# Swetha Sankar

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## Education

- **Johns Hopkins** — Baltimore, MD
  *Astrophysics Ph.D. Student; GPA: 3.857* — *2022 - Current*
  ***Advisor:*** *Nadia Zakamska*
- **UCLA** — Los Angeles, CA
  *Astrophysics Bachelor of Sciences; GPA: 3.757* — *2018 - 2022*
  ***Advisors:*** *Ben Zuckerman, Carl Melis, & Beth Klein*

## Skills Summary

- **Hard Skills**: Python, CASA, PyRAF/IRAF, DS9/QfitsView, LaTeX, Unix, Mathematica, C++, Javascript, AutoCad
- **Packages**: Q3Dfit, PyQSOfit, Prospector, Seaborn, Scipy, Lowess, Lightkurve, TheJoker, Specutils, Spectral_Cube
- **Technical**: Data Reimaging/Reduction (ALMA/JWST IFU), Cube/FITS Use, Statistical Modeling, MCMC Analysis
- **Soft Skills**: Leadership, Event Management, Writing, Public Speaking, Time Management
- **Languages**: English, Tamil, Spanish

## Projects

- **Johns Hopkins Research: Constraining Ionization Mechanisms in a Red Quasar** — Baltimore, MD
  *Graduate Researcher* — *August 2022 - Current*
  - **Data Reduction**: Utilized JWST pipeline to reduce and combine IFU data from the NIRSpec instrument using raw and background files; implemented separate outlier detection step
  - **Science Maps Creation**: Utilized the Q3Dfit package to produce science ready flux, velocity field, and velocity dispersion maps to study the overall kinematics; produced line ratio maps to study ionization mechanism and physical conditions of regions
  - **Black Hole Mass Calculation**: Applied the PyQSOfit package and used the virial method to determine black hole mass and reddening of nuclear region
  - **SED fitting**: Fitting photometric data using the Prospector package to determine black hole luminosity and accretion
- **National Radio Astronomy Observatory REU: Measuring $H_2$ in Dwarf Galaxy Pairs** — Charlottesville, VA
  *Student Researcher* — *June 2021 - 2022*
  - **Data Reimaging**: Utilized CASA to reimage/primary-beam correct raw calibrated ALMA ACA spectral cubes of 10 low-redshift dwarf galaxy pairs via tclean/impbcor
  - **Moment Map Creation**: Created mfs/cleaned cube images; analyzed velocity fields/dispersion from reduced data via moment 0, 1, & 2 maps
  - **Data Analysis**: Quantified molecular gas reservoirs in data set via dust/continuum emission & CO $2 \rightarrow 1$ flux density; compared total gas mass to SDSS star formation rates
- **UCLA Research & REU: A Study of V488 Per in the Alpha Persei Cluster** — Los Angeles, CA
  *Student Researcher* — *June 2019 - 2021*
  - **Statistical Modeling**: Cross correlated Lick Observatory APF spectra in UCLA REU to gain sparse RV data; utilized & refined *The Joker* Markov Chain Monte Carlo Python code to model plausible mass-period companions & place upper limit within parameter space
  - **Photospheric Analysis**: Acquired photometric data from TESS MAST database to analyze and calculate stellar rotational velocities and periods via Lombscargle in Python
  - **Direct Imaging**: Analyzed AO data from Keck NIRC2 instrument; determined V488 Per and possible companion sensitivity in magnitude
  - **Mid-IR Analysis**: Collected flux data from Herschel PACS Catalog & assembled SED to determine dust parameters; Analyzed mid-infrared spectrum from Subaru telescope to constrain debris disk composition
- **UCLA Bruin Space: Project High Altitude Balloon** — Los Angeles, CA
  *Team Member* — *September 2019 - 2020*
  - **Payload Design**: Identified and redesigned the structure carrying the payload of balloon using AutoCad
  - **Atmospheric Modeling**: Modeled the temperature and pressure fluctuations of the expected course (∼10,000 ft) of balloon to update design
  - **Python Use**: Tested and refined the software used to track the balloon during its flight
- **UCLA Upsilon Lab: Project Solar Analysis** — Los Angeles, CA
  *Team Member* — *March 2019 - Aug 2019*
  - **Preparation**: Studied voltage-current relations in solar diode and the effects of solar radiance and irradiance
  - **Python Use**: Implemented and parameterized solar panel data to produce current-voltage graph
  - **Impact**: Analyzed solar optimization to determine which conditions produce maximum output power

- **UCLA Bruin Space: Project Endeavor** — Los Angeles, CA
  *Team Member* — *September 2018 - 2019*
  - **Preparation**: Analyzed the propagation of plasma/solar magnetic flux ropes theoretically using information from the CME databases; used particle motion data from STEREO/WAVES and MMS database to study magnetic reconnection in atmosphere and the role of flux ropes in propagation of plasma
  - **Physical Modeling**: Employed fluid dynamics to model particle interaction with Sun and Earth's magnetic field

