

Justin Yirka

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

Virginia Commonwealth University (VCU)

B.S. in Computer Science

B.S. in Mathematical Sciences, GPA: 3.98 out of 4.0

Specialization in Data Science

Concentration in Pure Math

Minor in Physics

Supported by VCU Presidential Scholarship

Richmond, VA

May 2018

Dual degrees

Research

Experience.....

Graph Theory Computational Discovery Lab, VCU

Research Assistant

Summer 2018

Supervisor: Craig Larson, Ph.D.

Topic: Automated conjecturing and graph Hamiltonicity. Implement algorithms for graph properties, improve open-source project repository structure for future research, and evaluate conjectures for graph Hamiltonicity.

**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. PQMA^{log}) and partially developed “quantum Toda’s Theorem” $\text{QCPH} \subseteq \text{P}^{\text{PP}}$.

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 hierarchy with applications to $\text{QMA}(2)$ ”. 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 at 18th Asian Quantum Information Science Conference (AQIS). Nagoya, Japan, Sept. 2018.

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

Sevag Gharibian, Miklos Santha, Aarthi Sundaram, and **Justin Yirka**. “Quantum generalizations of the polynomial hierarchy 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, LIQUi|). 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

- o Coordinated 46 weekly seminars including 9 corporate speakers.
- o Secured and managed \$2400 in funding and resources.
- o Increased weekly attendance to 20 students, becoming largest C.S. organization at VCU.

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