Saarah Hall

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Education

Northwestern University   Evanston, IL
Ph.D. Student, Astronomy   September 2022 - present
 Certificate: Integrated Data Science
 Advisor: Adam A. Miller

University of Pennsylvania   Philadelphia, PA
B.A., Physics (with Departmental Honors), cum laude   August 2018 - May 2022
 Concentration: Astrophysics
 Advisor: Gary Bernstein

Research Experience

Hierarchical Models of BTS Supernovae   May 2024 - present
Northwestern University
Advisor: Assistant Professor Adam A. Miller

- Implementing hierarchical Bayesian models for thousands of supernova light curves from the Bright Transient Survey (BTS) using probabilistic programming library 'numpyro'
- Deriving time-dependent luminosity functions from fine-tuned model hyperpriors

Data Reduction Pipeline for SEDM-KP   November 2022 - present
Northwestern University
Advisor: Assistant Professor Adam A. Miller

- Developing the photometric data reduction pipeline (DRP) for the Spectral Energy Distribution Machine at Kitt Peak (SEDM-KP, formerly SEDMv2)
- Collaborating across institutions to develop an open-source Python package for DRP building; the Modular Image Reduction and Analysis Resource (MIRAR)
- Regularly monitoring and observing with SEDM-KP during commissioning phase

Scene Modeling Photometry on HPM Stars   August 2021 - August 2022
University of Pennsylvania - Senior Honors Thesis
Advisor: Professor Gary Bernstein

- Modeling images from the Dark Energy Survey (DES) as sums of point spread functions (PSFs)
- Optimizing models of images for precise measurements of fluxes and motions of high-proper-motion (HPM) stars discovered in the DES

Optical Counterparts to Gravitational Waves   June 2021 - August 2021
Northwestern University CIERA REU
Advisors: Dr. Kerry Paterson and Professor Wen-Fai Fong

- Analyzing and reducing image data from Steward Observatory's Bok Telescope using Python
- Upgrading image subtraction software to facilitate the counterpart candidate vetting process by writing and integrating Python code into the team's pipeline

Animating Trans-Neptunian Objects   May 2020 - May 2021
University of Pennsylvania
Advisor: Professor Gary Bernstein

- Developing Python code to transform numerical data into an animation of any Trans-Neptunian Object (TNO) detected in the Dark Energy Survey (DES)
- Curating a video which visualizes 800+ TNOs from their first detection to their orbital patterns over thousands of years (see video also at vimeo.com/662683536)

Software	Robert Stein, Viraj Karambelkar, Sulekha Kishore, **Saarah Hall**, Benjamin Roulston, & Jamie Soon (2024), *MIRAR*, DOI: 10.5281/zenodo.11043914 *Photometric reduction code, used for WINTER, SEDM-KP, DREAMS, GMOS, WASP, and WIRC*

Awards & Honors		
LSST Discovery Alliance Data Science Fellowship Program	2025 - 2027
Illinois Space Grant Graduate Fellow, *Northwestern*	2024 - 2025
GEM Associate Fellow, *Northwestern*	2022 - 2024
Dean's List, *UPenn*	2021 - 2022
Hispanic Scholarship Fund	2021
NSF REU Stipend	2021
Allied Family Scholarship Fund	2018 - 2021, 2023-2024
Vagelos Endowed Scholarship in Molecular Life Sciences, *UPenn*	2018 - 2021
American Association of Physics Teachers (AAPT)	2018
Outstanding Physics Student of the Year	

Posters & Presentations

Deriving Time-Dependent Supernova Luminosity Functions via Hierarchical Bayesian Modeling
Contributed Talk; January 2025; 245th American Astronomical Society (AAS) Meeting

Deriving Time-Dependent Supernova Luminosity Functions via Hierarchical Bayesian Modeling
Poster Presentation; August 2024; Rise_Time Conference at Purdue

Status Update on SEDMv2's Photometric Data Reduction Pipeline
Contributed Talk; October 2023; ZTF 5th Science Meeting

Data reduction pipeline for SEDMv2 built with MIRAR
Contributed Talk; October 2023; CIERA Observational Group Meeting

