SIJIN CHEN

(+1) 609-937-9583 | chensj@princeton.edu | sjchen0.github.io | Google Scholar

EDUCATION

Princeton University Princeton, NJ, United States

Ph.D. in Electrical and Computer Engineering *Sep. 2023 – present*

- Dissertation advisor: Prof. Jason M. Klusowski; Cumulative GPA: 3.8/4.0
- Awards: Gordon Y. S. Wu Fellowship in Engineering (2023)
- Courses: machine learning theory, measure-theoretic probability, stochastic calculus, reinforcement learning theory

Chinese University of Hong Kong Hong Kong

B.Sc. in Computer Science with Honours, First Class; Minor in Mathematics *Sep. 2019 – Jun. 2023*

- Major GPA: 3.9/4.0; Cumulative GPA: 3.8/4.0
- Awards: Hong Kong Government Scholarship for Outstanding Performance (2022); VTech Group of Companies Scholarship (2022); Best Project Award of Summer Research Internship (2020)
- Courses: approximation algorithms, stochastic processes, real analysis, abstract algebra

RESEARCH INTEREST

Optimization, statistics, and their association with the theoretical foundations of modern machine learning.

PUBLICATIONS

1. **Sijin Chen**, Omar Hagrass, and Jason M. Klusowski, *Decoding Game: On Minimax Optimality of Heuristic Text Generation Strategies*, Preprint, 2024. https://arxiv.org/abs/2410.03968 (under review of ICLR 2025)
2. **Sijin Chen**, Zhize Li, and Yuejie Chi, *Escaping Saddle Points in Heterogeneous Federated Learning via Distributed SGD with Communication Compression*, International Conference on Artificial Intelligence and Statistics (AISTATS), 2024. https://proceedings.mlr.press/v238/chen24d.html
3. **Sijin Chen**, Xiwei Cheng, and Anthony Man-Cho So, *Non-Convex Joint Community Detection and Group Synchronization via Generalized Power Method*, International Conference on Artificial Intelligence and Statistics (AISTATS), 2024. https://proceedings.mlr.press/v238/chen24e.html
4. Wu Zheng, Weiliang Tang, **Sijin Chen**, Li Jiang, and Chi-Wing Fu, *CIA-SSD: Confident IoU-Aware Single-Stage Object Detector from Point Cloud*, AAAI Conference on Artificial Intelligence (AAAI), 2021. https://ojs.aaai.org/index.php/AAAI/article/view/16470

RESEARCH EXPERIENCES

Game-theoretic foundations of language model decoding strategies

advised by Prof. Jason M. Klusowski, Princeton University *Jun. 2024 – Oct. 2024*

- Developed rigorous theory behind the heuristic design of truncation-based sampling methods for text generation
- Modeled text generation as a zero-sum game on log-likelihood maximization under adversarial shift of true distribution
- Established the implicit regularization induced by the adversary, deriving that truncation-based sampling is a first-order approximation to the minimax optimal solution

Second-order stationarity of compressed SGD for heterogeneous distributed learning

advised by Prof. Yuejie Chi, Carnegie Mellon University *May 2022 – Oct. 2023*

- Designed an error-feedback mechanism for gradient compression in distributed learning with heterogeneous data
- Proved convergence of the algorithm to second-order stationary points by escaping saddle points, using martingale concentration arguments under non-convex smooth landscape
- Implemented a PyTorch optimizer based on the proposed algorithm, achieving empirical advantages over state-of-the-art methods in heterogeneous distributed learning

Provably fast methods for generalized community detection

advised by Prof. Anthony Man-Cho So, Chinese University of Hong Kong *Jun. 2021 – Dec. 2021*

- Proposed a generalized power method (GPM) to solve a community detection problem with extra node information
- Established an estimation error bound for spectral initialization using random matrix and random graph arguments
- Proved a linear convergence guarantee for GPM, significantly reducing the time complexity from the existing semi-definite relaxation approach, while improving the information-theoretic limit from pure detection problems

SKILLS

Languages: Mandarin Chinese (native), Cantonese (conversational)
Programming: Python, PyTorch, MATLAB, R, C/C++
Computing: Linux, Slurm cluster, parallel computing