

# Sam Fine

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## EDUCATION

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<b>The University of Chicago</b> <i>M.S., Computer Science</i>	<b>December 2025</b> <i>Chicago, IL</i>
<b>The University of Chicago</b> <i>B.S., Mathematics, minor in Physics</i>	<b>June 2025</b> <i>Chicago, IL</i>

### Relevant Coursework:

Graduate: Quantum Measurements and Metrology, The Physics of Computation, Adv Classical Mechanics, Quantum Computer Systems, Distributed Systems, Introduction to Machine Learning (@ [TTIC](#))

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

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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

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<b>Quantum Error Correction for Correlated Noise</b> Advised by <a href="#">Liang Jiang</a>	<b>June 2025-Present</b> <i>Chicago, IL</i>
• 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.	

<b>Robust Quantum Optimal Control</b> Advised by <a href="#">Fred Chong</a>	<b>May 2025-Present</b> <i>Chicago, IL</i>
• 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.	

<b>Fermilab Mu2e Internship</b> Advised by <a href="#">Andrei Gaponenko</a>	<b>June – Aug 2024</b> <i>Batavia, IL</i>
• 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.

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## PUBLICATIONS & PREPRINTS

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

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## AWARDS & RECOGNITION

Metcalf Research Grant (\$4,500)	2024
<a href="#">UC Berkeley Regents' &amp; Chancellor's Scholarship</a> (~0.2% of all applicants selected, declined)	2020

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## VOLUNTEERING & SERVICE

<a href="#">South Side Science Fair</a> Volunteer	2025
Phoenix Outdoor Program Ranger	2021-2024
MakerFair Volunteer	2016-2020

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## 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