Saurabh Totey

Department of Computer Science, Tufts University
Citizenship: U.S.
SaurabhTotey@proton.me · SaurabhTotey.com · github.com/SaurabhTotey · Google Scholar · LinkedIn

Research Interests

Quantum complexity and algorithms; classical simulability of quantum systems; partition functions and zero-freeness; quantum Gibbs sampling and thermal states; bosonic quantum error correction.

Education

Tufts University Sept. 2025 – May 2027 (expected)
M.S., Computer Science
Research advisors: Saeed Mehraban, Vladimir Podolskii. Focus: quantum computing complexity and algorithms.

University of Colorado Boulder Aug. 2019 – May 2023
B.S., Engineering Physics and Computer Science
Minors: Mathematics, Quantum Engineering, Philosophy. GPA 3.93/4.0. Summa Cum Laude.

Research Experience

Tufts University — Mehraban group Sept. 2025 – present
Graduate Research Assistant

- Classical simulability of bosonic Hamiltonians with cross-Kerr interactions via Barvinok's interpolation method: zero-freeness of partition functions and quasi-polynomial-time approximation of thermal quantities (see publication [2]).
- Derived an $m^{O(k)}$-time algorithm for the k-th Taylor coefficient of $\log Z$ for cross-Kerr bosonic Hamiltonians, with symbolic and numerical validation.
- Contributed to collaborations on quantum Gibbs sampling and on quantum advantage for thermal-state problems, including bounds on the thermal energy gap of the Feynman–Kitaev Hamiltonian.

University of Colorado Boulder — Combes Theory Group May 2022 – Jan. 2024
Undergraduate Researcher

- Studied random quantum codes for bosonic (harmonic-oscillator) error correction; compared their performance against cat, binomial, and hexagonal GKP codes under loss and dephasing noise via numerical experiments in Python and Julia (see publication [1]).

University of Colorado Boulder — Autonomous Vehicle Systems Lab Aug. 2021 – May 2022
Undergraduate Researcher

- Physics-informed neural networks for gravity-field modeling, compared against polyhedral models. Selected (1 of 25 from 100+) to present a poster on the work.

University of Colorado Boulder — Mathematics Jan. 2020 – May 2020
Independent Study with Dr. Tianyuan Xu

- Wrote SageMath code to decide full commutativity of words in Coxeter groups.

Publications and Preprints

[1] **S. Totey**, A. Kyle, S. Liu, P. J. Barge, N. Lordi, J. Combes, "The performance of random bosonic rotation codes," arXiv:2311.16089 (2023).

[2] Classical approximation of partition functions of interacting bosonic Hamiltonians, with S. Mehraban and collaborators. In preparation.

Presentations

- Expository talk, "Applying Barvinok's Method for Bose-Hubbard Hamiltonians," Tufts Theory Group seminar talk, Tufts, 2026.

- Expository talk, "Learning quantum Gibbs states locally and efficiently," Mehraban group meeting, Tufts, 2026.
- Expository talk, "Computational transition at the uniqueness threshold," Mehraban group meeting, Tufts, 2026.
- Poster, "Comparing physics-informed neural networks against traditional asteroid gravity models," CU Boulder DLA Symposium, 2022.

Conferences and Workshops Attended

- Simons Institute for the Theory of Computing, Quantum Summer Cluster Final Workshop, Berkeley, CA, July 2026.
- Quantum Information Processing (QIP 2026), Riga, Latvia, January 2026.
- Institute for Pure & Applied Mathematics, New Frontiers in Quantum Algorithms for Open Quantum Systems, Los Angeles, CA, January 2026.
- New England Theory Day 2025, Amherst, MA, October 2025.
- 8th Eastern Great Lakes (EaGL) Theory of Computation Workshop, Rochester, NY, October 2025.

Teaching

- Teaching Assistant, Quantum Computer Science (CS 162), Tufts University, Fall 2026 (instructor: Saeed Mehraban).
- Learning Assistant, Classical Mechanics I (PHYS 2210), CU Boulder, Spring 2023 (instructors: Ethan Neil, Steven Pollock).
- Grader, Theory of Computation (CSCI 3434), CU Boulder, Fall 2022: graded weekly proof-based assignments for 40+ students (instructor: Rafael Frongillo).
- Learning Assistant, Data Structures (CSCI 2270), CU Boulder, Fall 2021 (instructor: Asa Ashraf).

Industry Experience

Amazon Web Services — Amazon Connect July 2023 – Aug. 2025
Software Development Engineer
Fully automated the service's infrastructure deployments (replacing a 20+-hour monthly manual process), made call-recording delivery resilient to host crashes, and launched supervisor barge-in feature in AWS GovCloud (US); ITAR engineer and on-call (Java, TypeScript, AWS CDK).

Amazon Devices — Alexa Summer 2022
Software Development Intern
Built LED-based timer progress indication for screenless Alexa devices.

PhET Interactive Simulations, CU Boulder May 2018 – Aug. 2021
Software Developer
Developed physics and math educational simulations in JavaScript, including Blackbody Spectrum and Curve Fitting.

Honors and Awards

- Quantum Scholars Fellow (with scholarship), CU Boulder.
- President Joseph A. Sewall Esteemed Scholar Award; Engineering Merit Scholarship, CU Boulder.
- Dean's List (8 semesters); Sigma Pi Sigma, CU Boulder.

Skills

Programming: Python, Julia, Mathematica, SageMath, QuTiP, Rust, Java, TypeScript, Nix.
Languages: English (native), Spanish (fluent), French (intermediate), Japanese (elementary).

Service

Organizer, HackCU (annual university hackathon), 2020 – 2023.