

# Savar D Sinha

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## EDUCATION

### California Institute of Technology

*Bachelor of Science in Computer Science and Physics*

Pasadena, CA

*Sept 2022 – June 2026*

## OBJECTIVE

I am an undergraduate student eager to pursue either theoretical or experimental research in quantum computing. While much of my past research, primarily in high school, has been related to computational biology, my current interests and future research aspirations lie in quantum computing. Nevertheless, as I transition away from my previous focus, I hope to utilize my past experience with working with large datasets and designing algorithms to contribute to the forefront of quantum computing and immerse myself in the complexities of this rapidly evolving field.

## RELEVANT GRADUATE-LEVEL COURSEWORK

### Computer Science:

Ph/CS 219ABC — Quantum Computation

CS 152 — Introduction to Cryptography

CS/IDS 150B — Probability and Algorithms

CS/IDS 153 — Current Topics in Theoretical Computer Science: Topics in the Intersection of Theoretical CS and Quantum Computing

### Physics:

Ph/CS 219ABC — Quantum Computation

APh/Ph 138A — Quantum Hardware and Techniques

Ph 125AB — Quantum Mechanics

## HONORS, AWARDS, AND CERTIFICATIONS

IBM Quantum Challenge Achievement	2024
IBM Variational Algorithm Design Certification	2024
IBM Practical Introduction to Quantum-Safe Cryptography Certification	2024
IBM Basics of Quantum Information Certification	2023
2023 Radiation Oncology Research Retreat Best Oral Presentation, WashU	2023
SURF Award	2023
Top 300 Regeneron STS Scholars	2022

## RESEARCH EXPERIENCE

**Prof. Yu Tong, Duke University, Electrical and Computer Engineering** February 2025 – Present

- Developed algorithm for Hamiltonian emptiness testing with complexity  $\mathcal{O}(1/\epsilon^2)$
- Developing algorithms for quantum Hamiltonian sparsity testing that achieve Heisenberg-limited  $\tilde{\mathcal{O}}(1/\epsilon)$  scaling

**Dr. Nathanan Tantivasadakarn, California Institute of Technology, The Division of Physics, Mathematics, and Astronomy** June 2024 – Present

- Developed algorithm for efficient simulation of  $d = 4$  qudit measurements in the stabilizer formalism
- Constructed cluster model to simulate the  $\mathbb{Z}_4$  projective transverse-field Ising model (PTIM) in  $\mathcal{O}(n)$  time
- Demonstrated equivalence between the topological phase transitions in the  $\mathbb{Z}_4$  and coupled  $\mathbb{Z}_2 \times \mathbb{Z}_2$  PTIMs
- Proved the nonexistence of a unitary mapping between the Hamiltonians of the  $\mathbb{Z}_4$  and coupled  $\mathbb{Z}_2 \times \mathbb{Z}_2$  PTIMs

**Dr. Aadel Chaudhuri, Washington University School of Medicine in St. Louis, Department of Radiation Oncology** June 2023 – October 2023

- Optimized Griffin pipeline to analyze nucleosome protection of prostate cancer marker genes
- Developed Bash, AWK, R, and Python scripts to parse through and analyze large datasets.

- Performed Kaplan-Meier and other statistical analyses via R to compare progression-free and total survival for risk-stratified patients
- Developed pipeline to calculate conversion rate of lambda phage DNA for genome-wide methylation analysis

**Prof. Jeremy G. Wideman, Arizona State University, Center for Mechanisms of Evolution, Biodesign Institute, School of Life Sciences**

Feb 2020 – May 2023

- Identified orthologues of animal and fungal ATP synthase subunits across over 200 eukaryotes.
- Utilized bioinformatic tools such as BLAST, MUSCLE, and HMMER on ASU's AGAVE cluster computing server.
- Developed Bash, AWK, and Python scripts to perform such analyses on large datasets.
- Predicted the structures of divergent ATP synthase subunits via machine-learning based software such as AlphaFold2.

## PUBLICATIONS AND MANUSCRIPTS (5 TOTAL, 37 CITATIONS)

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Chauhan PS, Alahi I, **Sinha SD**, et. al. (2024) Genomic and Epigenomic Analysis of Plasma Cell-Free DNA Identifies Stemness Features Associated with Worse Survival in Lethal Prostate Cancer. Clin Cancer Res. doi: [10.1158/1078-0432.CCR-24-1658](https://doi.org/10.1158/1078-0432.CCR-24-1658)

**Sinha SD**, Wideman JG. (2023) The persistent homology of mitochondrial ATP synthases. IScience, 26(5), 106700. doi: [10.1016/j.isci.2023.106700](https://doi.org/10.1016/j.isci.2023.106700).

