Daniel Y. Liang

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Research Interests

My focus is on the application of both classical and quantum statistical/computational learning theory to quantum problems. During my PhD, I focused on leveraging both analytic and algebraic properties of the stabilizer formalism to tackle topics such as PAC/SQ/Agnostic learning, property testing, tomography, and pseudorandomness. I am additionally broadly interested in quantum cryptography and pseudorandom quantum states, quantum query complexity, general quantum machine learning, and quantum complexity theory.

Education

University of Texas at Austin — **Austin, TX**
PhD in Computer Science — *2017-2023*
Advisor: Dr. Scott Aaronson
Dissertation: On Computationally Efficient Learning for Stabilizers and Beyond

Cornell University College of Engineering — **Ithaca, NY**
Bachelors of Science in Engineering, Magna Cum Laude — *2013–2017*
Double Major in Computer Science and Engineering Physics

Academic Positions

Rice University — **Houston, TX**
Postdoctoral Fellow — *2023-2024*
Supervisor: Dr. Nai-Hui Chia

Work Experience

X, the Moonshot Factory (formerly Google[x]) — **Mountain View, California**
Quantum Resident — *Summer 2019*
Published Work: Investigating quantum approximate optimization algorithms under bang-bang protocols.

Microsoft — **Redmond, Washington**
Software Engineering Intern — *Summer 2017*
Anti-Spam Machine Learning for Microsoft Office Exchange.

FedEx Services — **Memphis, Tennessee**
Information Technology Intern — *Summer 2016*

Publications (Alphabetical Order Unless Stated Otherwise)

[1] S. Grewal, V. Iyer, W. Kretschmer, and **D. Liang**. Efficient learning of quantum states prepared with few non-clifford gates ii: Single-copy measurements, 2023. URL https://arxiv.org/abs/2308.07175.

[2] S. Grewal, V. Iyer, W. Kretschmer, and **D. Liang**. Efficient learning of quantum states prepared with few non-clifford gates, 2023. URL https://arxiv.org/abs/2305.13409.

[3] S. Grewal, V. Iyer, W. Kretschmer, and **D. Liang**. Improved stabilizer estimation via bell difference sampling, 2023. URL https://arxiv.org/abs/2304.13915.

[4] **D. Liang**. Clifford Circuits can be Properly PAC Learned if and only if RP = NP. *Quantum*, 7:1036, June 2023. ISSN 2521-327X. URL https://doi.org/10.22331/q-2023-06-07-1036.
Presented at QTML 2022

[5] S. Grewal, V. Iyer, W. Kretschmer, and **D. Liang**. Low-Stabilizer-Complexity Quantum States Are Not Pseudorandom. In Y. Tauman Kalai, editor, *14th Innovations in Theoretical Computer Science Conference (ITCS 2023)*, volume 251 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 64:1–64:20, Dagstuhl, Germany, 2023. Schloss Dagstuhl – Leibniz-Zentrum für Informatik. ISBN 978-3-95977-263-1. URL https://drops.dagstuhl.de/opus/volltexte/2023/17567.
ITCS 2023 Best Student Paper

[6] A. Gollakota and **D. Liang**. On the hardness of PAC-learning stabilizer states with noise. *Quantum*, 6:640, feb 2022. URL https://doi.org/10.22331%2Fq-2022-02-02-640.

[7] **D. Liang**, L. Li, and S. Leichenauer. Investigating quantum approximate optimization algorithms under bang-bang protocols. *Physical Review Research*, 2(3), sep 2020. URL https://doi.org/10.1103%2Fphysrevresearch.2.033402.
Author Contribution Order

[8] P. Rall, **D. Liang**, J. Cook, and W. Kretschmer. Simulation of qubit quantum circuits via pauli propagation. *Physical Review A*, 99(6), jun 2019. URL https://doi.org/10.1103%2Fphysreva.99.062337.
Author Contribution Order

TA Experience

UT-Austin

Spring 2023: Algorithms and Complexity

Spring 2022: Introduction to Quantum Information Science II

Helped create the following lecture notes: https://www.scottaaronson.com/qisii.pdf

Fall 2020: Introduction to Quantum Information Science

Fall 2018: Introduction to Quantum Information Science

Cornell University

Spring 2017: AEP 4220: Mathematical Physics II

Fall 2016: CS 3110: Data Structures and Functional Programming

Spring 2016: CS 4820: Introduction to Analysis of Algorithms

Fall 2015: CS 3110: Data Structures and Functional Programming

Spring 2015: CS 2110: Object-Oriented Programming and Data Structures

Service

Graduate Representative Association of Computer Sciences at UT-Austin — **Austin, TX**
Elected Representative — *Fall 2018 – Fall 2020*

Journal Reviewer

Quantum, IEEE Transactions on Information Theory, Quantum Machine Intelligence

Conference Reviewer

IEEE Symposium on Foundations of Computer Science (FOCS), ACM Symposium on Theory of Computing (STOC), Conference on Quantum Information Processing (QIP), Quantum Techniques in Machine Learning (QTML), IEEE International Symposium on Information Theory (ISIT)