

Jyotiraditya Kumar Singh

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Education

Integrated Master of Science (BS-MS), Physics Major Indian Institute of Science Education and Research, Mohali, Punjab, India	Dec 2021 - May 2026 (Expected)
Higher Secondary Certificate (Grade 12) St. Karen's High School, Patna, Bihar, India	2020
Senior Secondary Certificate (Grade 10) Shanti M Academy, Saharsa, Bihar, India	2018

Research Interests

Magnetohydrodynamics (MHD), Partially Ionised Plasmas (PIP), AGN Jets, Numerical Simulations related to MHD/RMHD and Fluid Dynamics, Nonlinear Dynamics.

Projects and Internships

Understanding the role of magnetic fields in governing multi-wavelength polarisation signatures in blazar jets. Master's Thesis Project	July 2025 - present
<ul style="list-style-type: none">• Supervisors: Dr. Bhargav Vaidya (IIT Indore) and Dr. Pankaj Kushwaha (IISER Mohali)• Description: I studied the basis of polarisation from non-thermal sources and polarised radiative transfer. I am modelling multiwavelength polarisation due to synchrotron radiation for different static field geometries. Further, I have to study the polarization flips and the evolution of polarisation angle and fraction in Blazar jets.	
Waves in Partially Ionised Plasma Remote Project	June 2024 - present
<ul style="list-style-type: none">• Supervisor: Prof. Andrew Hillier (University of Exeter)• Description: I learnt about MHD waves and continued to analyze the waves in partially ionized plasma (PIP). My goal is to explore a wide range of parameters of the wave spectra using the two-fluid approach. This is an ongoing project on which I am working along with my academic coursework. Currently, I am documenting the results that we found.	
Numerical methods for Partial Differential Equations Summer project	May 2024 - July 2024
<ul style="list-style-type: none">• Supervisor: Dr. Jim Thomas (TIFR - Centre for Applicable Mathematics, Bangalore)• Description: I learnt about different finite difference methods used to solve PDEs. During the summer, I continued my analysis using spectral methods for both linear and nonlinear PDEs, focusing mainly on the heat equation, wave equations, Burgers' equation, and KdV equation in 1D. I implemented the numerical methods using Python.	
Elementary data analysis techniques and their applications in astronomy Summer Project	May 2023 - July 2023
<ul style="list-style-type: none">• Supervisor: Dr. Smriti Mahajan (IISER Mohali)	

- **Description:** I was given weekly tasks which introduced me to various software used in astronomy like TOPCAT, DS9, etc. A lot of general astronomy concepts were introduced during the project such as HR diagram, stellar spectra, etc.

Relevant Coursework

- Mechanics 1 and 2, Electrodynamics 1 and 2, Quantum Mechanics 1 and 2, Mathematical Methods, Statistical Mechanics, Fluid Mechanics, General Relativity and Cosmology, Modelling Complex Systems, Nonlinear Dynamics and Chaos Theory, Numerical Methods using Finite Differences.

Skills

- **Programming Languages and Scripts** - Python, MATLAB, LaTeX.
- **Programing Libraries**- NumPy, Matplotlib, SciPy, pandas, Astropy, SymPy.
- **Astronomy software** - VOSA, DS9, SDSS.
- **Numerical Methods** - For ODEs and PDEs: Finite Difference methods, Spectral Methods.
- **Languages** - English, Hindi, Maithili, Gujarati.

Conferences/Symposiums Attended (or will attend in the future)

- Challenges and Innovations in Computational Astrophysics VI (ChICA - 6)
(Sept 29 - Oct 2 2025), IISER Mohali

Other Activities

- Co-Convenor of the IISER Mohali Movie Club (2023-24).
- Amateur Mobile Photography and Film Making.