Justin Yirka

Ph.D. Student in Computer Science — beginning August 2019
The University of Texas at Austin, USA

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Research Interests

Quantum computing. Theoretical computer science. Connections to applications.

Education

University of Texas at Austin (UT)
Ph.D. in Computer Science   Beginning in August 2019
   Advisor: Scott Aaronson, Ph.D.

Virginia Commonwealth University (VCU)
B.S. in Computer Science   2018
B.S. in Mathematical Sciences   Concurrent/Dual degrees
   Minor in Physics

Research

Experience

Summer school / Research Assistant   June 2019–August 2019
Los Alamos National Laboratory (LANL)
   Quantum Computing Summer School program: 2 weeks of courses and 8 weeks of research assistantship.

Visiting Researcher   (3 weeks) November 2018
University of Paderborn, Germany
   Collaboration with Sevag Gharibian, Ph.D.
   Topic: Complexity theory and algorithms. Studied QMA_1-hardness of the quantum satisfaction problem (k-QSAT) given qudits of lower dimensions.

Research Assistant   Summer 2018
Graph Theory Computational Discovery Lab, VCU
   Supervisor: Craig Larson, Ph.D.
   Topic: Automated conjecturing and graph theory. Assisted with programming and open-source project management.

NSF Research Experience for Undergraduates (REU) / Undergraduate Researcher   Summer 2017
Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland
   Supervisor: Andrew Childs, Ph.D.
   Topic: Quantum tomography. Investigated minimum number of Pauli observables necessary to identify a pure state.

Undergraduate Research Assistant   2015–2016
Quantum Computing Lab, VCU
    Supervisor: Sevag Gharibian, Ph.D.
    Topic: Complexity theory. Studied quantum oracle classes (e.g. $\mathrm{P}^{\mathrm{QMA}[\log]}$) and complexity of simulating local measurements. Helped to develop "quantum PH" and "quantum Toda's Theorem" ($\mathrm{QCPH} \subseteq \mathrm{P}^{\mathrm{PP}^{\mathrm{PP}}}$).

Preprints

S. Gharibian, S. Piddock, and J. Yirka. Oracle complexity classes and local measurements on physical Hamiltonians. In preparation.

S. Gharibian, M. Santha, J. Sikora, A. Sundaram, and J. Yirka. Quantum generalizations of the polynomial hierarchy with applications to QMA(2). Available at https://arxiv.org/abs/1805.11139. April 2018.

Journal Publications

S. Gharibian and J. Yirka. The complexity of simulating local measurements on quantum systems. Accepted to *Quantum* pending revisions to presentation. Available at https://arxiv.org/abs/1606.05626. 2016.

Conference Presentations ..... (grouped by paper)

S. Gharibian, S. Piddock, and J. Yirka. Oracle complexity classes and local measurements on physical Hamiltonians.

- o Poster by S. Piddock at Workshop on Quantum Computing Theory in Practice (QCTIP). Bristol, UK, April 2019.
- o **Poster by J. Yirka** at 22nd Conference on Quantum Information Processing (QIP). Boulder, CO, USA, Jan. 2019.
- o **Contributed talk by J. Yirka** at 18th Asian Quantum Information Science Conference (AQIS). Nagoya, Japan, Sept. 2018.

S. Gharibian, M. Santha, J. Sikora, A. Sundaram, and J. Yirka. Quantum generalizations of the polynomial hierarchy with applications to QMA(2).

- o Poster by A. Sundaram at 22nd Conference on Quantum Information Processing (QIP). Boulder, CO, USA, Jan. 2019.
- o Contributed talk by A. Sundaram at 18th Asian Quantum Information Science Conference (AQIS). Nagoya, Japan, Sept. 2018. — **"Long"/plenary talk: top 7% of submissions**.
- o Contributed talk by A. Sundaram at 43rd International Symposium on Mathematical Foundations of Computer Science (MFCS). Liverpool, UK, Aug. 2018.

S. Gharibian and J. Yirka. The complexity of simulating local measurements on quantum systems.

- o Contributed talk by S. Gharibian at 12th Conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC). Paris, France, 2017.
- o **Poster by J. Yirka** at 20th Conference on Quantum Information Processing (QIP). Seattle, USA, 2017. Presented under a different title.

