

Emmanuel T. Fleurantin

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AREAS OF INTEREST

Dynamical systems, computational mathematics (numerical methods for boundary value problems, computation of smooth invariant manifolds), computer assisted proofs in dynamics, mathematical biology, data assimilation.

RESEARCH EXPERIENCE

NSF MPS-Ascend Postdoctoral Fellow

George Mason University, Fairfax, VA

January 2022-Present

- Mentor: Distinguished Professor Christopher K.R.T. Jones.

University of North Carolina at Chapel Hill, Chapel Hill, NC

January 2022-Present

- Mentor: Distinguished Professor Christopher K.R.T. Jones.

Doctoral Dissertation Research

Florida Atlantic University, Boca Raton, FL

August 2015-December 2021

- Co-advisors: Professors Jason Mireles-James and Vincent Naudot.

TEACHING EXPERIENCE

Affiliate/Adjunct faculty

August 2022- Present

George Mason University, Fairfax, VA

- Courses taught as Instructor of Record: MEGL Undergraduate Research and Introduction to Applied Math.

Graduate Teaching Assistant

June 2015- December 2021

Florida Atlantic University, Boca Raton, FL

- Duties: teaching, grading, tutoring for the department of Mathematical Sciences.
- Courses taught as Instructor of Record: Intermediate Algebra, College Algebra, Methods of Calculus, Trigonometry, Introductory Statistics, Precalculus Algebra, Introduction to Calculus with Applications, and Calculus I.
- Courses taught as Teaching Assistant: Calculus III, Engineering Math I, Matrix Theory.

Adjunct Faculty/ School of Science, Technology and Engineering Management

August 2016-August 2017

Saint Thomas University, Miami, FL

- Courses taught: Introduction to Computer Science, Microcomputer Applications.

Instructor

April 2014 – October 2015

International Education Corporation, Miami, FL

Helped develop curriculum and taught upper level math classes.

EDUCATION AND CERTIFICATES

PhD in Mathematics

May 2018-December 2021

Florida Atlantic University, Boca Raton, FL

- Co-advisors: Dr. Jason Mireles-James, Dr. Vincent Naudot. Dissertation title: Formation, evolution, and breakdown of invariant tori in dissipative systems: from visualization to computer assisted proofs. Successful defense October 8, 2021.

Graduate Certificate in Cyber Security

August 2016-May 2018

Florida Atlantic University, Boca Raton, FL

Masters of Science in Mathematics (thesis option)

August 2015-May 2018

Florida Atlantic University, Boca Raton, FL

- Advisor: Dr. Jason Mireles-James. Thesis title: On the study of the Aizawa system. Successful defense March 29, 2018.

Masters of Science in Mathematics Education

August 2008-August 2010

Nova Southeastern University, Davie, FL

Bachelors of Arts

August 2002-December 2007

University of South Florida, Tampa, FL

SCHOLARLY ACTIVITIES:

Journal Referee, Communications in Nonlinear Science and Numerical Simulation (CNSNS), International Journal of Bifurcation

and Chaos (IJBC), and SIAM Journal on Applied Dynamical Systems (SIADS).

President, Society of Industrial and Applied Mathematics local student chapter (August 2020-August 2021).

Co-Organizer of the *FAU SIAM Student Chapter Colloquium Series*. This is a monthly online talk focusing on the use of mathematics and its applications. Previous recorded talks are available at: <https://www.youtube.com/channel/UCLLIwI8E06aAfs2dNKve0g>.

Co-Organizer of the *M@TH Hub Workshop: Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations* weekly seminar. This is a weekly hybrid talk targeting senior undergraduate students and beginning graduate students in order to introduce them to various math research fields. Previous recorded talks are available at: <https://www.youtube.com/channel/UCCBDxJI7F3Tiz2ZsfjYdVOQ>.

Faculty mentor of the Mason Experimental Geometry Lab (MEGL) project *Tipping in Climate Impact Models*, where I mentored 2 undergraduate and 2 graduate students on a project related to tipping in low-dimensional climate models for the fall semester of 2022.

Co-Organizer of the *Society for Industrial and Applied Mathematics (SIAM) Special Session on SIAM Minisymposium on Applications of the Maslov Index* at the Joint Mathematics Meetings (JMM) in January 2023 in Boston, MA.

Co-Organizer of the American Institute of Mathematics (AIM) workshop on *Computer assisted Proofs for Stability Analysis of Nonlinear Waves* in June 2023. Details can be found here: <https://aimath.org/workshops/upcoming/compproofstability/>.

