

NISHKAL RAO

Indian Institute of Science Education and Research, Pune
Main Academic, Dr Homi Bhabha Rd, Pashan, Pune, Maharashtra

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RESEARCH INTERESTS

Gravitational Wave Transients, Quantum Foundations, General Relativity, Mathematical Physics

EDUCATION

Indian Institute of Science Education and Research (IISER) Pune Pune, India

🎓 BS-MS DUAL DEGREE PROGRAM (PHYSICS MAJOR, MATHEMATICS MINOR) 2021 – *present*

GPA: 9.3/10 | EXPECTED COMPLETION: JULY 2026

Mount Carmel Central School Mangalore, India

🎓 CLASS XII CBSE ALL INDIA SECONDARY SCHOOL EXAMINATION 2021 2019 – 2021

PERCENTAGE: 97.2% | PHY : 98, MATH : 99

Sharada Vidyalaya Mangalore, India

🎓 CLASS X CBSE ALL INDIA SECONDARY SCHOOL EXAMINATION 2019 2009 – 2019

PERCENTAGE: 97.4% | SCIENCE : 100

PUBLICATIONS

Preprints



Comprehensive analysis of time-domain overlapping GW transients: A Lensing Study

N. Rao, A. Mishra, A. Ganguly, A. More – *Phys. Rev. D* (*in review*)

 [arXiv:2510.17787](https://arxiv.org/abs/2510.17787)

In Preparation

Eccentric non-spinning post-merger waveforms from binary black hole mergers

N. Rao, G. Carullo – *Phys. Rev. D* (*in prep*)

Horizons are Watching You

N. Rao, G. Satishchandran – *Phys. Rev. D* (*in prep*)

MASTER'S THESIS

Quasi-Local Black Hole Horizons

Dr. Badri Krishnan, Dr. Sukanta Bose

June 2025 - *present*

ALBERT EINSTEIN INSTITUTE, WASHINGTON STATE UNIVERSITY

Germany, USA

By introducing the notion of a quasi-local isolated horizon, we overcome the teleological limitations of event horizons and provides a natural framework for investigating near-horizon phenomena, perturbative analyses of tidal deformations and post-merger dynamics.

UNDERGRADUATE RESEARCH PROJECTS

Post-merger emission of non-circular binary mergers

Dr Gregorio Carullo

Jan 2025 - *present*

UNIVERSITY OF BIRMINGHAM

UK

Performed fitting and waveform-reconstruction analyses to capture ringdown physics of eccentric gravitational-wave mergers.

Quantum Superpositions: Entanglement and Decoherence through Black Holes

Dr. Gautam Satishchandran

Jan 2025 - *present*

PRINCETON GRAVITY INSTITUTE, PRINCETON UNIVERSITY

USA

Generalized decoherence of quantum superpositions in spacetimes with general causal horizons, characterizing local two-point functions of quantum fields.

On detectability of non-linear modes in ringdown through Parameter Estimation

Dr. Badri Krishnan

Dec 2024 - *present*

ALBERT EINSTEIN INSTITUTE

Germany

Implemented quadratic mode injections and developed parameter-estimation strategies to evaluate the detectability of non-linear ringdown modes.

Comprehensive analysis of time-domain Overlapping Gravitational Wave Transients

Dr. Anupreeta More, Dr. Apratim Ganguly

July 2022 - *present*

INTER UNIVERSITY CENTRE FOR ASTRONOMY AND ASTROPHYSICS (IUCAA) PUNE

India

Addressing challenges of overlapping compact binary coalescences in future gravitational wave detectors and their degeneracy with gravitational lensing.

Enhancing IMR Consistency Tests for Gravitational Wave Transients

Dr. Aditya Vijaykumar, Dr. Apratim Ganguly

September 2023 - *present*

CANADIAN INSTITUTE FOR THEORETICAL ASTROPHYSICS (CITA)

Canada

IMR consistency tests using time-domain analyses, improving the algorithms and investigating impact of higher modes on general relativity tests.

Improved Reduced-order-quadrature model for BNS merger parameter estimation

Dr. Sebastiano Bernuzzi

May 2024 - July 2024

THEORETISCH-PHYSIKALISCHES INSTITUT, FRIEDRICH-SCHILLER-UNIVERSITÄT, JENA

Germany

Developed an improved reduced-order-quadrature algorithm for binary-neutron-star parameter estimation.

Reconstruction of the Universe from the DESI Survey using Neural Networks

Prof. Tamara Davis, Dr. Khaled Said

June 2023 - August 2023

THE UNIVERSITY OF QUEENSLAND

Australia

Neural-network methods to create high-resolution density and peculiar-velocity maps from cosmological data.

PRESENTATIONS

Degeneracies between Overlapping and Lensing GWs

LVK Lensing Group Meeting

Online  

Feb 25, 2025

SCHOLASTIC EXCELLENCE

DAAD WISE Fellowship for a three-month funded research internship in Theoretisch-Physikalisches Institut, FSU Jena, Germany

Kishore Vaigyanik Protsahan Yojana (KVPY) SB Fellowship 2021 (AIR 93) and SX Fellowship 2020 (AIR 911) from the Department of Science and Technology, India.

National Initiative on Undergraduate Sciences (NIUS) Astrophysics Fellow 2022 at HBCSE.

Other notable achievements in academic contests/exams: JEE Mains 2021 (99.73 percentile), JEE Advanced 2021 (Rank 1739), ISI LIMIT (International Rank 1), Gramoly Fizika (International Rank 4), IISER Aptitude Test (AIR 46), and Karnataka Common Entrance Test (AIR 35), Regional Math Olympiad qualifier.

CO-SCHOLASTIC ACHIEVEMENTS

Tulu Script Revival: Led a project to develop and design the first computerized font for the nearly extinct script of Tulu, under the guidance of Dr. Prabhakar Adiga and with support from Dr. K.P. Rao, my brother Nishchith. Developed variations and different styles of the fonts and made them available for free download on a website I built: <https://www.thetulufont.in>. Within a year of its release, I co-authored a book titled Sriharistuthi, consisting of familiar hymns for studying the script. Invited to the World Tulu Convention in Dubai to publicize and raise awareness about its propagation.

CONFERENCES, WORKSHOPS & SCHOOLS

The Future of Gravitational-Wave Astronomy

ICTS-TIFR, Bangalore

Online 

Oct 2025

ICTS Summer School on Gravitational-Wave Astronomy 2025

ICTS-TIFR, Bangalore

Offline 

July 2025

QIQG 2025: Quantum Information in Quantum Gravity

Perimeter Institute for Theoretical Physics, Canada

Online 

June 2025

Masterclass by Edward Witten, Invitation to Black Hole Thermodynamics

DESY Hamburg & University of Hamburg, Hamburg

Online 

Jan 2025

A Hundred Years of Quantum Mechanics Discussion Meeting

ICTS-TIFR, Bangalore

Online 

Jan 2025

EOB@Work24 Conference

Theoretisch-Physikalisches Institut, FSU Jena

Offline 

June 2024

ICTS Summer School on Gravitational-wave Astronomy 2023

ICTS-TIFR, Bangalore

Online 

July 2023

COMPUTATION SKILLS

Programming Languages	Proficient : Python, Mathematica
	Familiar : Bash, C++, HTML, Julia
Version Control	Git, GitHub, Gitlab
Others	L ^A T _E X, Microsoft Word, PowerPoint, Excel

INTERESTS AND HOBBIES

Photography, Cooking, Visual effects

LANGUAGES

English, Hindi, Kannada, Tulu