

Soumyadeep Sarma

GRADUATE · DEPARTMENT OF PHYSICS

UMD College Park, MD 20742

☎ (+1) (227) 249-4460 | ✉ ssarma03@umd.edu | 🌐 www.soumyadeepsarma.com

Education

University of Maryland (Abbr. UMD)

PH.D. IN PHYSICS

College Park, MD

Sept. 2026 - Present

- **Lanzos and Dean fellow:** Offered to 3 outstanding applicants in incoming cohort

Indian Institute of Science (Abbr. IISc)

INTEGRATED BACHELORS + MASTERS IN PHYSICS

Bangalore, India

Nov. 2021 - Jul. 2026

- **Gold medalist** (Highest CGPA in batch and department)
- Cumulative GPA: **9.8/10**; Physics + CS GPA: **9.9/10**
- Additional Minor in **Quantum Technologies**; Minor GPA: **9.9/10**

Highlighted Research Projects

Analyzing k -mers on $k \times L$ strips

DEEPAK DHAR

ICTS, Bangalore

May 2023 - Dec. 2023

- Numerically studied zeroes of grand partition functions of k -mers on $k \times L$ lattice systems for $k = 2, 3$. Formulated novel transfer matrix methods, and optimised matrices by using symmetries of the configurations.
- Analytically study partition functions of the given setup using the recursive transfer matrix and phase jumps across branch cuts.
- Computed critical exponents at the end-points of branches of zeroes for trimers, comparing them with the ones postulated by Fisher.
- **Solo-author publication in JPhyA: Math and Theor.**

Benchmarking Floquet Kondo model using quantum simulations

ELIO KÖNIG (UW MADISON), JUKKA VÄYRYNEN (PURDUE)

MPI Stuttgart

May 2024 - Dec. 2024

- Simulated a Floquet Kondo model using quantum circuits in Qiskit.
- Numerically found oscillations in impurity magnetization in finite-sized chains. Analyzed entanglement between impurity and other fermionic sites and heating behaviour.
- Analytical calculations using bosonization and Emery-Kivelson transformation to support data.
- **First-author publication in PRB**

Semidefinite Programming for understanding Lindblad Equation limitations

DEVASHISH TUPKARY (IQC WATERLOO), MANAS KULKARNI

ICTS Bangalore

Aug. 2024 - Apr. 2025

- Used semidefinite programming (SDP) to test the feasibility of constructing QMEs that satisfy physical consistency requirements and accurate steady-state properties.
- Established rigorous no-go results for XXZ and XX spin chains, demonstrating that for most non-equilibrium and strongly coupled regimes, it is fundamentally impossible for a Markovian QME to satisfy local conservation laws while correctly reproducing the leading-order populations and coherences of the non-equilibrium steady state (NESS).
- Provided new measures of non-Markovianity for our framework optimized by SDP.
- Derived an analytical lower bound on the trace distance between the exact zeroth-order NESS and that of any locally-conserving Lindbladian QME.
- **First-author publication in PRA.**

Magic properties of finite-temperature eigenstates in quantum chaotic Hamiltonians

DARIEL MOK, TOBIAS HAUG, JOHN PRESKILL

Remote

Mar. 2025 - Mar. 2026

- Introduced the Scrooge ensemble, constructed from Haar-random states distorted by a thermal operator, and numerically demonstrated that its magic (filtered stabilizer entropy) accurately matches that of finite-temperature eigenstates in quantum chaotic systems.
- Derived analytical formulae for the magic of the Scrooge ensemble for inverse temperatures β , using Weingarten calculus, in strong agreement with numerical data.
- **Manuscript on arXiv**

Publications

S. Sarma, T. Haug, J. Preskill, D. Mok, Universal Theory of Magic in Quantum Many-body systems, [arXiv:2608.22939](#)

S. Sarma, M. Kulkarni, A. Purkayastha, D. Tupkary, Semidefinite programming for understanding limitations of Lindblad equations, *arXiv preprint*, 2602.01794. <https://arxiv.org/abs/2602.01794>

S. Sarma, J. Väyrynen, E. König, Design and Benchmarks for Emulating Kondo Dynamics on a Quantum Chip. *Physical Review B* Vol. 111, 235142 (2025).

S. Sarma, A numerical study of the zeroes of the grand partition function of hard needles of length k on strips of width k . *Journal of Physics A: Mathematical and Theoretical*, 58, 165001 (2025).

Joseph, A., **Sarma, S.** et al. Bug-eecha 2.0: An Educational Game for CS1 Students and Instructors, *COMPUTE '23: Proceedings of the 16th Annual ACM India Compute Conference* (2023)

Internships and Fellowships

Short term research stay

DR. KISHOR BHARTI, DR. DAX ENSHAN KOH

Invited for 2 months to study transversal non-Clifford gates and methods to bypass Eastin-Knill theorem.

*A*STAR, Singapore*

Jan. 2025 - Feb. 2025

Long Term Visiting Students Programme (LTVSP)

DR. MANAS KULKARNI

9 month fellowship to study bath optimization in quantum master equations.

ICTS Bangalore

Aug. 2024 - Apr. 2025

Working Internships in Science and Engineering

PROF. ELIO KÖNIG

12-week fellowship by German Academic Exchange Service (DAAD) to research on quantum computing.

MPI Stuttgart

May 2024 - July 2024

National Initiative for Undergraduate Students (NIUS)

PROF. DEEPAK DHAR

Summer fellowship where I studied k -mers on lattice models in Statistical Mechanics.

HBCSE, TIFR Mumbai

May. 2022 - Aug. 2022

KVPY Fellowship

DEPARTMENT OF SCIENCE AND TECHNOLOGY, INDIA

Provides stipend to those who clear the KVPY exam, for pursuing undergraduate studies in the basic sciences.

IISc Bangalore

2021 - 2026

NTSE Scholarship

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (NCERT)

Provides stipend to high school students who clear the NTSE exam.

DAV Intl. School

2019 - 2021

Conferences & Seminars

TQC: Theory of Quantum Computation, Communication and Cryptography

INDIAN INSTITUTE OF SCIENCE (IISc)

Attended and volunteered for TQC 2025

15 - 19 Sept. 2025

Volunteer and participant

Many-body entanglement in Quantum computing

INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES (ICTS)

Attended the ICTS seminar given by Prof. Aram Harrow

17th Feb. 2025

Online participant

Quantum Many-Body Physics in the Age of Quantum Information

INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES (ICTS)

Attended the Infosys-ICTS Chandrasekhar Lectures given by Prof. Joel Moore.

25 - 29 Nov. 2024

On-spot registrant

Topological Gap Opening without Symmetry Breaking

MPI FKF, STUTTGART

11 Jul. 2024

Informal Attendee