C.Tanner Murphey

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Education

PhD **University of Illinois, Urbana-Champaign**, Astronomy — Aug 2023 – Current

- **LSSTC Data Science Fellow**
- **Current Work:** Leading the Dark Energy Camera portion of the Young Supernova Experiment survey
- Advisor: Prof. Gautham Narayan

MA **Stony Brook University**, Physics — Aug 2021 – May 2023

- **Thesis:** *Fast Cosmological Inference from Black Hole Mass Functions With Markov Chain Monte Carlo*
- *Advanced Graduate Certificate in Data and Computational Science*
- Advisor: Prof. Will Farr

BS **University of Illinois, Urbana-Champaign**, Astronomy — Aug 2016 – May 2020

- **Thesis:** *Witnessing History: Rates and Distributions of Naked-eye Milky Way Supernovae*
- *Double minor in Physics and Computer Engineering*
- Advisor: Prof. Brian Fields

Research Experience

University of Illinois, Research Assistant, PhD Student — Urbana, IL, Aug 2023 – Current

- Managed entire survey pipeline, from obtaining telescope time to processing data to reporting transients, for the Dark Energy Camera side of the Young Supernova Experiment
- Upgraded *photpipe* image processing pipeline to speed up turnaround time between downloading image data and reporting detected transients
- Leading development of second YSE data release

Stony Brook University, Research Assistant, Masters Student — Stony Brook, NY, Aug 2021 – May 2023

- Developed cosmological inference model using LIGO binary black hole mergers that is orders of magnitudes faster than LIGOs models
- Used theoretical priors of black hole mass function to infer redshift from LIGO source frame mass posteriors and fit posteriors using Markov Chain Monte Carlo
- Actively participated in Gravitational Waves Group meetings at Flatiron Institute

University of Illinois, Undergraduate Researcher — Urbana, IL, June 2018 – Oct 2020

- Modeled supernova and dust distributions to explain lack of any naked-eye supernovae in the Milky Way since 1604
- Developed novel Monte Carlo method that allowed us to quickly show how rates and distributions change as observing criteria change
- Found that, while dust extinction and other visibility limiters (e.g. the Sun) could explain lack of Galactic supernovae, the predicted distributions strongly disagreed with locations of historical supernovae
- Results published in *Monthly Notices of the Royal Astronomical Society* and written about in *Popular Science*

Papers

JWST and Ground-based Observations of the Type Iax Supernovae SN 2024pxl and SN 2024vjm: Evidence for Weak Deflagration Explosions — May 2025
Lindsey A. Kwok, Mridweeka Singh, Saurabh W. Jha, et al. ***incl. C. Tanner Murphey,***
10.48550/arXiv.2505.02944 *Submitted to ApJL*

Photometry and Spectroscopy of SN 2024pxl: A Luminosity Link Among Type Iax Supernovae — May 2025
Mridweeka Singh, Lindsey A. Kwok, Saurabh W. Jha, et al. ***incl. C. Tanner Murphey***
10.48550/arXiv.2505.02943 *Submitted to ApJ*

Fast Cosmological Inference from Black Hole Mass Functions with Markov Chain Monte Carlo — May 2023
C. Tanner Murphey, Will M. Farr
Submitted as Masters Thesis to Stony Brook University

Witnessing history: sky distribution, detectability, and rates of naked-eye Milky Way supernovae — Oct 2021
C. Tanner Murphey, Jacob W. Hogan, Brian D. Fields, Gautham Narayan
10.1093/mnras/stab2182 *Accepted by MNRAS*

The Plane's The Thing: The Case for Wide-Fast-Deep Coverage of the Galactic Plane and Bulge — Jan 2004
Jay Strader, Elias Aydi, Christopher Britt, et al. ***incl. C. Tanner Murphey***
10.48550/arXiv.1811.12433

Talks

Invited

Supernovae in the Milky Way. *Boom! A Workshop on Explosive Transients with LSST*. — Urbana, IL Aug 2022
Recording at https://youtu.be/XWdPHraC65E?si=cnUOX_UHchZXBwbI

Astronomy Coding Education

Introduction to the Unix Terminal. — Sept 2024
Recording at https://youtu.be/-dq5vnra3z8?si=Wh4BNl3HS6gloJR-

Introduction to Using the UIUC Campus Cluster. — April 2025
Recording at https://youtu.be/XCdy4KpftZ8?si=AnoQMPcDPZ0rYERd

Students Advised

Gauri Nair, *Sophomore Undergraduate* — Oct 2024 - Current

- Assisting in processing subset of YSE fields as they're observed with DECam
- Implementing convolutional neural network for real-bogus detection of supernovae using *photpipe* DECam image products

DEI and Outreach

Society for Equity in Astronomy

Graduate Mentor for Undergraduates — Aug 2023 - Current

- Mentored multiple undergraduates from underrepresented minority backgrounds on how to get through college
- Gave advice on everything from living at college to navigating exams to finding research

Outreach

Urbana Science at the Market, *Urbana Farmers Market*	May 2025
STEM Night, *Yankee Ridge Multilingual School*	May 2025
Astronomy Conversations, *Adler Planetarium*	Mar 2025
Jump! Into Science, *Urbana Free Library*	Feb 2025
Astronomy Conversations, *Adler Planetarium*	Nov 2024
Astronomy Conversations, *Adler Planetarium*	Aug 2024
Jump! Into Science, *Urbana Free Library*	Aug 2024
International Dark Sky Appreciation, *Middle Fork River Forest Preserve*	Aug 2024
Urbana Science at the Market, *Urbana Farmers Market*	May 2024
Total Eclipse of the Park, *Marion, IL*	April 2024
Stars and Smores, *Allerton Park*	Sept 2023

Other Projects

Fitting a Power Law to the Main Sequence of an H-R Diagram

github.com/ctmurphey/H-R-Analysis

- Final Project for *PHY 521: Stars* at Stony Brook University, Fall 2021
- Data was taken from Gaia DR3
- Final model fit to main sequence very well after accounting for outliers like red giants/white dwarfs
- Model was fit using Markov Chain Monte Carlo in PyMC

Testing Various Machine Learning Techniques at Predicting Baseball Hall-of-Famers

github.com/ctmurphey/ML-BaseballHoF

- Final Project for *AMS 561: Introduction to Computational and Data Science*, Spring 2022
- Compared performance of 5 different ML techniques: Decision Tree, K-Nearest Neighbors, Support Vector Machine, Random Forest, and Logistic Regression
- Techniques we tested on 4 different datasets: Basic Batting, Basic Pitching, Advanced Batting, Advanced Pitching
- Random Forests obtained the highest F-1 scores across all 4 datasets

Reddit Bot to Track MLB Season Splits for Specific Team

github.com/ctmurphey/season-series-bot

- Fetches live game data using Major League Baseball's StatsAPI and breaks down season progress by opponent
- Data is represented as stack bar graphs that start as fully incomplete gradually fill up with wins and losses as season progresses
- Most recent figure is posted to Reddit via a bot twice a week

Coding Skills

Languages: Python, Bash, C++, Julia, SQL, Perl

Libraries: NumPy, SciPy, AstroPy, Matplotlib, Pandas, PyTorch, Scikit-learn, Tensorflow, PyMC

Frameworks and Tools: Jupyter, SSH, VS Code, Vim, Obsidian