Charvi Goyal

linkedin.com/in/charvgoyal

Email: charvi.goyal@gmail.com
Phone: 972-469-9824

Education

California Institute of Technology — Pasadena, California
Bachelor of Science in Computer Science — *Sep 2022 - Mar 2026 (Expected)*

Cumulative GPA: 4.2/4.0
Major GPA: 4.2/4.0

Relevant Courses: Algorithms (undergraduate and graduate level), Decidability & Tractability, Probability & Statistics, Discrete Mathematics, Linear Algebra, Introduction to Quantum Mechanics, Quantum Computing, Group Theory, Differential Equations

Research Experience

Classical Algorithm for Lindbladian Evolution — Pasadena, CA
John Preskill's Quantum Computing Group at Caltech — *June 2025 - Present*

- Constructed an efficient classical algorithm for continuous-time-evolved quantum systems experiencing depolarizing noise
- Conceived novel proof techniques inspired by mathematical physics and quantum information to prove the success and runtime of the algorithm
- Regularly attended and presented at group meetings. Also attended the quantum algorithms reading group on a biweekly basis.
- First-author paper is expected to be published mid-2026.

Gravity-Dual Spin Hamiltonains — Pasadena, CA
John Preskill's Quantum Computing Group at Caltech — *Oct 2024 - Present*

- Devised numerical algorithms to produce stable simulations of spin and fermionic Hamiltonian properties in Python, utilizing Dynamite (Python package for quantum simulation)
- Analyzing properties of different Hamiltonians to find spin Hamiltonians that can be realized in near-term quantum computers and display signatures of a holographic duality to gravity, similar to the SYK model.

Circumgalactic Properties from Varied Cosmic Ray Feedback from AGN — Pasadena, CA
Phil Hopkins' Theoretical and Computational Astrophysics Group at Caltech — *Jun 2023 - Present*

- Developed data extraction and analysis tools in Python (utilizing libraries such as NumPy, Astropy, SciPy, and Matplotlib) for FIRE, a cosmological magnetohydrodynamical simulation, and ran on national HPC allocation using SLURM
- Effectively communicated research findings to diverse audiences, including a general audience at the Summer Undergraduate Research Fellowship Seminar and experts in Phil Hopkins' group meetings
- First-author paper is under final collaboration review

Other Experience

CS 38/138: Algorithms — Pasadena, CA
Teaching Assistant — *Apr 2025 - Jun 2025*

- Hosted office hours, created solution keys, reviewed sets and exams, and graded student submissions.

Apple — Cupertino, CA
Maps Client Engineering Intern — *Jun 2024 - Sep 2024*

- Implemented a user-facing feature on Apple Maps for iOS, macOS, and watchOS using Swift and Objective-C, reaching 2+ billion devices
- Presented a technical overview to the entire organization and an end-to-end feature demo to executive leadership

TutorScope — Remote
Founder & President — *Mar 2020 – Dec 2022*

- Established a nonprofit for peer-to-peer tutoring during the pandemic, as featured on AP News, the Drew Barrymore Show, and various local news
- Led & coordinated a cross-functional team in a comprehensive development and expansion of the organization (i.e. software, operations, legal, outreach)
- **Impact**: Expanded organization to 70+ tutors to support 2000+ students globally

Publications

Charvi Goyal, Sam B. Ponnada, Philip F. Hopkins, Sarah Wellons, Iryna S. Butsky, Jose A. Benavides, and FIRE Collaboration. Effects of Varied Cosmic Ray Feedback from AGN on Massive Galaxy Properties. Publications of the Astronomical Society of the Pacific. 2025. (under final internal review)

Charvi Goyal, Thomas Schuster, and John Preskill. A quasi-polynomial-time classical algorithm for Lindbladian evolution. (Expected 2026)

Presentations

Summer Undergraduate Research Fellowship Seminar at Caltech. 2025. A quasi-polynomial-time classical algorithm for Lindbladian evolution. Oral presentation, 20 minutes.

Kavli Nanoscience Institute and Institute for Quantum Information and Matter at Caltech Joint Research Event. 2025. A quasi-polynomial-time classical algorithm for Lindbladian evolution. Poster presentation.

Summer Undergraduate Research Fellowship Seminar at Caltech. 2023. Effects of Varied Cosmic Ray Feedback from AGN on Massive Galaxy Properties. Oral presentation, 20 minutes.

Honors and Awards

Awarded the Summer Undergraduate Research Fellowship for research in quantum computing, with a special sponsorship by the Larson Family. June 2025.

Awarded the Summer Undergraduate Research Fellowship for research in astrophysics. June 2023.

Projects

- **Network Scheduling Simulator**:
  - Developed a network schedule simulator capable of simulating any priority-based, non-preemptive schedule on any given network topology and high-level workflow description for students to use in CS 143 (Networks: Algorithms & Architecture) using Python in a team of 2.
  - Implemented metric tracking (i.e. energy consumption and weighted completion time) so students can compare performance of different scheduling tactics
- **Shakespearean Poetry Generation With Machine Learning**:
  - Implemented supervised and unsupervised Hidden Markov Models from scratch in Python
  - Trained Long Short-Term Memory RNN written in TensorFlow and unsupervised HMM on 150+ Shakespearean poems in a team project
  - Generated new poems using trained models, experimenting with an augmented dataset, rhyme scheme constraints, and hyperparameters
- **Debug It Devin**:
  - 4-level puzzle game in C, written in a collaboration of 4 using Git/GitHub
  - Designed a path-finding algorithm to enhance player interaction and decision-making
  - Developed physics-based collision and event handling systems for various in-game elements

Skills Summary

Languages:	Python, C, Objective-C, Swift, Java, OCaml, Coq. Familiar with HTML/CSS, Assembly, and Qiskit.
Other Technical:	PyTorch, Scikit, Git, Linux, Slurm, Microsoft Excel. Familiar with VBA and TensorFlow.