

Justin Yirka, PhD

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SUMMARY

PhD with a decade in quantum computing research. Recent graduate, advised by Scott Aaronson. 9+ publications in top venues (QIP, *Quantum*), 20+ professional presentations, and internships at Los Alamos and Sandia National Labs.

EDUCATION

The University of Texas at Austin

PhD in Computer Science

May 2025

MS in Computer Science

May 2022

Advisor: Scott Aaronson

Research Focus: Quantum computing, Algorithms, Complexity Theory

Virginia Commonwealth University

BS in Computer Science

May 2018

BS in Mathematics

Minor in Physics, Certificate in Data Science. VCU Presidential Scholarship (full tuition & board).

EXPERIENCE

Blanqet | Remote

August 2025 - Present

Quantum Computing Researcher

- Founding employee (#2) at a UChicago startup with industry pioneers (e.g. Scott Aaronson, David Awschalom).
- Spearheading research into novel quantum networking protocols for trading in financial markets.

Sandia National Laboratories | Albuquerque, NM and Remote

June 2023 - May 2025

R&D Intern

- Initiated and completed a project in 6 months that was accepted to QIP (top venue).
- Analyzed and proved NP-hardness of computing product state solutions to Hamiltonian optimization problems.
- Developed new variants of Grover's (fault-tolerant) search algorithm with novel input models.

The University of Texas at Austin | Austin, TX

Graduate Research Assistant

Aug 2019 - May 2025

- Secured and led a \$10,000 NSF grant for a quantum seminar series, coordinating logistics and visitors.
- Developed an independent research agenda with minimal supervision, producing 6+ original research papers tackling multiple problems in quantum computational complexity.
- Identified research problems, managed multi-year projects and deadlines, and collaborated with distributed teams.
- Delivered 14+ technical presentations including at international conferences (videos available online).

Head Teaching Assistant: Quantum Information Science (online MS)

Aug 2021 - May 2024

- Managed a team of Graduate TAs and oversaw the technical instruction and grading workflows for a 200+ student advanced course for 4 semesters.
- Successfully launched the new course for the high-revenue online MS program, critical to the department's budget.
- Revised all course content and materials for the online delivery format, ensuring scalability and consistent quality.

Instructor: Software Engineering with Java (online)

June 2021 - July 2021

- Designed and executed a curriculum comprising 30 lectures and hands-on Java coding projects.

Los Alamos National Laboratory | Los Alamos, NM

June 2019 - Aug 2019

Graduate Student Researcher

- Designed low-width NISQ algorithms for entanglement spectroscopy with error mitigation using qubit resets; published in *Quantum*.
- Validated algorithms with experiments on Honeywell (Quantinuum) ion-trap device.
- Programmed noisy circuit simulations in Python Qiskit and maintained code using git, Jupyter, and Unix tools. ([link](#))

Graph Theory Discovery Lab at VCU | Richmond, VA

May 2018 - Aug 2018

Research Assistant

- Implemented graph analysis algorithms (Python, Sage, NumPy) while improving documentation and version control.

RamDev: Software Development at VCU | Richmond, VA

April 2016 - May 2018

Founder and President

- Founded and scaled to become the university's largest Computer Science organization.
- Coordinated 46 seminars and 9 corporate speakers and secured \$2,400 in funding and resources.

QuICS at The University of Maryland | College Park, MD

June 2017 - Aug 2017

Undergraduate Researcher

- Investigated pure-state quantum tomography with Pauli observables. Advised by Andrew Childs.

Quantum Computing Lab at VCU | Richmond, VA

March 2015 - Aug 2016

Undergraduate Research Assistant

- Published 2 papers as an undergraduate, contributing key ideas for multiple proofs.
- Researched Hamiltonian complexity, characterizing the complexity of estimating measurements on low-energy states of correlated quantum systems. Advised by Sevag Gharibian.

SKILLS AND PROJECTS**Languages:** Python (intermediate), Java (intermediate), C++ (beginner), LaTeX (expert)**Data & ML:** NumPy, Sage, Mathematica, Matplotlib**Tools:** git, Unix, Jupyter, AWS, Agile development**Courses:** Machine Learning, Randomized Algorithms, Natural Language Processing, Data Science, Software Engineering

- Machine Learning course projects: PCA, ICA, Gaussian regression, Tensorflow Sept 2020 - Dec 2020
- VCU Senior Project: Bluetooth tag network with Android app, Raspberry Pi, AWS backend Sept 2017 - May 2018
 - **Award:** VCU Engineering Capstone Design Award
- Course Project for Software Engineering: Android app with geofencing, AWS backend Sept 2016 - Dec 2016
- Hackathon projects: Mathematica app with map data; Android app using REST APIs 2016

SELECTED PUBLICATIONSGoogle Scholar: https://scholar.google.com/citations?user=UxIpR_UAAAAJ&hl=en

- B. Holman, R. Ramachandran, J. Yirka. Quantum search with in-place queries. TQC 2025. ([link](#))
- J. Yirka. A note on the complexity of the spectral gap problem. arXiv:2503.02747, March 2025. ([link](#))
- J. Yirka. Even quantum advice is unlikely to solve PP. *Theory of Computing*, 2025. ([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](#))
- J. Yirka. Evaluation of TCP header fields for data overhead efficiency. NCUR 2016.
 - Awarded “Launch Award” for Outstanding Research Poster