Daniel Grier

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Appointments

2022 - present **Assistant Professor** University of California, San Diego
Department of Computer Science and Engineering
Department of Mathematics

2019 - 2022 **Postdoctoral Fellow** University of Waterloo - Institute for Quantum Computing

Education

2013 - 2019 **Massachusetts Institute of Technology** Cambridge, MA
PhD in Computer Science
Three Complexity Classification Questions at the Quantum/Classical Boundary
Advisor: Scott Aaronson

2009 - 2013 **University of South Carolina** Columbia, SC
B.S. in Computer Science and Mathematics, GPA: 4.0

Publications and Preprints

Note: Author ordering in my field is alphabetical by default (all exceptions below are evident)

- D. Grier, J. Morris. Quantum Threshold is Powerful. *arXiv:2411.04953*.
- D. Grier, S. Liu, G. Mahajan. Improved Classical Shadows from Local Symmetries in the Schur Basis. *arXiv:2405.09525*.
- D. Grier, H. Pashayan, L. Schaeffer. Principle Eigenstate Classical Shadows. (COLT 2024).
- A. Bouland, D. J. Brod, I. Datta, B. Fefferman, D. Grier, F. Hernández, M. Oszmaniec. Complexity-theoretic foundations of BosonSampling with a linear number of modes. (QIP 2024, AQIS 2024)
- D. Grier, H. Pashayan, L. Schaeffer. Sample-Optimal Classical Shadows for Pure States. *Quantum*, 2024 (TQC 2022).
- D. Grier, D. Brod, J. M. Arrazola, M. Benicio, N. Quesada. The Complexity of Bipartite Gaussian Boson Sampling. *Quantum*, 6:863, 2022 (QIP 2022).
- S. Bravyi, D. Gosset, D. Grier, L. Schaeffer. Classical Algorithms for Forrelation. *arXiv:2102.06963*. In submission (QIP 2022).
- D. Grier, N. Ju, and L. Schaeffer. Interactive Quantum Advantage with Noisy, Shallow Clifford Circuits. *arXiv:2102.06833*. (QIP 2021).
- D. Gosset, D. Grier, A. Kerzner, and L. Schaeffer. Fast Simulation of Planar Clifford Circuits. *Quantum*, 8:1251, 2024 (QIP 2021).
- D. Padé, S. Fenner, D. Grier, and T. Thierauf. Depth-2 QAC Circuits Cannot Simulate Quantum Parity. *arXiv:2005.12169*. 2020.
- D. Grier, and L. Schaeffer. Interactive Shallow Clifford Circuits: Quantum Advantage Against NC^1 and Beyond. *52nd Annual ACM SIGACT Symposium on Theory of Computing*, pp. 875-888, 2020 (STOC 2020, QIP 2020).
- S. Aaronson, D. Grier, and L. Schaeffer. A Quantum Query Complexity Trichotomy for Regular Languages. *IEEE 60th Annual Symposium on Foundations of Computer Science*, 942-965, 2019

(FOCS 2019, QIP 2019).

- D. Grier, and L. Schaeffer. New Hardness Results for the Permanent Using Linear Optics. *Computational Complexity Conference*, 33(19):1–29, 2018.
- D. Grier, and L. Schaeffer. The Classification of Clifford Gates over Qubits. *Quantum*, 6:734, 2022 (QIP 2018).
- S. Aaronson, D. Grier, and L. Schaeffer. The Classification of Reversible Bit Operations. *8th Innovations in Theoretical Computer Science Conference*, 67(23):1–34, 2017.
- I. Arad, A. Bouland, D. Grier, M. Santha, A. Sundaram, and S. Zhang. On the Complexity of Probabilistic Trials for Hidden Satisfiability Problems. *Mathematical Foundations of Computer Science*, 12:1–14, 2016.
- S. Fenner, D. Grier, R. Gurjar, A. Korwar, T. Thierauf. The Complexity of Poset Games. *Journal of Graph Algorithms and Applications*, 26(1):1–4, 2022.
- S. Fenner, D. Grier, J. Messner, L. Schaeffer, and T. Thierauf. Game Values and Computational Complexity: An Analysis via Black-White Combinatorial Games. *International Symposium on Algorithms and Computation*, 689–699, 2015.
- D. Grier. Deciding the Winner of an Arbitrary Finite Poset Game is PSPACE-complete. *International Colloquium on Automata, Languages, and Programming*, 497–503, 2013.
- D. Grier. On the Cyclic Van der Waerden Numbers. *Geombinatorics*, 21:129–131, 2012.

