Sam Fine

+1 (650) 474-9534 | fine1@uchicago.edu | Website | LinkedIn | Chicago, IL

EDUCATION

The University of Chicago **December 2025**
M.S., Computer Science *Chicago, IL*

The University of Chicago **June 2025**
B.S., Mathematics, minor in Physics *Chicago, IL*

Relevant Coursework:
Graduate: Quantum Measurements and Metrology, Introduction to Machine Learning (@ TTIC), Quantum Computer Systems, Adv Classical Mechanics, The Physics of Computation, Distributed Systems
Undergraduate: Hon. Algebra I-III, Analysis in Rn I-III (accelerated), Hon. Discrete Math, Hon. Theory of Algorithms, Quantum Mechanics I & II, Mathematical Foundations of Machine Learning, Computational Physics

RESEARCH INTERESTS

Theory, design and control of physical systems that can represent and manipulate quantum information. I am particularly drawn toward two intersections of quantum computing theory and application:

- *Overcoming Noise:* Methods to more efficiently encode and process quantum information that minimize control complexity and error susceptibility in resource-limited, near-term devices.
- *Characterization:* Developing the theory and computational tools to calibrate and control quantum systems.

RESEARCH EXPERIENCE

Quantum Error Correction for Correlated Noise **June 2025-Present**
Advised by Liang Jiang *Chicago, IL*
- Designing and verifying teleportation-based fault-tolerant protocols for correlated noise.
- Explored the sample complexity of machine-learning based surface code decoders for higher-order errors.

Robust Quantum Optimal Control **May 2025-Present**
Advised by Fred Chong *Chicago, IL*
- Identified a critical discretization correction for a widely-used robustness estimator.
- Running experiments on quantum hardware to show measurable improvement using the corrected metric.
- Exploring the theoretical and practical trade-offs between control complexity and error susceptibility.

Fermilab Mu2e Internship **June – Aug 2024**
Advised by Andrei Gaponenko *Batavia, IL*
- Designed realistic models of the Mu2e Extinction Monitor detector using Geant4.
- Wrote production-scale code for monte-carlo simulations to assess the detector's radiation shielding.

Higgs Boson Self-Coupling Classification **Jan 2023 – Jan 2024**
Advised by Philipp Windischhofer *Chicago, IL*

- Investigated how modern machine learning methods can help to extract the maximum amount of information about the self-interactions of the Higgs boson from the data sets recorded at the LHC.
- Applied neural networks to define highly-compressed, information-preserving statistics of the original data.

SLAC Technology Innovation Directorate Intern **2020 – 2021**
Advised by Emilio Nanni *Stanford, CA*

- Studied the physics of the Cool Copper Collider: an advanced e^+e^- linear collider concept in the TeV class.
- Explored efficient normal-conducting particle accelerator design and built the website.

Designed & Built a 300 KeV Cyclotron **2016 – 2021**
Advised by Martin Breidenbach *Stanford, CA*

- Co-led project to build a 300 KeV cyclotron.
- Designed, constructed and tested vacuum, radiofrequency, ion source and detector systems.

PUBLICATIONS & PREPRINTS

A. Kamen, **S. Fine**, B. Bhattacharyya, F. Chong, A. Goldschmidt. Accurate metrics for robustness in quantum optimal control. (in preparation)

AWARDS & RECOGNITION

Metcalf Research Grant ($4,500) **2024**
UC Berkeley Regents' & Chancellor's Scholarship (~0.2% of all applicants selected, declined) **2020**

VOLUNTEERING & SERVICE

South Side Science Fair Volunteer **2025**
Phoenix Outdoor Program Ranger **2021-2024**
MakerFair Volunteer **2016-2020**

CERTIFICATIONS, SKILLS & INTERESTS

Languages: Julia, Python, C++, Spanish (B2) and French (B1)
Libraries: Piccolo.jl, NumPy, pandas, PyTorch, Matplotlib, QuTiP, SciPy
Interests: Backpacking; Biking; Climbing; Reading