Alex Pandya

Contact Information

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Research Interests

I am broadly interested in **high-energy astrophysical systems**, **strong-field gravity**, and **computational physics**.

Specific topics of interest include *relativistic viscous fluids*, *black holes*, *neutron stars*, *numerical PDE*, and *high-performance computing*, to name a few.

Professional Experience

Cornell University 2023–Present
Postdoctoral Associate, Center for Astrophysics and Planetary Science

Princeton University 2019–2023
NSF Graduate Research Fellow

University of Illinois at Urbana-Champaign (UIUC) 2014–2017
Undergraduate Researcher

Education

Princeton University 2019–2023
Ph.D. in Physics
Dissertation: "Toward astrophysics applications of causal, stable relativistic dissipative hydrodynamics"
Advisor: Prof. Frans Pretorius

Princeton University 2017–2019
M.A. in Physics

University of Illinois at Urbana-Champaign (UIUC) 2013–2016
B.S. in Physics
Minor: *Mathematics*

Grants, awards, & scholarships

Kusaka Memorial Prize in Physics 2022
Award for "outstanding performance in research and professional promise"; $3,000.
Department of Physics, Princeton University

NSF Graduate Research Fellowship 2019–2022
Competitive national fellowship grant totaling $138,000.
US National Science Foundation

Honorable Mention, Computational Science Graduate Fellowship 2017
Competitive national fellowship waitlist/honorable mention.
US Department of Energy

Robert E. Hetrick Outstanding Senior Thesis Award 2017
Award recognizing "outstanding independent research by an undergraduate"; $250.
Department of Physics, UIUC

Member, Phi Beta Kappa Honor Society 2016
UIUC

National STEM Scholarship 2016
Winner of a national scholarship competition for STEM undergrads; $5,000.
LGS Innovations LLC

Dean's List 2013–2016
UIUC

Lorella M. Jones Summer Research Fellowship 2015
Fellowship supporting summer research "for outstanding undergraduates"; $2,500.
Department of Physics, UIUC

Chancellor's Scholarship 2013–2014
Merit scholarship for incoming freshmen; $1,000.
UIUC

N. & D. Waffle Scholarship 2013
Merit scholarship for incoming freshman in the College of Agriculture; $2,000.
Department of Crop Sciences, UIUC

Publications

1. **Alex Pandya**, Elias R. Most, Frans Pretorius, "Causal, stable first-order viscous relativistic hydrodynamics with ideal gas microphysics" *Phys. Rev. D* **106** 123036 arXiv:2209.09265 (2022).
2. **Alex Pandya**, Justin L. Ripley, "Dynamics of a nonminimally coupled scalar field in asymptotically AdS_4 spacetime" *Class. Quantum Grav.* arXiv:2206.08854 (2022).
3. **Alex Pandya**, Elias R. Most, Frans Pretorius, "Conservative finite volume scheme for first-order viscous relativistic hydrodynamics" *Phys. Rev. D* **105** 123001 arXiv:2201.12317 (2022).
4. Andrew Marszewski, Ben S. Prather, Abhishek V. Joshi, **Alex Pandya**, Charles F. Gammie, "Updated Transfer Coefficients for Magnetized Plasmas" *ApJ*, 921:17 arXiv:2108.10359 (2021).
5. **Alex Pandya**, Frans Pretorius, "Numerical exploration of first-order relativistic hydrodynamics" *Phys. Rev. D* **104** 023015 arXiv:2104.00804 (2021).
6. **Alex Pandya**, Frans Pretorius, "The Rotating Black Hole Interior: Insights from Gravitational Collapse in AdS_3" *Phys. Rev. D* **101** 104026, arXiv:2002.07130 (2020).
7. **Alex Pandya**, Mani Chandra, Abhishek Joshi, Charles F. Gammie, "Numerical Evaluation of the Relativistic Magnetized Plasma Susceptibility Tensor and Faraday Rotation Coefficients" *ApJ*, 868:13 arXiv:1810.05530 (2018).
8. **Alex Pandya**, Zhaowei Zhang, Mani Chandra, Charles F. Gammie, "Polarized Synchrotron Emissivities and Absorptivities for Relativistic Thermal, Power-Law, and Kappa Distribution Functions" *ApJ*, 822:34 arXiv:1602.08749 (2016).

