

# 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, CURRENT GPA 4.0

Sep. 2021 - expected May 2023

- Thesis: *Comparing the post merger evolution of double degenerate white dwarfs using fully MHD and alpha disk prescription*  
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 magnetohydrodynamical solution and comparing it with the enhanced alpha disk prescription.
- 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 Brio-Wu to 3 cells by implementing a novel steepening algorithm based on Piecewise Parabolic Method (PPM) which led to a more resolved solution.
- Used yt to post process simulation data producing sliceplots of various physical quantities to generate insights.
- 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.

### 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.
- 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.
- Optimized the raw data set for better feature recognition which resulted in more accurate and precise collision predictions.

## Skills

<b>Frameworks</b>	FLASH (Adaptive Mesh Hydrodynamics Code)
<b>Programming</b>	Fortran, Python, Java, MATLAB
<b>Libraries</b>	yt (Python package for analyzing volumetric data), NumPy, SciPy, Scikit-learn, Matplotlib
<b>HPC</b>	MPI, TACC-Stampede2, Carnie(UMass Dartmouth)
<b>Languages</b>	English (fluent), Hindi (native)

## Publications

- "Late-time evolution of double degenerate white dwarf mergers", **Solanki, R.**, Mudalige, P., Ugalino, M., Fisher, R., Federrath, C. (In Preparation)

# Teaching

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## Graduate Teaching Assistant

MA, USA

UMASS DARTMOUTH

Sep. 2021 - present

- Prepared and led weekly lectures, review sessions, and lab experiments for classes consisting of 70+ students in the undergraduate series, Physics for Science and Engineering.
- Graded exams and problem sets, working with professors to assign final grades.

## Coursework

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

**Astronomy** Stellar Structures, Orbital Mechanics

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

## Conferences/Workshops

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

Virtual

PARTICIPANT

Aug 30, 2022

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

### Virtual Astronomy Software Talks (VAST)

Virtual

PARTICIPANT

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.

## Extracurricular Activities

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