

# SNEH PANDYA

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## SUMMARY

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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

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### 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

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**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. *Machine Learning: Science & Technology, 2025*. arXiv:2501.14048

**S. Pandya**, J. Halverson. On the Generality and Persistence of Cosmological Stasis. *Physical Review D, 2024*. arXiv:2408.00835.

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

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

**S. Pandya\***, J. Lin\*, D. Pratap, X. Liu, M. Kind, V. Kindratenko. AGNet: Weighing Black Holes with Deep Learning. *Monthly Notices of the Royal Astronomical Society, 2022*. arXiv:2108.07749

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

## WORK

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**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

August 2019 - May 2021

*National Center for Supercomputing Applications*

*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

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

## CONFERENCES & PRESENTATIONS

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IAIFI Summer School, <i>Tutorial Lead</i>	2025
NSF SkAI Institute Undergraduate Symposium, <i>Lightning Talk</i>	2025
DESC IA 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

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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

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**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

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**Programming:** Python (Jax, PyTorch, numpy, sklearn, Pandas, AstroPy, Numpyro, escnn), RStudio  
**Other:** photographer, concert-goer, washed-up tennis player, record-collector