018, Intern at ToSimple, Algorithm Research Group, work with Naiyan Wang.

PUBLICATIONS

* indicates equal contribution; ** indicates alphabetical order.

Conference

1. **A Statistical Analysis of Polyak-Ruppert-Averaged Q-Learning** [pdf]
   Xiang Li, Wenhao Yang, Jiadong Liang, Zhihua Zhang, Michael Jordan
   International Conference on Artificial Intelligence and Statistics (AISTATS) 2023
2. **Statistical Analysis of Karcher Means for Random Restricted PSD Matrices** [pdf]
   Hengchao Chen, **Xiang Li**, Qiang Sun
   International Conference on Artificial Intelligence and Statistics (AISTATS) 2023

3. **Statistical Estimation and Online Inference via Local SGD** [pdf]
   Xiang Li, Jiadong Liang, Xiangyu Chang, Zhihua Zhang
   Conference on Learning Theory (COLT) 2022

4. **Asymptotic Behaviors of Projected Stochastic Approximation: A Jump Diffusion Perspective** [pdf]
   Jiadong Liang, Yuze Han, **Xiang Li**, Zhihua Zhang
   Neural Information Processing Systems (NeurIPS) 2022, Spotlights

5. **Personalized Federated Learning towards Communication Efficiency, Robustness and Fairness** [pdf]
   Shiyun Lin*, Yuze Han*, **Xiang Li**, Zhihua Zhang
   Neural Information Processing Systems (NeurIPS) 2022

6. **Communication-Efficient Distributed SVD via Local Power Iterations** [pdf]
   Xiang Li, Shusen Wang, Kun Chen, Zhihua Zhang
   International Conference on Machine Learning (ICML) 2021

7. **Finding the Near Optimal Policy via Reductive Regularization in MDPs** [pdf]
   Wenhao Yang, **Xiang Li**, Guangzeng Xie, Zhihua Zhang
   Workshop on Reinforcement Learning Theory, ICML 2021

8. **On the Convergence of FedAvg on Non-IID Data** [pdf]
   Xiang Li*, Kaixuan Huang*, Wenhao Yang*, Shusen Wang, Zhihua Zhang
   International Conference on Learning Representations (ICLR) 2020, Oral presentation

9. **Do Subsampled Newton Methods Work for High-Dimensional Data?** [pdf]
   Xiang Li, Shusen Wang, Zhihua Zhang
   AAAI Conference on Artificial Intelligence (AAAI) 2020

10. **A Regularized Approach to Sparse Optimal Policy in Reinforcement Learning** [pdf]
    Wenhao Yang*, **Xiang Li***, Zhihua Zhang
    Neural Information Processing Systems (NeurIPS) 2019

Preprint

1. **A Statistical Framework of Watermarks for Large Language Models: Pivot, Detection Efficiency and Optimal Rules** [pdf]
   Xiang Li, Feng Ruan, Huiyuan Wang, Qi Long, Weijie J. Su

2. **Finite-Time Decoupled Convergence in Nonlinear Two-Time-Scale Stochastic Approximation** [pdf]
   Yuze Han**, **Xiang Li****, Zhihua Zhang

3. **Stochastic Approximation MCMC, Online Inference, and Applications in Optimization of Queueing Systems** [pdf]
   Xiang Li*, Jiadong Liang*, Xinyun Chen, Zhihua Zhang

4. **Online Statistical Inference for Nonlinear Stochastic Approximation with Markovian Data** [pdf]
   Xiang Li, Jiadong Liang, Zhihua Zhang

5. **Asymptotic Behaviors and Phase Transitions in Projected Stochastic Approximation: A Jump Diffusion Approach** [pdf]

Jiadong Liang, Yuze Han, **Xiang Li**, Zhihua Zhang

6. **Privacy-Preserving Community Detection for Locally Distributed Multiple Networks**
Shujie Ma, Xiao Guo, **Xiang Li**, Xiangyu Chang

7. **Variance-aware Robust Reinforcement Learning with Linear Function Approximation with Heavy-tailed Rewards** [pdf]
Xiang Li, Qiang Sun

8. **Privacy-Preserving Distributed SVD via Federated Power** [pdf]
Xiao Guo*, **Xiang Li***, Xiangyu Chang, Shusen Wang, Zhihua Zhang

9. **Communication-Efficient Local Decentralized SGD Methods** [pdf]
Xiang Li, Wenhao Yang, Shusen Wang, Zhihua Zhang

TALKS

- *A Regularized Approach to Sparse Optimal Policy in Reinforcement Learning* at PKU machine learning workshop, June 2019.
- *Statistical Estimation and Inference via Local SGD in Federated Learning* at the 14-th China-R conference, Nov. 2021.
- *Polyak-Ruppert-Averaged Q-Learning is Statistically Efficient* at RL workshop of Shanghai University of Finance and Economics, July 2022.
- *Complete Asymptotic Analysis for Projected Stochastic Approximation and Debiased Variants* at Allerton conference, Sep. 2023.

REVIEWER SERVICE

- Conferences: NeurIPS [2020,2021(outstanding reviewer, top 8%), 2022-2023], ICML [2020, 2023-2024], and ICLR [2021-2023], UAI [2023], AISTATS [2024], IJCAI [2024]
- Journals: Journal of the American Statistical Association (JASA), Annals of Applied Probability (AOAP), IEEE Open Journal of Signal Processing, IEEE JSAC SI on MTCNG.

TEACHING EXPERIENCES

- *Reinforcement Learning: Theory and Algorithms*, Fall 2019, PKU, Teaching Assistant
- *Linear Algebra*, Spring 2021, PKU, Teaching Assistant

SELECTED AWARDS

- Travel Award (NeurIPS 2019, AAAI 2020)
- President Scholarship for Excellent Ph.D Student, Peking University *2018, 2020-2021*
- National Scholarship, China *2017, 2019*
- Outstanding Graduates, School of Mathematical Sciences, Peking University *2018*
- First prize in National Undergraduate Mathematical Modeling Contest, China *2016*