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 research 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 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. Derived 3D geometric approximations to optimization problems. Designed new variants of Grover's algorithm.

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*.
- Programmed noisy quantum circuit simulations in Qiskit Python up to 24 qubits.
- Experimented with Honeywell Quantum device to test new circuit designs.
- Maintained code and data using git, GitHub, Jupyter, and Unix tools. (link)

Research Assistant | Computational Graph Theory Lab, Virginia Commonwealth University — Summer 2018
- Wrote algorithms for computing graph properties in Sage/Python.
- Maintained database and improved project documentation and management using git, GitHub. (link)

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

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
- Responsible for all assignments, students questions, and more. 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

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

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)