## Teaching Experience

- **Department of Physics & Astronomy, Johns Hopkins** — Baltimore, MD
  *Teaching Assistant* — *August 2022 - July 2023*
  - Taught sections in Introductory Mechanics, Electromagnetism, and Electromagnetism lab undergraduate physics courses
  - Graded midterms/ finals, homeworks, and quizzes; held separate review sessions beyond office hours
  - Received one of the highest TA ratings in course evaluations for this semester

- **Private Tutoring** — Los Angeles, CA
  *Tutor* — *July 2019 - 2021*
  - Taught math to high school students; topics include algebra, derivatives, limits, and calculus

## Publications

- **Author**: (in prep) **Sankar, S.**, Zakamska, N. L., Vayner, A., Ishikawa, Y., Diachenko, N., Rupke, D., Veillux S., Wylezak, D., Bertemes, C. (2023). First results from the JWST Early Release Science Program Q3D: ionization in red quasar at z=0.4
- **Author**: (submitted) **Sankar, S.**, Privon, G., Stierwalt, S., Pearson, S., Patton, D. P., Besla, G., Johnson K. E., & Kallivayalil, J. N. (2023). What drives star formation in dwarf galaxy pairs? A first look at molecular gas with ALMA.
- **Co-Author**: Rupke, D. S. N., Wylezalek, D., Zakamska, N. L., Veilleux, S., Bertemes, C., Ishikawa, Y., Liu, W., **Sankar, S.**, Vayner, A., Grace Lim, H. X., McCrory, R., Murphree, G., Whitesell, L., Shen, L., Liu, G., Barrera-Ballesteros, J. K., Chen, H.-W., Diachenko, N., Goulding, A. D., Greene, J. E., Hainline, K. N., Hamann, F., Heckman, T., Johnson, S. D., Lutz, D., Lützgendorf, N., Mainieri, V., Nesvadba, N. P. H., Ogle, P., & Sturm, E. (2023). First Results from the JWST Early Release Science Program Q3D: Benchmark Comparison of Optical and Mid-infrared Tracers of a Dusty, Ionized Red Quasar Wind at z = 0.435. The Astrophysical Journal Letters, 953(2), L26. (https://iopscience.iop.org/article/10.3847/2041-8213/aced85/pdf)
- **Co-Author**: Veilleux, S., Liu, W., Vayner, A., Wylezalek, D., Rupke, D. S. N., Zakamska, N. L., Ishikawa, Y., Bertemes, C., Barrera-Ballesteros, J. K., Chen, H.-W., Diachenko, N., Goulding, A. D., Greene, J. E., Hainline, K. N., Hamann, F., Heckman, T., Johnson, S. D., Grace Lim, H. X., Lutz, D., Lützgendorf, N., Mainieri, V., Maiolino, R., McCrory, R., Murphree, G., Nesvadba, N. P. H., Ogle, P., **Sankar, S.**, & Sturm, E. (2023). First Results from the JWST Early Release Science Program Q3D: The Warm Ionized Gas Outflow in z 1.6 Quasar XID 2028 and Its Impact on the Host Galaxy. The Astrophysical Journal, 953(1), 56. (https://iopscience.iop.org/article/10.3847/1538-4357/ace10f/pdf)
- **Co-Author**: Vayner, A., Zakamska, N. L., Ishikawa, Y., **Sankar, S.**, Wylezalek, D., Rupke, D. S. N., Veilleux, S., Bertemes, C., Barrera-Ballesteros, J. K., Chen, H.-W., Diachenko, N., Goulding, A. D., Greene, J. E., Hainline, K. N., Hamann, F., Heckman, T., Johnson, S. D., Lim, H. X. Grace, Liu, W., Lutz, D., Lutzgendorf, N., Mainieri, V., McCrory, R., Murphree, G., Nesvadba, N. P. H., Ogle, P., Sturm, E., & Whitesell, L. (2023). First results from the JWST Early Release Science Program Q3D: Powerful quasar-driven galactic scale outflow at z = 3. (https://arxiv.org/pdf/2307.13751)
- **Co-Author**: Vayner, A., Zakamska, N. L., Ishikawa, Y., **Sankar, S.**, Wylezalek, D., Rupke, D. S. N., Veilleux, S., Bertemes, C., Barrera-Ballesteros, J. K., Chen, H.-W., Diachenko, N., Goulding, A. D., Greene, J. E., Hainline, K. N., Hamann, F., Heckman, T., Johnson, S. D., Lim, H. X. Grace, Liu, W., Lutz, D., Lutzgendorf, N., Mainieri, V., McCrory, R., Murphree, G., Nesvadba, N. P. H., Ogle, P., Sturm, E., & Whitesell, L. (2023). First results from the JWST Early Release Science Program Q3D: Ionization cone, clumpy star formation, and shocks in a z = 3 extremely red quasar host. (https://arxiv.org/pdf/2303.06970.pdf)
- **Author**: **Sankar, S.**, Melis, C., Klein, B. L., Fulton, B. J., Zuckerman, B., Song, I., & Howard, A. W. (2021). V488 Per Revisited: No Strong Mid-infrared Emission and no Evidence for Stellar/Sub-stellar Companions. Astrophysical Journal. 922.1 (2021): 75. (https://iopscience.iop.org/article/10.3847/1538-4357/ac19a8)

