Jikai Jin

Curriculum Vitae

Education

Department of Information and Computational Sciences **Beijing, China**
School of Mathematical Sciences, Peking University
B.S. in Computational Mathematics GPA: 3.832/4.0 ranking: top 15% *Sept 2019 –*
Selected courses: Mathematical Analysis 94.33 (1-3 average), Advanced Algebra 99 (1-2 average), Probability Theory 100, Introduction to Computation 100, Function of Real Variables 90, Functional Analysis 90.5, Numerical Algebra 90, Data Structure and Algorithms 94, Mathematical Methods in Finance 100, Asymptotic Statistics 96, Computational Statistics 91, Game Theory 99, JAVA Programming 93, Practice of Programming in C and C++ 88.

Research Interests

I'm broadly interested in designing efficient data-driven algorithms and investigating their theoretical properties. The following is a list of topics that I find particular fascinating:

- Bridging the gap between optimization theory and machine learning practice.
- Robustness of machine learning models and training methods.
- Mathematical foundations of deep learning.
- Non-parametric estimation techniques with applications in scientific machine learning.

Research Experience

❖ **Stanford University** **online**
Summer Research Intern, advised by Prof. Lexing Ying *Summer 2022*
- Establish the statistical limit of learning a linear operator between two Sobolev RKHSs.
- Study the optimal bias-variance tradeoff and propose a multilevel estimator that achieves optimal learning rate.

❖ **Princeton University** **online**
Research Intern, advised by Prof. Jason D. Lee *Winter & Spring 2022*
- Study the incremental learning effect of GD on matrix sensing problems, as a form of algorithmic regularization.
- Obtain new landscape results for matrix sensing with square loss.

❖ **Massachusetts Institute of Technology** **online**
Summer Research Intern, advised by Prof. Suvrit Sra *Summer 2021*
- Propose a framework for Riemannian optimization which provably achieves acceleration.
- Discover a number of new first-order accelerated methods as special cases of our framework.

❖ **School of Intelligence Science and Technology, Peking University** **Beijing, China**
Research Intern, advised by Prof. Liwei Wang *Spring 2020 –*

(+86)-139-0162-1152 • jkjin@pku.edu.cn
https://www.jkjin.com/

- Theoretically study the superiority of adaptive methods for non-convex optimization.
- Propose a novel first-order method for distributionally robust optimization (DRO), with theoretical and empirical benefits.
- Investigate the hardness of robust generalization in deep learning and its connection to the expressive power of neural networks.

Publications

(* denotes alphabetical ordering or equal contribution)

1. Bohang Zhang*, **Jikai Jin***, Cong Fang & Liwei Wang. ***Improved Analysis of Clipping Algorithms for Non-convex Optimization***, *33th Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2020.

2. **Jikai Jin**. ***On The Convergence of First Order Methods for Quasar-Convex Optimization***, *12th Annual Workshop on Optimization for Machine Learning, arXiv preprint arXiv:2010.04937*.

3. **Jikai Jin***, Bohang Zhang*, Haiyang Wang & Liwei Wang. ***Non-convex Distributionally Robust Optimization: Non-asymptotic Analysis***, *34th Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2021.

4. **Jikai Jin** & Suvrit Sra. ***Understanding Riemannian Acceleration via a Proximal Extragradient Framework***, *35th Annual Conference on Learning Theory (COLT)*, 2022.

5. Binghui Li*, **Jikai Jin***, Han Zhong, John E. Hopcroft & Liwei Wang. ***Why Robust Generalization in Deep Learning is Difficult: Perspective of Expressive Power***, *arXiv preprint arXiv:2205.13863, accepted by NeurIPS 2022*.

6. **Jikai Jin**, Zhiyuan Li, Kaifeng Lyu, Simon S. Du & Jason D. Lee. ***Understanding Incremental Learning of Gradient Descent: Fine-grained analysis of Matrix Sensing***, *submitted*.

7. **Jikai Jin**, Yiping Lu, Jose Blanchet & Lexing Ying. ***Minimax Optimal Kernel Operator Learning via Multilevel Training***, *submitted*.

Awards and Scholarships

2021 Peking University Exceptional Award for Academic Innovation (**top 1% of PKU student researchers**)

2021 – 2023 (expected) The elite undergraduate training program of Applied Mathematics and Statistics

2021 Bronze Medal (rank No.5 in total), S.T. Yau College Student Mathematics Contest (Probability & Statistics individual)

2021 Qin-Jin Scholarship, Peking University

2020 Yizheng Scholarship, Peking University

2019 Silver Medal, 11th Romania Masters of Mathematics (RMM)

2018 First Prize (rank No.6) , Chinese Mathematical Olympiad

2017 First Prize (rank No.13) , Chinese Mathematical Olympiad

2016 Second Prize , Chinese Mathematical Olympiad

Standardized Tests

TOEFL	Reading 29, Listening 29, Speaking 26, Writing 29, Total 113	*Dec. 2021*
GRE math	Scaled score 970, ranking 97%	*Oct. 2021*
IELTS	Listening 7.5, Reading 8.5, Writing 7.0, Speaking 6.0, Total 7.5	*Sept. 2021*
GRE General	Verbal 170, Quantitative 170, Writing 4.0	*June 2019*