SNEH PANDYA

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SUMMARY

I am a fourth-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

E. Berman, **S. Pandya**, J. McCleary, et al. On Soft Clutering for Correlation Estimators: Model Uncertainty, Differentiability, and Surrogates. In preparation. OJA.

S. Pandya, Y. Yang, N. V. Alfen, J. Blazek, R. Walters. `IAEmu`: Learning Galaxy Intrinsic Alignment Correlations. In preparation. MNRAS.

S. Pandya, P. Patel, M. Walmsley, B. Nord, A. Ciprijanovic. `SIDDA`: SInkhorn Dynamic Domain Adaptation for Image Classificaiton with Equivariant Neural Networks. *Under Review at MLST*, 2024. 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**) ..... *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

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

Northeastern University, *Seminar*, "Machine Learning, Neural Networks, & All That" 2022
Urbana High School, *Lecture*, "Black Holes & AI" 2020
John Hersey High School (JHHS), *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 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: photographer, concert-goer, washed-up tennis player, record-collector