

Ruslan Shaydulin

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Google Scholar: <https://scholar.google.com/citations?user=PxOuGGcAAAAJ>

Profile

PhD candidate in computer science, expecting to graduate in May 2020. My research focusses around the intersection between (hyper)graph problems, optimization, machine learning, quantum and high-performance computing. I have extensive experience designing and implementing hybrid quantum-classical algorithms, with particular interest in variational and decomposition-based approaches (including multilevel).

Peer-reviewed Publications

Ruslan Shaydulin, Yuri Alexeev. Evaluating Quantum Approximate Optimization Algorithm: A Case Study. In *Proceedings of the 2nd International Workshop on Quantum Computing for Sustainable Computing (QCSC 2019) (in conjunction with 10th International Green and Sustainable Computing Conference (IGSC 2019)) (to appear)*, 2019

Sami Khairy, **Ruslan Shaydulin**, Lukasz Cincio, Yuri Alexeev, Prasanna Balaprakash. Reinforcement Learning for Quantum Approximate Optimization. *Research Poster, accepted at Supercomputing '19*, 2019

Ruslan Shaydulin, Ilya Safro, and Jeffrey Larson. Multistart Methods for Quantum Approximate Optimization. In *Proceedings of 2019 IEEE High Performance Extreme Computing Conference (HPEC)*, 2019

Best Student Paper. Preprint: [arXiv:1905.08768](https://arxiv.org/abs/1905.08768)

Ruslan Shaydulin, Hayato Ushijima-Mwesigwa, Christian F.A. Negre, Ilya Safro, Susan M Mniszewski, and Yuri Alexeev. A Hybrid Approach for Solving Optimization Problems on Small Quantum Computers. *Computer*, 52(6):18-26, 2019. **Cover Feature**. DOI: [10.1109/MC.2019.2908942](https://doi.org/10.1109/MC.2019.2908942)

Ruslan Shaydulin, Hayato Ushijima-Mwesigwa, Ilya Safro, Susan Mniszewski, and Yuri Alexeev. Network Community Detection on Small Quantum Computers. *Advanced Quantum Technologies*, 2(9):1900029, 2019. DOI: [10.1002/qute.201900029](https://doi.org/10.1002/qute.201900029)

Ruslan Shaydulin, Hayato Ushijima-Mwesigwa, Ilya Safro, Susan Mniszewski, and Yuri Alexeev. Community Detection Across Emerging Quantum Architectures. In *Proceedings of the 3rd International Workshop on Post Moore's Era Supercomputing (in conjunction with Supercomputing '18)*, 12-14, 2018. Preprint [arXiv:1810.07765](https://arxiv.org/abs/1810.07765)

Ruslan Shaydulin and Ilya Safro. Aggregative Coarsening for Multilevel Hypergraph Partitioning. In *Proceedings of 17th International Symposium on Experimental Algorithms (SEA 2018)*, 103:2:1-2:15, 2018. DOI: [10.4230/LIPIcs.SEA.2018.2](https://doi.org/10.4230/LIPIcs.SEA.2018.2)

Ruslan Shaydulin, Jie Chen, and Ilya Safro. Relaxation-Based Coarsening for Multilevel Hypergraph Partitioning. *Multiscale Modeling & Simulation*, 17(1):482-506, 2019. DOI: [10.1137/17M1152735](https://doi.org/10.1137/17M1152735)

Online Preprints and In-Submission Works

Justin Sybrandt, **Ruslan Shaydulin**, Ilya Safro. Hypergraph Partitioning With Embeddings. *In submission*. Preprint: [arXiv:1909.04016](https://arxiv.org/abs/1909.04016)

Ruslan Shaydulin, Caleb Thomas, Paige Rodeghero. Making Quantum Computing Open: Lessons from Open-Source Projects. Preprint: [arXiv:1902.00991](https://arxiv.org/abs/1902.00991)

Ruslan Shaydulin, Justin Sybrandt. To Agile, or not to Agile: A Comparison of Software Development Methodologies.
Preprint: [arXiv:1704.07469](https://arxiv.org/abs/1704.07469)

Working Papers

Hayato Ushijima-Mwesigwa, **Ruslan Shaydulin**, Christian F. A. Negre, Susan Mniszewski, Yuri Alexeev, Ilya Safro.
Multilevel Combinatorial Optimization Across Quantum Architectures.

Zain Saleem, **Ruslan Shaydulin**, Yuri Alexeev. Practical Constrained Optimization With Quantum Alternating Operator Ansatz.

Ruslan Shaydulin, Ilya Safro, Yuri Alexeev, Lukasz Cincio. Quantum-Assisted Network Community Detection.

Ruslan Shaydulin, Ilya Safro. Machine-Learning-Assisted Parallel QAOA Parameter Optimization.

