Eric D. Flynn, PhD

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Google Scholar

Education

2019–2025 **Dual PhD in Physics and Computational Science, Mathematics, and Engineering (CMSE)**, *Michigan State University*, East Lansing, MI
Thesis Title: Nuclear Fission and Tunneling Phenomena.
Advisor: Witold Nazarewicz

2018–2019 **MS in Physics**, *California State University, Fullerton*, Fullerton, CA
Project Title: Systematics of Hybrid Gravitational Waves
Advisor: Jocelyn Read

2012–2018 **BS in Physics, BA in Mathematics**, *California State University, Fullerton*, Fullerton, CA
Physics Advisor: Jocelyn Read, Mathematics Advisor: Alfonso Agnew

Professional Experience

2026-Current **Post-Doctoral Research Fellow**, *University of Michigan, Department of Nuclear Engineering and Radiological Sciences*, Dr. Y Z's Group

2020–2026 **Graduate Research Assistant**, *Michigan State University*
Research on modeling nuclear fission and quantum tunneling for nuclear decays.

1. Developed and implemented a new predictive model and numerical algorithms using Python, Fortran, and C++ to describe complex many-body systems to **reduce computational cost of model predictions and improve agreement with experimental data.**
2. Developed reduced order models using data-driven machine learning and artificial intelligence techniques and intrusive reduced basis methods for reducing computational cost of predictive numerical calculations for many-body dynamics. **This development reduced computational time needed to compute data needed for nuclear dynamic simulations from about a day to a few seconds.**.

2019–2020 **Graduate Teaching Assistant**, *Michigan State University*

1. Undergraduate physics data lab courses for classical mechanics and electromagnetism.

2018–2019 **Graduate Teaching Assistant**, *California State University, Fullerton*

1. Undergraduate classical mechanics and electromagnetism lab courses. Graded homework for undergraduate courses on linear algebra and differential equations

2015-2019 **Student Researcher**, *California State University, Fullerton Mathematics Department*

1. Developed mathematical formalism for describing properties of non-separable topological spaces with application to the Twistor theory of particle physics.

2014-2019 **Student Researcher**, *Gravitational Wave Physics and Astronomy Center, California State University, Fullerton*
Laser Interferometer Gravitational-wave Observatory (LIGO) collaboration member.

1. Developed theoretical models and used classification techniques to extract waveform signals from noisy gravitational wave detector data streams. **The result was quantified systematic model uncertainty in waveform models and their effects on experimental observations**.

Invited Talks

March 2025 **Cyclotron Seminar "Nuclear Fission and Tunneling Phenomena"**, *Cyclotron Institute at Texas A&M University*

February 2025 **Nuclear and Chemical Sciences Division Seminar "Nuclear Fission and Tunneling Phenomena"**, *Lawrence Livermore National Laboratory*

October 2024 **Physics Department Colloquium "Heavy Elements from Merging Neutron Stars"**, *California State University, Fullerton*

Contributed Talks

September 2024 **International School of Nuclear Physics, 45th Course: Nuclei in the Laboratory and in Stars: "Spontaneous fission yields and lifetimes from self-consistent calculations"**, *Erice, Italy*

Summer 2023 **Sci-DAC5 NUCLEI Collaboration Meeting: "Multi-modal fission from self-consistent calculations"**, *University of Tennessee, Knoxville, TN*

Spring 2022 **FRIB Theory Seminar: Nudged Elastic Band Method for Nuclear Fission**, *FRIB, MI*

Fall 2018 **APS April Meeting: "Hybrid Gravitational Wave Systematics and Model Comparisons for Binary Neutron Star Mergers"**, *Denver, CO*

Fall 2018 **APS Far West Meeting: "Hybrid Gravitational Wave Systematics and Model Comparisons"**, *CSU Fullerton, CA*

Spring 2016 **Southern California Conference for Undergraduate Research: "Characterization of Hybrid Gravitational Waves"**, *Cal Poly Pomona, CA*

Spring 2016 **Preparing Undergraduates through Mentoring towards PhDs (PUMP) conference: "Twistor Structure of the Biquaternionic Projective Point and Line"**, *CSU Northridge, CA*

Fall 2015 **Southern California Conference on Undergraduate Research (SCCUR) "An Application of Matrix Projective Spaces"**, *Harvey Mudd College, CA*

Poster Presentations

Fall 2024 **Fission Experiments and Theoretical Advances (FIESTA) 2024: "Nuclear fission lifetimes from self-consistent calculations"**, *Los Alamos, NM*

Spring 2023 **NNSA SSAP: "Multimodal Fission with the Nudged Elastic Band Method"**, *Arlington, VA*

Summer 2017 **CSU Fullerton Summer Research Symposium: "Matrix Projective Geometry of Scattering Amplitudes"**, *CSU Fullerton, CA*

Spring 2016 **Public poster presentation "Gravitational Waves: Examining the Universe in a Whole New Way"**, *Irvine, CA*

Summer 2015 **CSU Fullerton Summer Research Symposium: "Split-Quaternion Dirac Theory"**, *California State University, Fullerton*

Summer 2015 **CSU Fullerton Summer Research Symposium: "Hybridization of Gravitational Waves"** , *California State University, Fullerton*

Awards

2019 **Michigan State University Early Start Summer Fellowship**, *Michigan State Univeristy*
$6000 stipend to begin research at the Facility for Rare Isotope Beams (FRIB)

2018 **1st Prize Kenney Reed award for best Theoretical Research oral presentation as masters student**, *California State University, Fullerton*
2018 APS Far West meeting held at CSUF. $300 cash prize

2018 **Nancy Goodhue-McWilliams Graduate Fellowship**, *College of Natural Sciences and Mathematics, California State University Fullerton*
$10,000 fellowship for MS in physics at CSU Fullerton.

