Jason D. Chadwick

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jchadwick@uchicago.edu | jason-chadwick.com

Education

Ph.D. Candidate, Computer Science, University of Chicago 2022–present
Studying quantum computer systems and architecture, advised by Fred Chong.
I am primarily interested in low-level software optimizations that narrow the gap between existing hardware and the future goal of large-scale fault-tolerant quantum computation. I have worked on research in the areas of error correction syndrome extraction, control pulse engineering, device calibration, circuit compilation, and high-radix computation.

B.S. Physics, Carnegie Mellon University 2018–2022
Minor in Computer Science
GPA 3.95

Awards and Honors

Crerar Fellowship, University of Chicago 2022

University Honors, Carnegie Mellon University 2022

College Honors, Mellon College of Science, Carnegie Mellon University 2022

Dean's List, High Honors, Mellon College of Science, Carnegie Mellon University 2018–2022

Programming

Languages: Python, Julia, C/C++, C#/Unity, Common Lisp, SML
Python libraries: Stim/sinter, QuTiP, qiskit, Cirq, Pulser, pandas, TensorFlow, PyTorch
Julia packages: QuantumOptics, DataFrames, Juqbox

Experience

Graduate Intern, Intel Corporation Summer 2024
Discovered new ways of implementing two-qubit operations in silicon spin qubits, yielding up to 54% reduction in errors and spurring the development of novel chip designs to take advantage of these gains. Incorporated this work into existing Python hardware controller software and C++ compiler stack. Created integrated tools for hardware-informed exploration of the QEC code design space, providing guidance for Intel's quantum roadmap.

Undergraduate Researcher, University of Chicago Spring 2021 – Summer 2022
Optimized short-duration control pulses for high-radix quantum logic gates, motivating a new compiler design that takes advantage of mixed-radix operations. Research was presented at QCE 2022 and was a key part of papers at ASPLOS 2023 and ISCA 2023.

Undergraduate Intern, Princeton Plasma Physics Laboratory Summer 2020
As part of the Department of Energy SULI program, designed a neural network to predict fusion plasma cross-sectional density and pressure using only data available in real time during plasma operation, for use in real-time feedback control systems. Work published in *Nuclear Fusion*.

Service

Workshop organizer, QCE 2024 September 2024
Organized second edition of "Novel Applications of Optimal Control and Calibration for Quantum Technology" at QCE 2024, featuring invited talks and guided discussions.

Workshop organizer, QCE 2023 September 2023
Organized a day-long workshop "Advances in Numerical Quantum Optimal Control and Characterization Methods" at QCE 2023, featuring invited talks and guided discussions.

Physics Steering Committee, CMU Physics Department 2019–2021
Collaborated with physics department leadership to guide programs and policy.

Publications

Year	Title and Authors	Publisher	Category
2024	Averting multi-qubit burst errors in surface code magic state factories *J. D. Chadwick, C. Kang, J. Viszlai, S. F. Lin, and F. T. Chong* arxiv.org/abs/2405.00146	2024 IEEE International Conference on Quantum Computing and Engineering (QCE)	Refereed conference paper
2024	Verity: a resilient kernel for magic state distillation *C. Kang†, J. D. Chadwick†, S. F. Lin, and F. T. Chong*	In preparation	
2023	Efficient control pulses for continuous quantum gate families through coordinated re-optimization *J. D. Chadwick and F. T. Chong* doi.org/10.1109/QCE57702.2023.00145 QTEM Best Paper (3rd place)	2023 IEEE International Conference on Quantum Computing and Engineering (QCE)	Refereed conference paper
2023	Dancing the Quantum Waltz: Compiling Three-Qubit Gates on Four Level Architectures *A. Litteken, L. M. Seifert, J. D. Chadwick, N. Nottingham, J. M. Baker, and F. T. Chong* doi.org/10.1145/3579371.3589106	50th International Symposium on Computer Architecture (ISCA)	Refereed conference paper
2023	Qompress: Efficient Compilation for Ququarts Exploiting Partial and Mixed Radix Operations for Communication Reduction *A. Litteken, L. M. Seifert, J. D. Chadwick, N. Nottingham, J. M. Baker, and F. T. Chong* doi.org/10.1145/3575693.3575726	28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	Refereed conference paper
2022	Time-Efficient Qudit Gates through Incremental Pulse Reseeding *L. M. Seifert†, J. D. Chadwick†, A. Litteken, F. T. Chong, and J. M. Baker* doi.org/10.1109/QCE53715.2022.00051	2022 IEEE International Conference on Quantum Computing and Engineering (QCE)	Refereed conference paper
2021	Prediction of electron density and pressure profile shapes on NSTX-U using neural networks *M. D. Boyer and J. D. Chadwick* doi.org/10.1088/1741-4326/abe08b	*Nuclear Fusion* 61 046024	Journal article

† indicates equal contribution

Talks

Year	Title	Venue	Category
2024	Dynamic mitigation of time-varying noise in surface code magic state factories	APS March Meeting	Conference talk
2023	Efficient control pulses for continuous quantum gate families through coordinated re-optimization	2023 IEEE International Conference on Quantum Computing and Engineering (QCE)	Conference paper talk

Patents

Year	Title	Description
2023	SYSTEMS AND METHODS FOR OPTIMIZED PULSES FOR CONTINUOUS QUANTUM GATE FAMILIES THROUGH PARAMETER SPACE INTERPOLATION	Methods related to those described in “Efficient control pulses for continuous quantum gate families through coordinated re-optimization”, *QCE 2023*.