Invited talks

Nuclear Theory Group Seminar, *Bielefeld University* (virtual) February 2023
"Finite volume methods for relativistic dissipative hydrodynamics"

Strong Gravity Seminar, *Perimeter Institute for Theoretical Physics* January 2023
"On dissipation in relativistic fluid theories"

Numerical Relativity Community Call, *SXS Collaboration* (virtual) December 2022
"Numerical methods for first-order viscous relativistic hydrodynamics"

PDE Seminar, *Vanderbilt University Dept. of Mathematics* April 2022
"Initial investigations of causal, stable first-order relativistic hydrodynamics"

Medium & High Energy Physics Seminar, *UIUC Dept. of Physics* January 2022
"Initial investigations of causal, stable first-order relativistic hydrodynamics"

Conferences & Workshops

APS April Meeting, *Minneapolis, MN* April 2023
Contributed talk, "Modeling neutron stars using first-order viscous relativistic hydrodynamics"

Numerical Relativity Community Summer School, *Providence, RI* August 2022

APS April Meeting, *New York, NY* April 2022
Contributed talk, "Conservative finite volume scheme for BDNK relativistic dissipative hydrodynamics"

APS April Meeting, *Online* April 2021
Contributed talk, "Numerical methods for relativistic dissipative fluids"

APS April Meeting, *Online* April 2020
Contributed talk, "The Rotating Black Hole Interior: Insights from Gravitational Collapse in (2+1)D"

UIUC Undergraduate Research Symposium, *Champaign, IL* April 2016
Poster presentation, "Polarized Synchrotron Emissivities and Absorptivities for Relativistic Thermal, Power-Law, and Kappa Distribution Functions"

UIC College of Medicine Summer Science Forum, *Rockford, IL* August 2012
Poster presentation, "Synergistic Effects of c-Met and BRAF Inhibitors in Overcoming Tyrosine Kinase Inhibitor Resistance in Malignant Melanoma"

Teaching Experience

TA, Princeton: *Physics 104, General Physics II* Spring 2021

TA, Princeton: *Physics 103, General Physics I* Fall 2020

TA, Princeton: *Physics 115, Physics for Future Leaders* Fall 2019

TA, Princeton: *Physics 102, Introductory Physics II* Spring 2019

TA, Princeton: *Physics 103, General Physics I* Fall 2018

Leadership & Service

Zoom a Princeton Physicist 2022–2023
Spoke to high school physics classes about careers in research.

Princeton Graduate Student Buddy Program 2022–2023
Mentored incoming Princeton graduate students.

Physics Unlimited Premier Competition 2022
Volunteered to help with a high school physics competition.

Princeton Physics Ambassadors 2021–2023
Designed and staffed a series of webinars about graduate school, aimed at students from communities historically underrepresented in physics.

Princeton Society of Physics Students Mentorship Program 2018–2023
Mentored physics majors as they started coursework and the search for research opportunities.

ReMatch Peer Mentor 2018–2019
Mentored freshmen and sophomores as they started their first research experiences in science.

Cosmology for Kids 2018
Presented and explained cosmology-themed physics demonstrations to children of all ages and their parents.

YMCA of Trenton STEM Camp 2018
Designed a curriculum and presented a series of activities aimed to make science accessible and interesting for children aged 5–13, mainly from communities underrepresented in STEM.

UIUC Physics Peer Mentor 2016
Mentored incoming physics majors during their first semesters of college.

REFEREE **The Astrophysical Journal** 2023–Present