

# XIANG LI

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## EDUCATION

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**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

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- 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

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- 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

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\* indicates equal contribution; \*\* indicates alphabetical order.

### Conference papers

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*

#### Journal papers

1. **Variance-aware Decision Making with Linear Function Approximation with Heavy-tailed Rewards** [\[pdf\]](#) [\[arxiv\]](#)  
**Xiang Li**, Qiang Sun  
*Transactions on Machine Learning Research, 2024 April*

#### Preprints

1. **A Statistical Framework of Watermarks for Large Language Models: Pivot, Detection Efficiency and Optimal Rules** [\[arxiv\]](#)  
**Xiang Li**, Feng Ruan, Huiyuan Wang, Qi Long, Weijie J. Su
2. **Finite-Time Decoupled Convergence in Nonlinear Two-Time-Scale Stochastic Approximation** [\[arxiv\]](#)  
 Yuze Han\*\*, **Xiang Li\*\***, Zhihua Zhang\*\*
3. **Stochastic Approximation MCMC, Online Inference, and Applications in Optimization of Queueing Systems** [\[arxiv\]](#)  
**Xiang Li\***, Jiadong Liang\*, Xinyun Chen, Zhihua Zhang

4. **Online Statistical Inference for Nonlinear Stochastic Approximation with Markovian Data** [\[arxiv\]](#)  
Xiang Li, Jiadong Liang, Zhihua Zhang
5. **Asymptotic Behaviors and Phase Transitions in Projected Stochastic Approximation: A Jump Diffusion Approach** [\[arxiv\]](#)  
Jiadong Liang, Yuze Han, Xiang Li, Zhihua Zhang
6. **Privacy-Preserving Community Detection for Locally Distributed Multiple Networks** [\[arxiv\]](#)  
Xiao Guo, Xiang Li, Xiangyu Chang, Shujie Ma
7. **Privacy-Preserving Distributed SVD via Federated Power** [\[arxiv\]](#)  
Xiao Guo\*, Xiang Li\*, Xiangyu Chang, Shusen Wang, Zhihua Zhang
8. **Communication-Efficient Local Decentralized SGD Methods** [\[arxiv\]](#)  
Xiang Li, Wenhao Yang, Shusen Wang, Zhihua Zhang

## TALKS

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- *A Statistical Framework of Watermarks for Large Language Models: Pivot, Detection Efficiency and Optimal Rules*
  - May 2024, the NUS IMS workshop on statistical machine learning for high dimensional data.
  - July 2024, the 2nd joint conference on statistics and data science in China (JCSDS).
- *Complete Asymptotic Analysis for Projected Stochastic Approximation and Debiased Variants* at Allerton conference, Sep. 2023.
- *Polyak-Ruppert-Averaged Q-Learning is Statistically Efficient* at RL workshop held by Shanghai University of Finance and Economics, July 2022.
- *Statistical Estimation and Inference via Local SGD in Federated Learning* at the 14-th China-R conference, Nov. 2021.
- *A Regularized Approach to Sparse Optimal Policy in Reinforcement Learning* at PKU machine learning workshop, June 2019.

## ACADEMIC SERVICE

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- Conference review:
  - NeurIPS [2020,2021(outstanding reviewer, top 8%), 2022-2024]
  - ICML [2020, 2023-2024]
  - ICLR [2021-2023]
  - UAI [2023]
  - AISTATS [2024]
  - IJCAI [2024]
- Journal review:
  - Journal of Machine Learning Research (JMLR)

- Journal of the American Statistical Association (JASA)
- Annals of Applied Probability (AOAP)
- Operational Research (OR)
- IEEE Open Journal of Signal Processing
- IEEE Journal on Selected Areas in Communications
- World Wide Web

## TEACHING EXPERIENCES

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

## SELECTED AWARDS

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- 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*