Kaytlin Harrison

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Education

PhD in Computer Science, Systems and Networks Track Sept 2025 - **Current**
Northwestern University, QuantA@NU Group *Evanston, IL*
Advisor: Prof. Kate Smith

Bachelor of Science in Physics with Minor in Mathematics Sept 2020 - May 2023
University of Wisconsin–Madison *Madison, WI*

Research Experience

Science Undergraduate Laboratory Internships (SULI) Intern Aug 2024 – Dec 2024
Mathematics & Computer Science Division (MCS), Argonne National Laboratory *Lemont, IL*
Theoretically proved, designed, and coded a hybrid quantum-classical algorithm that improved Standard QAOA by combining two optimization techniques; QuCLEAR and Dynamic ADAPT QAOA. Results showed a 60% reduction of quantum gates and proved that the order of operations does not impact the final optimized circuit

Advisors: Dr. Ji Liu and Dr. Jeffrey Larson

Open Quantum Initiative (OQI) Undergraduate Fellow Jun 2022 – Aug 2022
Nuclear Theory Group, University of Wisconsin–Madison *Madison, WI*
Developed techniques of gate optimization and depth reduction in quantum circuits to mitigate error in quantum systems of both circuit and pulse design. Approaches included the incorporation of pre/post pulses, qubit-qubit cancellation pulses, and fundamental circuit reconstruction

Advisors: Prof. Baha Balantekin and Dr. Pooja Siwach

Research funded by the NSF Quantum Leap Challenge Institute HQAN

Undergraduate Research Assistant Feb 2022 – May 2023
Nuclear Theory Group, University of Wisconsin–Madison *Madison, WI*
Studied the effects of error mitigation techniques to improve decoherence in pulse-level quantum algorithms and explored noise reduction techniques including gate optimization, incorporation of pre/post pulses, and qubit-qubit cancellation pulses

Advisors: Prof. Baha Balantekin and Dr. Pooja Siwach

Research funded by the UW Madison Undergraduate Research Opportunities Program UROP

Employment

Open Innovations Intern May – Aug 2025
IBM Quantum Research *Yorktown Heights, NY*
Created on-boarding resources to migrate top-tier researchers in the Quantum Credits program to IBM's new Quantum Cloud platform. Led data-driven analysis reporting on program impact, developed a strategy to enhance program visibility, and implemented a strategy to optimize quantum credit usage through education in error mitigation techniques

Program Administrator Oct 2023 – May 2025
Chicago Quantum Exchange *Chicago, IL*
Managed projects and events related to education and workforce development, including event planning, outreach, and facility reservations in an effort to support the growing network of industries and people interested in QISE applications. Supervised the daily operations of student workers in support of this mission

Teaching Assistant June – July 2023
Brookhaven National Laboratory (C^2QA) Quantum Information Science (101) *Remote*
Provided conceptual and technical support to students, as they completed 50 coding tasks meant to enhance their Python proficiency. Assisted with troubleshooting environments(VS Code, Jupyter), as well as LaTeX and GitHub

ACT Tutor March 2022 – Feb 2023
Cambridge Educational Services *Madison, WI*
Designed my own reference notes, homework sets, and lectures for biweekly lessons and combined this with personalized one-on-one sessions to supplement student learning

Publications and Awards

Collective neutrino oscillations on a quantum computer with hybrid quantum-classical algorithm
Second author with Pooja Siwach and Baha Balantekin

Published as a Regular Article in Physical Review D. Oct 2023

NSF Graduate Research Fellowship Program Award (GRFP)
Awarded by the NSF to support my PhD in Quantum-Classical Systems Architecture design, May 2025

Presentations

Mathematics, Computer Science Division (MCS), Argonne National Laboratory Dec 2024
How to Optimize a Quantum Optimization Algorithm *Lemont, IL*

QRISE Coalition Microsoft Challenge April 2024
Quantum Resource Estimation of the Quantum Approximate Optimization Algorithm (QAOA) *Remote*

NYUAD Hackathon May 2023
Tanbeeh: An API that detects fraudulent transactions by leveraging QML *Abu Dhabi, United Arab Emirates*

Open Quantum Initiative Symposium, Chicago Quantum Exchange Aug 2022
Pulse level quantum computing of collective neutrino oscillations *Chicago, IL*

Programming Projects

Microsoft Quantum Computing Challenge: Winner Jun 2024
QRISE *Remote*

Implemented in the quantum programming language Q#, an example of QAOA and used Microsoft's Quantum Resource Estimator to evaluate parameters and determine the quantum resources required to run QAOA on both NISQ and Fault-Tolerant quantum computers

NYUAD Hackathon May 2023
New York University–Abu Dhabi *Abu Dhabi, United Arab Emirates*

Created ***Tanbeeh***, an API that detects fraudulent transactions in financial institutions by leveraging the computational benefits of QML utilizing a quantum neural network where nodes (qubits) were fraudulent transactions and edges (combination of gates) are weighted based on shared features between nodes