Ryan LaRose

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Education

2017– **Michigan State University**.
Ph.D. in Physics and Computational Mathematics, Science, and Engineering.

2013–2017 **University of Michigan, Ann Arbor**.
B.S. with Distinction in Physics and Mathematics.

Research Directions

Quantum algorithm engineering for near-term quantum computers.

Quantum-assisted machine learning.

Research Experience

2019 **IBM**, *Quantum Computing Applications Researcher (Intern)*, Thomas J. Watson Research Center, Yorktown Heights, NY.

2018 **Los Alamos National Laboratory**, *Quantum Computing Summer School*.
Hybrid quantum-classical algorithms for near-term quantum computers.
Co-mentored by Patrick Coles and Lukasz Cincio.
One of ten students selected internationally for first ever summer school.

2016–2017 **University of Michigan, Ann Arbor**, *Undergraduate Research Assistant*, Quantum Information Group led by Dr. Yaoyun Shi.
Attended weekly seminars and guided reading on quantum information/quantum computation.
Introduced group to digital and analog quantum simulation.

Summer 2016 & 2017 **Michigan Technological Research Institute**, *Intern*, Sensor and Signal Processing Lab.
Machine learning for subsurface imaging classification, signal processing.
Improved and developed codebases, implemented algorithms, developed mathematical models.

Teaching Experience

2019 **Quantum Machine Learning**, *edX, University of Toronto*.
Chief Community Moderator for $>$ 4000 students. Course developed and taught by Dr. Peter Wittek.

Spring 2019 **CMSE 201: Introduction to Computational Modeling**, *Michigan State University*.
TA for Section 002 (Instructor: Dr. Devin Silvia).

Fall 2018 **CMSE 202: Computational Modeling Tools and Techniques**, *Michigan State University*.
TA for Sections 001 (Instructor: Dr. Devin Silvia) and 002 (Instructor: Dr. Pierson Guthry).

Work and Leadership Experience

2019 **Alphabet X**, *Technical Writer*.
Contracted to write/revise chapters in textbooks on quantum computing and machine learning.

Summer 2017 **University of Michigan, Ann Arbor**, *Academic Mentor*, Academic Success Program and Summer Bridge Scholars Program.
Daily individualized tutoring sessions for academically at-risk students.
Tutoring by appointment for mathematics, computer science, and physics.

2015–2017 **University of Michigan, Ann Arbor**, *Grader*, Department of Mathematics.
Math 316, Differential Equation, Fall 2015 and Winter 2016.
Math 450, Advanced Engineering Mathematics, Summer 2016, Fall 2016, Winter 2017.

Journal Publications

2019 **Ryan LaRose**, Arkin Tikku, Étude O'Neel-Judy, Lukasz Cincio, and Patrick J. Coles Variational quantum state diagonalization, *npj Quantum Information* **5**, no. 1, pp. 1-10, Jun. 2019.

2019 Sumeet Khatri, **Ryan LaRose**, Alexander Poremba, Lukasz Cincio, Andrew T. Sornborger, and Patrick J. Coles, Quantum-assisted quantum compiling, Quantum **3**, 140 (2019).

2019 **Ryan LaRose**, Overview and comparison of gate level quantum software platforms, Quantum **3**, 130 (2019).

Pre-Print Publications

2018 **Ryan LaRose**, Distributed memory techniques for classical simulation of quantum circuits, arXiv:1801.01037, 2018.

Other Writing

2019 **Ryan LaRose**, NISQ Implementations. A curated list of algorithm implementations on NISQ computers. Website: https://github.com/rmlarose/nisq-implementations.

2019 **Ryan LaRose**, Teaching quantum computing through programming, 2019. To be featured on the Qiskit blog.

2019 **Ryan LaRose**, Practical quantum computing with Cirq, Featured on Quantum Computing Report, 2019. GitHub: https://github.com/rmlarose/cirq-overview.

Software Development

2018- **NISQAI**, *https://github.com/quantumai-lib/nisqai*, Lead developer.
Open-source platform for quantum neural networks on near-term quantum computers.
Recipient of the Unitary Fund Grant.
Qiskit, *https://github.com/qiskit*, Contributor.
Implemented (adaptive) analytic quantum gradient descent in Qiskit Aqua.
Implemented multiple algorithms in Aqua, e.g. state preparation for sparse vectors, quantum singular value estimation, quantum recommendation systems, and quantum linear systems.

Presentations

2019 **IBM Quantum Research Seminar**, *Thomas J. Watson Research Center, Yorktown Heights, NY.*
Quantum singular value estimation and its applications.

2019 **APS March Meeting**, *Boston, MA.*
Quantum software platforms.

2019 **FOSDEM 2019, Quantum computing devroom**, *Université Libre de Bruxelles, Brussells, Belgium.*
Towards Practical Quantum machine learning with NISQAI.

2019 **Quantum Information Processing**, *University of Colorado Boulder.*
[Poster] Variational quantum state diagonalization.

2018 **Quantum Information and Computation Seminar**, *Michigan State University.*
Quantum technologies in the second quantum revolution. Inaugural presentation of weekly seminar.

2018 **Quantum Information Science Workshop**, *Michigan State University.*
[Poster] Quantum-assisted quantum compiling. Runner-up for best poster presentation.

2018 **Fourth Annual International Conference for Young Quantum Information Scientists**, *University of Vienna, Austria.*
[Poster] Overview and Comparison of Gate Level Quantum Software Platforms

2018 **Information Science & Technology Institute Summer School Presentations**, *Los Alamos, New Mexico.*
Variational quantum state diagonalization.

