Anming Gu

CONTACT INFORMATION
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anminggu.github.io

RESEARCH INTERESTS
optimal transport, sampling and optimization, differential privacy, machine learning theory, theoretical computer science, statistics

EDUCATION

Boston University — Boston, MA
GPA: 3.97/4.0 (*summa cum laude*) — Sept 2020 – May 2024
B.A. in Computer Science, Minor in Mathematics

Honors in Major (Thesis with defense)
Thesis: *Latent Trajectory Inference with Drift Prior* (slides)
Committee: Edward Chien, Kristjan Greenewald, Mark Bun

HONORS AND AWARDS

BU, CS Convocation Student Speaker (video) — 2024
BU, Department of CS College Prize — 2024
Undergraduate Research Opportunity Program (UROP) funding — 2021

RESEARCH EXPERIENCE

Chien Lab, Boston University — Boston, MA
Research Assistant — Sept 2020 – Present

- Working on optimal transport for machine learning with Ed Chien, Assistant Professor @ BU and Kristjan Greenewald, Research Scientist @ IBM.
- *k-mixup regularization*: Generalized the mixup regularization technique using optimal transport. Ran experiments on a variety of architectures and datasets. **Publication [1]**.
- *Latent trajectory inference*: Proposed an algorithm to recover a latent path-space distributions from observed marginal distributions. Proved theoretical guarantees of the method using optimal transport, stochastic calculus, and variational calculus. **Preprint [2]**, in submission to ICLR 2025.
- *Differentially private Wasserstein barycenter*: Using the Johnson-Lindenstrauss and DP-SGD for private Wasserstein barycenter algorithms.
- *Differentially-private trajectory inference*: Continuous-time private synthetic data generation via trajectory inference.

External Research — Remote

With Marc Finzi, Post-doc @ CMU — Apr 2024 – Jun 2024

- Ran experiments to test a novel empirical Freedman-type martingale concentration inequality for LLM generalization bounds. In submission to ICLR 2025.

With Vishwak Srinivasan, PhD student @ MIT — Aug 2024 – Oct 2024

- Analyzed the convergence of the unadjusted Langevin algorithm for sampling on Riemannian manifolds in Rényi divergence. Proved guarantees when the stationary distribution satisfies a log-Sobolev or Poincaré inequality.

With Atsushi Nitanda, Principal Scientist @ A*STAR — Oct 2024 – Present

- Analyzing the convergence of the mean-field Langevin dynamics and its discretization under a uniform Poincaré inequality.

PUBLICATIONS

Preprint

[2] **A. Gu**, E. Chien, K. Greenewald. *Partially Observed Trajectory Inference using Optimal Trans-*

port and a Dynamics Prior. NeurIPS 2024 workshop OPT: Optimization for Machine Learning. In submission to ICLR 2025. arXiv: 2406.07475.

Journals

[1] K. Greenewald, **A. Gu**, M. Yurochkin, J. Solomon, E. Chien. k-*Mixup Regularization for Deep Learning via Optimal Transport*. Transactions on Machine Learning Research 2023. arXiv: 2106.02933.

TALKS

Mean-Field Langevin Dynamics: Convergence under a Poincaré Inequality
Boston University Algorithms and Theory Seminar — (scheduled) February 2025

k-Mixup Regularization for Deep Learning via Optimal Transport
Boston University SIAM — March 2023

TEACHING EXPERIENCE

Boston University, Department of Computer Science — Boston, MA

- CS235: Algebraic Algorithms — Fall 24
- CS330: Analysis of Algorithms — Spring 22, Fall 24
- CS332: Theory of Computation — Spring 24
- CS320: Concepts of Programming Languages — Fall 23

WORK EXPERIENCE

Boston University, Department of Computer Science — Boston, MA
Post-Bacc Academic Fellow — Sept 2024 – May 2025

Amazon — Sunnyvale, CA
Software Development Engineer Intern — Summer 2023

Capital One — McLean, VA
Software Engineer Intern — Summer 2022

SERVICE

Reviewer: ICLR 2025

MENTORING

Sasidhar Kunapuli (high school) — Oct 2024 – Present

SKILLS

- **Languages**: Python, C/C++, OCaml, Java, Bash, MATLAB
- **Technologies**: PyTorch, TensorFlow, Pandas, Jupyter Notebook
- **Other**: Linux, Git/Github, LaTeX, Make

PHD COURSEWORK

- **Theory**: Complexity Theory, Mathematical Methods for Theoretical Computer Science
- **ML/AI**: Machine Learning, Artificial Intelligence, Deep Learning
- **Mathematics**: Functional Analysis, PDEs, Stochastic PDEs
- **Statistics**: Stochastic Calculus, Mathematics of Deep Learning
- **Other**: Functional Compilers, Geometry Processing, Financial Econometrics