

# Ryan LaRose

Michigan State University

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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.

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## Research Directions

Quantum algorithm engineering for near-term quantum computers.

Quantum-assisted machine learning.

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## Research Experience

2019 **IBM Research**, *Quantum Computing Applications Researcher (Intern)*, 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 **Michigan Technological Research Institute**, *Intern*, Sensor and Signal Processing Lab.

& 2017 Machine learning for subsurface imaging classification, signal processing.

Improved and developed codebases, implemented algorithms, developed mathematical models.

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## Teaching Experience

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).

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## Work and Leadership Experience

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.

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## Journal Publications

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).

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## Pre-Print Publications

- 2018 **Ryan LaRose**, Arkin Tikku, Étude O’Neel-Judy, Lukasz Cincio, and Patrick J. Coles, Variational quantum state diagonalization, arXiv:1810.10506, 2018.
- 2018 **Ryan LaRose**, Distributed memory techniques for classical simulation of quantum circuits, arXiv:1801.01037, 2018.

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## Other Writing

- 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>.

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## 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.  
Pull Request accepted and featured in Qiskit 0.8.0.

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## Presentations

- 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 **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.

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## 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.

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## Professional Activities

- 2019 **Chief Community Moderator**, *Quantum Machine Learning*, edX Online Course, University of Toronto.
- 2019 **Presenter**, *Time for Quantum*, Michigan State University Science Festival (Science outreach).
- 2018– **Co-Founder and Organizer**, *Quantum Information and Computation (QuIC) Seminar*, 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.

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## Professional Affiliations

- 2018– Society for Industrial and Applied Mathematics (SIAM).
- 2017– American Physical Society.
- 2017– American Mathematical Society.
- 2017– IEEE.

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## Programming Languages

Experienced Python.

Intermediate C, C++, Matlab.

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

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## 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 **Disiplinary 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..
- 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*.

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## Scholarships, Fellowships, and Distinctions

- 2019 **Future Academic Scholars in Teaching (FAST) Fellowship**, *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*.

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## References

**Morten Hjorth-Jensen**, *Professor*, Michigan State University & the University of Oslo, PhD co-advisor.  
Department of Physics and Astronomy, National Superconducting Cyclotron Laboratory.  
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**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**, *Scientist 2, 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.  
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