# Peter E. **Francis**

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## Summary

I am completing a PhD in Mathematics, studying probability and combinatorics, and I'm passionate about quantative research and developement. 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**                                   *Gettysburg College*
- Major in Mathematics and Minor in Physics
- GPA: 4.25/4.33                                                    *Sept. 2017 - May 2021*

## Skills

| | |
|---|---|
| **Mathematical** | Combinatorics, Probability, Statistics |
| **Programming** | Python (NumPy, SciPy, Pandas, Matplotlib, PIL, Cython, SymPy), LaTeX, Java, MatLab, R, Sage |
| **Web & Network** | Python (Flask, Gunicorn, SQLAlchemy), Javascript, HTML/CSS |

## Programming Projects

Each of these entries is a tool or app that I made.

| | | |
|---|---|---|
| **AddComb** | JS | Extensive library for fast additive combinatorics computation (currently used by many researchers) |
| **IFS Fractals** | Python+JS | Web tool and python-module to generate fast IFS fractals |
| **graphPlot** | Python | Python module that uses physics to find ideal plotting coordinates for nodes of graphs |
| **Sedario** | Python+JS | Abstract strategy game of my own invetion with real-time online multiplayer and AI opponents |
| **Online-Poker** | Python+JS | Real-time multiplayer interface for games of Texas Holdem' and Omaha |
| **Canvas Games** | JS | Collection of games all made using the HTML Canvas element |
| **Complex Functions** | JS | Web app that plots colorful complex function transformations |
| **Custom Julia Sets** | JS | Web tool for generating Julia sets with custom parameters |
| **Table Editor** | JS | Web tool for editing and converting between various table formats |
| **Autostereograms** | JS | Web tool for generating autorstereograms (magic eyes) |
| **Bingo** | Python+JS | Real-time multiplayer interface for generating and playing bingo games |

## Selected Publications & In-Progress Work

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- Calculus: An Introductory Textbook                       *Unpublished (Free Online Access)*   *Dec. 2024*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