2018 **Los Alamos National Laboratory Student Symposium**, *Los Alamos, New Mexico.*
[Poster] Quantum-assisted quantum compiling. Recipient of 2018 Outstanding Poster Presentation in Physics.

2018 **APS April Meeting**, *Columbus, Ohio.*
Distributed memory techniques for classical simulation of quantum circuits.

2018 **Engineering Research Symposium**, *Michigan State University.*
[Poster] Distributed memory techniques for classical simulation of quantum circuits.

2018 **Graduate Academic Conference**, *Michigan State University.*
Quantum teleportation with photons.

2017 **Quantum Information Processing Seminar**, *University of Michigan, Ann Arbor.*
Optical simulation of quantum information: simplifying the teleportation circuit with timing qubits.

2017 **Quantum Information Processing Seminar**, *University of Michigan, Ann Arbor.*
Introduction to digital and analog quantum simulation.

Workshops & Tutorials Attended

2019 **Cirq Bootcamp**, *Google Venice*, Los Angeles, California.

2018 **Schrödinger's Class**, *Institute for Quantum Computing, University of Waterloo*, Waterloo, Canada.

2018 **Quantum Information Science Workshop**, *Michigan State University*, East Lansing, Michigan.

2018 **International Conference for Young Quantum Information Scientists (YQIS) and Summer School of the Vienna Doctoral Program on Complex Quantum Systems (CoQuS)**, *University of Vienna*, Vienna, Austria.

2018 **Quantum Information Workshop**, *APS March Meeting*, Los Angeles, California.

2018 **Hybrid Quantum Systems Workshop**, *APS March Meeting*, Los Angeles, California.

Professional Activities

2019 **Presenter**, *Time for Quantum*, Michigan State University Science Festival (Science outreach).

2018– **Co-Founder and Organizer**, *Quantum Information and Computation (QuIC) Semianr*, Michigan State University, https://www.ryanlarose.com/quic-seminar.html.

2019 **Presenter**, *CMSE Exhibition*, Michigan State University Science Festival (Science outreach).

2017 **Assistant Organizer**, *Frontiers in Computing and Data Science*, Michigan State University.

Referee for Journals

Quantum
PLOS ONE

Professional Affiliations

2018– Society for Industrial and Applied Mathematics (SIAM).

2017– American Physical Society.

2017– American Mathematical Society.

2017– IEEE.

Programming Languages

Experienced Python.

Intermediate C, C++, Matlab.

Quantum Software Cirq (experienced), ProjectQ (experienced), Qiskit (intermediate), pyQuil (intermediate).

Awards, Grants, and Prizes

2019 **NSF Student Travel Grant**, *TQC + NISQ 2019*, University of Maryland.

2019 **Qiskit Hackathon Winner**, *Qiskit Camp Conference at IBM*.
Implemented analytic gradient descent algorithms in Qiskit Aqua for optimization in variational quantum algorithms. Selected winner out of 20+ projects by judges.

2019 **Disciplinary Leadership Award**, *Michigan State University, Council of Graduate Students*.
$2k for advancing quantum information science research at Michigan State University.

2019 **CMSE Research Travel Grant**.
$1k for presenting research at conferences.

2019 **NSF Student Travel Grant**, *QIP 2019*, University of Colorado, Boulder, Colorado..

2018 **Unitary Fund Grant**.
$2k for open-source quantum software development.

2018 **Travel Scholarship for YQIS 2018**, *Erwin Schrödinger Institute for Mathematics and Physics*.

2018 **CMSE Research Travel Grant**.
$1k for presenting research at conferences.

2017 **Jackier Prize**, *University of Michigan*.

2013 **William J. Branstrom Freshman Prize**, *University of Michigan*.

Scholarships, Fellowships, and Distinctions

2019 **Future Academic Scholars in Teaching (FAST) Fellowhship**, *The Graduate School, Michigan State University*.
$2k for quantum computing education research and curriculum development at MSU.

2018 **Quantum Computing Summer School Fellowship**, *Los Alamos National Laboratory*.
1/10 awarded internationally.

2017 **Engineering Distinguished Fellowship**, *Michigan State University*.

2017 **Phi Beta Kappa**, *Alpha of Michigan Chapter*.

2017 **James B. Angell Scholar**, *University of Michigan*.
2+ consecutive terms of all A grades.

2017 **Bachelor of Science with Distinction**, *University of Michigan*.

2013–2016 **University Honors**, *University of Michigan*.

2016 **James B. Angell Scholar**, *University of Michigan*.
2+ consecutive terms of all A grades.

2013 **Michigan Competitive Scholarship**.

2013/2016 **M-PACT Scholarship**, *University of Michigan*.

References

Morten Hjorth-Jensen, *Professor*, Michigan State University & the University of Oslo, PhD co-advisor.
Deparment of Physics and Astronomy, National Superconducting Cyclotron Laboratory.
hjensen@msu.edu

Matthew Hirn, *Assistant Professor*, Michigan State University, PhD Advisor.
Department of Computational Mathematics, Science, and Engineering and Department of Mathematics.
mhirn@msu.edu

Patrick Coles, *Senior Scientist, T-4 Division*, Los Alamos National Laboratory, Summer School Mentor.
pcoles@lanl.gov

Yaoyun Shi, *Professor*, University of Michigan, Undergraduate Research Advisor.
Department of Electrical Engineering and Computer Science.
Vice President and Chief Scientist of Quantum Technologies, Alibaba group.
y.shi@alibaba-inc.com