Ananya Adhikari

PhD Graduate in Physics
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Education

PhD in Physics **2025**
Florida Atlantic University, Boca Raton, FL, USA.
Thesis Advisor: Professor Wolfgang Tichy

MS in Physics **2018**
Florida Atlantic University, Boca Raton, FL, USA.

MS in Physics **2016**
Indian Institute of Technology Guwahati, Guwahati, Assam, India.

BS in Physics **2014**
Hooghly Mohsin College (The University of Burdwan), Chinsurah, WB, India.

Awards and Felicitations

Nathan W. Dean Award 2025
Department of Physics, Florida Atlantic University.

Ph.D. Student Spotlight, 2024
Charles E. Schmidt College of Science, Florida Atlantic University.

Bjorn Lamborn Scholarship in Physics (Graduate) 2024
Department of Physics, Florida Atlantic University.

Dr. John Samuel Faulkner Award for PhD Students in Physics 2023
Department of Physics, Florida Atlantic University.

Provost's Fellowship 2017
Department of Physics, Florida Atlantic University.

Felicitation for performance in WBCHSE Higher Secondary Exam 2011
Chief Minister of West Bengal and Hooghly Zila Parishad, WB, India.

Publications and Preprints

In Preparation

A. Adhikari, F. Herschelman, H. Rüter, W. Tichy, T. Dietrich, V. Sagun, E. Giangrandi, "Dark matter admixed binary neutron stars mergers: Independently spinning baryonic and dark matter", in preparation.

M. Pirog, **A. Adhikari**, W. Tichy, F. Torshizi, "Gravitational waves from mergers of precessing binary neutron stars with large eccentricities", in preparation.

L. Ji, **A. Adhikari**, W. Tichy, "Toward Moving Puncture Simulations with the Generalized Harmonic System", in preparation.

Preprints

E. Giangrandi, H. R. Ruter, N. Kunert, M. Emma, A. Abac, **A. Adhikari**, T. Dietrich, V. Sagun, W. Tichy, C. Providencia, "Numerical Relativity Simulations of Dark Matter Admixed Binary Neutron Stars" (2025),
arXiv: 2504.20825 [astro-ph.HE].

A. Adhikari, W. Tichy, L. Ji, A. Poudel, "Neutron star evolution by combining discontinuous Galerkin and finite volume methods" (2025),
arXiv: 2502.07204 [gr-qc].

Published

A. Gonzalez, F. Zappa, M. Breschi, S. Bernuzzi, D. Radice, **A. Adhikari**, A. Camilletti, S. V. Chaurasia, G. Doulis, S. Padamata, A. Rashti, M. Ujevic, B. Brügmann, W. Cook, T. Dietrich, A. Perego, A. Poudel, W. Tichy, "Second release of the CoRe database of binary neutron star merger waveforms", Class. Quantum Grav. 40 085011 (2023),
url: https://dx.doi.org/10.1088/1361-6382/acc231, arXiv: 2210.16366 [gr-qc].

W. Tichy, L. Ji, **A. Adhikari**, A. Rashti, M. Pirog, "The new discontinuous Galerkin methods based numerical relativity program Nmesh", Class. Quantum Grav. 40, 025004 (2023),
url: https://dx.doi.org/10.1088/1361-6382/acaae7, arXiv: 2212.06340 [gr-qc].

R. Dudi, **A. Adhikari**, B. Brügmann, T. Dietrich, K. Hayashi, K. Kawaguchi, K. Kiuchi, K. Kyutoku, M. Shibata, W. Tichy, "Investigating GW190425 with numerical-relativity simulations", Phys. Rev. D106, 084039 (2022),
url: https://link.aps.org/doi/10.1103/PhysRevD.106.084039, arXiv: 2109.04063 [astro-ph.HE].

A. Adhikari, K. Bhattacharya, C. Chowdhury, B. Majhi, "Fluctuation-dissipation relation in accelerated frames", Phys. Rev. D97, 045003 (2018),
url: https://link.aps.org/doi/10.1103/PhysRevD.97.045003, arXiv: 1707.01333 [gr-qc].

Conference Presentations

"Recent neutron star simulations with the Nmesh Program", March 18, 2025
American Physical Society (APS) Global Physics Summit 2025,
Anaheim Marriott, Anaheim, CA, USA.

"Neutron star evolution by combining discontinuous Galerkin and finite volume methods", March 3, 2025
Invited talk, Numerical Relativity Community Calls,
Virtual Meeting Presentation.

"Neutron Star Evolutions with the Nmesh Program", April 4, 2024
American Physical Society (APS) April Meeting 2024,
SAFE Credit Union Convention Center, Sacramento, CA, USA.

"Neutron Star Tests with the Nmesh Program", April 16, 2023
American Physical Society (APS) April Meeting 2023,
Hilton Minneapolis, Minneapolis, MN, USA.

