HARUM AHMED

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EDUCATION

University of North Texas - Denton, TX
Ph.D. in Physics *Expected May 2027*
Concentration: Astrophysics – Active Galactic Nuclei
GPA: 3.9 (4.0 scale)

University of North Texas - Denton, TX
Bachelor of Science in Physics *May 2023*
Concentration: Astrophysics

SKILLS

- Python
- Java
- C++
- MATLAB
- Mathematica
- Computational Astrophysics
- Observational Astronomy
- Scientific Writing
- Statistical Methods
- Machine Learning for Data Analysis
- Ultraviolet Astronomy
- Infrared Astronomy

RESEARCH EXPERIENCE

Deriving Reliable Fundamental Quasar Properties with Gemini Near-Infrared Spectroscopy – Denton, TX
Research Lead *01/2024 – Present*
Supervisor: Dr. Ohad Shemmer

- Leading ongoing observations of high-redshift quasars ($z > 3.2$) with the Gemini Observatory using the Gemini Near-Infrared Spectrograph (GNIRS). Performing comprehensive data reduction and spectral fitting with Python and MATLAB to analyze key emission lines.
- Deriving precise black hole masses, accretion rates, and redshifts to improve prescriptions for ultraviolet-based proxies for these parameters that are crucial for a wide range of extragalactic investigations.

Exploring the Spectral Energy Distributions of Luminous Broad Absorption Line Quasars at High Redshifts – Western University, CA
Research Lead *05/2024 – Present*
Supervisors: Dr. Sarah Gallagher and Dr. Ohad Shemmer

- Analyzed multiwavelength spectral energy distributions (SEDs) of 65 luminous broad absorption line (BAL) quasars using data from ground- and space-based observatories, constructing comprehensive spectral profiles from radio to X-rays.
- Found no significant SED differences between BAL and normal quasars of comparable luminosity, aside from enhanced reddening in the UV-optical continuum for BAL quasars.

Gemini Near Infrared Spectrograph - Distant Quasar Survey: Rest-Frame Ultraviolet-Optical Spectral Properties of Broad Absorption Line Quasars - Denton, TX
Research Lead *08/2022 – 05/2023*
Supervisor: Dr. Ohad Shemmer

- Research on understanding the spectroscopic measurements of 65 BAL Quasars with redshifts between 1.55 to 3.5 using data from the Gemini Near Infrared Spectrograph-Distant Quasar Survey (GNIRS-DQS).
- Rest-frame optical properties of BAL quasars are compared to those of normal quasars to understand if BAL quasars are a distinct class of quasars or if they differ only due to orientation or other properties.

Research Experience for Undergraduates (REU) Program at TAMUC - Commerce, TX
Research Lead *06/2021 – 08/2021*
Supervisor: Dr. Kent Montgomery

- Determined the rotational periods for five main belt asteroids by plotting their lightcurves derived from photometric data taken over several nights using the TAMUC & SARA-CT telescopes.
- Data was calibrated, reduced, and aligned using different softwares and utilized differential/aperture photometry to produce lightcurves.

OTHER EXPERIENCE

Astronomy Labs Teaching Assistant - Denton, TX
Department of Physics, UNT *08/2024 – Present*

- Gave in-person instructions to 100+ students on understanding concepts in introductory-level astronomy labs such as Planetarium, Experimental and Observatory labs.
- Assisted in grading reports for all astronomy labs.

RESEARCH PUBLICATIONS

Ahmed, H.; Shemmer, O.; Matthews, B.; Dix, C.; Ha, T.; Myers, A.; Brotherton, M.; Richards, G. (2026). "Deriving Reliable Fundamental Quasar Properties with Gemini Near-Infrared Spectroscopy." *The Astrophysical Journal*, in-preparation.

Ahmed, H.; Gallagher, S.; Shemmer, O.; Dix, C.; Brotherton, M.; Richards, G. (2025). "Exploring the Spectral Energy Distributions of Luminous Broad Absorption Line Quasars at High Redshifts." *The Astrophysical Journal*, under-review.

Ahmed, H.; Shemmer, O.; Matthews, B.; Dix, C.; Ha, T.; Myers, A.; Brotherton, M.; Richards, G. (2024). "Gemini Near Infrared Spectrograph - Distant Quasar Survey: Rest-Frame Ultraviolet-Optical Spectral Properties of Broad Absorption Line Quasars." *The Astrophysical Journal*, 968, 77.

Ahmed, H.; Montgomery, K.; Cheek, M. (2022). "Determining the Lightcurves and Rotational Periods of Five Main Belt Asteroids." *Minor Planet Bulletin*, 49 (2), 113-116.

CONFERENCE PRESENTATIONS

Oral Presentations

- "**Broad Absorption Line Quasars from the Gemini Near Infrared Spectrograph-Distant Quasar Survey**," Texas Astronomy Undergraduate Research Symposium. Texas A&M University, College Station, TX, November 2022
- "**Lightcurves and Rotational Periods of Five Main Belt Asteroids**," Joint Meeting of the Texas Sections of APS, AAPT and SPS Zone 13. University of Houston-Clear Lake, Houston, TX, October 2021

Poster Presentations

- **"Spectral Energy Distributions of High-Redshift Broad Absorption Line Quasars from the Gemini Near Infrared Spectrograph – Distant Quasar Survey,"** University Research Symposium. University of North Texas, Denton, TX, October 2024.
- "**Gemini Near Infrared Spectrograph - Distant Quasar Survey: Rest-Frame Ultraviolet-Optical Spectral Properties of Broad Absorption Line Quasars**," American Astronomical Society 243rd Winter Meeting. New Orleans, LA, January 2024.
- "**Gemini Near Infrared Spectrograph - Distant Quasar Survey: Rest-Frame Ultraviolet-Optical Spectral Properties of Broad Absorption Line Quasars**," University Research Symposium. University of North Texas, Denton, TX, October 2023.