Neil Ghugare

Education

The Ohio State University **08-2022 – Present**

BS in Physics, BS in Astronomy and Astrophysics *Columbus, Ohio*

- German and Honors Math Minors.
- Involved in multiple campus clubs including the Society of Physics Students, Astro Society, CETA, and AI Club.

Goethe-Institut Dresden **05-2024 – 06-2024**

Course Participation Certificate *Dresden, Germany*

- Completed the Goethe I75 German course at the CEFR B2 level.
- Summer study abroad program that included cultural immersion and language practice experiences, including programs provided by the institute.
- Practiced German with native speakers in multiple German cities including Dresden, Leipzig, Meißen, and Bad Schandau.

Experience

The Ohio State University **01-2023 – Present**

Undergraduate Research Assistant *Columbus, Ohio*

- Currently working in theoretical astrophysics under Dr. Todd Thompson, Dr. Prasanna, and Dr. Coleman on a project related to neutron star formation and Magnetar winds using the high-performance computing resources and Athena++.
- Worked in experimental condensed matter physics under Dr. ChunNing Lau and Ph.D. Student Jiayin Wang.
- Participated in the OSU Physics Summer Research Program 2023 working on a project related to AI identification of Graphene layers through unsupervised clustering algorithms.
- Participating in the Undergraduate Research Apprenticeship Program 2025 working on a project on 3D full-physics and isothermal magnetar simulations using Athena++ on the Ohio Supercomputing Center.

The Ohio State University **09-2023 – 09-2024**

Student Assistant - Grader *Columbus, Ohio*

- Assist professors with teaching through grading homework and assignments. The answer keys were made by hand in order to grade the assignments.
- Classes graded: Math 3345 (Foundations of Higher Mathematics).

Certifications

Goethe Zertifikat B2 **06-2024**

- Successfully demonstrated reading, listening, speaking, and writing abilities at the CEFR B2 level for German.

Wolfram Language & Mathematica Level 1 Certification **04-2023**

- Demonstrated proficiency in using the Wolfram Mathematica software, including use of notebooks.
- Demonstrated proficiency in using the Wolfram Language, including how to represent and visualize data, understading the syntax and basic functions of the language, using the neural net framework, and more.

PCEP Certified Entry-Level Python Programmer **07-2022**

- Demonstrated proficiency in entry-level python programming skills and basic OOP principles.
- Given by the OpenEDG Python Institute | Certification ID: w5Aq.PwDt.ArRc

Technical Skills

Programming Languages: Python, Java, C++, MATLAB, and Mathematica. Familiar with C and FORTRAN.
Tools: LaTeX, Git, Gradle/Maven, Jupyter, Conda/PyPI/Venv, and Tensorflow/Scikit-Learn/CUDA, and HPC practices.
Language Skills: English (Native), German (CEFR Level B2), and understands Marathi.

Projects

Magnetar Wind Simulations in Athena++ **Ongoing**

- Ran 3D full-physics and isothermal magnetar wind simulations utilizing OSC HPC resources and the MHD code-base Athena++.
- Created and made profile plots and animations of the simulation results using multiple libraries in Python. Generalized the code to work for different simulation cases and to work in the command line.
- Project supported by the OSU Undergraduate Research Apprenticeship Program 2025.

Graphene Layer Identification AI **07-2023**

- Employed unsupervised clustering algorithms like DBSCAN and GMM along with OpenCV image pre-processing to automatically identify layers of graphene on an Si/SiO_2 substrate using RGB color channels.
- Created a CNN Tensorflow model to identify if a graphene sample was present on the given image.
- Presented most recent version of the program in a poster presentation.
- Project supported by the OSU Physics Summer Research Program 2023.

Hemoglobin Binding Cooperativity **04-2023**

- Used MATLAB to compare models (Non-Cooperative/Pauling/Adair) of oxygen binding to hemoglobin, as a part of the OSU Polaris program to foster diversity and research opportunities for under-represented communities in physics.
- Concluded project with a poster presentation session with a poster created in LaTeX.
- Project included data analysis and contour plots of to fit polynomial constants and running Monte Carlo simulations.