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Ansh Gupta

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Research Interests

I am interested in searching for distant objects in the high-redshift universe, including the earliest galaxies and AGN. I would like to study how these sources formed and evolved over time and investigate their impacts on a large scale, using them as probes of cosmology and measuring their contributions to cosmic reionization.

Education

Bachelor of Science — **August 2020 - May 2024 (expected)**
The University of Arizona — *Major: Astronomy, Physics;* ***GPA: 4.0/4.0***

Relevant Coursework: Structure and Dynamics of Galaxies, Astronomical Instrumentation, Astronomy and Astrophysics (galaxies/cosmology), Astronomy and Astrophysics (stars), Theoretical Astrophysics, Observational Astronomy, Quantum Theory II, Electricity and Magnetism II, Computational Physics, Thermal Physics (*links to Github repositories containing computational final projects and assignments*)

Awards & Honors

Lea Booher Memorial Scholarship — **2023-2024**
Awarded for proven scholastic ability and research excellence

Angelos C. Langadas Fund in Astronomy Scholarship — **2023-2024**
Awarded for strong commitment to pursuing a career in Astronomy and academic achievement

Weaver Award for Undergraduate Research — **2023-2024**
Awarded for promise as a future research scholar based on demonstrated achievement

National Merit Finalist Tuition Scholarship — **2020-2024**

Publications

Yang, J., Fan, X., **Gupta, A.**, et al, 2023, ApJS, DESI z $>\sim$ 5 Quasar Survey. I. A First Sample of 400 New Quasars at z $\sim 4.7 - 6.6$.

Gupta, A., Kirkpatrick, A. et al, 2023, in prep., Emission-Line Ratios and Ionization Conditions of CEERS EGS Galaxies with JWST/NIRSpec. (Read-only Overleaf draft, to be submitted to the *Research Notes of the American Astronomical Society* by end of December 2023)

Presentations

Emission-Line Ratios and Ionization Conditions of CEERS EGS Galaxies with JWST/NIRSpec — **January 2024**
- Poster to be presented at the 243rd Meeting of the American Astronomical Society (abstract)
- Presented at University of Kansas Undergraduate Research Symposium (recording)

The Night Sky — **July 2023**
- Invited public outreach presentation at the Rolling Hills Library (recording)

Using Machine Learning to Detect Science Misinformation — **January 2023**
- Contributed to poster at the 241st Meeting of the American Astronomical Society (iPoster)

Invited and Contributed Public Outreach Presentations — **2016 - 2023**
- 20+ presentations at University of Arizona and Saint Joseph Astronomy Clubs (list)

Research Experience

DESI High Redshift Quasar Survey **August 2021 - Present**
Advisors: Prof. Xiaohui Fan, Prof. Jinyi Yang
Steward Observatory, The University of Arizona

- Constructed high-redshift quasar sample using Dark Energy Spectroscopic Instrument (DESI) data
- Confirmed >1000 candidates from the DESI Legacy Imaging Surveys
- Identified emission line and absorption features using spectral analysis tools
- Currently working on determination of quasar luminosity function and two point correlation function
- Using machine learning tools to simulate mock quasar spectra
- Simulating observations of mock spectra to compare with observations
- Using statistical tools to compare currently observed sample with simulations
- Coauthored publication, expect to produce first-author publication by end of spring 2024

Ionization Conditions of JWST/NIRSpec CEERS Galaxies **May 2023 - August 2023**
Advisor: Prof. Allison Kirkpatrick
Department of Physics & Astronomy, The University of Kansas

- Research Experience for Undergraduates (REU) at the University of Kansas
- Investigated ionization conditions in JWST CEERS galaxies at redshift $\sim 2-8$
- Creating optical line ratio diagrams from NIRSpec data
- Correlated positions on diagrams with redshift, stellar mass, and star formation rate
- Compared galaxy specific star formation rates to main sequence of star forming galaxies
- Determined AGN properties including bolometric luminosity and accretion rate from optical line fluxes
- Preparing research note for submission to the *Research Notes of the American Astronomical Society*

Machine Learning Tools to Combat Fake Science **August 2021 - May 2023**
Advisor: Prof. Christopher Impey
Steward Observatory, The University of Arizona

- Tagged real/fake science articles and selected open source datasets for analysis using large language models
- Created educational astronomy YouTube videos for Active Galactic with $>$ 50,000 total views (playlist)
- Wrote questions for and edited astronomy-focused Massive Open Online Course with $>$ 3,000 enrollments
- Coursera course name - Knowing the Universe: History and Philosophy of Astronomy (course link)

Leadership

Citizens' Climate Lobby **2020 - Present**
Northwest Missouri Chapter Leader

- Lobbying for bipartisan legislative action on climate change
- Organize regular meetings and plan community direct action events
- Meet with representatives' and senators' legislative teams to push for improved climate policy
- Direct grassroots climate change action efforts including securing endorsements from local businesses
- Help members send messages to representatives and write letters to the editor in local newspapers
- Organize outreach and educational events about the impacts of climate change and effective policy

Saint Joseph Astronomy Club **2016 - Present**
Founder and President

- Founded astronomy club in hometown to promote science outreach with $\sim$ 50 active members
- Gave monthly educational public lectures on popular astronomy topics and current events
- Invited to give presentations for 2017 total solar eclipse at East Hills Library with $\sim$ 100 attendees each
- Currently run online newsletter about developments in space and new astronomy research

Leadership (Continued)

TIMESTEP **2023 - Present**
Tucson Initiative for Minoritized Student Engagement in Science & Technology Program

- Selected as undergraduate student leader
- Help lead professional development and career advice program for astronomy and physics undergraduates
- Participate in student-led panels to discuss navigating the astronomy and physics majors
- Serve as peer mentor for students and advise how to find undergraduate research experiences

University of Arizona Astronomy Club **2021 - Present**
Presenter

- Regularly give presentations on astronomical news, my individual research, and broader topics in science
- Have participated in $>$ 15 monthly outreach events throughout the greater Tucson area
- Operate telescopes at public showings and run demonstrations at nearby elementary and middle schools
- Interviewed for department public engagement videos/media

Other Experience

Astromatic 2023 **August 2023**
Astrophysics Machine Learning/AI Program
Ciela Institute, Université de Montréal

- Trained score-based generative model for denoising and deblurring of HST PROBES dataset images
- Used score-based neural network to generate simulated HST-like noise
- Successfully constructed posterior samples of galaxy images from images with added noise
- Worked with a team to produce and analyze results
- Prepared and delivered an oral presentation, awarded 2nd place team by hackathon judges

Skills

Programming	Python, Git, LaTeX, Jupyter, SQL, Linux
Other	Microsoft Office, Adobe Creative Suite