

# Anming Gu

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CONTACT INFORMATION	<a href="mailto:gu.anming106@gmail.com">gu.anming106@gmail.com</a> <a href="https://anminggu.github.io">anminggu.github.io</a>
RESEARCH INTERESTS	<p>Foundations of Machine Learning, Algorithms and Theory of Computation, Optimization, Stochastic Calculus, Optimal Transport</p> <p>I enjoy applying tools in theoretical computer science (e.g. Boolean Fourier analysis, pseudo-randomness, and complexity theory) and mathematics (optimization, stochastic calculus, and analysis) to prove theoretical results on machine learning algorithms and architectures.</p>
EDUCATION	<p><b>Boston University</b> Boston, MA B.A. in Computer Science, Minor in Mathematics Expected May 2024 GPA: 3.96/4.00</p>
HONORS AND AWARDS	<p>Putnam Math Competition Top 35% 2022</p> <p>3x AIME Qualifier 2017, 2019, 2020</p> <p>USA Biology Olympiad Top 30 2020</p> <p>4x USA Biology Olympiad Semifinalist 2017 – 2020</p> <p>British Biology Olympiad Gold Medal 2019, 2020</p> <p>University of Toronto Biology Competition International 18th Place 2019</p>
RESEARCH EXPERIENCE	<p><b>Chien Lab, Boston University</b> Boston, MA <i>Research Assistant, supervised by Prof. Edward Chien</i> Sept 2020 – Present</p> <ul style="list-style-type: none"><li>• Undergraduate Research Opportunity Program (Spring 2021, Fall 2021), Honors Thesis I &amp; II (Expected Fall 2023, Spring 2024).</li><li>• Optimal transport and spectral graph theory for k-mixup regularization in deep learning.</li><li>• Optimal transport, stochastic calculus, and mean-field Langevin dynamics for trajectory inference of probability distributions and particle filters.</li></ul> <p><b>Independent Research</b> Boston, MA <i>Primary Researcher</i> March 2023 – Present</p> <ul style="list-style-type: none"><li>• Bernstein polynomial approximation, real analysis, topology, and probability theory for Fourier analysis of Boolean functions.</li></ul>
PUBLICATIONS	<p><b>Manuscripts</b></p> <p>K. Greenewald, <b>A. Gu</b>, M. Yurochkin, J. Solomon, E. Chien. k-Mixup Regularization for Deep Learning via Optimal Transport. arXiv preprint: <a href="https://arxiv.org/abs/2106.02933">arXiv:2106.02933</a>.</p>
PRESENTATIONS	<p><b>k-Mixup Regularization for Deep Learning via Optimal Transport</b> Boston University SIAM, March 2023</p>
ACADEMIC PROJECTS	<p><b>American Option Pricing via Particle Filters</b> Created American option pricing algorithms in Python under stochastic volatility and jump-diffusion models using Monte Carlo simulation and particle filters, (Financial Econometrics, Spring 2023).</p> <p><b><math>\lambda</math>-Calculus Compiler</b> Wrote a type-checker and compiler for a <math>\lambda</math>-calculus language to the C language, (Functional</p>

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

*Software Development Intern*

Sunnyvale, CA  
Summer 2023

### Capital One

*Software Engineering Intern*

McLean, VA  
Summer 2022

## SKILLS

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

## GRADUATE COURSEWORK

- **Upcoming:** Complexity Theory, Stochastic Calculus, Game Theory
- **Theory:** An Algorithmist's Toolbox
- **ML/AI:** Machine Learning, Artificial Intelligence, Deep Learning
- **Software:** Functional Compilers
- **Applications:** Geometry Processing
- **Pure Mathematics:** Functional Analysis
- **Economics & Finance:** Financial Econometrics