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. `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

Department of Energy SCGSR Fellow August 2024 - February 2025
Fermilab *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

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

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

OUTREACH

John Hersey High School, *Lecture*, "Synergies Between AI & Physics" 2024
Northeastern University, *Seminar*, "Machine Learning, Neural Networks, & All That" 2022
Urbana High School, *Lecture*, "Black Holes & AI" 2020
John Hersey High School, *Lecture*, "Black Holes & AI" 2020

AWARDS & RECOGNITON

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 Discusssion
- Teaching assistant, Graduate Computational Physics
- Teaching assistant, Undergraduate Computational Physics

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