

Rishik Perugu

Graduate Student in Physics

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Education

University of California, Irvine

Irvine, CA

Ph.D. in Physics

Sept 2024 – present

- GPA: 3.97/4.00, Advisor: Prof. Thomas Scaffidi.
- Selected Coursework: Advanced Condensed Matter Physics, Quantum Many-Body Theory, Statistical Field Theory, Tensor Networks and DMRG, Group Theory.

Indian Institute of Science

Bangalore, India

Master of Science in Physics

Aug 2023 – May 2024

- GPA: 9.1/10.
- Selected Coursework: Quantum Field Theory, Advanced Statistical Physics, Quantum Computation.

Indian Institute of Science

Bangalore, India

Bachelor of Science (Research) in Physics

Aug 2019 – May 2023

- GPA: 9/10.
- Selected Coursework: Condensed Matter Physics, Topological Phases of Matter, General Relativity.

Publications

1. (under preparation) Adinath Mahalingam, Jaswanth Uppalapati, **Rishik Perugu**, Sumilan Banerjee, *Entanglement growth of pure states in Sachdev-Ye-Kitaev model and thermalization in the thermodynamic limit*
2. **Rishik Perugu**, Bryce Kobrin, Michael O. Flynn, Thomas Scaffidi, *Krylov Winding and Emergent Coherence in Operator Growth Dynamics*. [Physical Review Letters](#) **136**, 150402 (2026), **Editor's suggestion**. See also the coverage in [UCI news](#), [Phys.org](#), [EurekAlert!](#).
3. **Rishik Perugu**, Arijit Halder, Sumilan Banerjee, *Universal nonequilibrium dynamics of pure states and density-dependent thermalization in the Sachdev-Ye-Kitaev model*. [Physical Review B](#) **112**, 184301 (2025).

Undergraduate and Master Research Experience

Non-equilibrium dynamics of pure states in the Sachdev-Ye-Kitaev model

Sept 2023 – Apr 2025

Mentor: *Prof. Sumilan Banerjee*, Indian Institute of Science, Bangalore

Master Thesis

- Developed a general and elegant Schwinger-Keldysh field theory method to describe far-from equilibrium dynamics of arbitrary pure states in interacting fermionic systems.
- Applied the method to study the density-dependent thermalization of unentangled and entangled initial pure states in the interacting SYK model and contrasted it with its non-interacting counterpart.
- Established a remarkable universality in the non-equilibrium dynamics of pure states in SYK models, where the time evolutions of all local and non-local correlations for almost all initial pure states are entirely describable through a single universal two-point correlation function.

Learning SYK ground states with neural network quantum states

May 2023 – Apr 2024

Mentor: *Prof. Thomas Scaffidi*, University of California, Irvine

- Developed a NetKet-based code to optimize the overlap of a variational wavefunction with the target ground state, extending the package's existing energy-optimization framework.
- Investigated various neural network based ansätze if they recover finite energy density of the ground state in strongly correlated Fermionic systems such as the Sachdev-Ye-Kitaev model in the thermodynamic limit.

DMRG study of the one dimensional extended Bose-Hubbard model

May 2022 – Apr 2023

Mentors: *Prof. Thomas Schmidt*, DPhyMS, University of Luxembourg, Luxembourg

Bachelor Thesis

- Implemented single-site and zero-site DMRG algorithms in Julia with ITensors, providing a faster, more memory-efficient alternative to the standard two-site algorithm.
- Simulated the phase diagram of the one-dimensional Bose-Hubbard model with on-site and nearest-neighbor density interactions using zero-site DMRG code developed.
- Characterised the supersolid, superfluid and charge density wave phases using correlation functions and quantum state tomography.

Skills

Programming languages: Python, Julia, Mathematica, MATLAB

Packages and Tools: LaTeX, ITensors, NetKet, Numpy, Scipy, Matplotlib

Techniques: Large-N field theory, Neural Network Quantum States, DMRG/Tensor Networks

Talks

1. *Krylov methods for quantum (many-body) dynamics*, **EQI Graduate Student Tutorial Conference**, Irvine, June 2026. [\[Slides\]](#)
2. *Krylov Winding and Emergent Coherence in Operator Growth Dynamics*, **APS Global Physics Summit**, **Denver**, March 2026. [\[Slides\]](#)
3. *Non-equilibrium dynamics of pure states in the Sachdev-Ye-Kitaev model*, **APS Global Physics Summit**, **Anaheim**, March 2025. [\[Slides\]](#)

Schools attended

1. Princeton Summer School on Condensed Matter Physics (PSSCMP), Princeton University, New Jersey, July 2026.
2. Theory Winter School on Strongly Correlated Systems, National High Magnetic Field lab, Florida, January 2025.
3. Light and Beyond, International Center for Theoretical Sciences (virtual), June 2020.

Teaching

Physics 3C. Classical Physics: Electricity and Magnetism, Modern Physics

UC Irvine

Teaching Assistant

Fall 2025

- Led discussion sessions, conducted quizzes, and proctored and graded exams.

Physics 7LC. Classical Physics Laboratory

UC Irvine

Teaching Assistant

Fall 2025

- Taught and monitored lab sessions. Proctored and graded exams.

Physics 7E. Classical Physics: Fluids, Oscillations, Waves and Optics

UC Irvine

Teaching Assistant

Spring 2025

- Led discussion sessions, conducted quizzes, and proctored and graded exams.

Academic Achievements

- Awarded the prestigious **Regents Scholarship** by the University of California *2024-26*
- Recipient of the prestigious **KVPY Fellowship and Scholarship**, awarded by the Department of Science and Technology, Government of India *2019-24*
- **All India Rank 135** in Joint Entrance Examination (JEE Advanced) among 1.2 million candidates *2019*

Leadership

Decoherence event coordinator

July 2020 – Aug 2021

Science and Tech team, Pravega, the undergraduate festival of the Indian Institute of Science

- Served as one of two coordinators for the physics events of Pravega, successfully leading and managing a team of 15 members.
- Organized the [Coherence Lecture Series](#), research seminars for advanced undergraduates featuring eminent physicists worldwide, including **Prof. Steve Simon, Prof. Apoorva Patel, and Prof. Julia Yeomans**.
- Led the team in organizing the online undergraduate physics competition **Decoherence**, designing its structure and questions, with over 500 participants worldwide.

CovEducation mentor

May 2020 – Aug 2021

- Mentored two high school students from India via the [CovEducation](#) initiative during COVID-19.
- Improved their conceptual understanding and problem-solving skills in mathematics and physics while guiding them for national-level college entrance exams such as the Joint Entrance Exam.