2018 **Special Recognition for Undergraduate Research**, *College of Natural Sciences and Mathematics, California State University Fullerton*
College wide annual award for outstanding undergraduate research

2017 **Special Recognition for Undergraduate Research**, *College of Natural Sciences and Mathematics, California State University Fullerton*
College wide annual award for outstanding undergraduate research

2015 **Preparing Undergraduates through Mentoring towards PhDs (PUMP)**, *Department of Mathematics, California State University, Fullerton*
$12,000 award to conduct mathematical research on the Topology and Twistor Structure of Biquaternionic Point and Line

Workshops/Summer Schools

2024 **Fission Experiments and Theoretical Advances (FIESTA) 2024**, *Los Alamos, NM*

2024 **International School of Nuclear Physics, 45th Course**, *Erice, Sicily*

2023 **ISNET 9 Conference**, *Washington University in St. Louis*

2023 **FRIB-TA Summer School: Practical Uncertainty Quantification and Emulator Development in Nuclear Physics**, *Facility for Rare Isotope Beams, MI*

2020 **ISNET 8 Conference**, *Facility for Rare Isotope Beams, MI*

2020 **Machine Learning and Data Analysis for Nuclear Physics TALENT School**, *ECT*, Trento Italy*

2020 **FRIB-TA Summer School: Dense Matter in Astrophysics**, *Facility for Rare Isotope Beams, MI*

Software Projects

PyNEB **Developer and Maintainer**, *Python-based Nudged Elastic Band Package*, Flexible Python package for determining minimum energy and least action pathways on curved manifolds.

Dimensionality reduction book **Developer and Maintainer**, *Dimensionality reduction technique demonstrations.*, Jupyter notebooks to demonstrate various dimensionaltiy reduction and reduced order modeling techniques for nuclear physics problems.

Computational Skills

Programming Languages: Python, Fortran (90 and 95), C++, Mathematica, Shell scripting

Packages: git, Numpy, JAX, Scipy, Numpy, Pandas, Scikit-Learn, Matplotlib, Tensorflow, Keras, SQL, Paraview, PyNEB, HFBTHO, Sky3D,

Paradigms: High performance computing, MPI, OpenMP

System Experience: Orange County Relativity Cluster for Astronomy at California State University, Fullerton, Michigan State University High Performance Computing Center, Argonne LCRC Bebop

Society memberships

American Physical Society

FRIB Theory Alliance

Community Building/Outreach

2024 **FRIB Summer School**, *Participated in creation of summer school materials to help graduate students come up to speed for graduate coursework.*

2022-2025 **FRIB Community Lunch Coordinator**, *Helped setup, clean up, and pick up food for weekly lab wide lunch.*

2024 **FRIB Theory Seminar Co-host**, *Co-host the FRIB nuclear theory seminar speakers during their visit.*

2022-2025 **FRIB Theory Coffee Club Maintainer**, *Maintained Coffee machines and kitchen area for the FRIB Theory Coffee Club.*

Selected Published Articles

[1] D. Lay, E. Flynn, S. A. Giuliani, W. Nazarewicz, and L. Neufcourt, "Neural network emulation of spontaneous fission", Phys. Rev. C **109**, 044305 (2024).

[2] D. Lay, E. Flynn, S. Agbemava, K. Godbey, W. Nazarewicz, S. A. Giuliani, and J. Sadhukhan, "Multimodal fission from self-consistent calculations", Phys. Rev. C **109**, 044306 (2024).

[3] E. Flynn, D. Lay, S. Agbemava, P. Giuliani, K. Godbey, W. Nazarewicz, and J. Sadhukhan, "Nudged elastic band approach to nuclear fission pathways", Phys. Rev. C **105**, 054302 (2022).

[4] K. Chatziioannou, R. Cotesta, S. Ghonge, J. Lange, K. K. Ng, J. Calderón Bustillo, J. Clark, C.-J. Haster, S. Khan, M. Pürrer, et al., "On the properties of the massive binary black hole merger gw170729", Phys. Rev. D **100**, 104015 (2019).

[5] B. P. Abbott, R. Abbott, T. D. Abbott, F. Acernese, K. Ackley, C. Adams, T. Adams, P. Addesso, R. X. Adhikari, V. B. Adya, et al., "Search for post-merger gravitational waves from the remnant of the binary neutron star merger gw170817", The Astrophysical Journal Letters **851**, L16 (2017).

[6] T. Cullen, I. Harry, J. Read, and E. Flynn, "Matter effects on ligo/virgo searches for gravitational waves from merging neutron stars", Classical and Quantum Gravity **34**, 245003 (2017).