# Justin Yirka

703-229-7956 | yirka@utexas.edu | JustinYirka.com | linkedin.com/in/justinyirka

## SUMMARY

Ph.D. candidate in quantum computing advised by Scott Aaronson, graduating in 2025, seeking an industry position. Strong mathematical background, creative problem solver, and practiced analyzing and assessing technical literature. Proven communicator and collaborator in research, teaching, and leadership roles.

- Math: Quantum physics, proofs, TCS, linear algebra, probability, computational games, algorithms.
- Coding: College Java Instructor, quantum simulations in Python, undergraduate coursework.
- 20+ professional and public presentations.
- 8+ semesters teaching, including as Instructor.

## 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, Combinatorics, Programming Languages

**B.S. in Mathematical Sciences** | Virginia Commonwealth University — 2018

**B.S. in Computer Science** — concurrent degrees
Specialization in Data Science | Capstone Design Award for senior project Android app 2017 | VCU Presidential Scholarship (**$110,000**) 2014.

## RESEARCH EXPERIENCE

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

- Initiated, led, and completed a project in 6 months which was accepted to QIP (top venue).
- Studied complexity of quantum optimization problems, derived 3D geometric approximations, and designed new quantum algorithms out-performing classical algorithms.

**Summer School Fellow** | Los Alamos National Laboratories — Summer 2019

- Designed new algorithms for entanglement spectroscopy requiring fewer qubits while maintaining noise-resilience, enabling useful quantum computation on smaller, noisier devices.
- Programmed noisy quantum circuit simulations in Qiskit Python up to 24 qubits.
- Contracted with Honeywell to test our circuit designs on their experimental quantum computer.
- 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 at top venues as an undergraduate.

## ADDITIONAL EXPERIENCE

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

- Responsible for all assignments, student 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.

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

**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)