# Shamuel Auyeung

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## SUMMARY

Recent Mathematics PhD graduate with expertise in probability, statistics, and data science. Skilled in Python, machine learning, and quantitative modeling, with a strong passion for applying advanced mathematics to financial markets. Proven ability to work collaboratively and individually to solve complex problems and deliver actionable insights.

## SKILLS & CERTIFICATIONS

- **Quantitative:** calculus, linear algebra, probability (stochastic processes), statistics (modeling, hypothesis testing)
- **Languages/Platforms:** Python, GitHub, MS Excel, VSCode, Mathematica, Dolt; Linux, SQL, C++, MATLAB
- **Python Libraries:** Pandas, NumPy, Scikit-learn, Matplotlib, seaborn, statsmodels, ARCH, Prophet
- **Machine Learning/AI:** linear regression, PCA, XGBoost, Random Forest, LLM's, NLP (Flair, Fundus)
- **Certifications:** The Erdős Institute Data Science Boot Camp

## WORK EXPERIENCE

**Trinity College, Department of Mathematics:** Hartford, CT **2023 - Present**

*Harold L. Dorwart Visiting Assistant Professor*

- Taught single/multivariable/vector calculus, statistics, and differential equations, translating abstract mathematical concepts into intuitive explanations. Developed problem-solving skills, emphasizing logical reasoning and quantitative analysis.

**Stony Brook University:** Stony Brook, NY **2017 - 2023**

*Research Assistant & Teaching Assistant*

- Led problem-solving sessions for over 400 students across 12 semesters, covering Precalculus, Business Calculus, Calculus I-III, and Advanced Linear Algebra. Designed and delivered course materials (lectures, homework, exams), for Mathematical Thinking, Applied Abstract Algebra, and Calculus II, fostering analytical reasoning and problem-solving skills.

## LEADERSHIP EXPERIENCE

*The Erdős Institute Data Science Boot Camp Teaching Assistant* **Spring 2025**

- Instructed participants in data science/machine learning theory and practices through hands-on guidance

*Graduate Student Seminar co-founder and organizer*, Stony Brook University **2019-2023**

- Co-founded the Graduate Student RTG and Symplectic Geometry Seminars for students to learn advanced geometry, topology, and mathematical physics not offered in graduate school courses

## SELECTED PROJECTS

*Binomial Options Pricing Model with Nonconstant Volatility* (in progress) **Spring 2025**

- With a team, implemented options pricing model with nonconstant volatility. Used time series analysis (GARCH forecasting), machine learning models, NLP (sentiment analysis), and binomial trees. Seasonality trends of agricultural future contracts were specifically studied

*LLM Prompt Engineering and Training* (in progress) **Spring 2025**

- With a team of mathematicians, generated language data to train LLMs to understand solutions and proofs of graduate-level math problems

*The Effects of Daylight Savings Times (DST) on Market Outcomes* (The Erdős Institute) **Fall 2024**

- Worked on a 3-person team to web scrape data to study DST effects on the US and Japan Stock Exchange, using statistical methods, logistic regression, k-nearest neighbors, and random forest (with AdaBoosting) classifiers. Our team detected a statistically significant effect in fall returns and spring volatility

## PUBLICATIONS

*Adjacent Singularities, TQFTs, and Zariski's Multiplicity Conjecture,* arXiv **2024**

- Proved a 52-year-old algebro-geometric conjecture using Floer cohomology.

*On the algebra generated by* $\bar{}\mu, \bar{}\partial, \partial, \mu,$ with J. Guu, J. Hu, Complex Manifolds **2023**

- Proved results for differential bi-graded algebras using Macaulay2 software.

*The Krein Matrix and an Interlacing Theorem*, with E. Yu, SIURO **2014**

- Conducted spectral analysis/numerical computations with MATLAB to study a generalized eigenvalue problem

## EDUCATION

**Ph. D.** *Stony Brook University***,** Mathematics (geometry and topology) **2023**

**B.S.** Calvin University, Mathematics, *summa cum laude* **2017**

- NSF Scientific Computing Scholar: for excellence in mathematical modeling and computation
- Barry Goldwater Scholar: for excellence in mathematical research
- Math Club Organizer, Top 17% in 2014 William Lowell Putnam Mathematical Competition