

# KAUSHAL JOSHI

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## EDUCATION:

- **Indian Institute of Technology - Banaras Hindu University, Varanasi, Uttar Pradesh**  
Doctor of Philosophy, Theoretical Physics; Expected June 2030
  - **Visvesvaraya National Institute of Technology, Nagpur, Maharashtra**  
Master of Science, Physics; CGPA: 8.13; Completed June 2025
  - **University Of Delhi, Motilal Nehru College, New Delhi**  
Bachelor of Science, Physics (Hons.); CGPA: 8.378; Completed June 2023
  - **Heera Public School, New Delhi (CBSE)**  
Senior Secondary, Non-Medical stream with Computer Science; Percentage: 90.8% ; Completed June 2019
  - **The Asian Academy, Chaukori, Uttarakhand (CBSE)**  
Higher Secondary; CGPA: 10; Completed June 2017
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## RESEARCH EXPERIENCE:

- **Master's Thesis Project (August, 2024 – June, 2025) at VNIT Nagpur**  
In this project I worked on the topic “Entanglement Studies in the Affleck-Kennedy-Lieb-Tasaki (AKLT) Spin 1 Biquadratic Model” and did numerical studies of entanglement in such systems using Wootters’s Concurrence and von Neumann Entropy that are well defined for qubit systems under the guidance of Dr. M. S. Ramkarthik (Assistant Professor, Department of Physics). We first verified that the ground state of system is a singlet state as proposed by AKLT, then we found out that the system is undergoing phase transitions, however we tried to work on the analytical study of these phase transitions but due to lack of time we were not able to do that. In this project I also explored some computational methods to optimize our programs i.e. Sparse Matrix, Parallel Programming.
- **[Summer Research Fellowship Program 2024](#) at IIT Dharwad**  
In this internship I explored the field of Quantum Information Theory working on the topic “Quantum Entanglement in Multi-qubit systems using Covariance Matrix” under the guidance of Dr. R. Prabhu (Assistant Professor, Department of Physics) from 15 May – 15 July 2024. We first understood the concept of covariance matrix criterion, and then formulated it for 4 qubit system and higher qubit systems, however we stuck on some optimization problem in finding out the

measure for quantifying the entanglement, so the criterion tells us whether the state is entangled or not but we cannot quantify using that.

- **JMPAO ([Jantar Mantar Positional Astronomy Observations](#)) Project under NMML Delhi**

In this project I enhanced my knowledge in Positional Astronomy by applying it in the practical observations using our National heritage at Jantar Mantar, New Delhi under the guidance of Miss Megha Rajoria. We worked on the instruments present there and calculated the altitude and azimuth of the Sun, we also calculated the local time for several places (3 places) using the instrument called as Niyat Chakra, we also figured out the working of an instrument named as Dakshinottri Vitti Yantra.

- **I-astronomer at RAD@Home**

In this internship I explored the field of Radio Astronomy working on “RGBC image Analysis in Extragalactic Astronomy” under the guidance of Dr. Ananda Hota (Founder RAD@Home). We first download the fits file from NASA’s server and then analyse it, if we found something which does not fits in the Type 1 and Type 2 radio galaxies then we generate the RGB image of that and do the analysis of that celestial object in different wavelengths, which gives us a small understanding of the object, if it seems interesting then we apply to GMRT for the study of that object.

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## WORKSHOPS / LEARNING SCHOOLS:

- Winter School on “[Astronomical Calculation using Python](#)” organized by Wilson College, IAPT Mumbai and Kritika : The Astronomy Club IIT Bombay (27 Dec, 2024 – 2 Jan, 2025).
- Workshop on “[Gravitational Waves and LIGO India](#)” at the University of Goa and IUCAA Pune(27 Nov - 1 Dec, 2023).
- Workshop on “[Origin and Evolution of Solar Eruptive Phenomena](#)” at IIT Indore (1 Mar 2023).
- Workshop on “[RGBC image analysis in Extragalactic Astronomy](#)” by RAD@Home at NMML, New Delhi (10 Sept – 9 Oct 2022).

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## PRESENTATIONS:

- Took lectures on the topics “*Optimisation Nature of Universe*”, “*Number of Images formed by Inclined Plane Mirrors*”, “*AKLT Model*”, “*Kraus Representation*” in our Theoretical Group as a part of Saturday Talks at VNIT, Nagpur (2024-2025).
- **ASI conference 2024 at IISc Bangalore (31 Jan - 4 Feb)**  
Co-authors: Rakhi Suklan, Jaskirat Singh, Chinmay Shahi, Kaustav Kapil, Mansi Vats, Megha Rajoria

Presented poster on the topic "[Unraveling Celestial Legacy: Jantar Mantar's Astronomical Heritage through Citizen Science](#)".

- **ASI conference 2023 at IIT Indore (1-5 Mar)**

Co-authors: Lehar Joshi, Kakul, Vikalp Sharma, Chinmay, Aviral, Ayushka, Megha Rajoria, Nandivada Rathnasree\*

Presented poster on the topic "[Appreciating Indian astronomical heritage with Jantar Mantar through Citizen Science](#)".

- **CDTK conference 2023 at CSIR-NIScPR, New Delhi (14-15 Feb)**

Co-authors: Megha Rajoria, Devansh Aggarwal

Presented poster on the topic "[Indian astronomical heritage with Jantar Mantar through Citizen Science](#)".

- PowerPoint presentation at Kirorimal College, New Delhi (22 Mar) on the topic "[Coronal Mass Ejections](#)".

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## ASTRONOMY COURSES @ NPTEL:

- [Nuclear Astrophysics](#)
- Fluid Dynamics for Astrophysics

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## TECHNICAL STRENGTHS:

- **Programming Languages:** C, C++, Python, Fortran, Scilab.
- **Parallel Programming:** Open MPI & Open ACC in Fortran.
- **Computer Algebra System:** Mathematica, Wolfram.
- **Tools:** Microsoft Office Suite, PowerPoint, Canva.
- **Operating Systems:** Windows, Linux.
- **Other useful software:** SOA-DS9.

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## ACADEMIC HONORS:

- Rank Holder in 1<sup>st</sup> Yr. academic session (2020-21).
- Rank Holder in M. Sc. Physics (2023-25).

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## LEADERSHIP/ VOLUNTEER WORK:

- Co-founder of the Science Club "Jigyasa" at Motilal Nehru College.

- Vice-President of the Departmental Society “Anusandhan” for the session 2021-22.
  - Volunteered at “[Moon Festival](#)” under the Ministry of Culture and Arts (6-8 Jan 2023) at India Gate, New Delhi.
  - Hosted Various Webinars and Seminars Under the College Department.
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### **ADDITIONAL EXPERIENCE:**

- Editor of Departmental Magazine in my College ([Quanta 2022 & 2023](#)).
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### **LANGUAGES:**

- English (Fluent).
  - Hindi (Fluent).
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