Justin Yirka

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SUMMARY

Ph.D. candidate in quantum computing advised by Scott Aaronson, graduating in 2025, seeking an industry position. Proven skills in research and communication.

- 7+ publications in top venues (QIP, TQC, …)
- 20+ professional and public presentations.
- Quantum algorithms, complexity, Hamiltonians
- 2 National Labs, 3 universities, and 11+ co-authors

EDUCATION

Ph.D. in Computer Science | The University of Texas at Austin — Expected May 2025
Advised by Scott Aaronson. Quantum computation, Complexity theory, Algorithms

M.S. in Computer Science | The University of Texas at Austin — 2022
Selected courses: Machine learning, Randomized algorithms, Programming languages

B.S. in Computer Science | Virginia Commonwealth University — 2018

B.S. in Mathematical Sciences — (Concurrent degrees)
Specialization in Data Science. Minor in Physics.

Awards: **Capstone Design Award**. $660 grant for senior project Android app. 2017
VCU Presidential Scholarship ($110,000). Awarded to 0.6% of students. 2014

EXPERIENCE

R&D Intern | Sandia National Laboratories — June 2023 – present

- Initiated and completed a project in 6 months which was accepted to QIP (top venue).
- Proved complexity of Hamiltonian product state optimization problems, complementing the work of the Sandia optimization algorithms group.
- Retained as a year-round intern.

Summer School Fellow | Los Alamos National Laboratories — Summer 2019

- Designed new algorithms for entanglement spectroscopy requiring fewer qubits while maintaining noise-resilience. Published in *Quantum*.
- Experimented with Honeywell Quantum device to test new circuit designs.
- Programmed noisy quantum circuit simulations in Qiskit Python up to 24 qubits.
- Maintained code base using git, GitHub, Jupyter, and Unix tools.

Research Assistant | Computational Graph Theory Lab, Virginia Commonwealth University — Summer 2018

- Wrote algorithms for computing graph properties in Sage/Python.
- Maintained a database of graphs, properties, and theorems.
- Improved project documentation and management using git, GitHub.

NSF REU Researcher | QuICS, The University of Maryland — Summer 2017

- Reviewed literature, performed numerical experiments, and investigated quantum tomography.

Research Assistant | Quantum Computing Lab, Virginia Commonwealth University — 2015 – 2016

- Started as a freshman and self-taught necessary linear algebra, TCS, and QC over the summer.
- Contributed key ideas for multiple proofs. Published 2 papers as an undergraduate.

Teaching

Head Teaching Assistant | Quantum Information Science for M.S. students — Spring '22, '23, '24

- Led entire course except for recorded lectures. Supervised 4 graduate TAs, 200+ students.

Instructor | Software Engineering (Java), UT International Academy — Summer 2021

- Developed entire course including lectures and Java programming assignments.

Teaching Assistant | Undergraduate Rhetoric (English), Virginia Commonwealth University — 2015

(Publications listed on next page)

PUBLICATIONS

Author order determined alphabetically except in #4

- S. Grewal and J. Yirka. The entangled quantum polynomial hierarchy collapses. CCC, July 2024. (link)
- J. Kallaugher, O. Parekh, K. Thompson, Y. Wang, J. Yirka. Complexity classification of product state problems for local Hamiltonians. QIP, January 2024. (link)
- S. Gharibian, M. Santha, J. Sikora, A. Sundaram, J. Yirka. Quantum generalizations of the polynomial hierarchy with applications to QMA(2). *Computational Complexity*, 2022. (link)
- J. Yirka and Y. Subasi. Qubit-efficient entanglement spectroscopy using qubit resets. *Quantum*, 2021. (link)
- S. Gharibian, S. Piddock, J. Yirka. Oracle complexity classes and local measurements on physical Hamiltonians. QIP, 2020. (link)
- S. Gharibian and J. Yirka. The complexity of simulating local measurements on quantum systems. TQC, 2017 and *Quantum*, 2019. (link)

ADDITIONAL ACTIVITIES

Chair | UT Computer Science Graduate Student Association — Sep 2020 – Dec 2021

- GRACS representative to UTCS Diversity, Equity, and Inclusion (DEI) Council.
- Co-Organized Application Assistance Program for under-represented Ph.D. applicants. — 2020

Founder and President | RamDev: Software Development at VCU — 2016 – 2018

- Coordinated 46 weekly seminars including 9 corporate speakers and several hackathon trips.
- Secured and managed $2400 in funding and resources.
- Increased weekly attendance to 20+ students, becoming largest C.S. organization at VCU.