Luke Schaeffer

Postdoctoral Researcher

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Current Position

2019–present **Postdoctoral Researcher**, *Institute for Quantum Computing, University of Waterloo*, Waterloo, ON.
Supervised by David Gosset and John Watrous.

Education

2013–2019 **PhD in Computer Science**, *Massachusetts Institute of Technology, Electrical Engineering and Computer Science*, Cambridge, MA.
Thesis: *Computation in Models Inspired by Near-Term Quantum Devices*. Supervised by Scott Aaronson.

2011–2013 **MMath in Computer Science**, *University of Waterloo, Faculty of Mathematics*, Waterloo, ON.
Thesis: *Deciding Properties of Automatic Sequences*. Supervised by Jeffrey Shallit.

2006–2011 **BMath in Computational Math**, *University of Waterloo, Faculty of Mathematics*, Waterloo, ON.
Minor in Pure Mathematics

Publications & Preprints

Quantum Papers

Daniel Grier, Nathan Ju, and Luke Schaeffer. Interactive quantum advantage with noisy, shallow Clifford circuits. February 2021, `arXiv:2102.06833`. Appeared in QIP 2021.

Sergey Bravyi, David Gosset, Daniel Grier, and Luke Schaeffer. Classical algorithms for Forrelation, February 2021, `arXiv:2102.06963`.

David Gosset, Daniel Grier, Alex Kerzner, and Luke Schaeffer. Fast simulation of planar Clifford circuits. September 2020, `arXiv:2009.03218`. Appeared in QIP 2021.

Daniel Grier and Luke Schaeffer. Interactive shallow Clifford circuits: quantum advantage against NC^1 and beyond, November 2019, `arXiv:1911.02555`. Presented in STOC 2020, appeared in QIP 2020.

Adam Bene Watts, Robin Kothari, Luke Schaeffer, and Avishay Tal. Exponential separation between shallow quantum circuits and unbounded fan-in shallow classical circuits, June 2019, `arXiv:1906.08890`. Presented in QIP 2019, appeared in STOC 2019.

Guang Hao Low, Vadym Kliuchnikov, and Luke Schaeffer. Trading T-gates for dirty qubits in state preparation and unitary synthesis, December 2018, `arXiv:1812.00954`. Appeared in QIP 2020.

Scott Aaronson, Daniel Grier, and Luke Schaeffer. A quantum query complexity trichotomy for regular languages. December 2018, `arXiv:1812.04219`. Appeared in QIP 2019 and FOCS 2019.

Daniel Grier and Luke Schaeffer. New hardness results for the permanent using linear optics. October 2016, `arXiv:1610.04670`. Appeared in CCC 2018.

Daniel Grier and Luke Schaeffer. The classification of stabilizer operations over qubits. March 2016, `arXiv:1603.03999`. Presented in QIP 2018.

Luke Schaeffer. A physically universal quantum cellular automaton. June 2015. Presented in AUTOMATA 2015.

Scott Aaronson, Daniel Grier, and Luke Schaeffer. The classification of reversible bit operations. April 2015, `arXiv:1504.05155`. Appeared in ITCS 2017.

Luke Schaeffer. A physically universal cellular automaton. *Electronic Colloquium on Computational Complexity (ECCC)*, June 2014. Best Student Paper in ITCS 2015.

Selected Other Papers

Alex Lombardi and Luke Schaeffer. A note on key agreement and non-interactive commitments. *IACR Cryptol. ePrint Arch.*, March 2019.

Stephen A. Fenner, Daniel Grier, Jochen Messner, Luke Schaeffer, and Thomas Thierauf. Game values and computational complexity: An analysis via black-white combinatorial games. February 2015. Appeared in ISAAC 2015.

Julien Cassaigne, James D. Currie, Luke Schaeffer, and Jeffrey O. Shallit. Avoiding three consecutive blocks of the same size and same sum. *J. ACM*, 61(2):10:1–10:17, June 2014, `arXiv:1106.5204`.

Teaching

Fall 2018	Design and Analysis of Algorithms (Teaching Assistant, MIT)
Spring 2018	Geometric Computation (Teaching Assistant, MIT)
Fall 2017	Advanced Algorithms (Teaching Assistant, MIT)