Raghav Chari

Contact Information

Nielsen Physics Building, 401
1408 Circle Dr
Knoxville, TN 37996 USA

rchari1@tennessee.edu
github.com/Rchari1
1-919-886-3354

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 Publications

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].

Unsubmitted Publications

1. Lackey-Stewart, A., **Chari, R.**, Cole, A., Brey, N., K. G., Guidry, M., and Endeve, E. (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].

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**

Software Developed

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.

Research Experience

4. **Research Assistant and Fellow, Computational Astrophysics Group**, The University of Tennessee, Knoxville, TN, (September 2021 - Present).
   - Spearheaded research in computational algorithms for solving intricate partial differential equations in hydrodynamics, radiation transport, and thermonuclear reactions under the mentorship of Professor Mike Guidry.
   - Secured a Department Summer Fellowship in 2022 and played a pivotal role in the conceptualization and development of "FENN," a computational framework.
   - Innovated and optimized Neutrino Transport Algorithms specifically for deployment on NVIDIA GPUs within Oak Ridge National Labs' Exascale Computing System.
3. **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.
   - Leveraged the SERPENDS numerical 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.
2. **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.
1. **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.
   - Spearheaded 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.

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 J. Clark], 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.