

# Justin Yirka

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

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## Education

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**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

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### Experience

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

### Preprints

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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>. May 2016.

### Conference Presentations

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Sevag Gharibian, Stephen Piddock, and **Justin Yirka**. “Oracle complexity classes and local measurements on physical Hamiltonians”. **Upcoming contributed talk by J. Yirka** at 18<sup>th</sup> 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** by S. Gharibian at 18<sup>th</sup> 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 43<sup>rd</sup> 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 12<sup>th</sup> 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 20<sup>th</sup> 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

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### 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

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### 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 [www.justinyirka.com/](http://www.justinyirka.com/)