Photometric Data Reduction Pipeline for the Spectral Energy Distribution Machine Version 2 (SEDMv2)
Poster Presentation; June 2023; Transient and Variable Universe Conference at UIUC

Searches After Gravitational-waves Using ARizona Observatories (SAGUARO): Updating Optical Counterpart Search Methods
iPoster Presentation; June 2022; 240th American Astronomical Society (AAS) Meeting

Gravitational Waves: Streamlining the Optical Counterpart Search
Virtual Poster; August 2021; CIERA REU Poster Session

The DES Year 6 catalog of trans-Neptunian objects
Bernardinelli, P. and **Hall, S.**
Virtual Presentation; May 2021; Dark Energy Survey (DES) Videocon

Animating TNOs
Virtual Presentation; July 2020; UPenn P&A Undergraduate Summer Research Academy

Publications

Adam A. Miller, Natasha S. Abrams, Greg Aldering, and 75 others, including **Saarah Hall** (2025), *The La Silla Schmidt Southern Survey*, arXiv:2503.14579

Yashvi Sharma, Jesper Sollerman, Shrinivas Kulkarni, and 33 others, including **Saarah Hall** (2024), *Dramatic Rebrightening of the Type-changing Stripped-envelope Supernova SN 2023aew*, ApJ, 966, 199. 10.3847/1538-4357/ad3758

Griffin Hosseinzadeh, Kerry Paterson, and 15 others, including **Saarah Hall** (2024), *SAGUARO: Time-domain Infrastructure for the Fourth Gravitational-wave Observing Run and Beyond*, ApJ, 964, 35. 10.3847/1538-4357/ad2170

Chang Liu, Adam A. Miller, and 29 others, including **Saarah Hall** (2023), *SN 2022joj: A Peculiar Type Ia Supernova Possibly Driven by an Asymmetric Helium-shell Double Detonation*, ApJ, 958, 178. 10.3847/1538-4357/acffc9

J. C. Rastinejad, K. Paterson, W. Fong, and 9 others, including **S. Hall** (2022), *A Systematic Exploration of Kilonova Candidates from Neutron Star Mergers During the Third Gravitational Wave Observing Run*, ApJ, 927, 50. 10.3847/1538-4357/ac4d34

Outreach & Leadership	**Astronomer Conversations Volunteer**, *Adler Planetarium*	2024 - present
	Coding Tutor, *CIERA REACH*	2023, 2024
	Research Mentor, *CIERA REACH Further*	2023
	STEAM Mentor (Volunteer), *Operation Airlift by Adler Planetarium*	2023
	Astronomy on Tap (Volunteer)	2022 - present
	Science Olympiad at UPenn (SOUP) Grader (Volunteer)	2022
	Women in Physics Board Member, *UPenn*	2020 - 2022
	Video Editor, *Singh Center for Nanotechnology*	2019 - 2022
	K-12 Math Tutor (Volunteer), *The Merry Tutor*	2017 - 2018

Teaching Experience	**Teaching Assistant,** *Northwestern Department of Physics & Astronomy*	
	• Physics 126-3 - Physics for ISP Lab - Waves and Optics	Spring 2024
	• Physics 126-2 - Physics for ISP Lab - Electricity and Magnetism	Winter 2024
	• Data Science 421 - Integrated Data Analytics I	Fall 2023
	Tutor & Grader, *UPenn Physics Department*	
	• Astronomy 001 - A Survey of the Universe	2021
	• Astronomy 007 - The Big Bang and Beyond	2021

Workshops & Summer Schools	**LS4 Team Meeting,** *Northwestern University*	March 2025
	Astro Imaging Workshop, *Northwestern University*	July 2023
	ZTF Summer School, *Virtual*	July 2023
	Time Domain Astronomy in the Rubin Era, ZTF & SEDM-KP	October 2022
	Collaboration Meeting, *Northwestern University*	
	LSSTC-DSFP (Audit), *Northwestern University*	September 2022
	P&A Undergraduate Summer Research Academy, *UPenn*	June - August 2020