Andrew Morgan
Tucson, AZ
morgaan@alumni.iu.edu

Education

Indiana University Bloomington, IN
B.Sc. in Astronomy & Astrophysics, B.Sc. in Physics, B.Sc. in Mathematics *May, 2023*

Undergraduate Theses

- A Python-Based Machine-Learning Model of the Milky Way's Chemical Structure and Atomic Interstellar Absorption
- The Thermodynamic Effects of Metallicity on Star Formation

Research Experience

NSF's NOIRLab / Astro Data Lab Tucson, AZ
Research Science Intern (CosmicAI, DESI Collaboration) *Sep 2025 – Present*

- Developing AEON-Flow, a deep learning framework that provides a probabilistic standard for DESI data validation, trained on 1.1M+ spectra.
- Architected Plato ($\sim$190M params), a multi-modal transformer with a spectral-similarity (CCF-defined) preserving latent space.
- Designed Aristotle ($\sim$48M params), a distilled (student) CNN & self-attention model, to provide fast, spectrum-only inference for deployment in the live Redrock redshift pipeline.
- Implementing Kanon Flow, a redshift-conditioned Continuous Normalizing Flow (CNF) for probabilistic outlier detection.
- Training all models in multi-node, multi-GPU environments on the TACC Vista and NERSC Perlmutter supercomputers

Publications

AEON-Flow I: Structured Latent Spaces with Ratio-Preserving Similarity Loss | *Morgan, A., Juneau, S.* In Prep
- Details the AEON-Flow framework, focusing on the 'Plato' teacher model; its architecture and latent space. First in a series.

AEON-Flow First Applications: Detection and Extraction of Post-Starburst Subtypes | *Morgan, A., Juneau, S.* In Prep
- Letter on the AEON-Flow framework, focusing on the 'Plato' teacher model; first uses in subpopulation detection, extraction, and study.

AEON-Flow II: Redshift Anomaly Detection with Continuous Normalizing Flows | *Morgan, A., Juneau, S.* In Prep
- Details the AEON-Flow framework, Focusing on the teacher-student distillation and the resulting 'Aristotle'/'Kanon Flow' instrument for identifying spectral and redshift anomalies in DESI. Second in a series.

Presentations & Posters

AAS 247 | *Abstract & Poster* UPCOMING: Jan 2026
- Presented preliminary results from the AEON-Flow suite as an e-poster and abstract at the AAS 247 in Phoenix.

FLASH Talk | *Powerpoint Presentation* UPCOMING: Dec 2025
- Presented AEON-Flow research updates to NOIRLab faculty as a FLASH Talk presentation.

DESI Winter Collaboration Meeting | *Poster* UPCOMING: Dec 2025
- Presented AEON-Flow research to DESI collaborators as a poster at the DESI Winter Collaboration Meeting.

DESI Data Telecon | *Invited Talk* Oct 2025
- Presented preliminary work on using continuous normalizing flows for redshift prediction, redshift correction, and outlier detection to the DESI Data team.

Technical Skills

Languages: Python, C++, SQL
Frameworks: PyTorch, Scikit-Learn, Pandas, Numpy, Scipy
Tools: Git, LaTeX, SLURM, HDF5, Astro Data Lab, Sparcl

Additional Experience

Hendrickson Suspension Lebanon, IN

Data Analyst Intern *Dec 2020 – Aug 2021*

- Drove data analysis for an assembly line re-balancing project, leveraging ML to optimize workloads and achieve an 18% increase in production efficiency.
- Automated site data management and streamlined daily operational reporting for department leads.