Justin Yirka

B.S. in Computer Science and B.S. in Mathematics
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Education

Virginia Commonwealth University (VCU) **Richmond, VA**
B.S. in Computer Science *May 2018*
B.S. in Mathematical Sciences, GPA: 3.98 out of 4.0 *Dual degrees*
Specialization in Data Science
Concentration in Pure Math
Minor in Physics
Supported by VCU Presidential Scholarship

Research

Experience

Graph Theory Computational Discovery Lab, VCU
Research Assistant *Summer 2018*
Supervisor: Craig Larson, Ph.D.
Topic: Automated conjecturing and graph Hamiltonicity. Implemented algorithms for graph properties, improved open-source project structure for future use, and evaluated graph Hamiltonicity conjectures.

Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland (UMD)
NSF REU Undergraduate Researcher *Summer 2017*
Supervisor: Andrew Childs, Ph.D.
Support: NSF Research Experience for Undergraduates (REU). P.I.: William Gasarch, Ph.D.
Topic: Quantum pure-state tomography. Investigated Pauli observables using group theory (e.g. Clifford group) and bounds from study of hypergraphs.

Quantum Computing Lab, VCU
Undergraduate Research Assistant *2015–2016*
Supervisor: Sevag Gharibian, Ph.D.
Topic: Quantum computational complexity. Studied quantum oracle classes characterized by local physical problems (e.g. $\mathrm{P}^{\mathrm{QMA[log]}}$) and partially developed "quantum Toda's Theorem" $\mathrm{QCPH} \subseteq \mathrm{P}^{\mathrm{PP}}$.

Preprints

Sevag Gharibian, Stephen Piddock, and **Justin Yirka**. "Local measurements on physical Hamiltonians and oracle complexity classes". Preprint available soon.

Sevag Gharibian, Miklos Santha, Aarthi Sundaram, and **Justin Yirka**. "Quantum generalizations of the polynomial hiearchy with applications to QMA(2)". Available at https://arxiv.org/abs/1805.11139. Apr. 2018.

Sevag Gharibian and **Justin Yirka**. "The complexity of simulating local measurements on quantum systems". Available at https://arxiv.org/abs/1606.05626 [quant-ph]. May 2016.

Conference Presentations

Sevag Gharibian, Stephen Piddock, and **Justin Yirka**. "Oracle complexity classes and local measurements on physical Hamiltonians". **Upcoming contributed talk by J. Yirka** at 18$^{\text{th}}$ Asian Quantum Information Science Conference (AQIS). Nagoya, Japan, Sept. 2018.

Sevag Gharibian, Miklos Santha, Aarthi Sundaram, and **Justin Yirka**. "Quantum generalizations of the polynomial hiearchy with applications to QMA(2)". **Upcoming** contributed **"long"/plenary talk** by S. Gharibian at 18$^{\text{th}}$ Asian Quantum Information Science Conference (AQIS). Nagoya, Japan, Sept. 2018.

Sevag Gharibian, Miklos Santha, Aarthi Sundaram, and **Justin Yirka**. "Quantum generalizations of the polynomial hiearchy with applications to QMA(2)". **Upcoming** contributed talk at 43rd International Symposium on Mathematical Foundations of Computer Science (MFCS). Liverpool, UK, Aug. 2018.

Sevag Gharibian and **Justin Yirka**. *The complexity of simulating local measurements on quantum systems*. Contributed talk by S. Gharibian at 12th Conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC). Paris, France, 2017.

Sevag Gharibian and **Justin Yirka**. *The complexity of estimating local physical quantities*. **Poster by J. Yirka** at 20th Conference on Quantum Information Processing (QIP). Seattle, USA, 2017.

Department 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. — **Only undergraduate invited in previous 5 years**.

Public-Audience Talks

Computer Science theory is *fun*. VCU RamDev software development club. Apr. 2018.

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

Independent Studies

Convex Optimization (CMSC 601)
VCU *Fall 2017*
Independently studied material for graduate optimization course as an undergraduate.

Awards and Scholarships

Presidential Scholarship
$110,000, Virginia Commonwealth University *2014–May 2018*
Top scholarship offered. Full cost of 4-year tuition, room, and board.
Awarded to 0.6% of students

Mark A. Sternheimer Capstone Design Award
VCU School of Engineering *2017*
For "innovation and entrepreneurship" of senior project developing mobile app. Included grant of $660.

Launch Award for Outstanding Research Poster
VCU Symposium for Undergraduate Research and Creativity *2015*

Presidential Scholarship *[unable to accept]*
$80,000, Worcester Polytechnic Institute *2014*

Rensselaer Medal Merit Scholarship *[unable to accept]*
$100,000, Rensselaer Polytechnic Institute *2014*

Extracurricular Experience

Founder and President
RamDev: Software Development at VCU *2016–May 2018*
- 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.

Programming Experience: Skills and portfolio available at www.justinyirka.com/