Faculty mentor of the Mathematics Climate Research Network (MCRN) summer school and research program. Details can be found here: <https://aimath.org/workshops/upcoming/mcrn2023/>.

SERVICE:

Volunteer, FAU Math Day, (Fall 2015, Spring 2016, Fall 2016, Spring 2017, Spring 2018, Spring 2019, December 2021).

Volunteer, Mu Alpha Theta Math Competition (Spring 2016, Spring 2017, Spring 2020).

Peer Judge, FAU Graduate research day (Spring 2016).

Volunteer, Florida Section of the Mathematical Association of America (MAA) and the Florida Two-Year College Mathematics Association - FTYCMA (Spring 2018).

WORKSHOPS, SUMMERSCHOOLS AND RESEARCH MEETINGS:

- Visit to Université Lille 1, Département Mathématiques Cité Scientifique, Villeneuve-d'Ascq, France, December 2018.
- NSF-CBMS Regional Research Conference: Fitting Smooth Functions to Data, hosted at the University of Texas at Austin, August 2019.
- 39th Southeastern-Atlantic Regional Conference on Differential Equations (SEARCDE), hosted at ERAU-Daytona Beach, October 2019.
- 45th Annual New York Regional Graduate Mathematics Conference (Virtual), hosted at Syracuse University, March 2020.
- Summer School on Dynamics, Data and the COVID 19 Pandemic (Virtual), hosted at the American Institute of Mathematics (AIM), June-July 2020.
- Mathematical Models for Prediction and Control of Epidemics (Virtual Workshop), hosted by the Mathematical Sciences Research Institute (MSRI), August 2020.
- 2nd SIAM Knights Conference (Virtual), hosted by the SIAM student chapter at University of Central Florida (UCF), December 2020.
- AMS Spring Southeastern Sectional Meeting (Virtual), formerly at Georgia Institute of Technology, March 2021.
- SIAM Conference on Applications of Dynamical Systems (Virtual), formerly in Portland, Oregon, May 2021.
- SIAM Annual Meeting (Virtual), July 2021.
- Visit to Brigham Young University, Department of Mathematics, Provo, Utah, February 2022.
- Dynamics, Topology and Computations 2022 (DyToComp 2022), Bedlewo, Poland, June 2022.
- SIAM Mathematics of Planet Earth Conference 2022 (SIAM MPE 2022), Pittsburgh, Pennsylvania, July 2022.
- SIAM Washington-Baltimore Section Fall Meeting 2022, Arlington, VA, November 2022.
- Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations Mini-Conference, hosted by the Georgia Institute of Technology, December 2022.
- Joint Mathematics Meetings 2023, Boston, MA, January 2023.
- Spring Opportunities Workshop 2023, Hosted by the Institute for Advanced Study (IAS), January 2023.
- Ascend Fellowship Conference, Hosted by Carnegie Mellon University (CMU), February 2023.

RESEARCH:

Publications:

- “A mathematical model based on IC50 curves to predict tumor responses to drugs,” with Catherine I. Berrouet, Jacob Nadulek, Sunil Giri, Katarzyna A. Rejniak, and Necibe Tuncer. *FAU Undergraduate Research Journal*, Vol 7, pp. 18–32 (2018).
- “On the Study of the Aizawa System,” Masters Thesis, Florida Atlantic University, 2018.
- “Resonant Tori, Transport Barriers, and Chaos in a Vector Field with a Neimark-Sacker Bifurcation,” with J.D. Mireles-James. *Communications in Nonlinear Science and Numerical Simulation*, Volume 85, 2020, 105226, ISSN 1007-5704.
- “Computer Assisted Proofs of Two-Dimensional Attracting Invariant Tori for ODEs,” with Maciej J. Capinski and J.D. Mireles-James. *Discrete and Continuous Dynamical Systems-A*, Vol. 40, No. 12, pp.6681-6707 (2020).
- “A study of disproportionately affected populations by race/ethnicity during the SARS-CoV-2 pandemic using multi-population SEIR modeling and ensemble data assimilation,” with C. Sampson, D. Maes, J. Bennett, T. Fernandes Nunez, S. Marx, and G. Evensen. *Foundations of Data Science*, Vol. 3, No. 3, pp. 479-541 (2021), doi: 10.3934/fods.2021022.
- “Formation, Evolution, and Breakdown of Invariant Tori in Dissipative Systems: from Visualization to Computer Assisted Proofs,” Dissertation, Florida Atlantic University, 2021.
- “A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries”, joint work with Katherine Slyman (UNC-CH), Blake Barker (BYU) and Christopher K.R.T. Jones (UNC-CH, GMU). Submitted (2023).
- “A Data Driven Study of the Drivers of Stratospheric Circulation via Reduced Order Modeling and Data Assimilation”, joint work with Julie Sherman (UofU), Christian Sampson (JCSDA) and Christopher K.R.T. Jones (UNC-CH, GMU). In Preparation.

