

# PATRICK D. ALEO

## CURRICULUM VITÆ

ASTRONOMY PH.D. CANDIDATE

University of Illinois at Urbana-Champaign

### CONTACT

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### 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

### PUBLICATIONS

5 First-Author · 18 Total Publications · 326 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](#)*  
*Press Release: [CAPS, NCSA Present First Data Release From Young Supernova Experiment](#)*

**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](#)*

*Advisor: Prof. Xin Liu*

**Star/Galaxy Instance Segmentation with Mask R-CNN Deep Learning** *May 2019 – Present*  
Applied a new deep learning technique to detect, classify, and deblend sources in multi-band astronomical images. Trained and evaluated the performance of an artificial neural network built on the Mask R-CNN image processing framework, a general code for efficient object detection, classification, and instance segmentation.  
*Publication: [Colin J. Burke, Patrick D. Aleo et al. 2019, MNRAS](#)*

*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](#)*

### HONORS, AWARDS & FELLOWSHIPS

*\$1000, [2023 Mr. and Mrs. Hsiang-Pai and Wen-Hua Chu Award](#)* *Mar. 2023*  
*\$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*