Daniel A. Profili

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Education

North Carolina State University — Raleigh, NC

Ph.D Mathematics; Advisor: Hoon Hong; GPA: 4.00 — *Aug. 2021 - May 2026 (expected)*

Georgia Institute of Technology — Atlanta, GA

B.S. Mathematics & B.S. Computer Science; GPA: 3.93 — *Aug. 2016 - May 2021*

Thesis: Resultant polytope f-vectors in four and five dimensions

Work Experience

Naval Information Warfare Center (NIWC) Atlantic — Charleston, SC

High Performance Computing Intern — *May 2025 - August 2025*

- **High Performance Computing and Big Data Analysis**: Leveraged DoD HPC clusters and Apache Spark to implement a genetic algorithm to generate a graph of maritime traffic from very large GPS datasets.
- **AI to Enhance User Interactivity with Graph Data**: Developed a framework to allow users to use natural language to interact with a large graph dataset via a large language model.

Electronic Systems Lab (ELSYS), Georgia Tech Research Institute — Atlanta, GA

Embedded Systems Research Co-op — *Aug. 2018 - May 2020*

- **Embedded Systems Software Development**: Performed testing and agile development on embedded software used in radar systems, including writing unit tests, documentation, and fixing bugs, in C++, C#, and Python.
- **Radar Systems Development**: Designed, implemented, and maintained both backend and frontend features for radar systems testing software.

Research Experience

Department of Mathematics, North Carolina State University — Raleigh, NC

Graduate Research Assistant; Advisor: Prof. Hoon Hong — *June 2021 - present*

Project: Conditions for eigenvalue configurations of two real symmetric matrices

- Developed two novel algorithms for computing the configuration of the eigenvalues of two symbolic real symmetric matrices, with focus on applications in science and engineering.
- Implemented algorithms in Maple and achieved efficiency exceeding current general methods for quantifier elimination.

School of Mathematics, Georgia Institute of Technology — Atlanta, GA

Undergraduate Research Assistant; Advisor: Prof. Prasad Tetali — *Jan. 2020 - May 2021*

Project: Resultant polytope f-vectors in four and five dimensions

- Developed Python scripts to compute combinatorial properties of geometric objects in four and five dimensions.
- Implemented parallelism and efficient computing techniques in Python.

School of Chemistry, Georgia Institute of Technology — Atlanta, GA

Undergraduate Research Assistant; Advisor: Prof. Jesse McDaniel — *Jan. 2018 - Aug. 2019*

- **Machine Learning**: Worked with open-source machine learning libraries to develop neural networks to accurately and quickly calculate molecular properties including energy and atomic charge.
- **High-Performance Computing**: Utilized PACE, Georgia Tech's high performance computing environment, to efficiently perform costly quantum-chemical calculations.
- **Chemical Simulations**: Developed and scripted processes to run quantum-chemical simulations of various molecular systems.

Coulter Dept. of Biomedical Engineering, Georgia Inst. of Technology — Atlanta, GA

Undergraduate Research Assistant; Advisor: Prof. Stanislav Emelianov — *Jan. 2016 - Jan. 2018*

- **Image Processing Algorithms**: Developed and implemented image processing algorithms for the dynamic labeling of ultrasound contrast agents in living organisms and tissue samples.
- **Contrast Agent Characterization**: Synthesized ultrasound contrast agents and designed and performed experiments to characterize them in tissue-simulating environments.
- **Ultrasound and Photoacoustics**: Performed and assisted with experiments investigating perfluorocarbon nanodroplets and their ultrasonic and photoacoustic behavior.

Skills

Programming: Python, C#, C/C++, Assembly, Java, Bash, MATLAB, HTML, JavaScript

Software: Linux, LaTeX, SageMath, Git, NumPy, Maple, Apache Spark, Keras/TensorFlow

Code Portfolio: https://github.com/danielprofili

Teaching

Department of Mathematics, North Carolina State University — Raleigh, NC
Recitation Leader (approx. 50 students) — *Fall 2022 - present*

- **MA 242 Calculus III**: Fall 2022, Spring 2023, Fall 2023, Fall 2024
- **MA 241 Calculus II**: Spring 2024

College of Computing, Georgia Institute of Technology — Atlanta, GA
Undergraduate TA (approx. 50 students); CS 1371 Computing for Engineers — *Aug. 2017 - Dec. 2018*

Awards

ISSAC 2024 Distinguished Poster Award — North Carolina State University
Poster: Conditions for eigenvalue configurations of two real symmetric matrices — *July 2024*

Provost's Fellowship — North Carolina State University
Full support for one year awarded to select incoming doctoral students. — *Fall 2021 - Spring 2022*

President's Undergraduate Research Award — Georgia Tech
Project: Neural Networks to Predict Chemical Descriptors — *Spring 2019*

Invited Talks

AMS Joint Mathematics Meeting (JMM) — Washington, DC
Special Session on Numerical Algebraic Geometry and Its Applications — *January 2026*
Eigenvalue configurations for general real symmetric matrices: a stochastic definition

Publications

1. Hong, Hoon, **Daniel Profili**, and J. Rafael Sendra. "Conditions for eigenvalue configurations of two real symmetric matrices: a symmetric function approach." arXiv preprint arXiv:2401.00089 (2023).

2. Hong, Hoon, **Daniel Profili**, and J. Rafael Sendra. "Conditions for eigenvalue configurations of two real symmetric matrices: a signature approach." arXiv preprint arXiv:2401.00086 (2023).

3. Santiesteban, Daniela Y., Diego S. Dumani, **Daniel Profili**, and Stanislav Y. Emelianov. "Copper sulfide perfluorocarbon nanodroplets as clinically relevant photoacoustic/ultrasound imaging agents." Nano letters 17, no. 10 (2017): 5984-5989.