

RESEARCH INTEREST

- **Optimization:** Federated Learning, Distributed Optimization, SGD Analysis
- **Machine Learning and Deep Learning:** Efficient LLM, Machine Learning System, Deep Learning Theory

EDUCATION

Peking University

Beijing, China

- *B.A. in Mathematics, School of Mathematical Sciences* *Sep. 2022–Jul. 2026 (Expected)*
 - **Mathematics Courses:** Mathematical Analysis, Advanced Algebra, Complex Analysis, Probability Theory, Mathematical Statistics, Stochastic Processes, Stochastic Analysis, Basic Numerical Method, Basic Optimization Method.
 - **Computer Science Courses:** Basic Artificial Intelligence and Deep Learning, Parallel and Distributed Computing, Introduction to Computer Vision, Introduction to Multi-model(auditor).
 - **Honors and Awards:** [Applied Mathematics Elite Program](#) (The program accepted only 15 people this year)

RESEARCH EXPERIENCE

Convergence and Speedup Analysis of Distributed Optimization Algorithms

Peking University

- *Undergraduate Research Assistant* *Nov. 2023 – Present*
 - **Advisor:** [Kun Yuan](#)
 - **Project 1: Analysis of Push-Pull Algorithm**
 - * **Push-Pull Algorithm Provably Achieves Linear Speedup Over Arbitrary Network Topologies**
[Liyuan Liang*](#), [Gan Luo*](#), [Kun Yuan](#) (*Equal contribution) [coming soon to Arxiv]
 - * **Currently finalizing this paper for submission to SIOPT.**
 - * Conducted research on the [Push-Pull Algorithm](#), focusing on convergence and linear speedup properties in non-convex and stochastic settings on arbitrary topology.
 - * First to prove convergence and linear speedup properties of the [Push-Pull Algorithm](#) under non-convex and stochastic settings on arbitrary topology.
 - * Validated the proposed theoretical results by conducting distributed optimization numerical experiments on the MNIST and CIFAR10 datasets.
 - **Project 2: Analysis on Decentralized Optimization over Row-stochastic Networks**
 - * **Achieving Linear Speedup and Optimal Complexity for Decentralized Optimization over Row-stochastic Networks**
[Liyuan Liang*](#), [Xinyi Chen*](#), [Gan Luo*](#), [Kun Yuan](#) (*Equal contribution) [coming soon to Arxiv]
 - * **Accepted to ICML2025, Spotlight**
 - * Introduced effective metrics to capture the influence of row-stochastic mixing matrices
 - * Established the first convergence lower bound for decentralized learning over row-stochastic networks
 - * Incorporated a multi-step gossip (MG) protocol, to attain the lower bound, achieving optimal complexity.
 - * Proposed a novel analysis framework demonstrating that [PULL-DIAG-GT](#) achieves linear speedup, which is the first such result for row-stochastic decentralized optimization.
 - * Conducted numerical experiments to validate theoretical results.

Online Scheduling on LLM Inference

Massachusetts Institute of Technology

- *Undergraduate Research Assistant* *Oct. 2024 – Present*
 - **Advisor:** [David Simchi-Levi](#)
 - **Project 1: Online Batching Algorithm on LLM Inference**
 - * **Optimizing LLM Inference: Fluid-Guided Online Scheduling with Memory Constraints**
(α - β) [Ruicheng Ao*](#), [Gan Luo*](#), [David Simchi-Levi](#), [Xinshang Wang](#), available on [SSRN] and [Arxiv]
 - * **This paper is submitted to Operations Research.**
 - * Formulated the LLM inference as a multi-stage online scheduling task with stochastic queueable requests.
 - * Proposed a novel online batching algorithm for LLM inference.
 - * Proved that the algorithm achieves near-optimal throughput while controlling latency and Time to First Token (TTFT).
 - * Conducted numerical experiments on synthetic and real-world datasets with Llama-7B on A100 GPU to validate theoretical results.