J. Yirka. Evaluation of TCP header fields for data overhead efficiency.

- o **Poster by J. Yirka** at 30th National Conference on Undergraduate Research (NCUR). Asheville, NC, USA, 2016.

○ **Poster by J. Yirka** at VCU Symposium for Undergraduate Research and Creativity. Richmond, VA, USA, 2015. — **Awarded "Launch Award for Outstanding Research Poster"**.

Departmental Seminars..

Pure state tomography with Pauli observables. QuICS, University of Maryland. 2017.

Quantum complexity of estimating local physical quantities. Department of Computer Science, VCU. 2016.

Scholarships and Funding　(all dollar amounts in USD)

VCU Presidential Scholarship	2014–2018
$110,000, Virginia Commonwealth University	
Awarded to 0.6% of students.	

Travel grant to attend QIP 2019 in Boulder, CO, USA	January 2019
$400, QIP student support / NSF	

Event grants for seminar series by VCU RamDev software development club	2016–May 2018
$1,900, VCU Student Government Association	

Mark A. Sternheimer Capstone Design Award	2017
$660, VCU School of Engineering	
Grant for developing and testing senior project mobile app.	

Travel grant to present at QIP 2017 in Seattle, USA	2017
$500, VCU Honors College	

Travel grant to present at NCUR 2016 in Asheville, NC, USA	2016
$550, VCU Honors College	

Awards and Honors

Honorable Mention	April 2019
National Science Foundation Graduate Research Fellowship Program (NSF GRFP)	
Awarded to top 30% of over 12,000 applicants.	

Pure Mathematics Award	May 2018
VCU College of Humanities and Sciences	
Student in pure math concentration with highest graduating GPA.	

Launch Award for Outstanding Research Poster	2015
VCU Symposium for Undergraduate Research and Creativity	
For poster *Evaluation of TCP header fields for data overhead efficiency*.	

Volunteer of the Year	2014
Grade-school robotics program, Prince William County Schools, VA	

Teaching Experience

VCU

Teaching Assistant   (2 semesters) 2016–2017
Algebra with Applications (MATH 141)
    Assisted with in-class exercises, offered tutorials, graded assignments.
    Average student evaluation scores — Fall 2016: 4.78 / 5.0; Spring 2017: 4.36 / 5.0.

Mentor for first-year student   Fall 2016
Honors College freshman mentorship program

Teaching Assistant   Fall 2015
Honors Rhetoric (HONR 200) — first-year honors writing and research course

Other

Instructor   2016–March 2018
CPR and first-aid courses for lifeguards
Department of Parks and Recreation, Prince William County, VA

Service

University Service

Student Advisory Board member   (2 academic years) 2016–2018
VCU Department of Computer Science

Senior Reader for Honors program graduation dossiers   (2 academic years) 2016–2017
VCU Honors College

Panelist — Career workshop for freshman mentorship program   2017
VCU Department of Computer Science

Panelist — Undergraduate conference preparation workshops   2017
VCU Honors College

Judge — Launch Award for Outstanding Research Poster   2016
VCU Symposium for Undergraduate Research and Creativity

Organizer — Local Hack Day of Richmond, VA   2016
Major League Hacking (MLH) and VCU Department of Computer Science
    Hosted event for 30 students, including 12 high school students.

Extracurricular Service

Founder and President   (2.5 academic years) 2016–2018
RamDev: Software Development at VCU
- Coordinated 46 weekly seminars including 9 corporate speakers.
- Secured and managed $2400 in funding and resources.
- Increased weekly attendance to 20 students, becoming largest C.S. organization at VCU.

Community Service and Outreach..

Tutor for remedial math students at local high school   Spring 2019
Manchester High School, Midlothian, VA

Asked to meet with U.S. Army Operations Group   November 2018
Answered questions about my observations from AQIS 2018.

Talk — Computer Science theory *is* fun   April 2018
VCU RamDev software development club

Talk — Quantum programming (e.g. IBM Q, LIQ$Ui|\rangle$)   2017
VCU RamDev software development club

Volunteer for grade school robotics competitions (FIRST, Vex robotics)   2011–2015
Prince William County Schools, VA
    Awarded "Volunteer of the Year", 2014.