Rishabh Solanki

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Interests

Compact binary stellar object mergers, Type Ia supernovae, Machine learning, Deep Neural Networks, Accretion disks, Magnetohydrodynamics, general relativity, cosmology

Research Experience

Master's Thesis: Evolution of white dwarf mergers with magnetohydrodynamic and alpha disk prescription, *SEP 2021 - ongoing* (Adviser: Robert Fisher, PhD)

- Developed and implemented modules for a novel approximate Riemann solver, Bouchut, (Waagan et al, 2011), to understand the post-merger evolution of Carbon Oxygen white dwarfs.
- Reduced the spread of contact discontinuity by almost 70% by implementing a novel steepening algorithm based on Piecewise Parabolic Method (PPM) which led to more resolved and sharper discontinuities.
- Increased Bouchut solver's ability to handle astrophysical fluid dynamics by implementing calls to FLASH's Helmholtz EOS.

Classifying Supernovae using Deep Neural Network , *MAY 2022- ongoing* (Independent)

- Developed and trained a Convolutional Neural Network on supernova spectra data from Berkeley SN Ia Program.
- Reduced the supernova classification time from hours (template matching methods) to seconds without compromising on accuracy.
- Implemented segmentation methods that allows for better feature recognition.

Undergraduate thesis: ***Orbital analysis and collision detection using machine learning*** *MAY 2017- AUG 2018* (Adviser: Ugur Guven, PhD)

- Reduced runtime by 20% optimizing the step size in RK4 interpolation scheme by implementing error-based step size control.
- created a machine learning algorithm that trained itself in real-time on data produced by the orbital analysis module which led to a ML based collision avoidance system

Reduction in Background Noise in the data of distant celestial bodies (Intern, Instruments Research & Development Establishment) *MAY – SEP 2017*

- increased the performance of adaptive optics system. Collaborated with team from IRDE and wrote code to obtain centroidal shift which led to refined modelling of refractive index parameter and improved the angular resolution from 3 arc-sec to 10 milliarc-sec.

Work Experience

Graduate Teaching Assistant

Department of Physics, University of Massachusetts Dartmouth

SEP 2021 – MAY 2022

Designed, managed, and taught recitation and laboratory classes consisting of 50+ students in the undergraduate series, Physics for Science and Engineering.

Education

Master of Science, Physics

University of Massachusetts Dartmouth

SEP 2021- MAY 2023, current GPA 4.0

Bachelor of Technology, Aerospace Engineering

University of Petroleum and Energy Studies (UPES)

SEP 2014 - MAY 2018, GPA 3.0

Skills

Independent and collaborative research.

Handling complex data.

Machine learning

Computer Languages: `Python`(expert), `Java`(expert), `FORTRAN`(proficient)
`C`(fluent), `HTML`(fluent)

Languages: English, Hindi

Conferences/ Workshops

- XSEDE HPC Workshop: BIG DATA and Machine Learning

Outreach

I am currently an active member in the following organizations/clubs at UMass Dartmouth.

- Graduate Student Senate
- Society of Physics Students
- Outdoor club

Co-organizer: Infinity Space Club, UPES *(SEP 2016 - MAY 2018)*