Sarah E. Draves

 sarahedraves | sarahedraves | sarahedraves.github.io | sarah@draves.org | +1.206.669.6004

EDUCATION

CUNY New York City College of Technology, Bachelor of Science — Jan 2024 – Dec 2025
- Major: Applied Computational Physics, Overall GPA: 4.00/4.00
- Graduated *summa cum laude*
- Relevant Coursework: Statistical Physics and Thermodynamics, Electricity and Magnetism, Classical Mechanics, Quantum Mechanics, Modern Physics, Machine Learning for Physics, Partial Differential Equations, Computational Astrophysics (CUNY Graduate Center)

CUNY Borough of Manhattan Community College — Jan – Dec 2023
- Overall GPA: 4.00/4.00
- Relevant coursework: General Astronomy, University Physics I, Ordinary Differential Equations

Colgate University, Bachelor of Arts — Sep 2016 – Dec 2019
- Major: Mathematical Economics, Major GPA: 3.90/4.00
- Graduated *magna cum laude*
- Dean's List with Distinction (4 semesters); Dean's List (2 semesters)
- Study abroad: Colgate London Economics Study Group, Fall 2018
- Relevant Coursework: Computational Mathematics, Computer Science II, Computer Organization, Linear Algebra, Multivariable Calculus, Probability

SUMMARY

Astrophysics researcher and physics undergraduate with a strong foundation in computational methods, data analysis, and physics. Highly experienced in exploring large astronomical datasets with Python. Currently applying to physics and astronomy PhD programs with the goal of continuing research in observational astrophysics.

RESEARCH EXPERIENCE

Brown Dwarfs in New York City — May 2025 – Present
- Research assistant to Dr. Mark Popinchalk as part of the AstroCom NYC program (see Fellowships)
- Compiled a catalog of nearly 200 Complex Rotator M Dwarf Stars from past papers and analyzed them with data from TESS, GAIA, and K2 to learn more about their characteristics and changes over time

Gotham Web Lab — May 2024 – Present
- Research assistant to Dr. Charlotte Welker and Dr. Charlotte Olsen
- Using Legacy Survey of Space and Time simulated data to develop and improve identification method of 2D cosmic filaments, taking into account the uncertainties of photometric redshifts
- Ran group journal club in Spring 2025, including making sure that each meeting had new articles and a discussion leader and creating a notes document to archive past insights

Emerging Scholars Program, CUNY New York City College of Technology — Feb – May 2024
- Completed research project on Galaxy Bulge Regions using Sloan Digital Sky Survey data under the guidance of Dr. Ari Maller

Fellowships

AstroCom NYC Jan 2025 – Present

– Undergraduate research fellowship for students at CUNY schools interested in pursuing graduate studies in Astronomy

– Funded by the National Science Foundation

– Included the class Scientific Thought & Practices, which emphasizes experimental design and the scientific method

Publications

A Library of Light Curves: A Catalogue of All Known Complex Rotators through K2 and TESS. Popinchalk, M., Draves, S., et al. in prep.

- Planned submission by the end of 2025

- Extending my work in the presentation of the same name in the section below

Presentations

A Library of Light Curves: A Catalogue of All Known Complex Rotators through K2 and TESS 7.30.2025

Presented at the 2025 Undergraduate Summer Research Symposium at the American Museum of Natural History in New York City.

Abstract: Complex rotators (CRs) are a recently discovered type of young M dwarf star that have unusual light curves, showing periodic behavior that cannot be explained by more typical causes like starspots. Previous studies have focused on identifying CRs and have suffered from a lack of observations over long temporal baselines. In this project, we compiled a data set of previously identified CRs in the literature and their available K2 and TESS light curves. Also using Gaia data, we investigate the similarities between these objects as well as how they change over time. In the multiyear timeframe we looked at (in some cases over a decade), we found CRs changed their complex patterns significantly or lost their complexity entirely. Further analysis of the light curves could yield better insights into the causes of these changes. This data set will be pivotal for others in the field to continue studying this unusual phenomenon.

Posters

Refining 2D Filament Recovery Methods with the Legacy Survey of Space and Time 1.6.2026

Presented at the 247th meeting of the American Astronomical Society in Phoenix, Arizona. [Poster link](#).

Abstract: The evolution of relatively massive galaxies is known to be impacted by nearby cosmic filaments, but the impact on dwarf galaxies is difficult to study observationally, because dwarf galaxies are relatively faint and the position of the filaments must be inferred from the galaxy distribution. The ongoing Legacy Survey of Space and Time is expected to discover billions of new galaxies, predominantly dwarfs, which presents an opportunity to study how those dwarfs are affected by their environments. Our research focuses on the best way to estimate the location of the filaments with the future LSST data using the simulated data from Data Challenge 2. We recover 2D filaments in photometric redshift slices and compare their positions to 3D filaments found using the underlying redshift data in the simulated data to evaluate how accurate the 2D filaments are. We are developing non-linear methods to improve to quality of filament reconstruction, especially on smaller-scale filaments. We will present on which filament reconstruction methods work best for a variety of fields in the LSST mock data. In the future, these methods can be used on the actual survey data, opening a new window on the evolution of dwarf galaxies and the impact of filaments.

