Ritvik Sai Narayan

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EDUCATION

University of Wisconsin-Madison — Madison, WI, USA

B.S. in Astronomy, Physics (Hons.) & B.S in Economics; GPA: 3.967/4.00 — *Sep 2022 – Jun 2026*
- Minor Degree in Mathematics.

Creative School — Bengaluru, KA, India

Cambridge AS and A Level Certification — *Jun 2019 – May 2022*

RESEARCH EXPERIENCE

Wisconsin Center for Origins Research (WiCOR) — Madison, WI, USA

Undergraduate Researcher — *Aug 2024 – Present, Part-time*
- *Project*: Computing Exoplanet Transit Yields
- *Mentors*: Prof. Melinda Soares-Furtado & Prof. Mary Anne Limbach
  * Predicted the population of young stars and exoplanets the Nancy Grace Roman Space Telescope is expected to discover in the Rosette Nebula with a month-long observation.
  * Determined cluster memberships using machine-learning techniques and a comoving population algorithm and spectral models to characterize the Rosette Nebula's stellar population.
  * Modeled a sample of one million FGK and M-dwarf host stars using known planetary occurrence rates with a Monte Carlo injection recovery model to estimate the number of new worlds this survey will uncover.
- *Project*: Moving Group Analysis
- *Mentors*: Prof. Melinda Soares-Furtado
  * Determined age constraints based on white dwarf cooling ages for a newly discovered young moving group in the solar neighborhood, as a part of the TESS Hunt for Young and Maturing Exoplanets (THYME).
- *Project*: Asteroseismology
- *Mentors*: Prof. Melinda Soares-Furtado
  * Developed a framework for applying asteroseismic techniques to Sun-like main-sequence stars using high-precision radial-velocity (HPRV) data, refining methods to resolve age degeneracy in stars lacking precise age estimates. This work was designed to help constrain target-selection for the Habitable Worlds Observatory.
  * Developed a data pipeline to optimize observational strategies (cadence, signal-to-noise) for detecting solar-like oscillations in HPRV datasets.

WIYN Open Cluster Study (WOCS) — Madison, WI, USA

Undergraduate Researcher — *Oct 2022 – Present, Apprenticeship*
- *Project*: Spectroscopic and Radial-Velocity Study of NGC 188
- *Mentors*: Prof. Robert Mathieu and Evan Linck
  * Extended a 27-year radial-velocity survey of the old open cluster NGC 188 using data from the WIYN 3.5m telescope and APOGEE-2 datasets, deriving 76 new spectroscopic binary orbits and revising membership using proper-motions from Gaia DR3.
  * Measured key cluster properties such as a completeness-corrected binary fraction and a refined tidal circularization period, providing constraints on binary evolution theory.
  * Identified candidate mass-transfer products, including a possible first Blue Lurker in NGC 188, through spectral energy distribution modeling and UV excess detection.
  * Demonstrated the role of binary interactions in cluster evolution, showing that the absence of short-period giants is consistent with mass-transfer pathways that produce Blue Stragglers and related anomalous stellar populations.
- *Project*: Binary Mass-Transfer Simulations
- *Mentors*: Prof. Robert Mathieu and Evan Linck
  * Assisted in creating and analyzing models to study the evolution of Blue Straggler binary systems in the WIYN Open Cluster Study, using Modules for Experiments in Stellar Astrophysics (MESA) to investigate their formation and evolution.

Peer-Reviewed Publications

- **Narayan, R. S.**, et al. *Twinkle Twinkle Little Star, Roman Sees Where You Are: Predicting Exoplanet Transit Yields with a 30-day Survey of the Rosette Nebula with the Nancy Grace Roman Space Telescope*, in-prep.
- **Narayan, R. S.**, et al. *WIYN Open Cluster Study. XCIII. An Extended Radial-Velocity Survey and Spectroscopic Binary Orbits in the Open Cluster NGC 188*, submitted to The Astronomical Journal.
- Kroft, M., et al. (including **Narayan, R. S.**) *Confirmation of the Dense Sub-Neptune GJ 523b*, in-prep.
- Distler, A., et al. (including **Narayan, R. S.**) *TESS Hunt for Young and Maturing Exoplanets (THYME) XIII: A 130 Myr Moving Group Containing Two Transiting Planetary Systems*, submitted to The Astronomical Journal.