Zirou Qui, **Ruslan Shaydulin**, Ilya Safro, Yuri Alexeev, Christopher Henry. GNAGC: Global Network Alignment Based on the Growing Confidence

Education

Clemson University, SC

Spring 2020 (expected)

PhD candidate in Computer Science, advisor: Ilya Safro

Research in algorithms, high performance computing, big data analysis and quantum computing

Relevant coursework: Design & Analysis of Algorithms, Data Mining, Distributed & Cluster Computing, Parallel Architecture, Network Science

Moscow Institute of Physics and Technology

Summer 2016

Department of Control and Applied Math,

Bachelor of Science in Applied Mathematics and Physics

Minor: Computer Science and Data Analysis

Work Experience

Research Aide, Argonne National Laboratory

Summer 2018, 2019

- Developed quantum-accelerated frameworks for network community detection and graph partitioning under the supervision of Yuri Alexeev
- Co-authored 4 papers on quantum optimization (3 first author)
- Contributed to multiple proposals

Research Intern, Parallels LABs

Winter 2014 - Summer 2016

- Improved stability and security of SmartMail macOS email client by isolating potentially unstable parts as separate services
- Added features to UI of iQuickMark iOS app

Proposal Contributions

Defense Advanced Research Projects Agency (DARPA) Optimization with Noisy Intermediate-Scale Quantum devices (ONISQ) Spring 2019

PI: Chris Monroe. Contributed sections with co-PI Yuri Alexeev

Defense Advanced Research Projects Agency (DARPA) Optimization with Noisy Intermediate-Scale Quantum devices (ONISQ) Spring 2019

PI: Tom Noel. Contributed sections with co-PI Yuri Alexeev (*under review*)

Defense Advanced Research Projects Agency (DARPA) Optimization with Noisy Intermediate-Scale Quantum devices (ONISQ) Spring 2019

PI: Ilya Safro (*under review*)

Department of Energy (DOE) Quantum Computing Application Teams (QCAT) Summer 2018

PI: Yuri Alexeev

Contributed Talks and Posters

SIAM Conference on Parallel Processing for Scientific Computing (PP20) Feb 12-15, 2020
Seattle, WA

Gave talk "Multilevel Hybrid Quantum-Classical Algorithms on Graphs"

Chicago Quantum Exchange Meeting June 12, 2019
University of Chicago

Presented poster "Practical Quantum Approximate Optimization"

SIAM Conference on Computational Science and Engineering (CSE19) Feb 25-28, 2019
Spokane, WA

Presented poster "[Quantum Local Search for Graph Community Detection](#)"

Quantum Computing Tutorial Dec 10-11, 2018

Argonne National Laboratory

Gave talk "[QAOA Algorithm Introduction](#)"

Quantum Computing Workshop Jul 25-27, 2018

Argonne National Laboratory

Presented preliminary results on "[Machine Learning on Near-Term Quantum Computers](#)"

32nd Clemson Mini-Conference on Discrete Mathematics and Algorithms Nov 4, 2017

Clemson University

Presented poster "Relaxation-Based Coarsening for Multilevel Hypergraph Partitioning"

58th Scientific Conference Nov 23-28, 2015

Moscow Institute of Physics and Technology

Gave talk "IPC (Inter-Process Communication) in OS X"

Leadership and Service

SIAM Conference on Parallel Processing for Scientific Computing (PP20)

Feb 12-15, 2020

Seattle, WA

Led and co-organized a minitutorial "[Combinatorial Optimization on Quantum Computers](#)"

SIAM Conference on Parallel Processing for Scientific Computing (PP20)

Feb 12-15, 2020

Seattle, WA

Co-organized a minisymposium "Recent Advances and Trends in Hybrid Quantum-Classical Algorithms"

Quantum Computing Tutorial

May 14, 2019

Argonne National Laboratory

Led and co-organized a [hands-on tutorial for Qiskit, a framework for quantum computing](#)

Mathematics Teacher, Summer School

Summer 2014

Kostroma, Russia

School administrator, organized extracurricular activities.

Teaching

Network Science CPSC 8480

Fall 2018, 2019

Clemson University

Teaching Assistant responsible for grading and answering students' questions during office hours

Design and Analysis of Algorithms CPSC 8400

Spring 2019

Clemson University

Teaching Assistant responsible for grading and answering students' questions during office hours

Algorithms and Data Structures CPSC 2120

Spring 2019

Clemson University

Teaching Assistant responsible for running the lab section, grading and answering students' questions during office hours

Mathematics Teacher, Summer School

Summer 2014

Kostroma, Russia

Created and taught a course on basics of graph theory, combinatorics and number theory to middle and high school students.

Languages and Technologies

C, Python

Prior experience: C++, MATLAB, Objective-C, Swift, Bash, IBM QISKit

Limited prior experience: R, SQL, yacc, bison, AWS, Google Cloud Engine

Technologies and tools: Git, Xcode for iOS/OSX UI/Backend, TCP/IP, UNIX/Linux, MPI

Honors and Awards

- International Green and Sustainable Computing Conference (IGSC 2019) student travel award, *recipient*
- Best Student Paper at IEEE HPEC 2019, *recipient*

- Upsilon Pi Epsilon CS Honor Society, *member*
- Supercomputing '19 Student Volunteer Travel award, *recipient*
- SIAM CSE '19 Broader Engagement Travel award, *recipient*
- Clemson CCIT Supercomputing '17, '18 and '19 travel award, *recipient*
- Clemson Graduate Travel Grant, Spring '19, *recipient*
- Moscow Institute of Physics and technology Abramov scholarship - Top 300 students in the university, based on high academic achievement, *recipient*