VANSHAJ KERNI

https://vanshajkerni.com | vkerni@ph.iitr.ac.in | vanshaj kerni | vanshaj18

EDUCATION

Indian Institute of Technology Roorkee *July 2018–September 2023(tentative)*
Integrated Master (BSc+MSc) Physics ***CGPA: 8.918***

Awards
IIT Roorkee Heritage Excellence Award(2019), IIT Roorkee Merit-cum-Means Scholarship (five semesters), International Astronomy and Astrophysics Competition Bronze Honour.

PUBLICATIONS

• ***Conference Paper (Paper Id-181)***
Vanshaj Kerni, M.Majhi, A.K.Nayak - *Flow characteristics and platelet adhesion of blood flow in a corrugated microchannel with the reduction and extension of shear effects.*
Procedings of the 26^{th} National & 4^{th} International ISHMT-ASTFE Heat and Mass Transfer. [Presentation]

• **Preprint on *ResearchGate***
V.Kerni, A.Rawat et.al - Analysis of Stellar Parameters of Ultra Compact X-Ray Binary-OGLE-UCXB-01. [PDF]

• ***Preprint on arXiv***
V.Kerni, J.Komaragiri - Verification of Bethe-Bloch formula using Geant4 toolkit. [PDF]

RESEARCH EXPERIENCE

Analytical derivation of fluid flow equation *Spring 2021 – Fall 2021*
IIT Roorkee, Advised by Dr.Ameeya K. Nayak

- Expanding on previous works, we analysed incompressible Navier Stokes equations with a power-law model to analyse blood flow velocity in two dimensions.
- I was primarily involved with deriving an analytical solution to the non-linear Navier Stokes equations with power-law viscosity model for blood flow in stenosed section with potential and pressure gradient as driving agents.
- I also contributed in the conference paper for the 4^{th}International IHMTC 2021 conference.

Analysis of Stellar Parameters of OGLE-UXCB-01 *Fall 2021*
Remote Work Advised by Ms.Feven Markos Hunde

- We analysed the observational and stellar parameters of the Ultra-Compact X-Ray binary OGLE-UCXB-01 in the Djorg 2 cluster was analysed.
- We used modelled and data from Gaia, Simbad, Viser databases to validate the model used in the theory.
- I worked with a diverse team of ten undergraduate and graduate student teams from different Indian Institutes.

Verification of Bethe-Bloch formula using Geant4 toolkit *Summer 2020*
Remote Work, Advised by Dr.Jyothsna Rani Komaragiri.

- Used the electromagnetic package to verify the Bethe-Bloch energy loss formula for charged particles developed mainly by Hans Bethe and analyse the extent of its validity.
- Reviewed the different interaction, scattering mechanisms, energy loss relations and derived the cross-section relations-following classical and quantum field approaches.
- Work is a part of IAS Summer Research Program. [IAS]

Asteroseismology of Solar Type Stars *Fall 2019-Spring 2020*
HBCSE Mumbai, Advised by Dr.Anwesh Mazumdar.

- Studied the stellar evolution stars with emphasis on internal structure, characteristics based on HR diagram and oscillation processes. [PRs]
- Verified modelled data for seven different stars with age ranging from 73 million to 3.5 billion years using Python and and Gnuplot to correlate with theoretical study.

SELECTED PROJECTS

Mathematical Modelling *Spring 2021*

- Written python scripts as self work for analysing different models arising in the mathematical modelling course work. The work helped in getting a GPA 10 in the course. [code][repo]

Dark Matter and Dark Stars *Fall 2020*

- Undertook dark matter, dark stars and their evolutionary processes as a course work research project for the PHN-331 (Nuclear Astrophysics). [ppt][video] [repo]

Open source contribution: Gravity Spikes, Dark Energy Hunters *Spring 2021-Present*
[profile] *Zooniverse*

- Classifying LIGO-VIRGO-KAGRA gravitational signal data-sets to generate high quality training dataset to train Machine Learning algorithms.
- Classifying HETDEX images of galaxies as `real` or `noise` to measure dark energy in universe.

CONFERENCE & SCHOOLS

Dark Matter 2021: From the Smallest to the Largest Scales *Fall 2021*
virtual, Organised by Instituto de Física de Cantabria, Santander *Attendee*

Fundamental of Deep Learning *Fall 2021*
virtual, Organised by Nvidia Deep Learning Institute

SLAC Summer School: Higgs Fair *Fall 2021*
virtual, Organised by SLAC National Accelerator Laboratory

National Initiative on Undergraduate Sciences (NIUS) *Summer 2019*
onsite, Hosted by HBCSE-TIFR, Mumbai

WORK & TEACHING EXPERIENCE

Nuclear Astrophysics *Current*

Chegg Online *Spring 2021-Present*
Advanced Physics Expert

- Spend around 14 hours weekly solving advanced physics question posted using Chegg online platform.

Quantum Chemistry *Fall 2020*

- Tutored second year undergraduate students clarifying doubts on fundamentals of quantum mechanics.
- Spend 10+ hours preparing content, marking assignments and holding doubt sessions.

LEADERSHIP & MANAGEMENT EXPERIENCE

Additional Secretary, PaAC (Physics and Astronomy Club) *Spring 2021–Present*

- Supervised team in organising club activities, group discussions, lectures, quizzes and star-gazing and telescope-handling sessions.
- Responsible for club events during our annual event, Cosmic Voyage.

PROGRAMMING AND DESIGN SKILLS

Languages	Python, Gnuplot, MATLAB, C++, HTML, CSS, React, Git LaTeX
Libraries	Numpy, Matplotlib, Pandas, Astropy, Jupyter, TensorFlow, Keras
Scientific software	Mathematica, DS9, R, Comsol Multiphysics, Geant4, MESA
Design	Canva, LightRoom, Figma
System	Linux, Mac