

# Justin Yirka

## Curriculum Vitae

Candidate for B.S. in Computer Science and B.S. in Math  
Virginia Commonwealth University, Richmond, VA, USA

Email: [YirkaJk@vcu.edu](mailto:YirkaJk@vcu.edu)

Phone: (703) 229-7956

LinkedIn: [www.linkedin.com/in/yirkajk](http://www.linkedin.com/in/yirkajk)



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## Research Interests

Quantum computing, algorithms, complexity theory

## Education

### B.S. in Computer Science

### B.S. in Mathematical Sciences – concentration in Pure Math

Dual-degree – Virginia Commonwealth University (VCU) (Richmond, VA, USA) 2014 – 2018

- GPA 3.97 / 4.0
- Minor in Physics
- University Honors

### International Baccalaureate Diploma, Gar-Field High School

2014

IB Diploma score: 37 out of possible 45 (88<sup>th</sup> percentile globally).

GRE Scores (score, percentile): Verbal 170 / 170, 99<sup>th</sup> – Math 166 / 170, 91<sup>st</sup> – Writing 5.0 / 6.0, 93<sup>rd</sup>

## Research

### Internships

Quantum Computing Lab, VCU

2015 – 2016, Fall 2017

Supervisor: Sevag Gharibian, Ph.D.

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

Joint Center for Quantum Information and Computer Science (QuICS),  
University of Maryland (UMD)

Summer 2017

Supervisor: Andrew Childs, Ph.D.

Topic: Quantum tomography, pure-state tomography with Pauli observables.

### Publications and Posters

S. Gharibian and J. Yirka. The complexity of simulating local measurements on quantum systems.

Preprint available at <https://arxiv.org/abs/1606.05626>.

**To appear in:** *Proceedings of 12<sup>th</sup> Conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC 2017).* 2017

**Contributed talk:** 12<sup>th</sup> Conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC 2017). Presented by S. Gharibian. 2017

**Poster presentation:** 20<sup>th</sup> Conference on Quantum Information Processing (QIP 2017). 2017

**Department seminar:** Department of Computer Science, VCU 2016

*Only undergraduate invited in previous 5 years.*

J. Yirka. Evaluation of TCP header fields for data overhead efficiency.  
 Poster available at <http://scholarscompass.vcu.edu/uresponse/148/>.  
**Poster presentation:** 30<sup>th</sup> National Conference on Undergraduate Research (NCUR 2016) 2016  
**Poster presentation:** VCU Symposium for Undergraduate Research and Creativity 2015  
**Awarded:** “Launch Award” for Outstanding Research Poster.

#### Additional Talks

Pure state tomography with Pauli observables 2017  
**Department seminar:** UMD QuICS. On partial results from summer internship.

Quantum programming 2017  
**Seminar:** VCU RamDev software club. On quantum computing software (e.g. IBM Q, LIQUIT).

#### Independent Studies

Convex Optimization (CMSC 601), Virginia Commonwealth University Fall 2017  
 Independently studied material for graduate optimization course as an undergraduate.  
*Only undergraduate to receive independent study approval in computer science in Fall 2017.*

#### Funding and Scholarships (all dollar amounts in USD)

Presidential Scholarship 2014 – 2018  
 ~\$110,000. VCU.  
 Top scholarship offered. Full cost of 4-year tuition, room, and board.  
*Awarded to ~0.6% of students.*

Funding for *RamDev* software club seminars 2016 – current  
 ~\$1,400 to date. VCU Student Government Association.

NSF Research experience for undergraduates (REU). 2017  
 ~\$6,000. Combinatorics and Algorithms for Real Problems REU, UMD.  
 Stipend and housing to fund summer research internship with UMD QuICS.  
 Acceptance rate: ~11%.

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

Travel grant for poster presentation at NCUR 2016 2016  
 ~\$550. VCU Honors College.

Presidential Scholarship [*declined*] 2014  
 ~\$80,000. Worcester Polytechnic Institute.

