

# Prajakta Mane

FINAL YEAR, PHYSICS MAJOR, BS-MS, IISER MOHALI

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## Education

**Indian Institute of Science Education and Research, Mohali**  
Integrated BS-MS Dual Degree, Physics Major with Astronomy and Astrophysics Minor  
Cumulative Performance Index (CGPA): 8.5/10

Mohali, Punjab, India  
Aug. 2019 - Jun. 2024 (Exp.)

## Research Experience

### Identifying Gravitational Lenses in Rubin LSST Data

IUCAA, Pune

Master's Thesis and INSPIRE Project; Supervisors: Dr Surhud More, Professor, Dr Anupreeta More, Scientific Officer, Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune

Apr. 2022 - Present

- Developing a difference imaging pipeline, within the LSST Stack Framework, to identify the strongly lensed Type Ia Supernovae (SNIa) from the upcoming Vera-Rubin Telescope's LSST survey data.
- Prepared and analysing simulated dataset of multiply-imaged SNIa systems to look for a pattern that can act as an early-detection marker for multiple-imaged SNIa systems in future searches.

**Skillset involved:** Gravitational Lensing, SNIa Modelling Templates, LSST Stack Software, HTCondor, High-Throughput Computing, Elementary PostgreSQL, Python Packages: lsst, SNCosmo

### Study of Disk Winds in the X-ray Binary Systems

IISER Mohali

Supervisor: Dr Aru Beri, INSPIRE Faculty, Department of Physics, IISER Mohali

Jun. 22 - Sept. 22; Sept. 23 - Present

- Studying launching mechanism of the disk winds observed in the highly inclined X-ray binary systems by performing spectral analysis and high-resolution spectroscopy on observed X-ray spectra of one such system.

**Skillset involved:** Accretion in X-ray Binary Systems, Spectral Fitting, CIAO (Chandra Interactive Analysis of Observations) Software, NASA HEASOFT Utilities: NICERDAS (NICER Data Analysis Software), XSPEC and SPEX (X-Ray Spectral Fitting Packages)

### Study of the Tidal Disruption Events

IISER Mohali

INSPIRE Project; Supervisor: Dr Aru Beri, INSPIRE Faculty, Department of Physics, IISER Mohali

May. 2021 - Jul. 2021

- Carried out a literature review to familiarise myself with our current understanding of tidal disruption events, analysed Swift-XRT spectral data of a tidal disruption event candidate, and learned to model the accretion in such systems.

**Skillset involved:** Spectral Fitting, NASA HEASOFT Utilities: XSPEC (X-Ray Spectral Fitting Package)

### Application of Clustering Algorithms in RNA Velocity

IISER Mohali

In collaboration with Devang Liya, IISER Mohali and Dr. Ashwin Jainarayanan, University of Oxford

May. 2020 - Jul. 2020

- This project aimed to reconstruct the cell dynamics by analysing the amount of spliced and unspliced RNA within each cell. I analyzed single-cell sequencing data of Glioblastoma (a common type of brain tumor) patients to reconstruct cellular dynamics to study the evolution of the tumorous tissues.

**Skillset involved:** Dimension reduction techniques: PCA, UMAP, tSNE; Data clustering algorithms: KNN; Python Packages: scVelo, Scanpy, CellRank; R Packages: velocity.R.

### Reading Project in Quantum Chemistry

IISER Mohali

INSPIRE Project; Supervisors: Dr Ramesh Ramchandran, Associate Professor, Department of Chemistry, IISER Mohali

May. 2020 - Jul. 2020

- Learnt the basics of quantum encryption and coded specific functions required to program the NMR machines in the lab in Fortran.

**Skillset involved:** Elementary Fortran programming.

## Computational Skills

### Python

#### Mission-specific data analysis software

#### R

#### Other Languages

#### Web-development

#### Misc.

lsst, SNCosmo, AstroPy, GWpy, scVelo, Scanpy, CellRank, Matplotlib, Numpy, Scipy

LSST Stack, CIAO, NICERDAS

velocity.R, Seurat, seurat-disk, dplyr

Elementary Fortran and C++; Matlab, Mathematica

HTML, CSS, Elementary Java and Django

Linux Operating System, HTCondor, LaTeX, Elementary PostgreSQL, Arduino Uno

## Relevant Coursework

### Astronomy

Relativistic Cosmology and the Early Universe, Galaxies and Cosmology, Astrophysical Processes and Stars, Introduction to Astrophysical Fluids, Astronomy and Astrophysics (Introductory Astronomy)

### Physics

Nuclear and Particle Physics, Atomic and Molecular Physics, Quantum Mechanics I and II, Classical Mechanics I and II, Quantum Computation and Quantum Information, Statistical Mechanics, Math Methods for Physicists, Electrodynamics, Waves and Optics, Thermodynamics

### Math

Probability and Statistics, Introductory Linear Algebra and Group Theory, Curves and Surfaces, Analysis in One Variable

### Computational

Computational Methods in Physics, Number Theory and Cryptography

## Workshops and Conferences

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### 42nd meeting of the Astronomical Society of India

In-person participant

Selected to present a poster based on the master's thesis work in the category Galaxies and Cosmology.

