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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.

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 in Economics

August 2002-December 2007

University of South Florida, Tampa, FL

PREPRINTS

1. "Investigating Ocean Circulation Dynamics Through Data Assimilation: A Mathematical Study Using the Stommel Box Model with Rapid Oscillatory Forcings", with Nathaniel Smith, Anvaya Shiney-Ajay, and Ivo Pasmans (2024). url: <https://arxiv.org/pdf/2404.07134.pdf>.

PUBLICATIONS

2. "A Data Driven Study of the Drivers of Stratospheric Circulation via Reduced Order Modeling and Data Assimilation", with Julie Sherman, Christian Sampson, Zhimin Wu and Christopher K.R.T. Jones. *Meteorology*, 2024; 3(1):1-35, doi: 10.3390/meteorology3010001.
3. "A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries", with Katherine Slyman, Blake

4. “Formation, Evolution, and Breakdown of Invariant Tori in Dissipative Systems: from Visualization to Computer Assisted Proofs,” Dissertation, Florida Atlantic University, 2021.
5. “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.
6. “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), doi: 10.3934/dcds.2020162.
7. “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, doi: 10.1016/j.cnsns.2020.105226.
8. “On the Study of the Aizawa System,” Masters Thesis, Florida Atlantic University, 2018.
9. “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).

RESEARCH SUPPORT, FELLOWSHIPS AND AWARDS

- Mathematically Gifted and Black - Society of Industrial and Applied Mathematics (MGB-SIAM) Early Career Fellow, January 2024 - Present.
- National Science Foundation (NSF) Grant DMS - 2137947: “Computing Invariant Manifolds and Assimilating Data in Tipping Problems”. This grant funds the MPS-Ascend Postdoctoral fellowship, January 2022 - Present.
- Florida Atlantic University Graduate Grant, Summer 2021.
- Travel Award for NSF-CBMS Conference "Fitting Smooth Functions to Data", August 2019.
- Travel award for exploratory research in dynamical systems at University de Lilles, France, December 2018.

ADVISING AND TRAINING

- **Faculty mentor** of the Mason Experimental Geometry Lab (MEGL) project *Existence (and Stability) of Traveling Waves in Heterogeneous Reaction-Diffusion Systems*, planned for Fall semester, 2024.
- **Faculty mentor** of a project on using data-assimilation on a low-order climate model where I supervised one undergraduate and one graduate student during weekly meetings. We conducted this project throughout the fall semester of 2023 (and part of Spring 2024) and submitted our findings in a research journal.
- **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/>. This was a summer program in July-August of 2023 where I taught intro to dynamical systems and data assimilation mini-courses, provided relevant Python codes and held daily office hours. I also organized and maintained a Canvas webpage. Finally, for the last week, I lead a research group on a project on ocean circulation.
- **Faculty mentor** of the Mason Experimental Geometry Lab (MEGL) project *Tipping in Climate Impact Models*, where I supervised 2 undergraduate and 2 graduate students on a project related to tipping in low-dimensional climate models for the fall semester of 2022. The students presented their work both at George Mason University and at the *Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations* mini-conference hosted at Georgia Tech in December of 2022.
- **Co-Organizer** of the *FAU SIAM Student Chapter Colloquium Series*. This was a monthly online talk focusing on the use of mathematics and its applications. Previous recorded talks are available at: <https://www.youtube.com/channel/UCLLIwl8E06aAfks2dNKve0g>.

CONFERENCE AND WORKSHOP ORGANIZATION

- **Co-Organizer** of the minisymposium on *Stability of Traveling Waves - Theoretical and Numerical Methods* at the 2024 SIAM Conference on Nonlinear Waves and Coherent Structures.
- **Co-Organizer** of the *AMS Special Session on Recent Developments in Nonlinear and Computational Dynamics* at the 2024 Spring Eastern Sectional Meeting hosted at Howard University.
- **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/>.
- **Co-Organizer** of the *Society for Industrial and Applied Mathematics (SIAM) Special Session on Applications of the Maslov Index* at the Joint Mathematics Meetings (JMM) in January 2023 in Boston, MA.
- **Co-Organizer** of the *M@TH Hub Workshop: Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations* weekly seminar. This was 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/UCcBDxJ17F3Tiz2ZsfjYdVOQ>.

