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Summary

I am a fifth year doctoral candidate in the Department of Mathematics and Statistics at Florida Atlantic University studying computational dynamical systems, differential equations, and nonlinear analysis. In particular, I employ functional-analytic techniques and computer-assisted proofs to rigorously study chaotic systems of ordinary differential equations, state-dependent delay differential equations, and traveling wave solutions of partial differential equations. Part of my work involves creating novel software to automate the computation and validation of invariant manifolds in ODE systems, and I am applying this in my thesis as a new approach to classify the stability of traveling waves. I am also interested in using machine learning to study dynamical systems and I plan to pursue this course of research in my postdoctoral studies. In general, I view the computer as an invaluable tool in mathematics research and I enjoy learning and developing computational techniques to study open problems in mathematics.

Education

Doctor of Philosophy, Mathematics — *Spring 2025 (Expected)*

Florida Atlantic University

- Dissertation: *Existence and stability of nonlinear waves: a computer-assisted approach.*
- 3.98/4.00 GPA

Master of Science, Mathematics — *2020*

Florida Atlantic University

- MS Presentation: *The Stable Manifold Theorem*
- 4.00/4.00 GPA

Bachelor of Science, Mathematics — *2018*

Florida Atlantic University

- Minor in Statistics
- 3.84/4.00 GPA

Professional Experience

Graduate Teaching Assistant — *2018-Current*

Florida Atlantic University

- Duties include tutoring, grading, and teaching for undergraduate courses in mathematics and statistics.

Mechanical Draftsman — *2024-Current*

Rick Corbett Inc.

- Duties include designing and drafting HVAC and plumbing plans, as well as assisting in field work and mechanical surveying for new and existing buildings in the South Florida area.

Graduate Research Assistant — *2020-2021, 2022-2024*

Florida Atlantic University

- Partially supported to perform data analysis on an NSF-funded project in collaboration with FAU's College of Education.

NSF Mathematical Sciences Graduate Research Intern — *2023*

U.S. Army Corps of Engineers' Research and Development Center

- Intensive summer-long applied mathematics research program, funded by the NSF and administered by the Oak Ridge Institue for Science and Education (ORISE). The appointment took place onsite in Vicksburg, Mississippi.
- Performed research concerning the development of cryptanalytic tools to make predictions in chaotic systems. This work culminated in a paper and has been submitted to *Physical Review E* (see Publications [2]).

Publications

[1] **"Periodic orbits of state-dependent delay differential equations"** — *Accepted September 2024*

with V. Naudot. *International Journal of Bifurcation and Chaos.*

[2] **"Predicting State Switches in Chaotic Dynamical Systems"** *Submitted July 2024*
with K. Pilkiewicz and M. Mayo

[3] **"Existence and Stability of Nonlinear Waves: A Computer-Assisted Approach"** *In preparation*
with J. D. Mireles-James

[4] **"Periodic Orbits in the State-Dependent Van der Pol System"** *In preparation*
with V. Naudot

[5] **"Recruitment and Retention of STEM Teachers in High Need Schools: an Alumni Survey Analysis of Selected NSF Robert Noyce Programs"** *In preparation*
with D. Kumar and S. Moffitt

[6] **"A Mixed Method Study of STEM Teacher Supply to High Need Schools in Florida and Texas"** *In preparation*
with D. Kumar, S. Moffitt, and C. Restrepo-Widney

Teaching Experience

As Course Instructor
- MAP 3305 Engineering Mathematics 1 (Fall 2024, Fall 2022, Spring 2022)
- MAS 2103 Matrix Theory (Spring 2024)
- MAC 2312 Calculus with Analytic Geometry 2 (Fall 2023, Spring 2023)
- MAC 1105 College Algebra (Fall 2021)
- STA 2023 Introductory Statistics (Spring 2020)
- MAC 2233B Methods of Calculus (Fall 2019)

As Teaching Assistant/Embedded Tutor
- MAS 2103 Matrix Theory (Summer 2024)
- MAD 3400 Numerical Methods (Fall 2023)
- MAD 2104 Discrete Mathematics (Summer 2022)
- STA 3100 Computational Statistics (Spring 2021)

