Zhuoqi (Will) Liu

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EDUCATION

- **University of Michigan, Ann Arbor** *Sep. 2021 - June 2026 (Expected)*

  Ph.D. in Astronomy & Astrophysics
  - Advisor: Sean D. Johnson
  - Core Coursework: Linear Regression, Machine Learning, Applied Statistics
  - NASA FINESST Fellowship; **$100,000**
  - Principal Investigator, NASA Hubble Space Telescope Cycle 33 Proposal (GO-18039); **$40,000**
  - Rackham Summer Fellowship; **$40,000**

- **University of California, Santa Barbara** *Sep. 2017 - June 2021*

  B.S. in Physics, GPA: 3.95/4.00
  - Awards: Highest Honors (Top 2.5% at UCSB)

PUBLICATIONS

Highlights: 3 first & second author, and 6 co-authored articles published.

[1] **Liu, Z.**, Johnson, S. D., Li J. I.-H., Epinat, B., Rudie, G. C., Monreal-Ibero, A., Cantalupo, S., Qu, Z., Chen, M. C., Kollatschny, W., Muzahid, S., Zahedy, F. Z., Kesler, E., Mishra, N., 2025, *The Morphology and Kinematics of a Giant, Symmetric Nebula Around a Radio-Loud Quasar 3C57: Extended Rotating Gas or Biconical Outflows?*, ApJ, 984, 2, 140

[2] **Liu, Z.**, Johnson, S. D., Li J. I.-H., Rudie, G. C., Schaye, J., Chen, H.-W., Brinchmann, J., Cantalupo, S., Chen, M. C., Kollatschny, W., Mishra, N., Muzahid, S., 2024, *The first comprehensive study of a giant nebula around a radio-quiet quasar in the $z < 1$ Universe*, MNRAS, 527, 3, 5429

PROJECTS

- **IMC Prosperity 3** *April 2025*

  Methods: Mean Reversion, Black-Scholes Model, Delta Hedging
  - Developed trading strategies using historical data for a simulated market competition.
  - Implemented a mean reversion model to forecast short-term market trends, improving PnL by **50%** compared to direct market-making.
  - Applied the Black–Scholes model to identify mispriced options; executed long/short positions with delta hedging to maintain portfolio risk within 5% of neutrality.

- **Characterization of Galactic and Gaseous Environments Surrounding Quasars** *2021 - Present*

  Methods: Optimization, Regression, Statistical Hypothesis Testing
  - Developed a new algorithm for constructing comprehensive galaxy surveys from **0.5TB** of imaging data, reduced runtime from **100 hours** to **20 hours**.
  - Created a pipeline for emission detection and optimal extraction, standardizing emission map construction and reducing manual processing time by **50%**.
  - Developed an algorithm to model ionized gas kinematics, improving consistency and reproducibility in characterization across datasets.

- **Photoionization Simulations and Estimation of Physical Conditions in Ionized Gas** *2021 - Present*

  Methods: Parallel Computing, Bayesian Statistical Inference, Monte Carlo Simulation
  - Enhanced simulation efficiency by **35%** through implementing high-dimensional interpolation and vectorization techniques.
  - Developed an inference algorithm to determine the physical conditions of the gas by analyzing **1TB** simulation results against observations.

- **Photometric Correction and Variability Study in unWISE** *2018 - 2021*

  Methods: Stochastic Process, Time Series Analysis, Principal Component Analysis
  - Investigated various stochastic models to effectively model quasar variability, leading to a novel method that improved high-redshift quasar selection.
  - Developed and implemented advanced statistical techniques to analyze **1TB** astronomical datasets, successfully identifying and correcting key patterns and anomalies.

SKILLS

- **Programming Languages:** Python, R, MATLAB, Javascript
- **Languages:** English, Mandarin