

Kaizhao Liu

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EDUCATIONAL BACKGROUND

Peking University, Beijing, China

School of Mathematical Sciences

Selected Courses:

Enrolled: September 2021 — Expected: July 2025

Overall GPA: **3.926**/4.0 — Rank: \leq **3**/230

Mathematical Analysis (H) I,II,III	97(Averaged)	Advance Algebra I,II	97(Averaged)
Ordinary Differential Equations	97	Mathematical Statistics (H)	94
Introduction to Computation (B)	99	Geometry	93
General Physics (1),(2)	98 (Averaged)	Topics in Deep Learning Theory	93.5
Mathematical Methods of Classical Mechanics	100	Probability Theory	100
Mathematical Introduction to Machine Learning	100	Game Theory	97
Statistical Models and Computing Methods	94	High-Dimensional Probability	92

PUBLICATIONS

- [1] ***Kaizhao Liu**, *Zihao Wang, and Lei Wu. “The Local Landscape of Phase Retrieval Under Limited Samples”. (2023). URL: <https://arxiv.org/abs/2311.15221>.
- [2] **Kaizhao Liu**, Jose Blanchet, Lexing Ying, and Lu Yiping. “Orthogonal Bootstrap: Efficient Simulation of Input Uncertainty”. (2024). URL: <https://arxiv.org/abs/2404.19145>.

RESEARCH EXPERIENCES

Research on Uncertainty Quantification

Research Intern, supervised by Prof. Yiping Lu

Online

June 2023 - September 2023

- Propose the Orthogonal Bootstrap method to reduce the number of Monte-Carlo replications when bootstrapping.
- Theoretically investigate the improvement of Orthogonal Bootstrap method, specifically under a Reproducing Kernel Hilbert Space setting where the functional being estimated has a continuous derivative under kernel Maximum Mean Discrepancy.
- Empirically show the efficiency of Orthogonal Bootstrap under various simulated and real-world tasks, including bias correction, confidence interval construction, and prediction interval construction.

Research on Nonconvex Optimization

Research Intern, supervised by Prof. Lei Wu

Beijing, China

March 2023 – Now

- Investigate the local landscape of phase retrieval around the global minimum when the sample size is small compared to the input dimension.
- Theoretically establish the non-convexity of the local landscape when the sample size falls below a threshold and that gradient descent provably approaches the global minimum when the sample size falls above certain thresholds.
- Empirically confirm our theoretical results with various well-designed numeric experiments.

SKILLS

- **Programming:** Python
- **Software:** L^AT_EX, PyTorch, SCOW, Qutip

Awards

- **Silver Medal**, S.-T. Yau College Student Mathematics Contest - Team Event, Yau Mathematical Sciences Center, 2024
- **Tongdeng Scholarship**, Tongdeng Fund, 2023
- **Elite Undergraduate Training Program of Applied Mathematics and Statistics**, 2023-2025(Expected)
- **National Scholarship**, Ministry of Education, 2022
- **Shisun Ding and Linlin Gui Scholarship**, Peking University, 2022
- **Top 0.05%**, National College Entrance Examination, 2021
- **Gold Medal**, 37th Chinese Physics Olympiad, 2020

Standardized Tests

- **GRE General** Verbal 163, Quantitative 170, Writing 4.0
- **TOEFL** Reading 30, Listening 28, Speaking 22, Writing 25, Total 105