Macher JN, Coots NL, Girard EB, Langerak A, Muñoz-Gómez SA, **Sinha SD**, Vos R, Wissels R, Gile G, Renema W, Wideman JG. (2023) Single-Cell Genomics Reveals the Divergent Mitochondrial Genomes of Retaria (Foraminifera and Radiolaria). MBio, 0(0), e00302-23. doi: [10.1128/mbio.00302-23](https://doi.org/10.1128/mbio.00302-23)

Singh RP, Poh Y-P, **Sinha SD**, Wideman JG. (2023) Evolutionary history of oxysterol binding proteins (OSBPs) reveals complex history of duplication and loss in animals and fungi. Contact. 2023;6. doi: [10.1177/25152564221150428](https://doi.org/10.1177/25152564221150428).

Záhonová K, Lax G, **Sinha SD**, Leonard G, Richards TA, Lukeš J, Wideman JG. (2021) Single-cell genomics unveils a canonical origin of the diverse mitochondrial genomes of euglenozoans. BMC Biology. 19: 103. doi: [10.1186/s12915-021-01035-y](https://doi.org/10.1186/s12915-021-01035-y).

## ORAL/POSTER RESEARCH PRESENTATIONS (9 TOTAL)

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**Sinha SD** et. al (2025), Exploring Entanglement Transitions in the 4-Level Qudit Projective Transverse Field Ising Model. National Conference for Undergraduate Research 2025

**Sinha SD** et. al (2024), Exploring Entanglement Transitions in the 4-Level Qudit Projective Transverse Field Ising Model. Southern California Conference for Undergraduate Research 2024, Cal State San Bernadino

**Sinha SD** et. al (2023), Combinatorial genomic and epigenomic analysis of plasma cell-free DNA identifies stemness features associated with worse prognosis in high-risk metastatic castration resistant prostate cancer. Southern California Conference for Undergraduate Research 2023, Cal State Fullerton

**Sinha SD** et. al (2023), Combinatorial genomic and epigenomic analysis of plasma cell-free DNA identifies stemness features associated with worse prognosis in high-risk metastatic castration resistant prostate cancer. Summer Undergraduate Research Fellowship 2023 Conference, Caltech

**Sinha SD** et. al (2023) Combinatorial genomic and epigenomic analysis of plasma cell-free DNA identifies stemness features associated with worse prognosis in high-risk metastatic castration-resistant prostate cancer. 2023 Radiation Oncology Research Retreat, WashU School of Medicine.

**Sinha SD**, Wideman JG (2021) The persistence of homology: Diversity and evolution of eukaryotic ATP synthases. ASU CME Lab Meeting Presentation.

Záhonová K, Lax G, **Sinha SD** et al. (2021) Single-cell genomics unveils a canonical origin of the diverse mitochondrial genomes of euglenozoans. International Society of Protistologists 2021 Online Poster (page 62).

**Sinha SD**, Muñoz-Gómez SA, Wideman JG (2021) The persistence of homology: Diversity and evolution of eukaryotic ATP synthases. International Society of Protistologists 2021 Online Poster (page 83).

**Sinha SD**, Wideman JG (2020) Evolution of Eukaryotic ATP Synthase. ASU Evolutionary Biology Symposium 2020.

## TEACHING EXPERIENCE

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### **Teaching Assistant:**

CS 001X — Intermediate Computer Programming

CS 011 — Computer Language Lab

### **Youtube Video Lecture Series (100+ subs and 50+ hrs of watch time)**

(<https://www.youtube.com/@VarPi-d7t>):

Algorithms

Quantum Mechanics

Quantum Computation

## TECHNICAL SKILLS

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**Languages:** Python, Java, C, C++, Bash, AWK, R, Matlab, x86-64 Assembly, Wolfram Mathematica, OCaml

**Developer Tools:** VS Code, PyCharm, IntelliJ, Jupyter Notebook, RStudio, Git

**Python Libraries:** pandas, NumPy, SciPy, Matplotlib, TensorFlow, sklearn, pytorch, qiskit