

# Justin Yirka, PhD

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## SUMMARY

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Quantum computing researcher with a decade of experience. PhD from UT Austin advised by Scott Aaronson. 9+ publications in top venues (QIP, *Quantum*) and 20+ professional presentations. Internships at Los Alamos and Sandia National Labs and now working in the quantum computing industry.

## EDUCATION

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### 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

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### 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

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**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 PUBLICATIONS

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Google Scholar: [https://scholar.google.com/citations?user=UxIpR\\_UAAAAJ&hl=en](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. Kallaughner, 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