

Marissa N. Perry

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RESEARCH INTERESTS

I am interested in the evolution of galaxies over cosmic time, leveraging large spectroscopic and imaging surveys as well as statistical and machine learning approaches to data analysis.

EDUCATION

The University of Texas at Austin	Aug. 2021—Present
Degree: B.S. Astronomy Honors	
Certificate: Programming and Computation: ML, Data Analytics, Visualization	

APPOINTMENTS

Research Assistant, UT Austin Dept. of Astronomy <i>Advisor: Prof. Steven Finkelstein</i>	Jan. 2023—Present
NSF REU Intern, MIT Haystack Observatory <i>Advisor: Dr. Jens Kauffmann</i>	June 2023—Aug. 2023
Freshman Research Initiative (FRI), UT Austin Dept. of Astronomy <i>Advisor: Prof. Michael Montgomery</i>	Jan. 2022—Dec. 2022

PUBLICATIONS

Refereed

- [[Paper in prep](#)]: [Perry, Marissa N.](#), Finkelstein, Steven L., Taylor, Anthony J., Chavez Ortiz, Oscar A., Leung, Gene C. K. “Investigating the Evolution of Bursty Star Formation with JWST”, *Will be submitted to ApJ by March 2025*

Non-refereed

- [[Research Note](#)] [Perry, Marissa N.](#), Sheen, Derek, Kauffmann, Jens. “The Foundations of Multi-Line Molecular Cloud Population Synthesis”, *Research Notes of the AAS*, Volume 8 (Dec. 2024).

RESEARCH EXPERIENCE (1 NSF REU, 2 Other Research Assistantships)

Bursty Star Formation in the Early Universe

Jan. 2024—Present

Dept. of Astronomy, The University of Texas at Austin

Advisor: Prof. Steven Finkelstein

- An unexpectedly high abundance of bright galaxies at cosmic dawn ($z \gtrsim 10$) have been unveiled by JWST observations. These observations are likely the result of the strong time variability (“burstiness”) of star formation, upscattering the apparent brightness of high-redshift galaxies. This work aims to identify at what point in the Universe’s history galaxies were dominated by bursty star formation.
- I am using large-scale JWST surveys—such as CEERS and RUBIES—to obtain spectral and imaging data for a sample of ~ 350 high-redshift ($1 < z < 7$) galaxies and analyzing the timescale of their star formation events. This involves using two star formation rate (SFR) indicators: Balmer and UV continuum emission, which are sensitive to different star-forming timescales. The ratio of these SFR indicators serves as a proxy for galaxy burstiness.

High-Redshift Galaxy Catalog Cleaning with ML

Jan. 2023—Dec. 2023

Dept. of Astronomy, The University of Texas at Austin

Advisor: Prof. Steven Finkelstein

- This work was included in JWST Cycle 3 and Cycle 4 Proposals (PI: Prof. Finkelstein)
- Background: develop an automated method for cleaning catalogs of high-redshift galaxies using public JWST NIRCам imaging data. Catalogs contain spurious (e.g., non-astrophysical) sources—such as bad pixels on the NIRCам detector or contamination from nearby stars—that typically require visual inspection to ensure a clean galaxy sample.
- Method 1: Used the t-Distributed Stochastic Neighbor Embedding algorithm to simplify the images while preserving important patterns and applied a clustering algorithm to group similar sources. This method significantly reduced the amount of data one would visually inspect by automatically flagging spurious sources.
- Method 2: Built a convolutional neural network (CNN) binary image classifier. Given a sample of galaxy images, the CNN is able to isolate and remove spurious sources, allowing for a quicker sample selection process.

The Foundations of Multi-Line Molecular Cloud Population Synthesis

June 2023—Aug. 2023

MIT Haystack Observatory - NSF REU

Advisor: Dr. Jens Kauffmann

- Wrote Markov Chain Monte Carlo (MCMC)-based Python programs to theoretically observe unresolved molecular clouds in extragalactic systems. In the future, these investigations point us in the direction of overcoming the resolution gap between local and extragalactic environments in radio astronomy.

Chemical Cartography of the Milky Way Galaxy

Jan. 2022—Dec. 2022

Dept. of Astronomy, The University of Texas at Austin

Advisors: Prof. Michael Montgomery and Prof. Keith Hawkins

- Tested recent findings of an apparent spiral structure in the chemical composition of stars in the Milky Way Galaxy (Poggio+2022; Hawkins+2023). These studies had shown a strong correlation between the galaxy's spiral structure and the chemical pattern observed in stars within the galaxy using data from the Gaia Data Release 3. However, this correlation was not found with data from the LAMOST survey. We further tested these findings using data from the APOGEE survey but similarly found no significant correlation.

Classifying White Dwarf Stars

June. 2022—Aug. 2022

Dept. of Astronomy, The University of Texas at Austin

Advisor: Prof. Michael Montgomery

- Analyzed white dwarf stars from the Gaia Data Release 3, compared their spectra to corresponding SDSS spectra, identified their surface composition, observed crystallizing white dwarfs, and discussed the potential ages and binary origin of targets within the instability strip.

