# Thomas Propson

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## EDUCATION

**Massachusetts Institute of Technology**  2021–2026
Ph.D. Electrical Engineering

**The University of Chicago**  2017–2021
B.A. Physics (summa cum laude), Minor Computer Science

## RESEARCH EXPERIENCE

**Experimental Control of Superconducting Qubits**  2019–2021
The University of Chicago Department of Physics, Advisor: David I. Schuster

- Developed numerical techniques using control theory and trajectory optimization to engineer high fidelity quantum gates in the presence of decoherence and systematic errors
- Performed calibration, control, and readout on superconducting qubits

**Quantum Hardware and Algorithm Optimization**  2018–2019
The University of Chicago Department of Computer Science, Advisor: Frederic T. Chong

- Developed a method for compiling variational quantum algorithms that achieves a 30x latency reduction
- Developed an operation scheduling algorithm for frequency-tunable qubits that mitigates cross-talk by an order of magnitude
- Investigated properties of near-term quantum hardware and algorithms to optimize quantum architectures for fidelity and latency

**Hyperparameter Optimization**  2018
Argonne National Laboratory Division of Math and Computer Science
Advisors: Stefan Wild, Prasanna Balaprakash

- Developed a software package to evaluate hyperparameter optimization algorithms that exposes a novel search space definition system
- Deployed neural network experiments on high-performance computing infrastructure

## PUBLICATIONS

1. **T. Propson**, B. E. Jackson, Z. Manchester, J. Koch, D. I. Schuster, "Robust Quantum Optimal Control with Trajectory Optimization." In review for Physical Review Applied. [arxiv:2103.15716].
2. Y. Ding, P. Gokhale, S. F. Lin, R. Rines, **T. Propson**, F. T. Chong, "Systematic Crosstalk Mitigation for Superconducting Qubits via Frequency-Aware Compilation." Proceedings of the 53rd Annual IEEE/ACM International Symposium on Microarchitecture, 201-214 (2020). [arxiv:2008.09503]
3. P. Gokhale, Y. Ding, **T. Propson**, C. Winkler, N. Leung, Y. Shi, D. I. Schuster, H. Hoffmann, F. T. Chong, "Partial Compilation of Variational Algorithms for Noisy Intermediate-Scale Quantum Machines." Proceedings of the 52nd Annual IEEE/ACM International Symposium on Microarchitecture, 266-278 (2019). [arxiv:1909.07522]

## PATENTS

1. P. Gokhale, Y. Ding, **T. Propson**, F. T. Chong, "System and Method for Partial Compilation of Variational Algorithms in Quantum Computers." Pending.

## Honors and Awards

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|---|---|
| National Science Foundation Graduate Research Fellowship | 2021 |
| Jacobs Presidential Fellowship, MIT EECS | 2021 |
| Grainger Scholarship, UChicago Physics, full-tuition senior year | 2020 |
| Barry Goldwater Scholarship | 2020 |
| Enrico Fermi Scholar, UChicago PSD, major GPA in top 5% from past 5 years | 2020 |
| Summer Research Fellowship, UChicago | 2019 |
| Liew Family College Research Fellowship, UChicago | 2018 |
| Jeff Metcalf Research Fellowship, UChicago | 2018 |
| University Scholarship, UChicago | 2017–2021 |

## Contributed Talks

Systematic Crosstalk Mitigation for Superconducting Qubits via Frequency-Aware Compilation
- MICRO 53 Conference (virtual), Athens, Greece, 2020

Partial Compilation of Variational Algorithms for Noisy Intermediate-Scale Quantum Machines
- MICRO 52 Conference, Columbus, OH, 2019

Commercial Outlook for Quantum Computing
- The University of Chicago Booth School of Business, Chicago, IL, 2019

## Contributed Posters

Benchmarking Hyperparameter Optimization Algorithms on Deep Neural Networks
- The University of Chicago Undergraduate Research Symposium, Chicago, IL, 2018
- Argonne National Laboratory Summer Student Symposium, Lemont, IL, 2018

## Outreach

**The University of Chicago Department of Physics**         2020–Present
- Organize a pre-freshman, summer, physics program for first-generation and limited-income students

**Uncommon Hacks**         2018–Present
- Organize an annual MLH endorsed hackathon to provide a platform for 300+ students to collaborate with peers, learn technical skills, and develop relationships with employers
- Lead a 10-person team of designers and software developers to build websites that reach 1000+ users

**Strive Learning**         2018
- Met weekly with students from limited-income households in the Chicago Public Schools to assist with coursework, college applications, and connecting students to extracurricular activities

## Teaching

**The University of Chicago**
- Grader, Winter 2020, CMSC 23300 Networks and Distributed Systems

## Work Experience

**PanorArt Inc.**         2018
Full-Stack Web Developer
- Angular, Node.js, HTTP, relational and non-relational databases, search engine optimization