

Raghav Chari – Curriculum Vitae

CONTACT INFORMATION

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CITIZENSHIP

United States & Canada

EDUCATION

B.S., Physics, The University of Tennessee, Knoxville, TN, USA

Expected Fall 2024

Degree to be conferred with honors (Expected).

Senior Thesis Advisor: Prof. Mike Guidry

PUBLICATIONS

REFEREED PAPERS

4. Miroshnichenko, A.S., **Chari, R.**, Danford, S., Prendergast, P., Aarnio, A.N., Andronov, I.L., Chinarova, L.L., Lytle, A., Amantayeva, A., Gabitova, I.A., *et al.* (2023). *Searching for Phase-Locked Variations of the Emission-Line Profiles in Binary Be Stars*. *Galaxies*, 11, 83. [[DOI:10.3390/galaxies11040083](https://doi.org/10.3390/galaxies11040083)].

UNSUBMITTED PUBLICATIONS

1. Lackey-Stewart, A., **Chari, R.**, Cole, A., Brey, N., K. G., Guidry, M., and Endeve, . (2023), *Fast explicit solutions for astrophysical neutrino transport: Explicit asymptotic methods.*, Manuscript in preparation.

CONFERENCE CONTRIBUTIONS

3. **Chari, R.**, Cole, A., Guidry, M. (2023), *Neutrino Electron Scattering in Dense Astrophysical Environments: A New Frontier in Neutrino Transport*, *Frontiers in Nuclear Astrophysics*. [[Abstract](#)].
2. Miroshnichenko, A., **Chari, R.**, Aarnio, A., Danford, S. (2021), *Spectral History Of The Bright Be Star Omicron Aquarii*, *Bulletin of the AAS*, 53(6). [[Abstract](#)].

RESEARCH EXPERIENCE

Research Assistant and Fellow, Computational Astrophysics Group, The University of Tennessee, Knoxville, TN, (September 2021 - Present).

- Developed new computational algorithms solving large sets of partial differential equations related to hydrodynamics, radiation transport, and thermonuclear reactions under the mentorship of Professor Mike Guidry.
- Awarded the Department Summer Fellowship in 2022 and played a pivotal role in the development of "FENN," (Fast Explicit Neutrino Networks) a computational framework.
- Innovated and optimized Neutrino Transport Algorithms specifically for deployment on NVIDIA GPUs within Oak Ridge National Labs' Exascale Computing System.

Research Assistant, Computational Astrophysics, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, (March 2022 - Present).

- Formulated advanced computational models under the guidance of Dr. Apurva Oza, focusing on stellar pollution, accretion disk dynamics, spallation reactions, and dust accretion.
- Performed calculations using SERPENDS, a 3-D weighted monte carlo simulation toolkit to innovate extended models for Black Hole Pollution dynamics across various frameworks.
- Conceptualized and implemented simulation models for a $10^8 M_\odot$ Supermassive Black Hole, advancing the field's understanding of such celestial objects.

Research Assistant, Astrophysics, The University of North Carolina at Greensboro, Greensboro, NC, (September 2020 - July 2023).

- Conducted extensive spectral analysis over a span of three years to scrutinize the binarity of Be stars.
- Co-authored a article titled "Searching for Phase-Locked Variations in Binary Be Stars," published in the journal "Galaxies."
- Explored the temporal behavior of Balmer line profiles, contributing to the detection of orbital periods in Be stars.

Research Intern, Particle Astrophysics, Wisconsin IceCube Particle Astrophysics Center, Madison, WI, (June 2021 - August 2021).

- Conducted specialized analyses of muons generated by cosmic rays, contributing to the body of knowledge in high-energy particle physics.
- Conducted a study on the angular dependence of muon detection, utilizing Arduino software to improve detection techniques.

SELECTED TALKS

2. **Chari, R.**, Cole, A., Guidry, M., Endeve, E. (2023), *An Explicit Method for Modeling Neutrino Electron Scattering in Core-Collapse Supernova*, University of Indiana Bloomington, Society of Physics Students Conference.
1. **Chari, R.**, Guidry, M., Brey, N., Cole, A. (2022), *New Approaches to Astrophysical Nucleosynthesis and Neutrino Transport in Stellar Explosions and Collisions*, University of Tennessee, Knoxville Department of Physics and Astronomy Fellowship Talk.

FELLOWSHIPS AND AWARDS

SPS National Leadership Scholarship , Society of Physics Students (AIP)	May 2023
Outstanding First-Year Physics Student , University of Tennessee, Knoxville	May 2022
Research Fellowship in Physics , University of Tennessee, Knoxville	May 2022
Robert Talley Physics Scholarship , University of Tennessee, Knoxville	August 2021
Tennessee Explore Scholarship , University of Tennessee, Knoxville	August 2021
Eagle Scout , Boy Scouts of America	Oct 2020

COMPUTER SKILLS Expert in C/C++. Proficient in Matlab, Python, Bash, Experience in HPC (Summit Supercomputer). Markup languages: \LaTeX , HTML, CSS, Markdown.

Software—Most contributions can be found at <https://github.com/Rchari1>. Author of **Fast Explicit Neutrino Networks (FENN)** (<https://github.com/Rchari1/FENN>).

FENN is a high-performance C++ based software suite designed for solving large sets of coupled Differential Equations for Neutrino Electron Scattering (NES) at incredible speeds. It provides efficient numerical solutions by using algebraically stabilized explicit methods, showing significant improvements in computational efficiency and scalability compared to conventional implicit methods. Currently FENN is in the process of being scaled to involve arbitrarily large Network Sizes and extended beyond simple Neutrino Electron Scattering.

TEACHING
EXPERIENCE**Undergraduate Teaching Assistant**, University of Tennessee, Knoxville

Astronomy 151: A Journey through the Solar System	Spring 2023, Falls 2022-2023
Astronomy 152: Stars, Galaxies, and Cosmology	Spring 2023, Falls 2022-2023
Astronomy 153 Lab I	Spring 2023, Falls 2022-2023
Astronomy 154 Lab II	Spring 2023, Falls 2022-2023
Physics 221: Elements of Physics I	Spring 2023
Physics 222: Elements of Physics II	Spring 2023

WORKSHOPS AND
TRAININGS

- **Author of Math Fundamentals Workshop for Astronomy,** **Fall 2023**
[Direct Download Link to PDF Workshop](#)

MENTORING/
SUPERVISION**High School Students**

[Olivia C.], Oak Ridge High School, TN **2023 - Present**

PROFESSIONAL
ACTIVITIES,
OUTREACH, AND
SERVICE**Leadership and Service**

- **People of Color in Physics, Founder and President** **2023–2024**
 - Established an inclusive initiative to amplify diverse voices in Physics, including meeting with Tennessee representatives to discuss diversity issues on the University level.
 - Led efforts resulting in the University of Tennessee hosting the National Society of Black Physicists Conference.
- **Carolinas District of Key Club, Kiwanis Key Club Committee** **2018–2023**
 - Served as a student and adult volunteer.
 - Organized large events like the Annual District Convention.
- **Provost Advisory Council** **2023–2024**
 - Selected by the Dean to serve on the Provost Council and serve as the Representative of the College of Arts & Sciences on the University level. Council term is 2 years.
 - Emphasized on diversity in Science during my term and focusing university admissions on broader ranges of socio-economic status's across Tennessee, with an emphasis on Science and Physics.