

Justin Yirka
Curriculum Vitae
B.S. in Computer Science and B.S. in Mathematics
Virginia Commonwealth University, Richmond, VA, USA

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Research Interests

Quantum computing algorithms
Quantum computational complexity

Interested in gaining experience with quantum computing applications and in studying a wider range of quantum computing theory.

Education

Virginia Commonwealth University (VCU)

B.S. in Computer Science

Richmond, VA

(Dual degree program) 2018

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

Concentration in Pure Math
Specialization in Data Science
Minor in Physics
University Honors

Research

Experience.....

Graph Theory Computational Discovery Lab, VCU

Research Assistant

Summer 2018

Supervisor: Craig Larson, Ph.D.

Topic: Use of automated conjecturing software (Python) to find conditions 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.

Topic: Quantum tomography. Pure-state tomography with Pauli observables.

Support: NSF Research Experience for Undergraduates (REU). P.I.: William Gasarch, Ph.D.

Quantum Computing Lab, VCU

Undergraduate Research Assistant

2015–2016

Supervisor: Sevag Gharibian, Ph.D.

Topics: Quantum computational complexity. Complexity of local physical problems, quantum oracle classes (e.g. $P^{QMA}[\log]$), quantum variants of the polynomial hierarchy.

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)”. Preprint available soon.

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

Conference presentations.....

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). 2017.

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

Justin Yirka. *Evaluation of TCP header fields for data overhead efficiency*. Poster at 30th National Conference on Undergraduate Research (NCUR). 2016.

Justin Yirka. *Evaluation of TCP header fields for data overhead efficiency*. Poster at VCU Symposium for Undergraduate Research and Creativity. 2015. — **Awarded “Launch Award for Outstanding Research Poster”**.

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. 2018.

Quantum programming (e.g. IBM Q, LIQUi|). VCU RamDev software development club. 2017.

Independent studies.....

Convex Optimization (CMSC 601)

VCU, Supervisor: Sevag Gharibian, Ph.D.

Fall 2017

Independently studied material for graduate optimization course as an undergraduate

Only undergraduate granted independent study approval in computer science in Fall 2017.

Scholarships (all dollar amounts in USD)

Presidential Scholarship

\$110,000, Virginia Commonwealth University

2014–2018

Top scholarship offered. Full cost of 4-year tuition, room, and board.

Awarded to 0.6% of students

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

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

Funding

Event grants for seminar series by VCU RamDev software development club
\$1,900, VCU Student Government Association 2016–2018

Travel grant for presentation at QIP 2017
\$500, VCU Honors College 2017

Travel grant for presentation at NCUR 2016
\$550, VCU Honors College 2016

Awards and Honors

Pure Mathematics Award
VCU College of Humanities and Sciences 2018
Awarded to student in pure mathematics concentration with highest graduating GPA.

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.

University Student Scholar Award
Virginia Commonwealth University 2015

Launch Award for Outstanding Research Poster
VCU Symposium for Undergraduate Research and Creativity 2015
For poster *Evaluation of TCP header fields for data overhead efficiency*.

Volunteer of the Year
Grade-school robotics program, Prince William County Schools, VA 2014

Teaching Experience

VCU.....

Teaching Assistant
Algebra with Applications (MATH 141) (2 semesters) 2016–2017
Assisted with in-class work, offered tutorials, graded assignments.
Average student evaluation scores — Fall 2016: 4.78 / 5.0, Spring 2017: 4.36 / 5.0.

Mentor for 1st year student
Honors freshman mentorship program Fall 2016

Teaching Assistant

Honors Rhetoric (HONR 200) — first-year honors writing and research course

Fall 2015

Assisted with in-class work and critiqued student papers.

Other.....

Instructor

CPR, first-aid, and lifeguarding courses

2016–2018

Department of Parks and Recreation, Prince William County, VA

Service

University service (VCU).....

Student Advisory Board member

Department of Computer Science

2016–2018

- o Invited to School of Engineering strategic planning retreat, 2017 (only C.S. undergraduate).
- o Participated in hiring interviews for new faculty, 2017 (one of two students to participate).

Senior Reader for Honors graduation dossiers

Honors College

(2 academic years) 2016–2017

Assessed papers submitted in fulfillment of University Honors. Coordinated other readers.

Panelist — Career workshop for freshman mentorship program

Department of Computer Science

2017

Panelist — Undergraduate conference preparation workshops

Honors College

2017

Judge — Launch Award for Outstanding Research Poster

VCU Symposium for Undergraduate Research and Creativity

2016

Organizer — Local Hack Day of Richmond, VA

Major League Hacking (MLH) and VCU Department of Computer Science

2016

Hosted event for 30 students including 12 high school students.

Extracurricular service.....

Founder and President

RamDev: Software Development at VCU

2016–2018

- 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.

Community service.....

Volunteer for grade school FIRST & Vex robotics competitions

Prince William County Schools, VA

2011–2015

Awarded “Volunteer of the Year”, 2014.

Mentor to middle school FIRST robotics team

Wilder Middle School, Richmond, VA

2014

Programming Experience

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

Software: LaTeX, git, Unix, Android & mobile apps, Mathematica, Weka, AutoCAD

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

Applications coursework: 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) 2017–2018

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 enabling users to share and discover 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 retrieve information about user's GroupMe conversations and provide interesting statistics to the user.

Vex, FIRST, and Zero (International Space Station) robotics competitions

C++

2010–2014

VA Governor's Cybersecurity Cup

Networking fundamentals (e.g. TCP/IP, OSI model)

Fall 2012

Learned and competively demonstrated cybersecurity fundamentals with a focus on network security. Qualified for invitation to 2013 VA Governor's Cybersecurity Conference and CTF.