HONORS AND AWARDS

Dept. of Astronomy Summer Undergraduate Research Stipend, UT Austin (\$2,500)	2024
NSF REU Fellowship, MIT Haystack Observatory (\$6,000)	2023
Freshman Research Initiative (FRI) Summer Fellowship, UT Austin (\$2,000)	2022

POSTERS AND TALKS (2 Talks, 2 AAS Meeting Posters, 6 Other Posters)

245TH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY | National Harbor, MD

[iPoster]: [Perry, Marissa N.](#), Finkelstein, Steven L., Taylor, Anthony J., Chavez Ortiz, Oscar A., Leung, Gene C. K. (Jan. 2025) "Investigating the Evolution of Bursty Star Formation with JWST"

UNDERGRADUATE RESEARCH FORUM 2024 | UT Austin, College of Natural Sciences

[Poster]: [Perry, Marissa N.](#), Finkelstein, Steven L., Taylor, Anthony J., Chavez Ortiz, Oscar A., Leung, Gene C. K., (Apr. 2024) "Measuring Bursty Star Formation with JWST CEERS"

243RD MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY | New Orleans, LA

[iPoster]: [Perry, Marissa N.](#), Kauffmann, Jens. (Jan. 2024) "The Foundations of Multi-Line Molecular Cloud Population Synthesis"

FRANK N. BASH SYMPOSIUM 2023 | UT Austin, Dept. of Astronomy

[Poster]: [Perry, Marissa N.](#), Chatur, L., Thakurdesai, U. (Oct. 2023) “Spurious Source Rejection Algorithms for Galaxies from JWST”

GALAXY EVOLUTION VERTICALLY INTEGRATED PROJ. MEETING | UT Austin, Dept. of Astronomy

[Talk]: [Perry, Marissa N.](#) (Dec. 2023) “Measuring Bursty Star Formation with JWST CEERS.”

REU SYMPOSIUM 2023 | MIT Haystack Observatory, Westford, MA

[Talk]: [Perry, Marissa N.](#), Kauffmann, Jens. (Aug. 2023) “The Foundations of Multi-Line Molecular Cloud Population Synthesis”

NORTHEAST STAR AND PLANET FORMATION MEETING 2023 | CfA, Cambridge, MA

[Poster]: [Perry, Marissa N.](#), Chatur, L., Thakurdesai, U. (June 2023) “Spurious Source Rejection Algorithms for Galaxies from JWST”

UNDERGRADUATE RESEARCH FORUM 2023 | UT Austin, College of Natural Sciences

[Poster]: [Perry, Marissa N.](#), Chatur, L., Thakurdesai, U. (Apr. 2023) “Gaussian Mixture Clustering Algorithm to Inspect $z = 6-8$ Galaxies from JWST CEERS”

FRESHMAN RESEARCH INITIATIVE PRESENTATION | UT Austin, Dept. of Astronomy

[Poster]: [Perry, Marissa N.](#), Thakurdesai, U., Navarrete, C., Keating, P. (Dec. 2022) “Chemical Cartography of the Milky Way Galaxy”

FRESHMAN RESEARCH INITIATIVE PRESENTATION | UT Austin, Dept. of Astronomy

[Poster]: [Perry, Marissa N.](#), Chatur, L., Navarrete, C., Shaji, R., Thakurdesai, U. (Sept. 2022) “White Dwarfs Research - Gaia”

OUTREACH, LEADERSHIP, AND WORK EXPERIENCE

McDonald Observatory Outreach

March 2022

[volunteered] *Dept. of Astronomy, UT Austin*

- Engaged with the public at the observatory's visitor center star party—an event which draws visitors from around the world to view the darkest skies in North America—by operating the center's dobsonian telescopes and inviting visitors to ask questions about famous astronomical objects.

Women in Natural Sciences (WINS) Program

Aug. 2021—May 2022

[member] *College of Natural Sciences, UT Austin*

- Selected as part of a cohort of first-year undergraduate women encouraged to pursue research, provided with peer mentoring, and supported in fostering a strong sense of community in STEM.

Research Group Leadership Positions

Jan. 2024—Present

[volunteered] *Galaxy Evolution Vertically Integrated Project (GEVIP) research group, UT Austin*

- Paper leader: reviewed recent astrophysical publications on arXiv, identified those most relevant to our research group’s focus, and facilitated discussions around them.
- Senior leader: held weekly office hours to mentor my peers with their ongoing research projects.

Freshman Research Initiative (FRI) Mentor

Jan. 2023—Present

[paid] *Dept. of Astronomy, UT Austin*

Supervisor: Prof. Michael Montgomery

- The FRI program at UT Austin is the largest undergraduate research program in the nation. I have worked directly with 70+ first-year students, assisting them through coding lab assignments and astronomy-based research projects.

Physics Demonstration Lab

Jan. 2022—Dec. 2023

[paid] *Dept. of Physics, UT Austin*

Supervisor: Dr. Aida Torabi

- Set up, tested, and delivered physics demonstrations to faculty.
- Assisted in designing new demonstrations and upgrading outdated demonstrations.
- Maintained the demo lab website using HTML .

LAITS: Classroom Support Technician Assistant

Jan. 2022—May 2023

[paid] *Dept. of Liberal Arts, UT Austin*

Supervisor: Jacob Reynolds

- Checked functionality of classroom technology across campus.
- Responded to customer support calls.

SKILLS

Programming:	Python, R, LaTeX (Overleaf), Data Visualization (Pandas, Matplotlib, Seaborn), Machine Learning (scikit-learn, TensorFlow, Keras), Numerical Optimization (SciPy), Probabilistic Programming (emcee, PyMC)
Languages:	English (native), ASL (beginner, taking college-level courses)