Rensselaer Medal Merit Scholarship [*declined*] 2014  
 ~\$100,000. Rensselaer Polytechnic Institute.

#### Awards and Honors

Mark A. Sternheimer Capstone Design Award 2017  
 VCU School of Engineering  
 For “innovation and entrepreneurship” of senior project developing mobile app.  
 Awarded to 23% of teams in 2016. Included grant of \$660.

University Student Scholar Award, VCU	2015
Launch Award for Outstanding Research Poster VCU Symposium for Undergraduate Research and Creativity	2015
Volunteer of the Year Grade-school robotics program, Prince William County Schools, VA	2014

## Teaching Experience

**VCU**  
Teaching Assistant for *Algebra with Applications* (MATH 141) (2 semesters) 2016 – 2017  
Assisted with in-class work, offered tutorials, graded assignments. Up to 28 students  
Average student evaluation scores - Fall 2016: 4.78 / 5.0, Spring 2017: 4.36 / 5.0

Mentor for 1<sup>st</sup> year student Fall 2016  
VCU Honors freshman mentorship program

Teaching Assistant for *Honors Rhetoric* (HONR 200) Fall 2015  
Assisted with in-class work and critiqued papers. First-year writing course. 17 students.

## Service

**University service (VCU)**  
Student Advisory Board member 2016 – current  
Department of Computer Science  
Details: **Invited to:** School of Engineering Strategic Planning Retreat, 2017 (*Only CS undergrad*)  
**Invited to:** Participated in hiring interviews for new faculty and instructors, 2017.  
(*One of only two students to participate*)

Senior Reader: Honors graduation dossiers (3 academic years) 2016 – current  
Honors College  
Assess papers submitted in fulfillment of University Honors. Coordinate other readers.

Panelist, Career Workshop for freshman mentorship program 2017  
Department of Computer Science

Panelist, Undergraduate conference preparation sessions 2017  
Honors College

Judge, Launch award for Outstanding Research Poster 2016  
VCU Symposium for Undergraduate Research and Creativity

**Extracurricular service (VCU)**  
Founder and President, *RamDev: Software Development at VCU* 2016 – current  
Details: Coordinated over 37 weekly seminars *to-date*, including 6 corporate speakers.  
Secured and managed over \$2000 in funding and resources.  
*Increased attendance to 20 students weekly – now largest C.S. organization at VCU.*

Organizer, Local Hack Day of Richmond, VA hosted at VCU 2016  
Planned and hosted event for over 30 students including 12 high school students.

## Community service

- Volunteer, *FIRST* and *Vex* robotics competitions 2011 – 2015  
Prince William County Schools, VA  
Awarded: “Volunteer of the Year,” for commitment to grade school robotics program.
- Mentor, *FIRST Tech Challenge* robotics team 2014  
Wilder Middle School, Richmond, VA

## Selected Courses

- Theory of computation – 2016
- Computer architecture – 2016
- Algorithms and data structures – 2016
- Operating systems – 2016
- Software engineering – 2016
- Intro to artificial intelligence – 2016
- Intro to data science – 2016
- Programming languages – 2017
- Intro to natural language processing – 2017
- Convex optimization – 2017
- Physics visualization w/ *Mathematica* – 2017
- Multivariate calculus – 2015
- Differential equations – 2015
- Linear algebra – 2015
- Mathematical reasoning / proofs – 2015
- Intro to statistics - 2016
- Graph theory and algorithms – 2016
- Abstract algebra – 2016
- Real analysis – 2017
- Topology (point-set) – 2017
- Mathematical writing – 2018
- Complex analysis – 2018
- Linear alg. applications in graph theory - 2018

## Additional Employment

- Instructor for CPR, first-aid, and lifeguarding courses 2016 – current  
Department of Parks and Recreation, Prince William County, VA  
Plan, lead, and co-teach critical, non-traditional courses of up to 40 students.
- Waterpark Supervisor 2011 – 2016  
Department of Parks and Recreation, Prince William County, VA