Reconstructing Cosmic Filaments around Dwarf Galaxies with the Rubin Observatory 1.14.2025 & 12.4.2024

Presented similar posters at the 245th meeting of the American Astronomical Society in National Harbor, Maryland and at the 41st Semi-Annual Dr. Janet Liou-Mark Honors & Undergraduate Research Poster Presentation at CUNY New York City College of Technology. AAS poster link and CUNY poster link.

Abstract: While the largest structures in the universe that make up the cosmic web are known to influence galaxy formation for massive galaxies, the details of which processes and conditions drive the growth of low mass galaxies remain unclear. Dwarf galaxies are particularly sensitive to the environment around them and are thus an ideal way to trace smaller filaments and then investigate how exactly they impact galactic evolution. To accomplish this, we use simulated observations for the upcoming Legacy Survey of Space and Time (LSST) conducted by the Rubin Observatory, which is expected to discover 20 billion new galaxies with excellent completeness for dwarfs in the nearby universe. We use this data to identify and select low mass galaxies and infer their properties, such as position, redshift stellar mass, and star formation rate. We bin these galaxies by redshift and use DisPerSE, a topological algorithm which we use recursively in a tomographic way, to reconstruct two-dimensional filaments. We then investigate how the properties of the dwarf galaxies are correlated with their proximity to a filament. This pipeline will be applied to upcoming LSST data, where the unprecedented wealth of data promises to unlock deep insights into the details of how the cosmic web drives galaxy evolution.

Examining Galaxy Bulge Regions with the Sloan Digital Sky Survey   5.9.2024

Presented at the 40th Semi-Annual Dr. Janet Liou-Mark Honors & Undergraduate Research Poster Presentation at CUNY New York City College of Technology. Poster link.

Abstract: Nearly all of the ordinary matter in the universe is located in galaxies, which are made up stars, gas, dust, and black holes, and range in size from a few thousand to a few hundred thousand light years across. Galaxies come in different shapes, but many of them are spiral shaped, and some of those have a central bulge region that is distinct from the rest of the galactic disk. This project used a large data set of galaxies that had their bulge and disk components separated to see what correlations those fractions of each galaxy have with other galaxy properties, including total stellar mass and redshift. Binned statistics techniques were used to reduce the noise in the data. The relationships between the bulge radius and total mass and the disk radius and total mass showed strong linear correlations. The relationship between bulge to total ratio and total mass showed that the bulge fraction increases with mass dramatically at first and then declines slowly with mass, for both the mass ratio and the luminosity ratio. This information can be used to constrain galaxy formation models to learn more about how the universe came to be as it is today.

RELEVANT WORK EXPERIENCE

ibidPrep, Associate Tutor   Oct 2023 – Present
– Tutoring middle school and high school students for test prep, math, high school physics, and general academic skills

Highspot, Data Analyst   Apr 2020 – Jun 2023
– Managed analytics projects from initial conception through finished products, documentation, and maintenance
– Designed dashboards using Tableau Desktop for both Sales and Marketing teams, ranging from individual requests for specific analysis to dashboards that have been in use for years and used by dozens of people
– Created multiple data sources using SQL within Snowflake that combined data from Salesforce, Workday, and Google Sheets to be used for analysis of different areas of the business
– Wrote and maintained documentation of popular dashboards so that new users could train themselves on the dashboards and to reduce the number of clarification questions directed to the analytics team

Colgate Economics Department, Intermediate Microeconomics Tutor   Sep 2017 – May 2018
– Held weekly tutoring sessions to help students practice problems, understand concepts, and prepare for exams
– Graded problem sets to provide feedback to students on their understanding

Volunteer Experience

CUNY Astro Student Union Representative   Fall 2025
- Planned events for undergraduates, graduate students, and faculty to promote department unity
- Communicated student needs and issues to faculty members at monthly faculty meetings
- Wrote and distributed monthly newsletter to keep community members informed of upcoming events and available resources

Skills and Interests

Programming Languages	Advanced	Python (Numpy, Pandas, Matplotlib, Astropy, Seaborn, SciPy)
	Intermediate	SQL, Java
	Beginner	Matlab, Stata, R, Maple
Software		Tableau Desktop, Tableau Prep, Snowflake, Excel, Salesforce, Adobe Illustrator, Adobe Photoshop
Hobbies		Running, Skiing, Reading, Cooking, Art Museums, Restaurants