Presentations, Posters, & Lectures

Existence and Stability of Nonlinear Waves: A Computer-Assisted Approach
Paper to be presented at:
- *AMS Special Session on Recent Developments in PDEs and Related Areas,* Joint Mathematics Meeting 2025, Seattle, WA. *January 11, 2025*

Periodic Orbits of State-Dependent Delay Differential Equations
Paper presented at:
- 2024 Florida Women in Math Day, Florida Atlantic University, Boca Raton, FL. *April 21, 2024*
- *Special Session on Recent Developments in Nonlinear and Computational Dynamics,* Spring 2024 AMS Eastern Sectional Meeting, Howard University, Washington, D.C. *April 7, 2024*
- Graduate Student Seminar, Florida Atlantic University, Boca Raton, FL. *March 29, 2024*

Predicting State Switches in Chaotic Dynamical Systems
Paper presented at:
- 13th Annual FAU Broward Research Symposium, Florida Atlantic University, Davie, FL. (Poster Session) *November 17, 2023*
- Graduate Student Seminar, Florida Atlantic University, Boca Raton, FL. *November 2, 2023*
- Analysis & Applications Seminar, Florida Atlantic University, Boca Raton, FL. *October 19, 2023*
- 2023 NSF MSGI Summer Research Symposium (*Virtual Event*) *August 22, 2023*
- Environmental Processes Branch Seminar, USACE ERDC, Vicksburg, MS. *August 10, 2023*

The Stable Manifold Theorem
- M.S. Presentation, Florida Atlantic University *April 17, 2020*

The Dynamics of Circle Maps and Denjoy's Theorem
- Multi-class lecture for graduate course in Dynamical Systems at Florida Atlantic University *February 2020*

The Fourier Transform, Regularity, and Sobolev Embedding
- Lecture for graduate course in Partial Differential Equations at Florida Atlantic University *November 2019*

Workshops Attended

Mathematics and Machine Learning Workshop *October 2024*

Center of Mathematical Sciences and Applications, Harvard University, Cambridge, MA.

- Attended the workshop's special week on the intersection of machine learning and numerical PDEs

Programming Experience

Languages: MATLAB | R | Python | LaTeX

Relevant Software/Libraries INTLAB | JAX | Haiku | SageMath | R Markdown | AutoCAD

Fellowships & Scholarships

Isaac Schur Graduate Scholarship *2021*

- Awarded to graduate students in mathematics who have successfully passed two qualifying exams, maintained a high GPA in graduate studies, and received distinguished letters of recommendation from two professors
- Award of $1,000

FAU Presidential Fellowship *2018-2020*

- Two-year fellowship awarded to doctoral students who have exhibited an excellent academic record and excellent letters of recommendation as determined by faculty at the time of admission
- Award of $5,000 per year for the first two years of graduate studies

Florida Bright Futures Scholarship *2018-2019*

- Undergraduate scholarship awarded to Florida public university attendees with distinguished GPAs and SAT scores

Activities & Services

Graduate Student Seminar, Organizer *2022-Current*

- Organized and co-hosted weekly seminars, with presentations by graduate students and faculty within FAU's Department of Mathematical Sciences

AMS Student Chapter

President *2023-Current*

- Organized and lead chapter meetings, aided in organizing chapter events, and recruited officers and members for AMS student chapter.

Treasurer *2022-2023*

- Managed funds and purchases for AMS-related events and activities at Florida Atlantic University.

Florida Atlantic Jazz Orchestra, Lead Trombone *2016-2017, 2024*

- Attended biweekly rehearsals and performed at various venues for concerts and events as the first-chair trombone player.

Technology Fee Committee, Graduate Student Representative *2021 - 2022*

- Served on committee formed to review proposals and allocate funds for various technology-related enhancements across FAU.

Certificates & Honors

- ACS Disaster Response Certificate (2024)
- CITI Responsible Conduct of Research Certificate (2023)
- CITI Social & Behavioral Research Investigators Certificate (2022)
- CRLA Level 3 Certified Tutor (2018)
- FAU Honors Program (2015-2018)