TEACHING EXPERIENCE

George Mason University, Fairfax, VA

- Computational Dynamics (MATH 689) - Instructor Spring 2024
- Introduction to Applied Math (MATH 314) - Instructor Spring 2023
- MEGL Undergraduate Research (MATH 491) - Instructor Fall 2022, Fall 2024

Florida Atlantic University, Boca Raton, FL

- Introduction to Calculus with Applications (MAC 2210) - Instructor Fall 2021
- Intermediate Algebra (MAT 1033) - Instructor Summer 2021
- Methods of Calculus (MAC 2233) - Instructor Spring 2017, Spring 2019, Spring 2021
- Calculus and Analytic Geometry 1 (MAC 2311) - Instructor Fall 2020
- Matrix Theory (MAS 2103) - Teaching Assistant Summer 2020
- Introductory Statistics (STA 2023) - Instructor Fall 2017, Spring 2018, Spring 2020
- College Algebra (MAC 1105) - Instructor Fall 2016, Fall 2019
- Calculus and Analytic Geometry 3 (MAC 2313) - Teaching Assistant Summer 2019
- Engineering Math I (MAP 3305) - Teaching Assistant Summer 2019
- Precalculus Algebra (MAC 1140) - Instructor Summer 2018, Fall 2018
- Calculus and Analytic Geometry 1 (MAC 2311) - Teaching Assistant Fall 2018
- Trigonometry (MAC 1114) - Instructor Summer 2017

Saint Thomas University, Miami, FL

- Microcomputer Applications - Instructor Spring 2017
- Introduction to Computer Science - Instructor Fall 2016

SELECTED COLLOQUIUM, CONFERENCE, AND SEMINAR PRESENTATIONS

Invited Talks:

- 2024 SIAM Conference on Nonlinear Waves and Coherent Structures - *Computation of Indices for Stability of Nonlinear Waves*, June 2024.
- 2024 AMS Spring Eastern Sectional Meeting - *Analytical and Computational Techniques for Noise-Induced Transitions over Periodic Boundaries*, April 2024.
- 16th Annual Symposium on BEER (Biomathematics and Ecology Education and Research) - *Parameter Estimation in Epidemiological and Climate Models Using Ensemble Smoothing with Multiple Data Assimilation*, November 2023.
- International Congress on Industrial and Applied Mathematics (ICIAM) - *A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries*, August 2023.
- 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications - *On the Interplay of Transient Dynamics and Noise-Induced Tipping*, June 2023.
- SIAM Conference on Applications of Dynamical Systems - *The Maslow Index and Noise-Induced Tipping*, May 2023.
- Joints Mathematics Meetings 2023 - *The Maslow Index and Noise-Induced Tipping*, January 2023.
- SIAM Conference on Mathematics of Planet Earth (MPE22) - *Using the Maslow Index in Noise-Induced Tipping*, July 2022.
- Dynamics, Topology and Computations 2022 (DyToComp 2022) - *A Dynamical Systems Approach to Most Probable Escape Paths in Non-Gradient Systems*, June 2022.
- AMS Spring Southeastern Sectional Meeting – *Computing Lyapunov Subcenter Manifolds (LSMs) for Hamiltonian Systems*, March 2021.
- CRM CAMP in Nonlinear Analysis – *Computer-assisted proofs of two-dimensional attracting invariant tori for ODEs*, December 2020.

Seminars and Colloquia:

- Iowa State University Computational and Applied Math (CAM) Seminar - *On the Study of Noise-Induced Transitions over Periodic Boundaries in Non-Gradient Systems*, April 2024.
- Virginia Commonwealth University Biomath Seminar - *Recent Analytical and Computational Tools for Noise-Induced Transitions over Periodic Boundaries*, September 2023.
- CDSNS colloquium, Georgia Tech - *A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries*, March 2023.
- 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.
- Applied Mathematics Seminar, George Mason University - *A Dynamical Systems Approach to Most Probable Escape Paths in Non-Gradient Systems*, April 2022.
- Applied Mathematics Seminar, Brigham Young University - *Formation, evolution, and breakdown of invariant tori in dissipative systems: from visualization to computer assisted proofs*, February 2022.
- Graduate Student Seminar at Florida Atlantic University– *Stable/Unstable Manifold Bubbles, Resonant Tori, and Torus-Chaos in the Aizawa System*, January 2019.