Proposals

- **WIYN Hydra Multi-Object Spectrograph (MOS)**: Co-Investigator, *A Study of Binary Populations and Alternative Pathways of Stellar Evolution in Open Clusters*, 5 nights. (2023B)

Presentations

- *Twinkle Twinkle Little Star, Roman Sees Where You Are*: 35th Annual Wisconsin Space Conference.
- *All the Mass We Cannot See: Verifying the Presence of Dark Matter in the Milky Way*: University of Wisconsin-Madison Undergraduate Symposium.
- *Probing the Long-Period Blue Straggler Progenitor Population of NGC 188: A Radial Velocity Study using The Joker*: 244th American Astronomical Society, https://doi.org/10.3847/25c2cfeb.e7358267.

Awards & Achievements

Alberta A. Taylor Scholarship: A one-time scholastic award presented to a student pursuing an economics degree. (Spring 2025)

NASA Wisconsin Space Grant Undergraduate Research Scholarship: Among the first international citizens to receive this award for research that supports a NASA Mission Directorate. (Fall 2024)

Chambliss Astronomy Achievement Award: Awarded an honorable mention at the 244th meeting of the American Astronomical Society for exemplary research as an undergraduate. (Nov 2024)

Honors Summer Research Apprenticeship Fellow: Awarded to support an intensive summer research project at the University of Wisconsin-Madison in recognition of academic achievement and research potential. (May 2024)

Dean's List: Students achieving at a high level academically are recognised by the Dean of the College of Letters & Science. (Fall 2022, Spring 2023, Fall 2023, Spring 2024, Fall 2024, Spring 2025)

Outstanding Delegate: The United Nations General Assembly Third Committee (SOCHUM), awarded by Ivy League Model United Nations India, hosted by UPenn. (Nov 2019)

Batch of 1975 Award: Highest marks in a 2nd Language, Kannada, awarded by St. Joseph's Boys' High . (July 2019)

Skills

Relevant Coursework:

- **Economics**: <u>ECON 101</u>: *Principles of Microeconomics*, <u>ECON 102</u>: *Principles of Macroeconomics*, <u>ECON 310</u>: *Statistics: Measurement in Economics*, <u>ECON 311</u>: *Intermediate Microeconomic Theory – Advanced Treatment*, <u>ECON 312</u>: *Intermediate Macroeconomic Theory – Advanced Treatment*, <u>ECON 410</u>: *Introductory Econometrics*, <u>ECON 570</u>: *Data Visualization For Economists*, <u>ECON 315</u>: *Fundamentals of Data Analytics for Economists*.
- **Astronomy**: <u>ASTRON 103</u>: *The Evolving Universe: Stars, Galaxies, & Cosmology*, <u>ASTRON 320</u>: *The Interstellar Medium*, <u>ASTRON 335</u>: *Cosmology*, <u>ASTRON 465</u>: Observational Astronomy & Data Analysis, <u>ASTRON 310</u>: *Stellar Astrophysics*, <u>ASTRON 681</u>: *Honors Senior Thesis I* (Fall 2025).
- **Physics**: <u>PHYSICS 207</u>: *General Physics 1*, <u>PHYSICS 208</u>: *General Physics 2*, <u>PHYSICS 241</u>: *Introduction to Modern Physics*, <u>PHYSICS 311</u>: *Mechanics*, <u>PHYSICS 322</u>: *Electromagnetic Fields*, <u>PHYSICS 415</u>: *Thermal Physics*, <u>PHYSICS 531</u>: *Introduction to Quantum Mechanics* (Fall 2025).

Software & Languages: HTCondor, Tableau, HTML5, StataSE, BASH, LaTeX, Python.

Work Experience

UW-Madison Department of Mathematics   Madison, WI, USA

Course Assistant and Tutor   *Aug 2023 − Apr 2025, Part-time*

- In-Classroom Peer Mentor for MATH 96: Preparatory Algebra and MATH 112: College Algebra, Fall 2023.
- Course Assistant for MATH 340, Spring 2024, Fall 2024.
- Tutor for all courses leading to and including MATH 234: Multivariable Calculus.

UW-Madison Dining and Culinary Services   Madison, WI, USA

Student Shift Lead   *Aug 2022 − May 2023, Part-time*

- Guided team members to maintain proper work procedure and standards in a leadership position while working with a diverse population of student employees and customers.