

# Peter E. Francis

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## Summary

I am completing a PhD in Mathematics, studying probability and combinatorics, with papers published in Math and AI journals. I'm passionate about quantitative research and development. Programming is a core part of who I am and what I do: I code for my research and for other side projects. I am looking forward to using my extensive experience for impactful, real-world projects.

## Education

### PhD in Mathematics (In progress)

Stony Brook University

- Advisor: Evita Nestoridi
- Thesis: Limit Profiles in Separation Distance for Markov Chains

Sept. 2021 - May 2026 (Expected)

### B.A. in Mathematics, Valedictorian, Summa cum laude

Gettysburg College

- Major in Mathematics and Minor in Physics
- GPA: 4.25/4.33, Selected Course Work: Linear Algebra, Numerical Methods, Research in Combinatorics

Sept. 2017 - May 2021

## Skills

<b>Programming</b>	Python (NumPy, SciPy, Pandas, Matplotlib, PIL, Cython, SymPy), $\text{\LaTeX}$ , Java, MatLab, R, Sage
<b>Web &amp; Network</b>	Python (Flask, Gunicorn, SQLAlchemy), nginx, Javascript, HTML/CSS
<b>Mathematical</b>	Combinatorics, Probability, Statistics, Calculus

## Selected Programming Projects

Each of these entries is a tool or app that I made. Click on any blue text for more information.

<b>AddComb</b>	JS	Extensive library for optimized additive combinatorics computation, currently used by several researchers
<b>IFS Fractals</b>	Python+JS	Web tool and <a href="#">python-module</a> to efficiently generate IFS fractals, used by 100+ students and instructors
<b>graphPlot</b>	Python	Python module that uses physics to find ideal plotting coordinates for nodes of graphs
<b>Sedario</b>	Python+JS	Strategy game of my own invention with real-time online multiplayer and 5 AI opponents
<b>Online-Poker</b>	Python+JS	Real-time multiplayer interface for games of Texas Holdem' and Omaha
<b>Canvas Games</b>	JS	Collection of games using <canvas>, some with AI opponents or generation, used in a Numberphile
<b>Complex Functions</b>	JS	Web app that plots complex functions, uses dynamic color schemes for better data visualization
<b>Custom Julia Sets</b>	JS	Web tool for generating Julia sets with custom parameters
<b>Table Editor</b>	JS	Web tool for editing and converting between various data formats (TSV, CSV, Markdown, HTML, etc.)
<b>Autostereograms</b>	JS	Web tool for generating autostereograms (magic eyes)
<b>Bingo</b>	Python+JS	Real-time multiplayer interface for generating and playing bingo games, used by 300+ people
<b>Quadegories</b>	Python+JS	The official web app for the trivia game invented by Brook Zelcer

## Selected Publications & In-Progress Work

• Nearest Neighbors in a Poisson Point Process	<i>In Progress</i>	Mar. 2025
• Leading All the Way: Comparability in Vector Posets	<i>In Progress</i>	Mar. 2025
• Calculus: An Introductory Textbook	<i>Unpublished (Free Online Access)</i>	Dec. 2024
• Secrets and Quantifiers	<i>Math Horizons, MAA</i>	May 2021
• Opponent Hand Estimation in the Game of Gin Rummy	<i>Proceedings of the AAAI, 35(17)</i>	Feb. 2021

## Experience

• Teaching Assistant	Department of Mathematics, Stony Brook University	Fall 2021 - PRESENT
• Peer Learning Associate, Calculus and Linear Algebra	Department of Mathematics, Gettysburg College	Jan 2018 - May 2021
• Advanced Technician	College Life Office, Gettysburg College	Sept. 2017 - May 2021
• Photographer	Office of Communications and Marketing, Gettysburg College	Jan. 2018 - May 2021
• Eagle Scout	Harrington Park, NJ	Sept. 2017
• Advanced SCUBA Diver	PADI	Feb 2025
• 3rd Degree Black Belt in Tae Kwon Do	World TaeKwonDo Federation	2016
• Camping/Outdoors Dept. Coordinator	Nature Place Day Camp	Summers 2016 - 2021