

Roshan Raj

Curriculum Vitae

Upto Oct., 2023

Personal Details

Name: Roshan Raj
Nationality: Indian
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Research Interests

I'm interested in the theoretical realms of Constructive Quantum Field Theories and Quantum Foundations. Fundamentally passionate about getting the essence of Mass, Time, Charge, and Symmetries in the Universe and aspiring to engage in Unification Theories and interpretative endeavours over time.

Educational Details

Five Years Integrated M.Sc. (Physics), *Sardar Vallabhbhai* National Institute of Technology (SV-NIT), Surat, India. CGPA: 9.35/10 (current)
Title of Dissertation: *On the novel approach to relativistic Quantum Mechanics**.
2019-24 Supervisor: Dr. Vikash K. Ojha.
- A connection between kinetic energy and momentum of a relativistic system is derived and used in quantum mechanical problems to demonstrate that it can formulate a *consistent* relativistic quantum mechanical Hamiltonian.
2016-18 Loyola High School, CBSE, Patna, Bihar, 77.2% , Senior Secondary High Schooling [Physics, Chemistry, Mathematics, Informatics Practices, English]
2010-16 St. Paul's High School, ICSE, Patna, Bihar, 91.6%, High Schooling [Science, Mathematics, Computer App., Social Sci., Hindi, English]

Achievements

09/16 NTS Scholarship of merit, Government of India, New Delhi.
04/23 Qualified Graduate Aptitude Test in Engineering (GATE)-23, National Rank: 3409
02/20 Winner (Physics), InQuest 4.0, SCOSH [Student Chapter], SVNIT
03/20 Runner Up (Pratyaksha), Physics Club, SVNIT

Skills

Programme: C, Python, MATLAB, Octave, Java, MySQL
Softwares: L^AT_EX, MS Excel, MS Office, Mathematica
Web Design: Basics of HTML5, CSS3, and use of GitHub.
Languages: English (Working), Hindi(Native)

Research Experience

- 09/05/22 “On the Investigation of Two Non-neutral Static Bodies.” arXiv. doi: [arXiv.2209.10641](https://arxiv.org/abs/2209.10641). [Submitted on 21 Sep 2022].
-Outcome of Institute Semester Project-II (Jan-May 2022). An original work. Investigates the *static two-body problem* considering the gravitational and electrostatic interactions simultaneously.
- 20/08/23 “Dynamics of Two Objects Considering the Minimum Total Potential Energy Principle.” OSF Preprints. doi:[osf.io/ukx9t](https://doi.org/10.21203/rs.3.rs-2899991/v1). [Submitted on 29 Sep 2023].
-Outcome of Institute Semester Project-I (Jul-Dec 2021). An original work. It deals with the dynamics of two neutral bodies of distinct densities under their gravitational attractions.
- 17/09/22 “Reviewing Observables in Classical and Quantum Mechanics” EdArXiv Preprints. doi:[edarxiv.org/2tjqr](https://doi.org/10.21203/rs.3.rs-2899991/v1). [Submitted on 08 Oct 2023].
-Outcome of Institute Semester Project-III (Jul-Dec 2022). Presents the evolution of the quantum observables from their classical counterpart and distinctly analyses the meaning of observable in context to both the classical and the quantum realms.
- 19/11/22 “An open-ended story on quantization” OSF Preprints. doi:[osf.io/92bvp](https://doi.org/10.21203/rs.3.rs-2899991/v1). [Submitted on 08 Oct 2023].
-Outcome of Institute Semester Project-III (Jul-Dec 2022). Presents an overview of the evolutionary track of quantization and inquiries which fundamental quantities are responsible for making Energy, momentum, and angular momentum quantized.
- 20/02/22 “The Coronal Heating Problem.” OSF Preprints. doi:[osf.io/63cag](https://doi.org/10.21203/rs.3.rs-2899991/v1). [Submitted on 02 Oct 2023].
-Outcome of Astrophysics Project (Feb 2022). Presents an overview of the Sun’s temperature inversion problem and recent developments.

UG Research Projects

- 07/22-12/22 *New light on the concepts of Observable and indeterminacy in the quantum realm.*
-Institute Semester Project-III. The work deals with *observable-unobservable correspondence* and the *Born-Jordan quantum condition*.

Other Projects

- 05/22-07/22 Internship, *The pictures of quantum dynamics* (Pramatrik Gatiki ke Chitra)
-A descriptive book-chapter on the *quantum dynamical methods* in Hindi.
- 06/21-07/21 Internship, *The front-end development of a dummy e-commerce website*
- Learning included using HTML5, CSS3 frameworks and training for web designing.
- 07/21-12/21 Project, *Building the student information management system using C language*
-Learning included using C languages and its application in file handling

Talk/Books

- 02/07/23 MaNoVighn: Short Poetry Collections, Kindle, ASIN: B0C9Y7X1PG
01/09/21 KālSanGharsha: Short Poetry Collections, Kindle, ASIN: B09FC1XRPK
13/11/21 *Unification in Mathematics*, IntERAct Seminar series, AMHD, SVNIT-Surat

Workshops & Webinars

- 07/21 *Quantum Fields, Geometry & Representation Theory*, ICTS-TIFR, Bangalore.
12/20 National workshop on *Data analysis using MS Excel*, BBD NITM, Lucknow.
08/20 National workshop on *MATLAB Tools And Applications*, BBD NITM, Lucknow.

Selected Courses

Ph.D. <i>self-preparation</i> / Undone :	Relativistic Quantum Mechanics, Classical Field Theory, Canonical Quantization, Interacting Quantum fields, Path Integrals*, General relativity I & II, SUSY & Supergravity, Cosmology, String theory I & II , Basics of Topology and Differential Manifold, Lie Groups & Lie Algebra*, Geometric Algebra*, Algebraic Geometry, Algebraic Topology, Groups & Representations, Differential Geometry, Geometric group theory.
University (Physics):	Quantum Field Theory I, Many-Body Physics and Relativistic Quantum Mechanics, Particle Physics, Nuclear Physics, Special Relativity, Quantum Mechanics I & II, Computational Physics(Python, Monte-Carlo), Computational Methods(MATLAB/Octave), Atomic and Molecular Physics, Electrodynamics, Statistical Mechanics, Astrophysics, Density Functional Theory, and Classical Mechanics.
Certifications:	A Course in Math History[Aug-Sep'21], Classical Electromagnetism[Aug-Dec'20], Learning Physics through Simple Experiments[Apr-Jun'20], The advanced course on Special Theory of Relativity[Jan-May'20], The basics of Quantum Mechanics[Aug-Nov'19] and The basics of Special Theory of Relativity[Jan'18-Mar'19]

Other

I am enthusiastic and will listen to Mathematical beauty, Ancient history and philosophy, and social justice. My hobbies are Hindi Poetry, Graphic Designing, and writing articles. I took responsibility as Co-convenor/Co-head of the SCOSH-student chapter SVNIT for a year and was its member as a graphic designer since 2020. Next year, I served as the Joint Academic Affairs Secretary appointed by the Student Academic Affairs Council SVNIT, Surat, and then later as Student Coordinator of the QUANTA Seminar series, Physics Department, SVNIT in 2022. Additionally, I am venturing into various flavours of Geometric Algebra. Open to learning, failure and exploration.