

Sumukha R Bharadwaj

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Research Interests

Circumgalactic Medium (CGM), Intergalactic Medium (IGM), Quasar Absorption Line Spectroscopy, Galaxy–Absorber Connections

Education

2024–Present: Ph.D. in Astronomy and Astrophysics

Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram

Advisor: Dr. Anand Narayanan

2021–2023: M.Sc. Physics

St. Joseph's College (Autonomous), Bengaluru City University

SGPA: 8.25

2018–2021: B.Sc. Physics, Chemistry, Mathematics

St. Joseph's College (Autonomous), Bengaluru City University

SGPA: 8.2

Computational Skills

Programming: Python (scientific computing, spectral analysis, data reduction)

Specialised Tools: GalPaK3D, Prospector, BAGPIPES, Cloudy, emcee

Astronomical Software: IRAF, PyRAF

Mathematics: Maxima

Typesetting: L^AT_EX

Research Experience

PhD Research: Spectroscopic study of the Circumgalactic Medium (CGM) and Intergalactic Medium (IGM) using quasar absorption line systems, combining *HST*–COS spectroscopy with *VLT*–MUSE observations to investigate galaxy–absorber connections and the physical and kinematic properties of gas around galaxies, including Ne VIII, O VI, and Mg II absorbers at low redshift.

Master's Dissertation: *Transiting Exoplanetary Atmospheres – Spectroscopic Reduction and Observational Techniques*

Indian Institute of Astrophysics (IIA), Bengaluru

Supervisor: Dr. Sivarani Thirupathi

Performed end-to-end spectroscopic reduction of ground-based observations of two hot Jupiter exoplanets (HAT-P1-b and WASP-33b) using IRAF, including bias subtraction, flat-field correction, aperture extraction, and wavelength calibration, followed by transit light curve fitting and MCMC parameter estimation using *pylightcurve*.

Publications

S. R. Bharadwaj et al.,

A Partial Lyman Limit Absorber Tracing Cold-Mode Accretion,

The Astrophysical Journal, 1008, 155 (2026). DOI: 10.3847/1538-4357/ae853b

Workshops and Summer Schools

Oct 2025: COSPAR JWST–UVIT Hands-on Workshop (Oct 20–31, 2025)

Centre of Excellence in Astronomy and Astrophysics, CHRIST (Deemed to be University), Bengaluru.

Gained end-to-end experience with the JWST data reduction pipeline (uncalibrated to Level 3), and independently attempted to reproduce published JWST results during a two-day personal project session.

Dec 2024: Manipal Astrostatistics School (Dec 10–15, 2024)

Manipal University.

Covered statistical methods for astrophysical data analysis including model fitting, uncertainty estimation, and an introduction to machine learning techniques relevant to modern astrophysics research.

Jan 2025: Scientific Grant Proposal Writing Workshop

Indian Institute of Science Education and Research (IISER), Thiruvananthapuram.

Attended sessions on structuring and writing competitive research grant proposals.

2023: Aditya-L1 Workshop

ISRO in collaboration with St. Joseph's University, Bengaluru.

Learned about the scientific payloads aboard Aditya-L1 and their role in solar observation. Served as part of the organising committee.

Professional Experience

Project Assistant: The COSMOS Project, Indian Institute of Astrophysics (IIA), Bengaluru.

Contributed to astronomy outreach activities under Dr. Niruj Mohan Ramanujam, including public lectures, night-sky observation sessions, and educational programs for school and college students.

Private Tutoring: Provided academic support in physics and mathematics to high school and pre-university students (ICSE and Karnataka state board) during B.Sc. and M.Sc.

Other Interests

Hindustani Classical Music (Praveshika Poorna); acting in Kannada films, television serials, and documentary productions.

References

Dr. Anand Narayanan

Professor and Head

Department of Earth and Space Sciences

Indian Institute of Space Science and Technology (IIST)

Thiruvananthapuram

(*PhD Advisor*) anand@iist.ac.in

Dr. Arun Varma Thampan

Associate Professor, Department of Physics

St. Joseph's University, Bengaluru

arunvarma@sju.edu.in