*IISc, ISRO, JNP, Bengaluru, India*

*Jan. 31 to Feb. 24, 2024*

### ZTF Summer School 2023

Virtual Attendee

Participated virtually in the ZTF (Zwicky Transient Facility) summer school that aimed to provide graduate-level astronomy students with hands-on experience and training in processing of ZTF and other transient survey data using modern data science techniques.

*University of Minnesota, USA*

*Jul. 24 to 28, 2023*

### Vigyan Vidushi 2023 – Physics

In-person Participant

One of the 40 (out of 700 applicants) participants across India to participate in the TIFR advanced program in Physics for women students in first-year of MSc. Participated in various physics modules, from Electrodynamics to Thinking Through Problems. Got exposure to the field of Physics Education Research.

*HBCSE, TIFR, Mumbai, India*

*Jun. 20 to Jul. 1, 2023*

### Introductory Summer School in Astronomy and Astrophysics

Virtual Attendee

Attended lectures on topics in astrophysics and cosmology, ranging from X-ray binaries, fluids and plasma physics to gravitational waves and gravitational lensing by faculty members from IUCAA, TIFR, and other leading research institutes in India.

*IUCAA, Pune*

*May. 16 to Jun. 17, 2022*

### Conferences for Undergraduate Women in Physics (CUWiP)

Virtual Attendee

Attended the virtual 2023 APS Conferences for Undergraduate Women in Physics (CUWiP) that aims to help undergraduate women continue in physics by providing them with information about graduate school and professions in physics and access to other women mentors of all ages with whom they can share experiences, advice, and ideas.

*American Physical Society*

*Feb. 11 and 12, 2023*

### Vijyoshi National Science Camp 2019

INSPIRE Fellow

Selected for and participated in the annual national science camp in India, organised by KVPY in collaboration with the INSPIRE program, at the Indian Institute of Science, Bangalore. The camp aimed to provide a forum for interactions between bright young students and leading researchers in various branches of Science and Mathematics.

*IISc, Bangalore*

*Dec. 2019*

## Awards and Activities

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### Department of Science and Technology, Government of India

Recipient of INSPIRE-SHE Scholarship

*2019 - Present*

INSPIRE Scholarship for Higher Education (INSPIRE-SHE) is offered to the top 1 percentile students on the national level based on their 10+2 level exam performance by the Department of Science and Technology to promote students to take up science research as a career option.

### American Physical Society

Student Ambassador

*IISER Mohali*

*Sept. 2023 - Present*

• One of the 83 students selected worldwide to represent the American Physical Society (APS), to discuss problems faced by undergraduate students in physics worldwide, and to be a mediator between the APS and the students in India to provide solutions.

### The Astronomy Club

Club Convener

*IISER Mohali*

*Nov. 2021 - Oct. 2022*

- As the convener of The Astronomy Club, a student-run astronomy club of IISER Mohali, organised various public outreach events, competitions, and talks to promote astronomy among the students of the institute and the members of the public.
- Was responsible for managing the club's social media, collaborating with other student-run clubs and other institutes for outreach activities, and utilising the club funds efficiently.
- Led the organisation of astronomy-based activities for IISER Mohali Foundation Day, 2022. Hosted over 300 school students from grade 3 to grade 12 for a total of 8 astronomy-based demos and activities designed and developed by club members.
- Led the organisation of the first-of-its-kind, two-day-long astronomy symposium at IISER Mohali in hybrid mode to provide exposure to research topics in astronomy to the newly enrolled students. The symposium included talks presented by 14 former students of the institute and was attended by about 100 participants from various institutes.

### Women in Physics, Math and Astronomy, WiPMA, Initiative

Co-founder and Core Team

*IISER Mohali*

*Dec. 2021 - Jun. 2023*

- Co-founded the Women in Physics, Math and Astronomy, a one-of-its-kind group among all the national institutes, at IISER Mohali, with the aim to provide mutual support to women peers to continue their careers in physics, math, and astronomy.
- Organised various academic events, informal sessions, and public talks addressing the gender disparity in science, focussing on physics, math, and astronomy.
- Collaborated with members of the GATI (Gender Advancement for Transforming Institutions) initiative by the Government of India to raise awareness about the issue of gender disparity in STEM by arranging talks and conducting interviews.

## Extra-curricular Interests

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### Ornithology

An avid, amateur birder, having identified over 130 bird species in the span of less than three years.

### Crochet

Amateur crochet artist, especially interested in making small decoration artefacts.

### Sports

Badminton and chess for recreation, competed in district-level badminton tournaments, competed in inter-batch womens' chess tournaments in the third and fourth year (secured third position) of undergrad.

### Books/Podcasts

A voracious reader, also enjoys podcasts, specifically into science fiction, mystery thrillers, and comics.