Selected Presentations, Talks and Posters:

- Graduate Student Seminar at Florida Atlantic University– *Stable/Unstable Manifold Bubbles, Resonant Tori, and Torus-Chaos in the Aizawa System*, January 2019.
- Florida Atlantic University Graduate and Professional Student Association Research Day – *Transport Barriers, Resonance Tori, and Torus-Chaos in a Vector Field with a Neimark-Sacker Bifurcation* (poster), April 2019.
- 45th Annual New York State Regional Graduate Mathematics Conference – *Resonant Tori in a Vector Field with a Neimark-Sacker Bifurcation*, March 2020.
- Summer School on Dynamics, Data and the COVID 19 Pandemic – *Interpopulation Mixing with Applications in a Two-Population SEIR Model: Using Age Stratification as a Proxy for Racial Disparity in COVID-19 Spread Within a Region (with Nonlinear Ensemble Data Assimilation)*, July 2020.
- CRM CAMP in Nonlinear Analysis – *Computer-assisted proofs of two-dimensional attracting invariant tori for ODEs*, December 2020.
- 2nd SIAM Knights Conference – *High order approximation of the center manifold for the Henon-Heiles system*, December 2020.
- AMS Spring Southeastern Sectional Meeting – *Computing Lyapunov Subcenter Manifolds (LSMs) for Hamiltonian Systems*, March 2021.
- Florida Atlantic University Graduate and Professional Student Association Research Day – *Frontline Communities and SARS-CoV-2 - Multi-population Modeling With an Assessment of Disparity by Race/Ethnicity Using Ensemble Data Assimilation* (poster), April 2021.
- SIAM Conference on Applications of Dynamical Systems - *Computing Lyapunov Subcenter Manifolds (LSMs) for Hamiltonian Systems*, May 2021.
- Applied Mathematics Seminar, Brigham Young University - *Formation, evolution, and breakdown of invariant tori in dissipative systems: from visualization to computer assisted proofs*, February 2022.
- Applied Mathematics Seminar, George Mason University - *A Dynamical Systems Approach to Most Probable Escape Paths in Non-Gradient Systems*, April 2022.

- Dynamics, Topology and Computations 2022 (DyToComp 2022) - *A Dynamical Systems Approach to Most Probable Escape Paths in Non-Gradient Systems*, June 2022.
- SIAM Conference on Mathematics of Planet Earth (MPE22) - *Using the Maslov Index in Noise-Induced Tipping*, July 2022.
- PhD Launchpad program at George Mason University - *Scholarship and Career Path*, August 2022.
- Applied Mathematics Seminar, United States Naval Academy - *A Study of Disproportionately Affected Populations by Race/Ethnicity during the SARS-CoV-2 Pandemic using Multi-Population SEIR Modeling and Ensemble Data Assimilation*, December 2022.
- Joints Mathematics Meetings 2023 - *The Maslov Index and Noise-Induced Tipping*, January 2023.
- Ascend Fellowship Conference - *A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries* (poster), February 2023.
- CDSNS colloquium, Georgia Tech - *A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries*, March 2023.

RESEARCH SUPPORT, FELLOWSHIPS AND AWARDS:

- National Science Foundation Grant DMS - 2137947: "Computing Invariant Manifolds and Assimilating Data in Tipping Problems", 2022-Present.
- FAU Graduate Grant, 2021.
- Travel Award for CBMS Conference "Fitting Smooth Functions to Data", 2019.
- Travel award to visit University de Lilles, France, 2018.

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS:

American Mathematical Society (AMS) and Society for Industrial and Applied Mathematics (SIAM).

COMPUTER SKILLS:

I have experience in programming with MATLAB, Python, C++, LaTeX, Fortran, and Linux.

CITIZENSHIP:

United States of America.

References available upon request