PATRICK D. ALEO

CURRICULUM VITÆ

PH.D. CANDIDATE IN ASTRONOMY — University of Illinois at Urbana-Champaign

CONTACT

Office: The University of Illinois at Urbana-Champaign
Department of Astronomy
128 Astronomy Building, 1002 W. Green Street, Urbana, IL 61801, USA

Email: paleo2@illinois.edu
Phone: +1 (860) 389 8203

EDUCATION

The University of Illinois at Urbana-Champaign — *Aug. 2018 – Present*
Pursuing Ph.D. in Astronomy

The University of Texas at Austin — *Aug. 2014 – Dec. 2017*
Completed B.S. Astronomy, B.S. Physics

REFEREED PUBLICATIONS

5 First-Author · 18 Total Publications · 1 Preprint · 289 Citations · h-index 8 · i10-index 8 *See*: Publications

SELECTED RESEARCH EXPERIENCE

THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Advisor: Prof. Gautham Narayan — Graduate Assistant, Illinois Transient Science Group

Similarity Searches for Transient Discovery and Anomaly Detection in the era of LSST — *Dec. 2022 – Present*
Currently developing and applying similarity search methods in large streaming data volumes for transient discovery, anomaly detection, and follow-up recommendation.

Photometric Classification for the Young Supernova Experiment (YSE) — *Sep. 2020 – Present*
Lead the First Data Release (DR1) for the Young Supernova Experiment (YSE) survey's first ∼2 years of operation. Prepared light curve forced photometry data, generated cutting-edge YSE+ZTF simulations, and trained and deployed the hybrid physics-VAE model *ParSNIP* for multi-band time-evolving photometric classification of 1975 YSE-observed transients including Type Ia supernovae (SNe), core-collapse SNe, and anomalies. ***Publication:*** Aleo et al. 2022, The Astrophysical Journal Supplement Series (submitted)

`SNAD` Transient Miner: Finding Missed Transient Events in ZTF DR4 — *Oct. 2021 – Present*
Pioneered a new method to calculate light curve features of simulations and use k-D trees and PCA to search for nearest matching light curve features of missed transient events in ZTF Data Releases. Found 11 missed transients (7 supernovae, 4 active galactic nuclei candidates). ***Publication:*** Aleo et al. 2022, New Astronomy

Real-Time Anomaly Detection — *Jan. 2020 – Present*
Built a real-time anomaly detection filter for ZTF broker ANTARES using machine learning techniques for transient detection. Highlights include a microlensing event, supernovae, and a luminous red nova in M31.

Advisors: Prof. Donna J. Cox, Prof. Matthew J. Turk — Advanced Visualization Lab, NCSA

Clustering Methods for Cinematic Astrophysical Data Visualization — *Jan. 2019 – Aug. 2020*
Developed Python pipeline, `Estra`, to enable scientists in creating their own production-quality visualizations in Houdini FX for publication, simulation testing, or public outreach using machine learning clustering algorithm results. Discovered and visualized "physically interpretable" clusters in the Moon-forming synestia simulation. ***Publication:*** Patrick D. Aleo et al. 2020, Astronomy and Computing

PROFESSIONAL AFFILIATIONS & SERVICE

The LSST Dark Energy Science Collaboration (DESC)
The LSST Transient & Variable Stars Collaboration (TVS)
The Advanced Visualization Lab (AVL) at NCSA
Center for AstroPhysical Surveys (CAPS) at NCSA
Reviewer for The Astronomical Journal
The ANTARES Project
The Young Supernova Experiment (YSE)
SuperNova Anomaly Detection (SNAD) Collab.
Supernova Machine Learning Topical Team (SMaLTT)

HONORS, AWARDS & FELLOWSHIPS

$30000, *Center for AstroPhysical Surveys (CAPS) Fellow* ***(2x)*** — *Aug. 2020 - Aug. 2022*
$10000, *Fiddler Innovation Scholar* — *Jan. 2020 – May 2020*
$1000, *Summer Digital Methods Fellow* — *Jun. 2020*