Akshar Ramkumar

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Education

Senior, California Institute of Technology Sep 2022 - Jun 2026 (Expected)
The Nueva School (High School) Aug 2018 - Jun 2022

Skills

Math Courses: Analysis, Algebraic Topology, Algebraic Geometry, Algebraic Number Theory, Intersection Theory
CS Courses: Complexity Theory, Quantum Computation, Cryptography (TA), Algorithms (TA)
Programming: Python, Rust, Java, Javascript, C (github link)
Languages: English, Spanish (Fluent)

Experience

Research Intern, Massachussetts Institute of Technology Jun - Aug 2025
Worked in Prof. Vinod Vaikuntanathan's group to establish the average-case hardness of decoding quantum stabilizer codes.

Research Intern, California Institute of Technology Jun - Aug 2024
Worked in Prof. John Preskill's lab to prove the fast mixing of a novel quantum Gibbs sampling Markov chain algorithm on a class of chaotic Hamiltonians, based on a simple condition on their spectrum.

Research Intern, California Institute of Technology Jun - Aug 2023
Worked in Prof. Elena Mantovan's group to develop a geometric generalization of Lagrange's theorem on continued fractions to unitary Shimura curves, and related conjectures.

Awards

Jack E. Froehlich Memorial Award Winner, 2024-2025
Won the Fredrick J. Zeigler award at the California Institute of Technology for showing outstanding promise for a creative professional career.

Fredrick J. Zeigler Memorial Award Winner, 2024-2025
Won the Fredrick J. Zeigler award as a junior at the California Institute of Technology for excellence in scholarship as demonstrated in class or in the preparation of an original paper.

H.J Ryser Scholarship Award Winner, 2023-2024
Won the H.J. Ryser scholarship as a sophomore at the California Institute of Technology for academic excellence in mathematics.

Extracurriculars

Member, Undergraduate Student Advisory Board September 2023 - Ongoing
Member of the student advisory board for the Physics, Math, and Astronomy department, organizing events and developing resources for students.

Subteam Lead, Physics Research Team Mar 2019 - June 2022
Worked with the team on the investigation of a variety of physics projects, including a fluid simulation for a lava lamp and a model for spherical magnets. Presented at the 2021 US Invitational Young Physicists Tournament.

Publications

Khesin, Andrey Boris, Jonathan Z. Lu, Alexander Poremba, Akshar Ramkumar, and Vinod Vaikuntanathan. "Average-Case Complexity of Quantum Stabilizer Decoding." arXiv preprint arXiv:2509.20697 (2025). **Talk at QIP 2026.**

Ramkumar, Akshar, Yiyi Cai, Yu Tong, and Jiaqing Jiang. "High-Temperature Fermionic Gibbs States are Mixtures of Gaussian States." arXiv preprint arXiv:2505.09730 (2025). **Talk at QIP 2026.**

Ramkumar, Akshar, and Mehdi Soleimanifar. "Mixing time of quantum Gibbs sampling for random sparse Hamiltonians." arXiv preprint arXiv:2411.04454 (2024). **Talk at TQC 2025, Poster at QIP 2025.**