Justin Yirka

Curriculum Vitae

Candidate for B.S. in Computer Science and B.S. in Math
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Research Interests

Quantum computing, algorithms, complexity theory

Education

B.S. in Computer Science – specialization in Data 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 (88th percentile globally).

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

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), Summer 2017
University of Maryland (UMD)
Supervisor: Andrew Childs, Ph.D.
Topic: Quantum tomography, pure-state tomography with Pauli observables.

Publications and Posters

S. Gharibian, M. Santha, J. Sikora, A. Sundaram, and J. Yirka. Quantum generalizations of the polynomial hierarchy with applications to QMA(2). 2018
Preprint available soon

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 12th Conference on the Theory of Quantum Computation, Communication, and Cryptography* (TQC 2017). 2017

Contributed talk: 12th Conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC 2017). Presented by S. Gharibian. 2017
Poster presentation: 20th 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/uresposters/148/.
Poster presentation: 30th 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
Computer Science theory *is* fun 2018
Seminar: VCU RamDev software club.

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, LIQ*UI*⟩).

Independent Studies
Convex Optimization (CMSC 601), VCU. 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
~$1,900 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

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

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 2015
VCU Symposium for Undergraduate Research and Creativity

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

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 1st 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 – 2018
Details: Coordinated 46 weekly seminars, including 9 corporate speakers.
Secured and managed over $2400 in funding and resources.
Increased attendance to 20 students weekly, becoming 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.