

SNEH PANDYA

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SUMMARY

I am a fifth-year Ph.D. candidate in the Department of Physics at Northeastern University and a junior researcher at the NSF Institute for Artificial Intelligence and Fundamental Interactions (IAIFI). My research interests broadly lie at the intersection of machine learning and cosmology, with a particular focus on particle cosmology, weak gravitational lensing, and robustness of neural networks. My work utilizes differentiable programming/simulations, Bayesian inference, optimal transport theory, and equivariance. Prior to pursuing my Ph.D., I worked in AI & computational astrophysics.

EDUCATION

Northeastern University

2021-Present

Ph.D., Physics

Advisors: Jim Halverson & Jonathan Blazek

Expected Graduation: May 2026

University of Illinois at Urbana-Champaign

2017-2021

B.S., Physics, Minors in Mathematics & Astronomy

GPA: 3.79/4.00

Treasurer of Sigma Nu Fraternity

PAPERS

S. Pandya, Y. Yang, N. V. Alfen, J. Blazek, R. Walters. A Diffusion Generative Model for Galaxy Intrinsic Alignments. *In Progress*.

S. Pandya, J. Halverson. Differentiably Learning Probabilities in the Inflationary Multiverse. *In Progress*.

S. Pandya, Y. Yang, N. V. Alfen, J. Blazek, R. Walters. IAEmu: Learning Galaxy Intrinsic Alignment Correlations. *Under Review at Open Journal of Astrophysics, 2025*. arXiv:2504.05235

E. Berman, **S. Pandya**, J. McCleary, et al. On Soft Clustering for Correlation Estimators: Model Uncertainty, Differentiability, and Surrogates. *Open Journal of Astrophysics, 2025*. arXiv: 2504.06174

S. Pandya, P. Patel, M. Walmsley, B. Nord, A. Ciprijanovic. SIDDA: Sinkhorn Dynamic Domain Adaptation for Image Classification with Equivariant Neural Networks. *Mach. Learn.: Sci. Technol. 6 035032 (2025)*. arXiv:2501.14048

S. Pandya, J. Halverson. On the Generality and Persistence of Cosmological Stasis. *Phys. Rev. D 110, 075041 (2024)*. arXiv:2408.00835.

S. Pandya, Y. Yang, N. V. Alfen, J. Blazek, R. Walters. Learning Galaxy Intrinsic Alignment Correlations. *ICLR Data-centric Machine Learning Research (2024)*. arXiv:2404.13702.

S. Pandya*, P. Patel*, F. O., J. Blazek. E(2) Equivariant Neural Networks for Robust Galaxy Morphology Classification. *NeurIPS Machine Learning for the Physical Sciences (2023)*. arXiv:2311.01500.

S. Pandya*, J. Lin*, D. Pratap, X. Liu, M. Kind, V. Kindratenko. AGNet: Weighing Black Holes with Deep Learning. *MNRAS, 518, 4921 (2023)*. arXiv:2108.07749

S. Pandya*, J. Lin*, D. Pratap, X. Liu, M. Kind. AGNet: Weighing Black Holes with Machine Learning. *NeurIPS Machine Learning for the Physical Sciences (2020)*. arXiv:2011.15095

WORK

Department of Energy SCGSR Fellow
Fermilab

August 2024 - February 2025
Batavia, IL

- Working on augmenting symmetry-aware equivariant neural networks to be robust to distributional shifts in data quality and adversarial attacks, utilizing optimal transport theory and domain adaptation techniques.

SPIN Intern & NSF REU Fellow
National Center for Supercomputing Applications

August 2019 - May 2021
Urbana, IL

- Utilized HAL supercomputing cluster to accelerate neural network training time, execute data simulation pipeline to expand training data set, and create informative visualizations for a general audience.

SCHOOLS & WORKSHOPS

IAIFI PhD Summer School and Workshop (Organizer, Presenter)	August 2025
IAIFI PhD Summer School and Workshop (Organizer)	August 2024
IAIFI PhD Summer School and Workshop (Organizer)	August 2023
IAIFI PhD Summer School and Workshop	August 2022
Princeton Deep Learning Theory Summer School	July 2021

CONFERENCES & PRESENTATIONS

NSF-Simons Open SkAI, <i>Poster</i>	2025
IAIFI Workshop, <i>Oral Presentation</i>	2025
IAIFI Summer School, <i>Tutorial Lead</i>	2025
NSF-Simons SkAI Institute Undergraduate Symposium, <i>Lightning Talk</i>	2025
DESC Intrinsic Alignment Telecon, <i>Oral Presentation</i>	2025
NSF-Simons SkAI Institute, <i>Oral Presentation</i>	2025
Institute of Astrophysics of the Canary Islands, <i>Oral Presentation (Invited)</i>	2025
Fermilab AI Meeting, <i>Oral Presentation</i>	2025
Cosmology & Galaxy Astrophysics w/ Simulations & ML 2024 @ Flatiron, <i>Oral Presentation</i>	2024
echoIA LILAC Workshop @ Harvard, <i>Lightning Talk</i>	2024
IAIFI Workshop @ MIT, <i>Poster</i>	2024
Tufts University, <i>Oral Presentation (Invited)</i>	2024
Fermilab Surveys Meeting, <i>Oral Presentation</i>	2024
Neural Information Processing Systems (NeurIPS) Workshop, <i>Poster</i>	2023
Mathematical Physics Days, <i>Oral Presentation (Invited)</i> (Video)	2021
Illinois Astrofest, <i>Poster (1st Place)</i>	2021
Neural Information Processing Systems (NeurIPS) Workshop, <i>Poster</i> (Video, Poster)	2020
Illinois Undergraduate Research Symposium, <i>Poster</i> (Video, Poster, Press)	2020

OUTREACH

John Hersey High School, <i>Lecture</i> , “Synergies Between AI & Physics”	2024
Northeastern University, <i>Seminar</i> , “Machine Learning, Neural Networks, & All That”	2022
Urbana High School, <i>Lecture</i> , “Black Holes & AI”	2020
John Hersey High School, <i>Lecture</i> , “Black Holes & AI”	2020

AWARDS & RECOGNITION

Fiddler Innovation Undergraduate Fellowship Award

2021

*National Center for Supercomputing Applications**Urbana, IL*

- \$1500 awarded to undergraduate students showing outstanding contributions during the Summer 2020 REU Inclusion program. The Fiddler Fellowship award is part of a \$2 million-dollar endowment from Jerry Fiddler and Melissa Alden to the University of Illinois in support of student interdisciplinary research initiatives through the Illinois eDream Institute at NCSA.

SERVICE & TEACHING

International Conference on Machine Learning (ICML) 2025

Reviewer for the GenBio workshop

International Conference on Machine Learning (ICML) 2025

Reviewer for the ML4Astro workshop

International Conference on Learning Representations (ICLR) 2023

Reviewer for the ICLR-DMLR workshop

Conference on Neural Information Processing Systems (NeurIPS) 2022, 2023

Reviewer for NeurIPS-AI4Science workshop

International Conference on Machine Learning (ICML) 2022

Reviewer for the ICML-AI4Science workshop

Department of Physics 2021-2023*Northeastern University**Boston, MA*

- Teaching assistant, Physics for Life Sciences Lab / Physics for Engineering Lab
- Teaching assistant, Physics for Engineering Discussion
- Teaching assistant, Graduate Computational Physics
- Teaching assistant, Undergraduate Computational Physics

Programming: Python, scientific computing, differentiable programming, probabilistic programming**Other:** rock-climber, lifter, photographer, concert-goer, washed-up tennis player, record-collector