

# Raghav Chari – Curriculum Vitae

CONTACT INFORMATION	Nielsen Physics Building, 401 1408 Circle Dr Knoxville, TN 37996 USA	<a href="mailto:rchari1@tennessee.edu">rchari1@tennessee.edu</a> <a href="https://github.com/Rchari1">github.com/Rchari1</a> 1-919-886-3354
CITIZENSHIP	United States & Canada	
EDUCATION	<b>B.S., Physics</b> , The University of Tennessee, Knoxville, TN, USA Degree to be conferred with Honors (Expected) Senior Thesis Advisor: Prof. Mike Guidry	<i>Expected Fall 2024</i>
PUBLICATIONS SUMMARY	<b>h-index</b> —As of 2024-01-04: 1, Total Publications: 3, Peer-Reviewed Papers: 1, <a href="#">Google Scholar</a>	
REFEREED PAPERS	4. Miroshnichenko, A.S., <b>Chari, R.</b> , Danford, S., Prendergast, P., Aarnio, A.N., Andronov, I.L., Chinarova, L.L., Lytle, A., Amantayeva, A., Gabitova, I.A., <i>et al.</i> (2023). <i>Searching for Phase-Locked Variations of the Emission-Line Profiles in Binary Be Stars</i> . <i>Galaxies</i> , 11, 83. [ <a href="#">DOI:10.3390/galaxies11040083</a> ].	
SUBMITTED PUBLICATIONS	3. Lackey-Stewart, A., <b>Chari, R.</b> , Cole, A., Brey, N., K. G., Crowley, R., Guidry, M., and Endeve, . (2023), <i>Fast Explicit Solutions for Neutrino-Electron Scattering: Explicit Asymptotic Methods</i> , [ <a href="#">arXiv:2312.09090</a> ].	
CONFERENCE PROCEEDINGS	2. <b>Chari, R.</b> , Cole, A., Guidry, M. (2023), <i>Neutrino Electron Scattering in Dense Astrophysical Environments: A New Frontier in Neutrino Transport</i> , <i>Frontiers in Nuclear Astrophysics</i> . [ <a href="#">Abstract</a> ]. 1. Miroshnichenko, A., <b>Chari, R.</b> , Aarnio, A., Danford, S. (2021), <i>Spectral History Of The Bright Be Star Omicron Aquarii</i> , <i>Bulletin of the AAS</i> , 53(6). [ <a href="#">Abstract</a> ].	
RESEARCH EXPERIENCE	<b>Research Assistant and Fellow, Computational Astrophysics Group</b> , The University of Tennessee, Knoxville, TN, (September 2021 - Present). <ul style="list-style-type: none"><li>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.</li><li>Awarded the Department Summer Fellowship in 2022 and played a pivotal role in the development of "FENN," (Fast Explicit Neutrino Networks) a computational framework.</li><li>Innovated and optimized Neutrino Transport Algorithms specifically for deployment on NVIDIA GPUs within Oak Ridge National Labs' Exascale Computing System.</li></ul> <b>Research Assistant, Computational Astrophysics</b> , Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, (March 2022 - Present). <ul style="list-style-type: none"><li>Formulated advanced computational models under the guidance of Dr. Apurva Oza, focusing on stellar pollution, accretion disk dynamics, spallation reactions, and dust accretion.</li><li>Performed calculations using SERPENDS, a 3-D weighted monte carlo simulation toolkit to innovate extended models for Black Hole Pollution dynamics across various frameworks.</li><li>Conceptualized and implemented simulation models for a <math>10^8 M_\odot</math> Supermassive Black Hole, advancing the field's understanding of such celestial objects.</li></ul>	

**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

3. **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 Regional Conference.
2. **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 Seminar.
1. **Chari, R.**, Guidry, M., Cole, A., Endeve, E., Brey, N., Crowley, R., Clark, O., (2023), *An Explicit Asymptotic approach to Neutrino Electron Scattering in Core-Collapse Supernovae using FENN* University of Tennessee, Knoxville High Energy Astrophysics Seminar

#### GRANTS SUMMARY **Total Grants: 3**

**Total Award Amount Received: \$7750**

#### GRANTS AND FELLOWSHIPS

- **Enhancing Astrophysical Modeling: Integrating WEAKLIB with Fast Explicit Neutrino Networks for Advanced Large Scale Neutrino Electron Scattering**, Faculty Mentor: Prof. Mike Guidry, **Advanced Undergraduate Research Activity (AURA)**, **\$1750**, 2024
- **New Approaches to Astrophysical Nucleosynthesis and Neutrino Transport**, Fellow, Faculty Mentor: Prof. Mike Guidry, University of Tennessee, Knoxville Department of Physics and Astronomy, **\$5500**, 2021
- University of Tennessee, Knoxville Undergraduate Research & Fellowships **Travel Grant**, **\$500**, 2023

#### AWARDS

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

**COMPUTER SKILLS** Expert in C/C++. Proficient in Matlab, Python, Bash, Experience in HPC (Summit Supercomputer). Markup languages:  $\text{\LaTeX}$ , 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	<b>Spring 2023, Falls 2022-2023</b>
Astronomy 152: Stars, Galaxies, and Cosmology	<b>Spring 2023, Falls 2022-2023</b>
Astronomy 153 Lab I	<b>Spring 2023, Falls 2022-2023</b>
Astronomy 154 Lab II	<b>Spring 2023, Falls 2022-2023</b>
Physics 221: Elements of Physics I	<b>Spring 2023</b>
Physics 222: Elements of Physics II	<b>Spring 2023</b>

**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.
- **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.
- **Carolinas District of Key Club, Kiwanis Key Club Committee** **2018–2024**
  - Served as a student and adult volunteer.
  - Organized large events like the Annual District Convention.