"Neutron Star Tests with the Nmesh Program", April 1, 2023
39th Pacific Coast Gravity Meeting,
Cahill Center for Astronomy and Astrophysics, Caltech, Pasadena, CA, USA.

"Relativistic blast wave and single neutron star tests with the Nmesh Code", April 11, 2022
APS April Meeting 2022,
New York Marriott Marquis Hotel, New York, NY, USA.

"Scalar wave and shock propagation tests with the Nmesh code", April 19, 2021
APS April Meeting 2021,
Virtual Meeting Presentation.

Research Experience

Doctoral Research **2018-present**

- Discontinuous Galerkin method-based numerical relativity (NR) program Nmesh written in C, specifically focusing on handling hydrodynamic shocks and non-smooth features and optimizing Nmesh's capability of simulating neutron stars to obtain higher accuracy efficient results.
- Analysis of LIGO GW observation event GW190425 by modeling it as a Binary Neutron Star (BNS) merger event and studying the effect of different Equations of State on various aspects such as the GW signal, remnant mass after merger, etc, using the BAM NR program.

- Sgrid Program generated NR initial data for BNSs with a dark matter core and the 2 fluids spinning independently, simulated with the BAM NR program, and analyzing the GW signals to gain new insight into the properties of dark matter and baryonic matter and their interactions.
- Simulations with precessing eccentric BNS Sgrid initial data with the BAM code using the entropy-limited hydrodynamics approach of using linearly combined high-order and low-order fluxes and studying the resulting GW signals.
- Working on single black hole simulations with Nmesh, focusing on testing and optimizing convergence of the numerical results.

Research Project **2016-2017**

- Conducted research related to conformal theory to demonstrate how well-known non-equilibrium statistical phenomenon corresponding to the fluctuation-dissipation theorem holds for the Unruh or Hawking radiation.

MS Thesis Research **2015-2016**

- Studied some preliminary dynamics of Goldstone modes due to spontaneous symmetry breaking of scalar electrodynamics, such as coupling the gauge fields with the Goldstone modes.

Technical Skills

- Programming languages and mathematical packages: C, Python, Bash, C++, Java, Mathematica, Matlab.
- Other: Linux, Valgrind, GNU Debugger, LaTeX, Windows OS.

Professional Experience

Graduate Teaching Assistant **2017-present**
Physics Department, Florida Atlantic University.

- Taught General Physics and College Physics I and II laboratory courses, including theory explanation, demonstration of experimental procedure, carrying out discussions and clarifying queries of students, grading of lab reports and designing and grading quizzes during 2017-present.
- Set up equipment for weekly lab-sessions for all students and TAs for all experiments during 2017-present.
- Developed course material for entire General Physics and College Physics I and II laboratory courses used by approximately 700 students and about 20 graduate teaching assistants (GTAs) in the entire department every semester during 2020-present.

- Helped develop course structure and policies for online General Physics and College Physics I and II laboratory courses during 2020-2021.
- Assisted training new GTAs for General Physics and College Physics I and II laboratory courses as Senior GTA in 2022.
- Managed and maintained equipment supply and status and overall well-functioning of General Physics and College Physics I and II laboratories and trained new GTAs to perform lab setup during 2019-2022.

Graduate PhD Candidate in Physics **2017-present**
Physics Department, Florida Atlantic University.

- Testing, developing and optimizing the C-based numerical general relativistic program, Nmesh, during 2017-present.
- Generating initial data with the Sgrid Program and running BNS simulations with the BAM program, during 2017-present.
- Mentoring an undergraduate student in generating initial data for spinning BNS with dark matter core using the Sgrid program and then evolving them with the BAM program during 2023-present.
- Mentoring a doctoral student in simulating precessing eccentric BNS Sgrid initial data with the BAM code using the entropy-limited hydrodynamics approach during 2024.
- Helped prepare research proposals for computational time on supercomputers through XSEDE and ACCESS during 2022-2023.

Research Project Scholar in Physics **2016-2017**
Physics Department, Indian Institute of Technology Guwahati.

- Conducted research related to Unruh radiation and Hawking Radiation through a non-equilibrium statistical approach.

Professional Membership

Member of the American Physical Society (APS). 2021-present

Community Service

Eye Donation Pledge Camp, SBA Foundation, Hooghly, WB, India.	2022
Social Outreach Project, SBA Foundation, Dhatal Adibasipara, WB, India.	2021
Middle School and High School Regional Science Olympiad Competition, FAU, Boca Raton, FL.	2018
Expo for High School Students, FAU, Boca Raton, FL.	2017
Annual Pumpkin Drop and Physics Carnival, FAU, Boca Raton, FL.	2017-19, 2022-2024