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. $P^{QMA[\log]}$) and partially developed "quantum Toda's Theorem" $QCPH \subseteq P^{PP}$.

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 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

Sevag Gharibian, Stephen Piddock, and **Justin Yirka**. *Oracle complexity classes and local measurements on physical Hamiltonians*. **Contributed talk by J. Yirka** 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). Contributed **"long"/plenary talk** by A. Sundaram 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). Contributed talk by A. Sundaram 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.

Programming Experience

Languages: Java, C, Python, Sage, Perl, Wolfram Language, Lua

Software: LaTeX, git and GitHub, Unix, Android, Mathematica, Weka, AutoCAD

Software Engineering coursework: Software Engineering (Agile, Android), Algorithm Analysis, Programming Languages (C, Python, Racket), Intro. to Operating Systems, Object Oriented Programming (Java)

Applications coursework: Convex Optimization (graduate course), Introduction to Natural Language Processing (assignments in Perl), Introduction to Data Science (Weka), Artificial Intelligence (neural networks), Graphs and Algorithms, Visualization of Physics with Mathematica

Projects

Graph Brains Project — Graph Theory Computational Discovery Lab, VCU

Python   *Summer 2018*

Implement functions for calculating graph properties. Manage known examples and properties in Python and SQL. Improve project structure, documentation, and usability.

Campus Bluetooth tag network **— Senior project**

Java, Swift, Python, Android, iOS, Raspberry Pi / Unix, Google Firebase   *(2 semesters) 2017–May 2018*

Team project developing campus item-tracking system implementing Android, iOS, and Raspberry Pi programs to locate users' items tagged with BLE beacons.

GeoViewer **Android app — Software Engineering course project**

Java, Android, Amazon AWS   *Fall 2016*

Team project with focus on Agile development. Implemented Android app for sharing geocached photos.

Run Planner **Mathematica program — RamHacks hackathon**

Wolfram Language, Mathematica   *2016*

Developed program utilizing opensource GPS data to take as input a starting location and a distance goal and output a jogging route of that distance along the city road network.

GroupMe Stats **Android app — VTHacks hackathon**

Java, Android   *2016*

Team project developing app to use GroupMe API to provide interesting statistics to a user.

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.

Awards and Honors

VCU Presidential Scholarship

$110,000, Virginia Commonwealth University   *2014–May 2018*

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*