T R Vishnu — Curriculum Vitæ

Contact Information

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Research Interests

Theoretical and Mathematical Physics: Quantum field theory, Integrability in classical and quantum systems and field theories, Dynamical systems, Heat transport, Open quantum systems, Random matrix theory, Nonlinear dynamics & Chaos.

Education

Ph.D *August 2016-September 2021*
Chennai Mathematical Institute, Ph.D. in Physics,
Thesis title: **Integrability and dynamics of the Rajeev-Ranken model**, Advisor: *Prof. Govind S Krishnaswami.*

Masters *August 2014-July 2016*
Chennai Mathematical Institute, M.Sc. in Physics,
Thesis Title: **Integrability and inverse scattering transform for the KdV equation**, Advisor: *Prof. Govind S Krishnaswami.*

Masters *July 2012-May 2014*
University of Hyderabad, M.Sc. in Physics,
Thesis Title: **Study of Neutrino mass models**, Advisor: *Prof. Rukmani Mohanta.*

Undergraduate *August 2009-July 2012*
St. Joseph's College, Devagiri, B.Sc. Physics,
Project Title: **Spectroscopic studies of the twin quasar 0957+561 - The first gravitational lens (Group project)**, Advisor: *Prof. S I Issac.*

Papers

- *Screwon spectral statistics and dispersion relation in the quantum Rajeev-Ranken model*, Govind S Krishnaswami and T R Vishnu, Physica D: Nonlinear Phenomena **463**,134170 (2024), arXiv:2312.13122 [nlin.SI].
- *Heat transport through an open coupled scalar field theory hosting stability-to-instability transition*, T R Vishnu and Dibyendu Roy, arXiv:2402.04986 [cond-mat.stat-mech].
- *Spectral solutions for the Schrödinger equation with a regular singularity*, Pushkar Mohile, Ayaz Ahmed, T R Vishnu, and Pichai Ramadevi, SciPost Phys. Core **7**, 041 (2024), arXiv.2309.00026 [quant-ph].
- *Quantum Rajeev-Ranken model as an anharmonic oscillator*, Govind S Krishnaswami and T R Vishnu, J. Math. Phys. **63**, 032101 (2022), arXiv:2111.03858 [math-ph].
- *The idea of a Lax pair-Part II: Continuum wave equations*, Govind S Krishnaswami and T R Vishnu, Resonance **26**, 257 (2021).
- *The idea of a Lax pair-Part I: Conserved quantities for a dynamical system*, Govind S Krishnaswami and T R Vishnu, Resonance **25**, 1705 (2020).
- *An introduction to Lax pairs and the zero curvature representation*, Govind S Krishnaswami and T R Vishnu, arXiv:2004.05791[nlin.SI].
- *Invariant tori, action-angle variables and phase space structure of the Rajeev-Ranken model*, Govind S Krishnaswami and T R Vishnu, J. Math. Phys. **60**, 082902 (2019), arXiv:1906.03141[nlin.SI].
- *On the Hamiltonian formulation, integrability and algebraic structures of the Rajeev-Ranken model*, Govind S Krishnaswami and T R Vishnu, J. Phys. Commun. **3**, 025005 (2019), arXiv:1804.02859 [hep-th].

Research experience

- Two dimensional field theory, Partial differential equations, Poisson-Lie algebras, Inverse scattering, KdV equation, Lax pairs, r-matrices, Hamiltonian formulation, Integrability, Invariant tori and action-angle variables, Exact-WKB method, Energy-level statistics, Quantum Langevin equations, Non-equilibrium Green's functions, OTOC.

