

# Justin Yirka

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## SUMMARY

Ph.D. candidate in quantum computing with 10+ years of experience. Advised by Scott Aaronson, graduating May 2025. Seeking an industry position applying my 10+ years in quantum research to industry applications. Proven communicator and collaborator in research, teaching, and leadership roles.

- 7+ publications in top venues: QIP, TQC, CCC, *Quantum*, and more
- **Coding:** College Java Instructor, simulations in Qiskit Python, project management in git, undergraduate projects with Android, Python, Java, and AWS.
- 2 National Labs internships

My research has focused on quantum Hamiltonian complexity, query complexity, and quantum algorithms. I've significantly contributed to developing new research areas, including the complexity of low-energy states in quantum systems, approximation algorithms, quantum algorithms in new input models, the complexity of quantum games, and more.

## EDUCATION

<b>Ph.D. in Computer Science</b>   The University of Texas at Austin	Expected May 2025
Advised by Scott Aaronson. Quantum computation, Complexity theory, Algorithms	
<b>M.S. in Computer Science</b>   The University of Texas at Austin	2022
Selected courses: Machine learning, Randomized algorithms, Programming languages	
<b>B.S. in Computer Science</b>   Virginia Commonwealth University	2018
<b>B.S. in Mathematical Sciences</b>	concurrent degrees
Specialization in Data Science. Minor in Physics.	
Awards: <b>Capstone Design Award.</b> \$660 grant for senior project Android app.	2017
<b>VCU Presidential Scholarship</b> (\$110,000). Awarded to 0.6% of students.	2014

## EXPERIENCE

<b>R&amp;D Intern</b>   Sandia National Laboratories	June 2023 – present
<ul style="list-style-type: none"><li>• Initiated and completed a project in 6 months characterizing NP-hardness of the Sandia group's approximation problems. Accepted to QIP (top venue).</li><li>• Analyzed Hamiltonian optimization problems. Derived geometric approximations. Designed new variants of Grover's algorithm.</li></ul>	
<b>Summer School Fellow</b>   Los Alamos National Laboratories	Summer 2019
<ul style="list-style-type: none"><li>• Designed new algorithms for entanglement spectroscopy, improving on the group's previous algorithms by requiring asymptotically fewer qubits while maintaining noise-resilience. Published in <i>Quantum</i>.</li><li>• Programmed noisy circuit simulations in Qiskit Python up to 24 qubits.</li><li>• Ran experiments on Honeywell Quantum device.</li><li>• Maintained code and data using git, GitHub, Jupyter, and Unix tools. (<a href="#">link</a>)</li></ul>	
<b>Research Assistant</b>   Computational Graph Theory Lab, Virginia Commonwealth University	Summer 2018
<ul style="list-style-type: none"><li>• Wrote and debugged algorithms for computing graph properties in Sage/Python.</li><li>• Improved project documentation and data management, working with git, GitHub, Unix. (<a href="#">link</a>)</li></ul>	
<b>NSF REU Researcher</b>   QuICS, The University of Maryland	Summer 2017
<b>Research Assistant</b>   Quantum Computing Lab, Virginia Commonwealth University	2015 – 2016
<ul style="list-style-type: none"><li>• Started as a freshman and self-taught necessary linear algebra, TCS, and QC over the summer.</li><li>• Contributed key ideas for multiple proofs. Published 2 papers as an undergraduate, including at <i>TQC</i>.</li></ul>	

## ADDITIONAL ACTIVITIES

<b>PI</b>   \$10,000 grant from NSF CIQC for quantum seminar and visitor series at UT	2024 – 2025
<b>Head Teaching Assistant</b>   Quantum Information Science for M.S. students	Spring '22, '23, '24
<ul style="list-style-type: none"><li>• Responsible for all operations, e.g. assignments and exams. Supervised 4 graduate TAs, 200+ students.</li></ul>	

**Instructor** | Software Engineering (Java), UT International Academy

Summer 2021

- Independently developed and taught entire Java course for undergraduates.

**Founder and President** | RamDev: Software Development at VCU

2016 – 2018

- Coordinated 46 weekly seminars. Increased attendance, 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. Kallaughier, 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](#))