Justin Yirka

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SUMMARY

Ph.D. candidate in quantum computing with 10+ years of experience. Advised by Scott Aaronson, graduating in 2025, seeking an industry position adapting my theory background to industry objectives. Proven communicator and collaborator in research, teaching, and leadership roles.

- Quantum algorithms and query complexity, Hamiltonian complexity
- Coding experience: College Java Instructor, quantum simulations in Python, undergraduate coursework.
- 7+ publications in top venues: QIP, TQC, CCC…
- 2 National Labs internships
- 20+ professional presentations

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 new project in 6 months which was accepted to QIP (top venue).
- Proved NP-hardness of Hamiltonian product state optimization problems given any non-trivial interactions (e.g. Quantum Max-Cut). Derived 3D geometric approximations to Bloch vector problems. Designed new variants of Grover's algorithm.
- Advised by John Kallaugher and Ojas Parekh.

Summer School Fellow | Los Alamos National Laboratories   Summer 2019
- Advised by Yigit Subsai.   Designed new algorithms for entanglement spectroscopy requiring asymptotically fewer qubits while maintaining noise-resilience by using mid-circuit measurements. Published in *Quantum*.
- Programmed noise circuit simulations in Qiskit Python up to 24 qubits. Experimented with Honeywell Quantum to test new circuit designs. Maintained code using git, GitHub, Jupyter, and Unix tools. (link)

Research Assistant | Computational Graph Theory Lab, Virginia Commonwealth University   Summer 2018
- Maintained and contributed to a database of graphs, properties, and theorems.
- Wrote algorithms for computing graph properties in Sage/Python.
- Improved project documentation and management, working with git, GitHub. (link)

NSF REU Researcher | QuICS, The University of Maryland   Summer 2017
- Investigated pure state quantum tomography. Supervised by Andrew Childs and Bill Gasarch.

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.
- Advised by Sevag Gharibian.

ADDITIONAL ACTIVITIES

Head Teaching Assistant | Quantum Information Science for M.S. students   Spring '22, '23, '24
- Led entire new Masters 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.

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.
- Increased weekly attendance to 20+ students, becoming largest C.S. organization at VCU.

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

PUBLICATIONS   Author order determined alphabetically except in #5
- J. Yirka. Even quantum advice is unlikely to solve PP. Preprint, March 2024. (link)
- S. Grewal and J. Yirka. The entangled quantum polynomial hierarchy collapses. *CCC* 2024. (link)
- J. Kallaugher, O. Parekh, K. Thompson, Y. Wang, J. Yirka. Complexity classification of product state problems for local Hamiltonians. QIP 2024 and *ITCS* 2025. (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 and *STACS* 2020. (link)
- S. Gharibian and J. Yirka. The complexity of simulating local measurements on quantum systems. TQC 2017 and *Quantum*, 2019. (link)