

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. 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. $P^{QMA[log]}$) 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> [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 $QMA(2)$ ”. **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.

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*

- 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.

Awards and Honors

Presidential Scholarship

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

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*