

QIYAO (CATHERINE) LIANG

(Updated as of October 2024)

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA *Sep 2022 - May 2027*
Ph.D. in Electrical Engineering and Computer Science
S.M. in Electrical Engineering and Computer Science
Research Advisor: Ila R. Fiete

Duke University, Durham, NC *Aug 2018 - May 2022*
B.S. in Physics, minor in Math
Dissertation Title: "Robust Control in Trapped-ion Quantum Computers"
Research Advisor: Kenneth R. Brown

RESEARCH INTERESTS

Physics of intelligence, Mechanistic Interpretability, Neuroevolution, Artificial life, AI for Science, Quantum Computing.

INTERNSHIPS

Zapata Computing, Boston, MA *July 2022 - Sep 2022*
Algorithm Team
Supervisor: Peter D. Johnson

IonQ, College Park, MD *May 2021 - Aug 2021*
Theory Team
Supervisor: Yunseong Nam

PUBLICATIONS

Qiyao Liang, Ziming Liu, , Mitchell Ostrow, and Ila Fiete. How diffusion models learn to factorize and compose. In *38th Conference on Neural Information Processing Systems, NeurIPS 2024*, 2024

Qiyao Liang, Ziming Liu, and Ila R Fiete. Do diffusion models learn semantically meaningful and efficient representations? In *ICLR 2024 Workshop on Mathematical and Empirical Understanding of Foundation Models*, 2024

Qiyao Liang, Mingyu Kang, Ming Li, and Yunseong Nam. Pulse optimization for high-precision motional-mode characterization in trapped-ion quantum computers. *Quantum Science and Technology*, 9(3):035007, Apr 2024

Qiyao Liang, Yiqing Zhou, Archismita Dalal, and Peter Johnson. Modeling the performance of early fault-tolerant quantum algorithms. *Phys. Rev. Res.*, 6:023118, May 2024

Mingyu Kang, **Qiyao Liang**, Ming Li, and Yunseong Nam. Efficient motional-mode characterization for high-fidelity trapped-ion quantum computing. *Quantum Science and Technology*, 8(2):024002, Jan 2023

Mingyu Kang, **Qiyao Liang**, Bichen Zhang, Shilin Huang, Ye Wang, Chao Fang, Jungsang Kim, and Kenneth R. Brown. Batch optimization of frequency-modulated pulses for robust two-qubit gates in ion chains. *Phys. Rev. Appl.*, 16:024039, Aug 2021

Ye Wang, Stephen Crain, Chao Fang, Bichen Zhang, Shilin Huang, **Qiyao Liang**, Pak Hong Leung, Kenneth R. Brown, and Jungsang Kim. High-fidelity two-qubit gates using a microelectromechanical-system-based beam steering system for individual qubit addressing. *Phys. Rev. Lett.*, 125:150505, Oct 2020

TALKS

Do Diffusion Models Learn Semantically Meaningful and Efficient Representations? *February 2024*
MIT Yang-Tan Collective Seminar, Jane Street Graduate Fellowship Workshop

Modeling Quantum Algorithm Performance on Early Fault-Tolerant *March 2023*
APS March Meeting, Las Vegas, NV, 2023

IBM Qiskit Advocate Demo *December 2020*

Invited Speaker at Women in Quantum Summit II *October 2020*

PATENTS

Efficient motional-mode characterization for high-fidelity trapped-ion quantum computing
Mingyu Kang, **Qiyao Liang**, Ming Li, Yunseong Nam
US Patent Application No.18/202,270, Date of Application: May 25, 2023

Implementation of Batch Optimization for Robust Two-qubit Gates for Quantum Computation
Mingyu Kang, Kenneth Brown, **Qiyao Liang**, Bichen Zhang
US Patent Application No.63/175,228, Date of Application: April 15, 2021

AWARDS AND SCHOLARSHIPS

Alan V. Oppenheim Fellowship, MIT EECS Department *2022*
Awarded based on merit to cover first-year graduate stipend

PME Graduate Fellowship, UChicago PME Department *2022*
Awarded based on merit to cover first-year graduate stipend (declined)

QuICS Lanczos Graduate Fellowship, UMD College Park Physics Department *2022*
Awarded based on merit to cover three-year graduate stipend (declined)

Rodney I. McCormick Award, Duke Physics Department *2022*
Awarded for outstanding undergraduate research to one graduating senior

Sigma Pi Sigma Physics Honor Society Inductee, Duke Physics Department *2022*

TEACHING

Applied Introduction to Quantum Computing *Spring, Fall 2021*
Lead Instructor, Physics Department, Duke University

Duke × QBraid Quantum Computing High School Summer Course *Summer 2021*
Lead Instructor, QBraid

SKILLS

Programming Languages and Frameworks
Python (PyTorch, SKLearn, Panda), Java, MATLAB, Mathematica, C, Julia, Assembly (MIPS), R, L^AT_EX, LabVIEW, Jupyter Notebook, Git.

Languages
English (native-level), Mandarin (native-level), Spanish (elementary), Japanese (elementary)