

Ryan LaRose

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Education

- 2017– **Michigan State University**.
Ph.D. in Physics and Computational Mathematics, Science, and Engineering.
- 2017 **University of Michigan, Ann Arbor**.
B.S. with Distinction in Mathematics and Physics.

Research Experience

- 2020 **Alphabet (Google) X**, *Quantum Resident*, Palo Alto, CA.
Tensor networks, near-term quantum algorithms.
- 2020 **Unitary Fund**, *Technical Staff Member (Part-time)*.
Research and software development for error-mitigated quantum programming.
- 2019 **NASA Ames**, *Intern, Quantum Artificial Intelligence Laboratory*, Mountain View, CA.
Quantum compiling, QAOA applications, and error mitigation.
- 2019 **IBM**, *Quantum Computing Applications Researcher (Intern)*, T.J. Watson Research Center, NY.
Quantum algorithms for linear systems of equations.
- 2018 **Los Alamos National Laboratory**, *Quantum Computing Summer School*, Los Alamos, NM.
Variational quantum algorithms for compiling, diagonalization, and other applications.
- 2017 **University of Michigan**, *Undergraduate Research Assistant*, Quantum Info. Group (Yaoyun Shi).
Introduction to quantum computation and quantum simulation.
- 2016 & 2017 **Michigan Technological Research Institute**, *Intern*, Sensor and Signal Processing Lab.
Inverse problems for subsurface imaging and machine learning for image classification.

Teaching Experience

- 2019 **Quantum Machine Learning**, *edX, University of Toronto*.
Chief Community Moderator for > 4000 students. Course developed and taught by Dr. Peter Wittek.
- 2019 **CMSE 201: Introduction to Computational Modeling**, *Michigan State University*.
TA for Section 002 (Instructor: Dr. Devin Silvia).
- 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 (Google) X**, *Technical Writer*.
Contracted to write/revise chapters in textbooks on quantum computing and machine learning.
- 2017 **University of Michigan, Ann Arbor**, *Academic Mentor*, Academic Success/Bridge Scholars Programs.
Tutoring for undergraduate courses in mathematics, physics, and computer science.
- 2015–2017 **University of Michigan, Ann Arbor**, *Grader*, Department of Mathematics.
Math 450, Advanced Engineering Mathematics (Summer 2016, Fall 2016, Winter 2017).
Math 316, Differential Equations (Fall 2015 and Winter 2016).

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

- 2019 Carlos Bravo-Prieto, **Ryan LaRose**, M. Cerezo, Yigit Subasi, Lukasz Cincio, and Patrick J. Coles, Variational quantum linear solver: A hybrid algorithm for linear systems, arXiv:1909.05820, 2019.
- 2018 **Ryan LaRose**, Distributed memory techniques for classical simulation of quantum circuits, arXiv:1801.01037, 2018.

Other Writing

- 2019 Jack Hidary, *Quantum computing: An applied approach*, Springer International Publishing, 2019. <https://www.springer.com/us/book/9783030239213>. **Contributing author**, chps. 6-10 & problem sets.
- 2019 **Ryan LaRose**, NISQ implementations. A curated list of algorithm implementations on NISQ computers. GitHub: <https://github.com/rmlarose/nisq-implementations>.
- 2019 **Ryan LaRose**, *Teaching quantum computing through programming*, 2019.
- 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

- 2020 **Rigetti Advantage Day**, *Rigetti Computing, Sacramento, CA*.
Variational quantum linear solver Rigetti Aspen-7.
- 2020 **SQuInT 2020**, *University of Oregon, Eugene, Washington*.
[Poster] Variational quantum linear solver.
- 2020 **FOSDEM 2020, Quantum Computing Devroom**, *Université Libre de Bruxelles, Brussels, Belgium*.
Quantum classifiers, robust data encodings, and software to implement them.
- 2020 **Quantum Computing Short Course**, *Air Force Institute of Technology (AFIT), Dayton, Ohio*.
Quantum subspace expansion and simultaneous measurements.
- 2019 **CME250Q: Intro. to Quantum Computing and Quantum Algorithms**, *Stanford, Palo Alto, Ca*.
[Guest Lecture] Quantum algorithms for linear systems of equations.
- 2019 **Quantum Techniques in Machine Learning**, *KAIST, Daejeon, South Korea*.
Robust data encodings for quantum classifiers.
- 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, Brussels, 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 **4th International Conference for Young Quantum Information Scientists**, *University of Vienna*.
[Poster] Overview and Comparison of Gate Level Quantum Software Platforms
- 2018 **Information Science & Technology Institute Summer School Presentations**, *Los Alamos, NM*.
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

- 2020 **Quantum Algorithms Workshop**, *Simons Institute for the Theory of Computing*, Berkeley, Ca.
- 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 **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

- 2020 **Instructional Assistant**, *Python bootcamp for non-engineers*, Google, New York, NY.
- 2019 **Lead Organizer**, *MSU-IBM Quantum Computing Bootcamp with Qiskit*, Michigan State University, October 18-19, 2019., Conference website: <https://egr.msu.edu/qcbq>.
Tutorials and talks: <https://github.com/rmlarose/qcbq>
- 2019 **Presenter**, *Time for Quantum*, Michigan State University Science Festival (Science outreach).
- 2018– **Co-Founder and Organizer**, *Quantum Information and Computation (QuIC) Seminar*, MSU.
Website: <https://www.ryanlarose.com/quic-seminar.html>
- 2019 **Presenter**, *CMSE Exhibition*, Michigan State University Science Festival (Science outreach).

Referee for Journals

Quantum Information and Computation, Rinton Press
Quantum
PLOS ONE

Programming Languages

Experienced Python.

Intermediate C, C++, Matlab.

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) Fellowship**, *Michigan State University*.
[Declined] \$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*.
- 2017 **Bachelor of Science with Distinction**, *University of Michigan*.
- 2013–2016 **University Honors**, *University of Michigan*.
- 2016 **James B. Angell Scholar**, *University of Michigan*.
- 2013 **Michigan Competitive Scholarship**.
- 2013 & 2016 **M-PACT Scholarship**, *University of Michigan*.

References

- Matthew Hirn**, *Assistant Professor*, Michigan State University, PhD Advisor.
Department of Computational Mathematics, Science, and Engineering and Department of Mathematics.
mhirn@msu.edu
- Morten Hjorth-Jensen**, *Professor*, Michigan State University & the University of Oslo, PhD co-advisor.
Department of Physics and Astronomy, National Superconducting Cyclotron Laboratory.
hjensen@msu.edu
- Davide Venturelli**, *Research Scientist at NASA QuAIL & Science Operations Manager for RIACS*,
NASA Quantum Artificial Intelligence Laboratory & Research Institute for Advanced Computer Science.
davide.venturelli@nasa.gov
- Patrick Coles**, *Senior Scientist, T-4 Division*, Los Alamos National Laboratory, Summer School Mentor.
pcoles@lanl.gov
- Yaoyun Shi**, (*former*) *Professor*, University of Michigan, Undergraduate Research Advisor.
Department of Electrical Engineering and Computer Science.
(current) Vice President and Chief Scientist of Quantum Technologies, Alibaba group.
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