Anming Gu

CONTACT INFORMATION

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RESEARCH INTERESTS

Foundations of Machine Learning, Algorithms and Theory of Computation, Stochastic Calculus, Optimal Transport

I'm interested in applying tools in theoretical computer science (e.g. Boolean Fourier analysis and pseudorandomness) and mathematics (e.g. stochastic calculus and analysis) to prove theoretical results on machine learning algorithms and architectures.

EDUCATION

Boston University — Boston, MA
B.A. in Computer Science, Minor in Mathematics — Expected May 2024
GPA: 3.96/4.00

HONORS AND AWARDS

Putnam Math Competition Top 35%	2022
3x AIME Qualifier	2017, 2019, 2020
USA Biology Olympiad Top 30	2020
4x USA Biology Olympiad Semifinalist	2017 – 2020
British Biology Olympiad Gold Medal	2019, 2020
University of Toronto Biology Competition International 18th Place	2019

RESEARCH EXPERIENCE

Chien Lab, Boston University — Boston, MA
Research Assistant, supervised by Prof. Edward Chien — Sept 2020 – Present

- Undergraduate Research Opportunity Program (Spring 2021, Fall 2021), Honors Thesis I & II (Expected Fall 2023, Spring 2024).
- Optimal transport and spectral graph theory for k-mixup regularization in deep learning.
- Optimal transport, stochastic calculus, and mean-field Langevin dynamics for trajectory inference of probability distributions and particle filters.

Independent Research — Boston, MA
Primary Researcher — March 2023 – Present

- Bernstein polynomial approximation, real analysis, topology, and probability theory for Fourier analysis of Boolean functions.

PUBLICATIONS

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.

PRESENTATIONS

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

ACADEMIC PROJECTS

American Option Pricing via Particle Filters
Implemented American option pricing algorithms in Python under stochastic volatility and jump-diffusion models using Monte Carlo simulation and particle filters, (Financial Econometrics, Spring 2023).

λ-Calculus Compiler
Wrote a type-checker and compiler for a λ-calculus language to the C language, (Functional

Compilers, Fall 2022).

Monte Carlo Geometry Processing
Implemented Monte Carlo algorithms in C++ to solve linear elliptic PDEs on triangle meshes following the paper [Monte Carlo Geometry Processing: A Grid-Free Approach to PDE-Based Methods on Volumetric Domains], (Geometry Processing, Spring 2022).

Hypergraph Expanders from Cayley Graphs
Explored spectral graph theory and expander graphs in the context of hypergraphs. Wrote an exposition on the paper [Hypergraph expanders of all uniformities from Cayley graphs], (Mathematical Methods for Theoretical Computer Science, Spring 2022).

Teaching Experience

Boston University — Boston, MA

- Teaching Assistant: Analysis of Algorithms (Spring 2022)
- Grader: Analysis of Algorithms, Linear Algebra, Honors Differential Equations, Calculus II (Fall 2021)

Industry Experience

Amazon — Sunnyvale, CA
Software Engineer Intern — Summer 2023

BU Spark! — Boston, MA
Machine Learning Engineer Intern — Spring 2023

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

Skills

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

Graduate Coursework

- **Theory**: Mathematical Methods for Theoretical CS, *Complexity Theory*, *Statistical Learning Theory*, *Advanced Optimization Theory*
- **ML/AI**: Machine Learning, Artificial Intelligence, Deep Learning, *Mathematics of Deep Learning*
- **Pure Mathematics**: Functional Analysis, *Algebraic Topology*, *Partial Differential Equations*
- **Statistics**: *Stochastic Calculus*
- **Other Quantitative**: Functional Compilers, Geometry Processing, Financial Econometrics, *Game Theory*

[*Expected Fall 2023 or Spring 2024*]