

# Ujjwal Kumar Upadhyay

Senior Research Fellow, Joint Astronomy Programme  
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## Research Profile

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I am a PhD student working in the field of theoretical and statistical cosmology under the joint supervision of Dr. Tarun Deep Saini and Prof. Shiv K. Sethi at the Indian Institute of Science (IISc) Bangalore. My thesis is primarily focused on developing statistical methods for cosmological inference with particular emphasis on incorporating the effect of peculiar motion into the analysis. I am also interested in understanding cosmological tensions and their resolution within the framework of scalar-tensor theories of gravity/dark energy.

## Education

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| <b>2021 – Present</b> | <b>PhD [Candidate] in Cosmology</b><br>Indian Institute of Science, Bangalore, India<br>Thesis: <i>Investigating the impact of peculiar motion of galaxies on cosmological inference from SNIa data</i> (tentative)<br>Supervisors: Dr. Tarun Deep Saini & Prof. Shiv K. Sethi |
| <b>2017 – 2019</b>    | <b>MSc, Masters Degree in Physics</b><br>Banaras Hindu University, Varanasi, India<br>Specialization: Spectroscopy<br>Thesis: <i>Phase Space Visualization of Quantum States</i><br>Supervisor: Dr. Devendra Kumar Mishra  |
| <b>2014 – 2017</b>    | <b>BSc, Bachelors Degree in Physics</b><br>St. Xavier College, Ranchi, India<br>Subjects: Physics, Mathematics & Computer Science with C/C++   |

## Publications

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- [1] Brijesh Kanodia, **Ujjwal Upadhyay**, Yashi Tiwari, *Revisiting Cosmic Distance Duality with Megamasers and DESI DR2: Model Independent Constraints on Early-Late Calibration*, [\[arXiv:2507.11518\]](#)
- [2] **Ujjwal Upadhyay**, Tarun Deep Saini and Shiv K. Sethi, *Accounting for motion of supernova host galaxy in statistical inference from SNIa data*, [\[arXiv:2502.09258\]](#)
- [3] Yashi Tiwari, **Ujjwal Upadhyay**, Rajeev Kumar Jain, *Exploring cosmological imprints of phantom crossing with dynamical dark energy in Horndeski gravity*, [PhysRevD.111.043530](#), [\[arXiv:2412.00931\]](#)

## Computational Experience

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### **Boltzmann Codes:** `class`, `hi_class`

Experience with Boltzmann codes to study scalar field models of dark matter and dark energy.

### **Statistical Codes:** Cobaya, Monte Python

Skilled in Bayesian analysis of cosmological models, with experience in Cobaya and Monte Python codes for statistical inference.

### **High Performance Computing**

Experience with high-performance computing clusters for MCMC analysis.

### **Programming Languages**

Skilled in C/C++ and Python.

### **Operating Systems**

Proficient in Linux, macOS, and Windows environments.

### **Other Software & Tools**

Proficient in Mathematica, GetDist, and Latex.

## Mentoring & Teaching Experience

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**Mentored**, a first-year PhD student on a project titled “Cosmological Parameter Estimation Using Bayesian Statistics and Markov Chain Monte Carlo Techniques”, conducted as part of their PhD coursework.

**Teaching Assistant**, for the course ‘General Relativity and Cosmology’ with Dr. Sanved Kolekar, from January 2024 - April 2024 at IISc, Bangalore.

**Teaching Assistant**, for the course ‘Fundamentals of Astrophysics’ with Prof. Nirupam Roy, from August 2023 - December 2023 at IISc, Bangalore.

## Academic Duties & Outreach

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### **Referee Task**

Referee for *Physical Review D*.

### **Organizational Tasks**

2024 – Present : Organizer of the Cosmology Journal Club at IISc.

2024 – Student volunteer in 42<sup>nd</sup> meeting of Astronomical Society of India, held at IISc.

### **IISc Open Day**

2025 – Public talk on ‘Decoding the Cosmos: How the Universe Evolves’.

2024 – Poster presentation on ‘The Standard Model of Cosmology’.

2023 – Public talk on ‘Multi-messenger Astronomy’.

## Awards & Achievements

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**Best Teaching Assistant Award 2024** for the course Fundamentals of Astrophysics, Indian Institute of Science, Bangalore.

**All India Rank 28** in the Graduate Aptitude Test for Engineering (GATE) for Physics, 2021.

**All India Rank 48** in Council for Scientific and Industrial Research (CSIR) – Lectureship for Physics, 2021.

**State Topper** in the National Graduate Physics Examination (NGPE ), 2017.

## Conference and Seminars

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[06/2025] – **Oral Presentation** in Cosmology from Home 2025 (Online).

[04/2025] – **Poster Presentation** in Radiocoscon'2025 at the International Center for Theoretical Sciences, Bangalore, India.

[01/2025] – **Oral Presentation** in PDA Student Seminar at the Indian Institute of Science, Bangalore.

[12/2024] – **Oral Presentation** in the 2nd Neighbourhood Cosmology Meeting at the Indian Institute of Science, Bangalore.

[11/2024] – **Oral Presentation** in In-house Symposium at the Indian Institute of Science, Bangalore.

[11/2024] – **Poster Presentation** at Kashiwa-no-ha Dark Matter and Cosmology Symposium, Kavli IPMU, Tokyo, University.

[10/2024] – **Poster Presentation** at 27th International Conference on Particle Physics and Cosmology, COSMO'24, YITP, Kyoto University, Japan.

[08/2024] – **Poster Presentation** in Frontiers of Particle Physics Conference, Centre of High Energy Physics, IISc.

[04/2024] – **Oral Presentation** in In-house Symposium at the Raman Research Institute, Bangalore, India.

[02/2024] – **Poster presentation** in 42nd Annual Meeting of Astronomical Society of India (ASI), IISc, Bangalore.

[12/2023] – **Oral presentation** in 10th International Conference on Gravitation and Cosmology (ICGC) at Indian Institute of Technology (IIT), Guwahati, India.

[12/2023] – **Poster presentation** in 21-cm Cosmology Workshop at NISER, Bhubaneswar, India.

[04/2023] – **Attended** a school on the Less Travelled Path to the Dark Universe, held at the International Center for Theoretical Sciences (ICTS), Bangalore, India.

## References

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**Dr. Tarun Deep Saini**

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Indian Institute of Science, Bangalore, India.  
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**Prof. Shiv K. Sethi**

Professor, Astronomy & Astrophysics Group,  
Raman Research Institute, Bangalore, India.  
Email: [shiv\\_sethi@yahoo.com](mailto:shiv_sethi@yahoo.com)

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May, 2025