Saarah Hall

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Research Interests

I am broadly interested in working with **observational data** to better understand the universe. I am most excited when projects blend art and science into one, as in any work with **astronomical images.** I also love to code!

Education

Northwestern University — Evanston, IL
Ph.D. Student, Astronomy — September 2022 - present
Advisor: Adam Miller

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

Research Experience

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

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

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

- Modeling images 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 Dark Energy Survey (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 and SAOImage DS9
- 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)

Posters & Presentations

Status Update on SEDMv2's Photometric Data Reduction Pipeline
Contributed Talk; October 2023; ZTF 5th Science 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: Updates to the Optical Counterpart Search
Virtual Presentation; August 2021; Fong Group 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; Penn Undergraduate Summer Research Academy

Publications

Hosseinzadeh, Griffin; Paterson, Kerry, and 15 others, including **Hall, Saarah** (2023), *SAGUARO: Time-domain Infrastructure for the Fourth Gravitational-wave Observing Run and Beyond*, Submitted paper, arXiv:2310.08624

Liu, Chang; Miller, Adam A., and 29 others, including **Hall, Saarah** (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

Rastinejad, J. C., Paterson, K., Fong, W., and 9 others, including **Hall, S.** (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

Awards & Honors

GEM Associate Fellow, *Northwestern*	2022 - 2023
Dean's List, *UPenn*	2021 - 2022
Hispanic Scholarship Fund	2021
NSF REU Stipend	2021
Allied Family Scholarship Fund	2018 - 2021, 2023
Vagelos Endowed Scholarship in Molecular Life Sciences, *UPenn*	2018 - 2021
American Association of Physics Teachers (AAPT) Outstanding Physics Student of the Year	2018

Outreach & Leadership

Research Mentor; CIERA REACH Further	2023
Operation Airlift by Adler Planetarium (Volunteer)	2023
Astronomy on Tap (Volunteer)	2022 - 2023
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 126-1 - Physics for ISP Lab - Electricity and Magnetism 2024
- Data Science 421 - Integrated Data Analytics I 2023

Tutor & Grader, *UPenn Physics Department*

- Astronomy 001 - A Survey of the Universe 2021
- Astronomy 007 - The Big Bang and Beyond 2021

Computer Skills

- Data reduction and processing, data visualization, version control (git)
- Programming languages: Python, SQL, HTML, CSS, bash