

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, with 2.5M lines of code public in GitHub. I am looking forward to using my extensive experience for impactful, real-world projects.

Education

PhD in Mathematics (In progress)

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

Stony Brook University

Sept. 2021 - May 2026 (Expected)

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

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

Gettysburg College

Sept. 2017 - May 2021

Skills

Programming	Python (NumPy, SciPy, Pandas, Matplotlib, PIL, Cython, SymPy), \LaTeX , Java, MatLab, R, Sage
Web & Network	Python (Flask, Gunicorn, SQLAlchemy), nginx, Javascript, HTML/CSS
Mathematical	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.

AddComb	JS	Extensive library for optimized additive combinatorics computation, currently used by several researchers
IFS Fractals	Python+JS	Web tool and python-module to efficiently generate IFS fractals, used by 100+ students and instructors
graphPlot	Python	Python module that uses physics to find ideal plotting coordinates for nodes of graphs
Sedarior	Python+JS	Strategy game of my own invention with real-time online multiplayer and 5 AI opponents
Online-Poker	Python+JS	Real-time multiplayer interface for games of Texas Holdem' and Omaha
Canvas Games	JS	Collection of games using <canvas>, some with AI opponents or generation (used in a Numberphile)
Complex Functions	JS	Web app that plots complex functions, uses dynamic color schemes for better data visualization
Custom Julia Sets	JS	Web tool for generating Julia sets with custom parameters
Table Editor	JS	Web tool for editing and converting between various data formats (TSV, CSV, Markdown, HTML, etc.)
Autostereograms	JS	Web tool for generating autorstereograms (magic eyes)
Bingo	Python+JS	Real-time multiplayer interface for generating and playing bingo games, used by 300+ people
Quadegories	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
• Programming Consultant	IT Department, Gettysburg College	Sept. 2020 - May 2021
• 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