Benjamin Greene

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Education

Duke University Durham, NC

Bachelor of Science in Mathematics • GPA 3.9 of 4.0 *Expected May 2027*

- *Relevant Graduate Level Coursework:* Algebraic Geometry, Algebraic Topology I, Commutative Algebra, Algebraic Structures I/II, Geometric Central Limit Theorems, Real Analysis, General Relativity, Theory & Algorithms for Machine Learning, Introduction to Algorithmic Trading, Applied Stochastic Processes
- *Relevant Undergraduate Level Coursework:* Topological Data Analysis, Advanced Linear Algebra, Advanced Introduction to Probability, Advanced Multivariable Calculus, Data Structures and Algorithms

Honors and Awards

Duke Trading Competition live trading 1st place, 1st in live trading case, 4th place overall. *March 2025*
First-year Julia Dale Prize, highest honor given to first-year students by Duke Math department. *April 2024*
Honorable Mention, M3 Challenge, one of top 22 of 650 submissions; awarded $1000. *March 2023*

Experience

Data Science Intern May 2025 – July 2025

Duke University (mentors: Profs. R. Clark, Ph.D., G. Herschlag, Ph.D., J. Mattingly, Ph.D.) *Durham, NC*

- Design and implement novel data-driven analytical framework for assessing community membership using public datasets and geospatial algorithms.
- Develop and optimize graph diffusion algorithm to calculate travel accessibility between neighboring areas.
- Determine importance of various demographics using machine learning and structural axial coding.
- Apply network analysis, and weighted graph clustering algorithms to demographic and geospatial data.

Research Assistant Oct. 2023 – Present

Duke University (mentor: Prof. Ezra Miller, Ph.D.) *Durham, NC*

- Develop explicit closed form for canonical combinatorial minimal free resolutions of arbitrary monomial ideals.
- Facilitate collaborative research through reading group on advanced algebra, enhancing team knowledge sharing and contributing to a solution-driven academic environment.
- Mentor high school student, including mini-lessons on advanced topics in commutative algebra.

Research Assistant May 2024 – Present

Duke University (mentor: Prof. Alex Dunlap, Ph.D.) *Durham, NC*

- Analyze and formalize the behavior of unsupervised machine learning algorithm under theoretical and applied conditions, contributing to robust understanding of algorithmic behavior.
- Use techniques from measure theory and partial differential equations to study behavior of clustering algorithm on continuous and discrete distributions, mirroring behavior on machine learning training data.
- Develop novel analytical and computational approaches to improve existing bound by 76% to decrease training speeds of machine learning models.

Projects

Efficient solver for sparse linear equations over finite fields • *NumPy, galois* April 2025 – Present

- Implemented Block Wiedemann and Berlekamp-Massey algorithms in Python.
- Applied algorithms to computational algebra, coding theory, and quantum error correction.

Volatility Surface Momentum Trading • *QuantConnect, pandas, SciPy, Scikit-learn* Jan. 2025 – April 2025

- Developed and tested a delta-neutral options trading algorithm grounded in options theory and financial market principles, leveraging PCA and spline interpolation to model implied volatility surface dynamics.
- Applied quantitative strategies and market risk principles to implement robust risk controls including stop-loss, take-profit, and daily delta hedging to ensure neutral market exposure during dynamic trading simulations.
- Achieved strong out-of-sample performance with 49.4% average annualized return rate over three backtest periods.

Fast Fourier Transform App • *Java* Nov. 2023 – Dec. 2023

- Created a Java-based application to demonstrate applications of the Fast Fourier Transform algorithm.
- Developed a day-long minicourse on introductory Fourier Analysis; presented to 100+ students.

Skills and Interests

Technical Tools: LaTeX, Python, Vim, Git, Rust, Bash, Linux, GIS (QGIS, GeoPandas)
Strategies: Strong proof skills, data analysis & visualization, machine learning, sentiment analysis, regression
Languages: English (Native), Spanish (Proficient), Chinese (Beginner)
Interests: Rock climbing, puzzle solving, cooking/baking