Contributed Talks

- International Workshop on Non-Autonomous Dynamics in Complex Systems (NADCOM23) - *Recent Analytical and Computational Tools for Noise-Induced Transitions over Periodic Boundaries*, October 2023.
- SIAM Conference on Applications of Dynamical Systems - *Computing Lyapunov Subcenter Manifolds (LSMs) for Hamiltonian Systems*, May 2021.

- 2nd SIAM Knights Conference – *High order approximation of the center manifold for the Henon-Heiles system*, December 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.
- 45th Annual New York State Regional Graduate Mathematics Conference – *Resonant Tori in a Vector Field with a Neimark-Sacker Bifurcation*, March 2020.

Poster Presentations

- Mathematics in Digital Twins (MATH-DT Workshop) - *A Data Driven Study of the Drivers of Stratospheric Circulation via Reduced Order Modeling and Data Assimilation*, December 2023.
- Ascend Fellowship Conference - *A Dynamical Systems Approach for Most Probable Escape Paths over Periodic Boundaries*, February 2023.
- 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*, April 2021.
- 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*, April 2019.

WORKSHOPS, SUMMER SCHOOLS AND RESEARCH MEETINGS

- 2024 SIAM Annual Meeting (AN24), Spokane, WA, July 2024.
- Conference for African-American Researchers in the Mathematical Sciences (CAARMS) 2024, hosted at Tufts University, June 2024.
- 2024 SIAM Conference on Nonlinear Waves and Coherent Structures, Baltimore, MD, June 2024.
- 2024 National Association of Mathematicians Faculty Conference on Research and Teaching Excellence, hosted at Howard University, April 2024.
- 2024 AMS Spring Eastern Sectional Meeting, hosted at Howard University, April 2024.
- Mathematics in Digital Twins (MATH-DT Workshop), hosted at George Mason University (Arlington campus), December 2023.
- 16th Annual Symposium on BEER (Biomathematics and Ecology Education and Research), hosted at Virginia Commonwealth University, November 2023.
- Non-Autonomous Dynamics in Complex Systems: Theory and Applications to Critical Transitions (NADCOM23), hosted at the Max Planck Institute for Physics of Complex Systems, October 2023.
- 2nd ASCEND Mentor Network Fellowship Conference, hosted at Iowa State University, October 2023.
- International Congress on Industrial and Applied Mathematics (ICIAM), hosted at Waseda University, August 2023.
- Workshop on Computer Assisted Proofs for Stability Analysis of Nonlinear Waves, San Jose, CA, June 2023.
- 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Wilmington, NC, June 2023.
- Mathematics and Climate Research Network Meeting, Portland, OR, May 2023.
- SIAM Conference on Applications of Dynamical Systems, Portland, OR, May 2023.
- East Coast Optimization Meeting 2023 (Virtual), hosted by George Mason University, April 2023.
- Ascend Fellowship Conference, Hosted by Carnegie Mellon University (CMU), February 2023.

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

PROFESSIONAL SERVICE

- **Journal Referee**, Communications in Nonlinear Science and Numerical Simulation (CNSNS), International Journal of Bifurcation and Chaos (IJBC), SIAM Journal on Applied Dynamical Systems (SIADS) and Physica D: Nonlinear Phenomena.
- **President**, Society of Industrial and Applied Mathematics local student chapter (August 2020-August 2021).

EDUCATION AND OUTREACH

- **Speaker**, Conference for African-American Researchers in the Mathematical Sciences (CAARMS) 2024, Tufts University, June 2024.
- **Lightning talk speaker**, BEER NSF-MODULUS Workshop, Virginia Commonwealth University, November 2023.
- **Lightning talk speaker**, 2nd Ascend Mentor Network Fellowship Conference, Iowa State University, October 2023.
- **Speaker**, PhD Launchpad program, George Mason University - *Scholarship and Career Path*, August 2022.
- **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).
- **Volunteer**, Florida Section of the Mathematical Association of America (MAA) and the Florida Two-Year College Mathematics Association - FTYCMA (Spring 2018).

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

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