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NSF Graduate Research Fellow

Department of Astronomy, The University of Texas at Austin

RESEARCH INTERESTS

Many early supermassive black holes (SMBHs) appear *overmassive*, with $M_{\bullet}/M_{*}$ ratios much greater than those observed in the local universe. I would like to explain the physical reasons for this trend by measuring the properties of the host galaxies of more intermediate-mass SMBHs. I'm also interested in a unique class of objects known as "little red dots", which appear to be compact galaxies with obscured AGN.

EDUCATION

Ph.D. in Astronomy

The University of Texas at Austin

August 2024 - Present
Advisor: Steven Finkelstein

Bachelor of Science in Astronomy and Physics

The University of Arizona

August 2020 - May 2024
GPA: 4.0/4.0

Relevant Coursework: Extragalactic Astronomy and Cosmology, Structure and Dynamics of Galaxies, Astronomical Instrumentation, Astronomy and Astrophysics (galaxies/cosmology), Astronomy and Astrophysics (stars), Theoretical Astrophysics, Observational Astronomy, Writing Across the Space Sciences, Quantum Theory II, Electricity and Magnetism II, Computational Physics, Thermal Physics, Optics
(*Hyperlinks to Github repositories containing computational final projects and assignments*)

AWARDS & HONORS

National Science Foundation Graduate Research Fellowship 2024-2029

Outstanding Senior - University of Arizona College of Science 2024
*Winner selected from College of Science departmental Outstanding Seniors (*commencement speech*)*

Outstanding Senior - Steward Observatory 2024
Selected from all graduating seniors in astronomy at the University of Arizona

Chambliss Astronomy Achievement Award - Honorable Mention 2024
Awarded for poster presentation at the 243rd meeting of the American Astronomical Society

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

Dean's List With Distinction 2020-2024

National Merit Finalist Tuition Scholarship 2020-2024

PUBLICATIONS

Gupta, A., Kirkpatrick, A., Fernandez, V., et al, 2024, RNAAS, Emission-Line Ratios and Ionization Conditions of CEERS EGS Galaxies with JWST/NIRSpec.

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 $z \sim 4.7 - 6.6$.

PRESENTATIONS

Emission-Line Ratios and Ionization Conditions of CEERS EGS Galaxies with JWST/NIRSpec January 2024

- Poster presented at the 243rd Meeting of the American Astronomical Society ([iPoster](#))
- Talk at University of Kansas Undergraduate Research Symposium ([recording](#))

The Night Sky at Splendido February 2024

- Invited outreach talk at Splendido Retirement Community in Tucson, AZ ([recording](#))

The Night Sky at Rolling Hills July 2023

- Invited outreach presentation at the Rolling Hills Library in Saint Joseph, MO ([recording](#))

Invited and Contributed Public Outreach Presentations 2016 - Present

- 30+ presentations at public outreach events, schools, astronomy clubs, etc. ([list](#))

RESEARCH EXPERIENCE

Host Properties of JWST Broad-Line AGN August 2024 - Present

Advisors: Prof. Steven Finkelstein

Department of Astronomy, The University of Texas at Austin

- Characterizing the properties of broad-line AGN host galaxies
- Using SED/spectrum fitting codes including CIGALE and BEAGLE-AGN
- Exploring the nature of little red dots (compact galaxies with blue rest-UV and red rest-optical slopes)
- Aim to explain the physical origins of *overmassive* black holes in the early universe

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
- 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 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 $\sim 2 - 8$
- Created 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
- Research note published in the *Research Notes of the American Astronomical Society* ([link](#))

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

Astronomy on Tap ATX

Fall 2024 - Present

Organizer

- Organize for the Austin, TX branch of the public outreach Astronomy on Tap program
- Select, research, and present astronomy news segment
- Edit recorded events for YouTube channel and social media

Deep Learning for Astrophysics Hackathon Series

Spring 2024

Organizer

- Organized and ran program for the UA Theoretical Astrophysics Program Computation and Data Initiative
- Produced presentations to teach attendees about theoretical and practical application of deep learning
- Created google colab notebooks for participants to read, modify, and write code
- Ran hands-on sessions, providing guidance, answering questions, and giving feedback to participants
- Achieved goal of providing machine learning training and hands-on experience to attendees

[Link to hackathon homepage with summary of activities](#)

American Astronomical Society Congressional Visit

April 2024

Advocate

- Selected for AAS sponsored program to support astronomical science at the congressional level
- Will meet with representatives to convey the importance of astronomical decadal surveys priorities
- Advocate for increased federal support and funding for space sciences
- Learn about ongoing work from NASA, the NSF, and Department of Energy

Citizens' Climate Lobby

2020 - Present

Northwest Missouri Chapter Leader

- Lobbying for bipartisan legislative action on climate change
- 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 ~ 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 ~ 100 attendees each
- Currently run online newsletter about developments in space and new astronomy research

TIMESTEP

2023 - 2024

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

- 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

PROFESSIONAL DEVELOPMENT

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, L^AT_EX, Jupyter, SQL, Linux

Other

Microsoft Office, Adobe Creative Suite