Avi Patel

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Education

California Institute of Technology 2022 – Present
B.S. Mechanical Engineering *Pasadena, CA, USA*

Haverford College 2019 – 2022
B.S. Physics *Haverford, PA, USA*

Research Experience

Machine Learning to extract Novel Information from ZTF Light Curves April 2023 – Present
Carnegie Observatories

- Mentored by **Dr. Dalya Baron**
- Participant of the Carnegie Astrophysics Summer Student Internship Program
- Investigating feature extraction methods for ZTF light curves and applying dimensionality reduction algorithms to identify finer sub-classes of transients and uncover hidden trends in the data

Characterizing Variable Stars in the Galatic Bulge January 2022 – October 2022
NSF's NOIRLab

- Mentored by **Dr. Monika Soraisam**
- Part of the Legacy Survey of Space and Time Kickstarter Grant
- Developed an unsupervised real/bogus classifier for alerts from the Dark Energy Camera Plane Survey East region using principal component analysis and a Gaussian mixture model to cluster the alerts
- Cross-matched sources with Gaia DR3 and OGLE catalogues
- Performed anomaly detection on the remaining candidates

Variability in M31 Star Clusters June 2021 – June 2022
University of California, Santa Cruz

- Mentored by **Dr. Puragra Guhathakurta, Dr. Monika Soraisam**
- Used the per exposure photometry to search for stars that showed evidence of variability in the Panchromatic Hubble Andromeda Treasury Survey
- Developed a robust difference imaging pipeline which optimizes the positional alignment, the relative photometric scale factor, and PSF shape between the pair of images that are being differenced to confirm these variable stars

Variability in Star Cluster Light Curves May 2020 – October 2021
Lehigh University

- Mentored by **Dr. Joshua Pepper**
- Participated in the Research Experience for Undergraduates during summer 2020
- Reduced TESS data to extract variability from Milky Way star cluster light curves
- Compared ensemble variability from star cluster light-curves to more resolved data

Research Presentations

DECam Deep Drilling Survey: Characterizing Variable Stars in the DECaPS-East Field — **Tucson, AZ**
DECam at 10 years (link to poster) — *September 2022*

Variable Stars in M31 Stellar Clusters using PHAT — **Pasadena, CA**
237th AAS Meeting (link to abstract) — *June 2022*

Searching for Variable Stars in M31 Using HST and Keck Spectra — **Haverford, PA**
Haverford Summer Research Symposium (poster) — *August 2021*

Extracting Light Curves from Unresolved Stellar Clusters to Infer Age — **Lehigh, PA**
Research Experience for Undergraduates Symposium (talk) — *August 2020*

Awards & Honors

Summer Undergraduate Research Fellowship
California Institute of Technology — *2023*

"Advancing our understanding of stellar variability with PHAT"
Co.I. (P.I. M. Soraisam), Hubble Space Telescope Cycle 30 — *2022*

Legacy Survey of Space and Time Kickstarter Grant
Las Cumbres Observatory — *2022*

Koshland Integrated Natural Sciences Center Summer Scholar
Haverford College — *2021*

Research Experience for Undergraduates
Lehigh University — *2020*

Publications, Peer Reviewed

Wainer, T., [...] **Patel, A.**, "Catalog of Integrated-Light Star Cluster Light Curves in TESS." *The Astronomical Journal, in press*

Graham, M. L., [...] **Patel, A.**, "Deep Drilling in the Time Domain with DECAM: Survey Characterization" *Monthly Notices of the Royal Astronomical Society 2023MNRAS, 519, 3881G*

Specialized Skills

Programming Languages: Python, MATLAB, SQL, Java, Go, Kotlin
Astronomy Software: DS9, Astropy, Astroalign, Optimal Image Subtraction
Image processing with HST, using large survey data (HST, TESS, DECam, ZTF)
Statistical Techniques: Kernel Density Estimation, Principal Component Analysis, Bootstrap Sampling
Other Software: LaTeX, Github

Outreach

Undergraduate Panelist for Upward Bound Program (2023)
Strawbrige Observatory Volunteer (2019-2022)
Upperclassmen Academic Advisor (2020-2021)