

# Rishabh Solanki

81 Mill street, New Bedford, MA 02740, United States

☎ (+1) 508-717-5407 | ✉ [rsolanki@umassd.edu](mailto:rsolanki@umassd.edu) | 🏠 [rishabh01solanki.github.io](https://rishabh01solanki.github.io) | 🌐 [rishabh01solanki](https://rishabh01solanki)

## Research Interests

Compact objects, Supernovae, Accretion disks, Magnetohydrodynamics (MHD), numerical simulation, AI/machine learning, general relativity, Application of computational methodologies to data-intensive astrophysics.

## Education

### University of Massachusetts Dartmouth

MA, USA

M.S. IN PHYSICS, GPA 4.0

Sep. 2021 - expected May 2023

- Thesis: *Comparison between an alpha disk and a magnetized model for a white dwarf merger evolution*  
Advisor: Professor Robert Fisher

### University of Petroleum and Energy Studies

Dehradun, India

B.S. IN AEROSPACE ENGINEERING, GPA 3.0

Jul. 2014 - May 2018

- Undergraduate thesis: *N-body simulations using Monte Carlo methods*  
Advisor: Professor Ugur Guven

## Research Experience

### Graduate Research Assistant

MA, USA

UMASS DARTMOUTH

Sep. 2021 - present

- Led a research effort to explore the evolution of magnetized White Dwarf mergers using fully Magnetohydrodynamics solution and comparing it with the alpha disk perscription (Shakura and Sunyaev, 1973).
- Developed and implemented modules in FLASH to simulate the merger evolution.
- Implemented astrophysical fluid dynamics by structuring calls to equation of state unit in FLASH.
- Reduced the spread of contact discontinuity in self similar standard tests such as Sod shock tube and BrioWu to 3 cells ( $\Delta x=1/512$ ) by implementing a novel steepening algorithm based on Piecewise Parabolic Method (PPM) which led to a more resolved solution.
- Optimized the flow and architecture of various numerical solvers to provide faster run time.
- Rearchitected, refactored, and documented microphysics modules, enhancing and extending core capabilities and enabling new kinds of stellar models.
- Proficient in distributive computing and massively parallel programming including MPI and multi-threading. Modeled large scale simulations which used thousands of cores to achieve realistic outcomes closely matching to the observations.

### Research Intern

Dehradun, India

INSTRUMENTS RESEARCH AND DEVELOPMENT ESTABLISHMENT

Aug. 2018 - Sep. 2019

- Modeled and reduced the noise from the light curve data using gaussian processes.
- Developed and built upon existing code in Java and Python to obtain centroidal shift which led to refined modelling of refractive index parameter and improved the angular resolution from 3 arc-sec to 20 milliarc-sec.
- Led migration of image processing codes to Git/GitHub, facilitating easier integration into signal processing pipelines.

### Undergraduate Research Assistant

Dehradun, India

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

Sep. 2017 - Aug. 2018

- Developed a machine learning based Java applet that trained itself in real-time on orbital data which led to a predictive model for collision detection. Reduced runtime by 30% by implementing error-based step size control.
- Optimized the raw data set for better feature recognition using Tensorflow which resulted in more accurate and precise collision predictions.

## Skills

<b>Frameworks</b>	FLASH, MESA, TORCH, SuperNu, yt, DASH, TARDIS, Git, LaTeX, TensorFlow
<b>Programming</b>	Fortran (expert), Python (expert), Java (expert), C++ (proficient), Processing, MATLAB, HTML
<b>HPC</b>	MPI, Open MP, TACC-Stampede2, Carnie(UMass Dartmouth)
<b>Languages</b>	English (fluent), Hindi (native), Sanskrit (intermediate)

## Publications

- "Comparison between an alpha disk and a magnetized model for a white dwarf merger evolution", **Solanki, R.**, Mudalige, P., Fisher, R., Ugalino, M., Federrath, C. (In Preparation)

## Teaching

### Graduate Teaching Assistant

UMASS DARTMOUTH

MA, USA

Sep. 2021 - present

- Prepared and led weekly lectures, review sessions, and lab experiments for classes consisting of 100+ students in the undergraduate series, Physics for Science and Engineering.
- Graded exams and problem sets, working with professors to assign final grades.

## Coursework

**Physics** Classical Mechanics, Electromagnetism, Quantum Mechanics, Statistical Thermodynamics, General Relativity

**Astronomy** Stellar Structures, Introduction to Astronomy, Compact objects, Orbital Mechanics

**Mathematics** Calculus, Differential Equations, Linear Algebra, Complex Analysis

## Conferences/Workshops

### XSEDE HPC Workshop: BIG DATA and Machine Learning

PARTICIPANT

Virtual

Aug 30, 2022

- Insights into the use of Machine learning and Big Data in large distributed systems.

### Virtual Astronomy Software Talks (VAST)

PARTICIPANT

Virtual

Sep. 2022- Jun. 2023

- The VAST seminar series puts Astronomy softwares in the spotlight, allowing developers to share their libraries and projects with the community.

## Honors & Awards

2022 **Outstanding Teaching Assistant**, UMass Dartmouth

MA, USA

2019 **Emerging Researcher**, Instruments Research and Development Establishment (IRDE)

Dehradun, India

2018 **Finalist**, UPES annual Java coding challenge

Dehradun, India

## Affiliations and Outreach

### American Physical Society (APS Physics)

MEMBER

USA

Oct. 2021 - Present

- Astrophysics (DAP)
- Computational Physics (DCOMP)
- Gravitational Physics (DGRAV)

### Society of Physics Students

UMass Dartmouth, USA

CORE MEMBER

Sep. 2021 - Present

- Advanced diversity and inclusion in physics as part of the Outreach Project, engaging undergraduates from groups traditionally under represented in the physical sciences through project-based courses and a mentoring program.

### Graduate Student Senate

UMass Dartmouth, USA

MEMBER

Sep. 2022 - Present

- Representing the goals, interests, concerns, and professional development of the graduate student population of UMass Dartmouth.

### Astronomy Club

UPES, India

ORGANIZER AND CO-DIRECTOR

Feb. 2017 - May 2018

- Organized night watch. Set up 8 and 10 inch Newtonian reflector telescopes with tracking (MEADE).

## Extracurricular Activities

Hikes, Piano, Badminton, Chess, Website Design (UIX)