Raghav Chari

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Citizenship United States & Canada

Education

B.S., Physics, The University of Tennessee, Knoxville 2021-2025

Thesis Advisor: Prof. Mike Guidry

B.A., Philosophy of Physics, The University of Tennessee, Knoxville 2021-2025

Thesis Advisor(s): Prof. Sean Lindsay (Physics) & Prof. Mariam Thalos (Philosophy)

Publications Summary **h-index** —As of 2024-02-28: 1, Total Publications: 3, Peer-Reviewed Papers: 1, Google Scholar

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].

Submitted Publications

3. Lackey-Stewart, A., **Chari, R.**, Cole, A., Brey, N., K. G., Crowley, R., Guidry, M., and Endeve, . (2023), *Fast Explicit Solutions for Neutrino-Electron Scattering: Explicit Asymptotic Methods*, [arXiv:2312.09090].

First Author Conference Proceedings

2. **Chari, R.**, Cole, A., Guidry, M., Brey, N., Endeve, E., Crowley, R. (2024), *Advancing Astrophysical Models through FENN: Algebraically Stabilized Explicit Integration for Neutrino Electron Scattering in Stellar Explosions and Mergers.* Bulletin of the AAS [Abstract].
1. **Chari, R.**, Cole, A., & Guidry, M. (2023), *Neutrino Electron Scattering in Dense Astrophysical Environments: A New Frontier in Neutrino Transport*, Frontiers in Nuclear Astrophysics Book of Abstracts (pp. 22). [Abstract].

Research Experience

Research Assistant and Fellow, The University of Tennessee, Knoxville TN
Professor Guidry & UT/ORNL Computational Astrophysics Group September 2021 - Present

- Developed new computational algorithms for solving large sets of partial differential equations related to hydrodynamics, radiation transport, and thermonuclear reactions.
- Awarded the Department Summer Fellowship in 2022 and played a pivotal role in the development of "FENN," a computational framework.
- Awarded AURA grant Spring 2024 to integrate FENN with WEAKLIB for demonstrating scalability to sets of large Neutrino Networks for arbirtary ρ, T, Ye

Research Assistant, California Institute of Technology, Pasadena, CA
Dr. Oza Group November 2022 - Present

- Formulated advanced computational models focusing on stellar pollution, accretion disk dynamics, and spallation reactions.
- Performed calculations using SERPENDS to innovate extended models for Black Hole Pollution dynamics.
- Conceptualized simulation models for a Supermassive Black Hole, advancing the understanding of such celestial objects.

Research Assistant, The University of Tennessee, Knoxville, TN
Professor Thalos/Department of Philosophy February 2023 - Present

- Conducting Philosophy research under the mentorship of Professor Mariam Thalos, primarily as it relates to the philosophy of physics.
- Working on a research project studying literature and investigating space (time) from a philosophical perspective.

Research Assistant, The University of North Carolina, Greensboro, NC
Professor Miroshnichenko/UNCG Astrophysics Group September 2020 - July 2023

- Conducted spectral analysis to scrutinize the binarity of Be stars, contributing to the detection of orbital periods.
- Used IRAF and python data analysis including leveraging NASA databases to model orbital periods and analyze data to contribute to overall mission.
- Co-authored an article titled "Searching for Phase-Locked Variations in Binary Be Stars," published in "Galaxies."

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

Awards

SPS National Leadership Scholarship, Society of Physics Students (AIP) **May 2023**

Outstanding First-Year Physics Student, 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**

Distinguished District Governor, Key Club International **May 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 extendeed beyond simple Neutrino Electron Scattering.

Grants Summary

Successfully secured **$8,250** in research funding through the following grants and fellowships.

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 Undergradute 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** ×2, **$1000**, 2023

Teaching Experience

Undergraduate Teaching Assistant, University of Tennessee, Knoxville

Astronomy 151: Journey through the Solar System	**Springs 2023-2024, Falls 2022-2023**
Astronomy 152: Stars, Galaxies, and Cosmology	**Springs 2023-2024, Falls 2022-2023**
Astronomy 153 Lab I	**Springs 2023-2024, Falls 2022-2023**
Astronomy 154 Lab II	**Springs 2023-2024, Falls 2022-2023**
Physics 221: Elements of Physics I	**Spring 2023**
Physics 222: Elements of Physics II	**Spring 2023**

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.
- **University Provost Advisory Council** **2023–2024**
  - Selected by the Dean to serve on the University 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–present**
  - Served as District Governor for the state of North & South Carolina as a student.
  - Served on the adult Kiwanis-Key club Committee to assist with the leadership development of High School students.
  - Helped organize large events like the Annual District Convention.