Conferences and Schools

- *9th Indian Statistical Physics Community Meeting*, 3-5 April, 2024, International Center for Theoretical Sciences, Bangalore.
- *Stability of quantum matter in and out of equilibrium at various scales*, 15-26 January, 2024, International Center for Theoretical Sciences, Bangalore.
- *8th Indian Statistical Physics Community Meeting*, 1-3 February, 2023, International Center for Theoretical Sciences, Bangalore.
- *Conference on Nonlinear Systems and Dynamics* (Online), 17-22 December, 2021, SASTRA Deemed University, Thanjavur.
- *Bangalore School on Statistical Physics - XII* (Online), 28 June-9 July, 2021, International Center for Theoretical Sciences, Bangalore.
- *Lecture series on Basics of nonlinear integrable systems and their applications* (Online), 7-17 April, 2021, SASTRA Deemed University, Thanjavur.
- *XXXIII SERB Main school-Theoretical High Energy Physics*, 7-26 December, 2019, S.G.T.B. Khalsa College, University of Delhi.
- *Young Researchers Integrability School and Workshop: A modern primer for 2D CFT*, 10-16 February, 2019, Erwin Schrödinger international Institute of Mathematics and Physics, Vienna.
- *Conference on Nonlinear Systems and Dynamics*, 11-14 October, 2018, Jawaharlal Nehru University - New Delhi.
- *Integrable systems in Mathematics, Condensed Matter and Statistical Physics*, 16 July-10 August, 2018, International Center for Theoretical Sciences, Bangalore.

Talks and Posters

- Talk, *Heat transport through an open coupled scalar field theory hosting stability-to-instability transition*, 9th Indian Statistical Physics Community Meeting, April 05, 2024, International Center for Theoretical Sciences, Bangalore.
- Talk, *Dynamical stability of a coupled scalar field theory: Different perspectives*, 8th Indian Statistical Physics Community Meeting, February 03, 2023, International Center for Theoretical Sciences, Bangalore.
- Talk, *Dynamics and integrability of the Rajeev-Ranken model*, Chennai Strings Meeting, December 15, 2020, Institute of Mathematical Sciences (Webinar).
- Talk, *Integrability of a mechanical reduction of a dual to the principal chiral model*, National Symposium on Theoretical High Energy Physics, December 20, 2019, SGTB Khalsa College, University of Delhi.
- CMI Seminar, *On the Hamiltonian formulation and integrability of the Rajeev-Ranken model*, Chennai Mathematical Institute, March 20, 2019, Chennai.
- Poster presentation, *Hamiltonian dynamics and integrability of the Rajeev-Ranken model*, Conference on Nonlinear Systems and Dynamics, 11-14 October, 2018, Jawaharlal Nehru University, New Delhi.
- Poster presentation, *Hamiltonian dynamics and integrability of the Rajeev-Ranken model*, Integrable systems in Mathematics, Condensed matter and Statistical Physics, 16 July-10 August, 2018, International Center for Theoretical Sciences, Bangalore.
- CMI Seminar, *Some features of a 1+1 dimensional field theory dual to the Principal Chiral model*, Chennai Mathematical Institute, October 3, 2017, Chennai.

Teaching

- Teaching assistant for the course on Classical Mechanics, Course Instructor: Govind S Krishnaswami, Sep-Dec 2021, Chennai Mathematical Institute.
- Teaching assistant for the course on Thermal Physics, Course Instructor: Govind S Krishnaswami, Aug-Nov 2019, Chennai Mathematical Institute.

- Teaching assistant for the Workshop of the Academy of Physics Teachers, Kerala, Topic: Scattering in Quantum Mechanics, Course Instructor: Govind S Krishnaswami, 23-24 June, 2018, Christ College, Irinjalakuda.
- Teaching assistant for the course on Continuum Mechanics, Course Instructor: Govind S Krishnaswami, Jan-Apr 2018, Chennai Mathematical Institute.

Internships

Institute of Physics *May-June 2013*
Students' summer visiting program (SSVP-2013)- A reading project on 'Neutrino oscillations' under the guidance of Prof. Pankaj Agarwal at IOP Bhubaneswar.

Achievements

- 2012 - Reached among top 25 in all Kerala Physics Talent Search, conducted by Academy of Physics Teachers, (APT) Kerala.
- 2014 - Qualified Joint Entrance Screening Test (JEST).

References

Prof. Govind S. Krishnaswami
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Prof. Dibyendu Roy
Professor, Raman Research Institute
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