## Conferences

- American Astronomical Society - AAS Meeting (January 2024)
- Johns Hopkins Women in Physics Summit (September 2023)
- American Astronomical Society - AAS Meeting (June 2022)
- APS Conference for Women in Physics - CuWip (January 2019 - 2022)
- Exoplanets III (July 2021)

## Presentations

- Sankar, S., Zakamska, N. L., Vayner, A., Ishikawa, Y., Diachenko, N., Chen, T., Rupke, D. S. N., Liu, W., Wylezalek, D., Bertemes, C., Veilleux, S. (2024, Jan). Ionization in a red quasar at z=0.4: Results from the JWST Q3D Program. Poster session presented at American Astronomical Society Meeting, New Orleans, LA
- Sankar, S., & Privon, G. (2022, Jan). ALMA ACA Observations of Molecular Gas in TNT Isolated Pairs. Poster session presented at American Astronomical Society Meeting, Pasadena, CA
- Sankar, S., & Privon, G. (2021, Aug). Molecular Gas Reservoirs and their role in Low Mass Galaxy Pair Evolution. Talk presented at NRAO/GBO Summer Student Symposium, Green Bank, VA
- Sankar, S., Melis, C., Klein, B. L., Fulton, B. J., Zuckerman, B., Song, I., & Howard, A. W. (2021, May). V488 Per Revisited: No Strong Mid-infrared Emission and no Evidence for Stellar/Sub-stellar Companions. Talk presented at Earth, Planetary, and Space Sciences Student Research Symposium, Los Angeles, CA
- Sankar, S., Melis, C., Klein, B. L., Fulton, B. J., Zuckerman, B., Song, I., & Howard, A. W. (2020, Aug). Dusty Debris Disks: a Study of V488 Per in the Alpha Persei Cluster. Talk presented as part of the UCLA REU, Los Angeles, CA
- Ando, J., Kwan, S., Pineda, P., Sankar, S., & Stubbs, M. (2017, Aug). Star Clusters in Galaxy Mergers. Poster session presented at the COSMOS STEM Program, Santa Cruz, CA

## Honors and Awards

- NSF GRFP Honorable Mention (2021)
- Physics and Astronomy Departmental Honors
- UCLA College Honors
- Student Spotlight Honor from the UCLA Undergraduate Research Center
- Outstanding Teen Citizen Award 2017 from City of San Ramon
- ABRSM, UK Royal School of Music - Piano Level 4-7 (certification of Merit)
- California High School Academic Achievement Commendation Award (all semesters)

## Volunteer Experience

- **Women in Physical Sciences (WiPS)** — Baltimore, MD
  *Member* — *2022 - Current*
  - Performed outreach presenting at High School student conferences
  - Mediated Grad School/ STEM Industry Panel and oversaw break out sessions
  - Organized speakers to discuss Imposter Syndrome effects and discussion event
  - Oversaw membership and determined ways to offer support in quarantine

- **Women Plus in Physical Sciences (W+PS)** — Los Angeles, CA
  *Membership Coordinator/External VP* — *2018 - 2022*
  - Performed outreach presenting at High School student conferences
  - Mediated Grad School/ STEM Industry Panel and oversaw break out sessions
  - Organized speakers to discuss Imposter Syndrome effects and discussion event
  - Oversaw membership and determined ways to offer support in quarantine

- **Interact 5160 District Council** — San Ramon, CA
  *Area 11 Delegate/ District Governor* — *2016 - 2018*
  - Organized five district wide events encompassing 65 local Interact clubs; prepared and led monthly council meetings
  - Maintained communication with officers of local Interact clubs and Rotary advisors
  - Planned, organized, and executed Community Cultural Fair to expand global understanding
  - Raised $20,000 for Rotary's End Polio Now campaign

- **Interact Service Club** — San Ramon, CA
  *District Communications Liaison/ VP* — *2016 - 2018*
  - Attended Rotary meetings (district and local), Communicated meeting notes with all Interact Area 11 schools representatives
  - Organized and conducted semi-monthly volunteering events including partnering with Rise Against Hunger and The Crayon Initiative

- **Rotary Leadership Retreat - Camp Royale** — San Ramon, CA
  *Attendee* — *June 2017*
  - Nominated for 9-day residential leadership camp by Rotary Youth Liaison Director of District 5160
  - Attended individual and team leadership building sessions focused on maximizing team potential
  - Attended lectures focused on how to efficiently work with others, evaluate skill sets