

Vishal Rao

PhD Student, Theoretical Physics – Indian Institute of Science

Research Interests

Lattice Quantum Chromodynamics (QCD), finite-temperature field theory, non-perturbative methods in gauge theories, Monte Carlo simulations of gauge field configurations, spectral analysis and potential models for quark-antiquark systems.

Education

- 2021–present **Doctor of Philosophy in Physics**, *Indian Institute of Science*, Bangalore, India.
Thesis area: Lattice QCD; non-perturbative study of the static quark-antiquark potential and finite-temperature phenomena using Monte Carlo methods.
- 2014–2019 **Five-year Integrated Master of Science in Physics**, *Sardar Vallabhbhai National Institute of Technology (SVNIT)*, Surat, India.
- 2011–2012 **Higher Secondary Certificate (CBSE)**, *Birla School*, Pilani, India.
Scored 92.0% with Physics, Chemistry, and Mathematics.

Research Experience

- Jan–Apr 2019 **Master's Thesis Project**, INDIAN INSTITUTE OF ASTROPHYSICS (IIA), Bangalore, India.
Title: *Mid-Infrared Spectroscopic Studies of Planetary Nebulae*
Decomposed mid-IR Spitzer spectra of 52 planetary nebulae into constituent spectral components using the PAHFIT package in IDL. Analysed trends in dust destruction and the evolution of ionization fraction of dust grains as a function of nebular age.
- May 2018 **Summer School Programme**, INDIAN INSTITUTE OF ASTROPHYSICS (IIA), Kodaikanal Solar Observatory, India.
Attended an intensive introductory lecture series covering multiple sub-disciplines of Astronomy and Astrophysics, with tutorials and hands-on sessions involving real astronomical datasets.

Publications

- 2025 V. Rao, P. Petreczky, P. Hegde, *Spatial String Tension at High Temperatures and Quantitative Tests of Dimensionally Reduced Effective Theories*, *PoS(LATTICE2025)*.

Conferences and Schools

- 2–8 Nov 2025 **42nd International Symposium on Lattice Field Theory (Lattice 2025)**, Mumbai, India.
Delivered a contributed talk titled *Spatial String Tension at High Temperatures and Quantitative Tests of Dimensionally Reduced Effective Theories* reporting non-perturbative lattice QCD calculations of the spatial string tension across a wide temperature range using the HISQ fermion action, with comparison to perturbative predictions from dimensionally reduced effective field theories (EQCD and MQCD). Proceedings published in *PoS(LATTICE2025)*.

Computational Skills

- Languages **Python** (primary), **C**, **C++**, **Fortran 90**, **CUDA**
- Tools & Environments **L^AT_EX**, **Git**, **Vim**, **awk**, **sed**

Operating Systems Linux (Arch-based, Ubuntu), macOS
Other **Quantum Computing** (introductory)

Courses and Certifications

2020–2021 One-year course on **Introduction to Quantum Computing** by IBM, delivered via qubitbyqubit.org (Oct 2020 – Apr 2021).

Extracurricular and Leadership

- **Convener**, IISc Gymkhana Cricket Club (Jan 2023 – Jan 2025); represented IISc in KSCA 4th Division matches (20-over and 50-over formats).
- **Chief Organiser** for two intra-institute cricket tournaments at IISc (Independence Cricket Tournament 2023; one additional tournament for students and employees).
- **Captain** of the winning team in the Challenger Series – Intra-college T20 white-ball tournament (2025).
- **Bronze Medal**, cricket, Inter-IISER Sports Meet 2022.
- **Silver Medal**, cricket, Inter-IISER Sports Meet 2024.
- Participated in *Researchathon*, a 10-hour intensive investigation into the topic of Cosmic Microwave Background Radiation.
- Captain of Volleyball and Cricket teams (Department), Spectrum 2022.

Other Interests

Science communication; Cricket; Volleyball; Sprint events (100 m, 200 m); Natural bodybuilding.

Languages

Hindi (native), English (professional proficiency).