Selected Presentations

2024 **Quantum Threshold is Powerful**
IMSI Workshop on The Power of Near-Term Quantum Experiments

2024 **A Practical Theory of the Pauli Algebra**
APS March Meeting Tutorial Session

2023 **Quantum Advantage with Shallow Clifford Circuits**
Simons Quantum Cluster

2023 **Sample-Optimal Classical Shadows for Pure States**
Google Quantum Theory Seminar
UCSD Theory Seminar
Information Theory and Applications Workshop

2022 **The Complexity of Bipartite Gaussian Boson Sampling**
Conference on Quantum Information Processing
NSF Workshop on Quantum Advantage and Next Steps

April 2021 **Classical Algorithms for Forrelation**
QuSoft Research Center for Quantum Software Seminar
IBM Quantum Computing Seminar

2019 - 2020 **Interactive Shallow Clifford Circuits**
IQC Math and Computer Science Seminar
Quantum Software and Information seminar at University of Technology Sydney
Conference on Quantum Information Processing

January 2019 **A Quantum Query Complexity Trichotomy for Regular Languages**
Conference on Quantum Information Processing

2018 - 2020 **New Hardness Results for the Permanent Using Linear Optics**
Computational Complexity Conference
University of Toronto CS Theory/CQICS Seminar
University of Waterloo Tutte Colloquium

December 2017 **The Classification of Reversible Bit Operations**
Innovations in Theoretical Computer Science Conference

December 2015 **Game Values and Computational Complexity**
International Symposium on Algorithms and Computation

July 2013 **Deciding the Winner of an Arbitrary Finite Poset Game is PSPACE-Complete**
International Colloquium on Automata, Languages and Programming

Teaching

Discrete Math & Graph Theory UCSD. Winter 2025.

Quantum Complexity Theory UCSD. Fall 2024, Fall 2022.

Introduction to Quantum Computing UCSD. Spring 2024.

Computability and Complexity UCSD. Fall 2023.

Theory of Computation UCSD. Spring 2023.

EECS Communication Lab Advisor MIT. 2017 - 2019.

Design and Analysis of Algorithms Teaching Assistant, MIT. Fall 2017, 2018.

Automata, Computability, and Complexity Teaching Assistant, MIT. Spring 2018.

Professional Service

2023 - present **Journal Editor** Quantum

Program Committee Quantum Information Processing (QIP 2024), Theory of Quantum Computation, Communication and Cryptography (TQC 2023), IEEE International Conference on Quantum Computing & Engineering (QCE 2020, 2021, 2022)

Journal Reviewer Science, Quantum, Theoretical Computer Science, Computational Complexity, Journal of the ACM, Quantum Information and Computation, npj Quantum Information, IEEE Transactions on Computers, IEEE Transactions on Information Theory, Linear Algebra and Its Applications.

Conference Reviewer IEEE Symposium on Foundations of Computer Science (FOCS), ACM Symposium on Theory of Computing (STOC), Conference on Quantum Information Processing (QIP), Innovations in Theoretical Computer Science (ITCS), Symposium on Theoretical Aspects of Computer Science (STACS), Mathematical Foundations of Computer Science (MFCS), Theory of Quantum Computation, Communication and Cryptography (TQC), Asian Quantum Information Science Conference (AQIS), IEEE International Symposium on Information Theory (ISIT).

2023 **CS Theory Seminar host** UCSD.

2021 - 2022 **IQC-QuICS Math and Computer Science Seminar Co-host** Virtual seminar sponsored by the Institute for Quantum Computing (Waterloo) and the Joint Center for Quantum Information and Computer Science (Maryland).

Awards

2013 - 2018 **NSF Graduate Research Fellowship**

April 2013 **CRA Outstanding Undergraduate Researcher Award - Finalist**

April 2013 **Outstanding Undergraduate Student in Mathematics**

April 2013 **Outstanding Senior in Computer Science**

March 2012 **Barry M. Goldwater Scholarship**