Emma Lucia Byrnes Finn

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Education

Harvard University Cambridge, MA
A.B, Mathematics and Classics, GPA 3.96/4.00. Expected May 2026
Concurrent A.M, Statistics, GPA 4.00/4.00.
Honors Thesis in Mathematics: *Mathematical Foundations of Interpretable Diffusion*, in preparation under Dr. Mark Sellke
Thesis in Classics: *Quantifying the Past: Empirical Tropes in Greek Historiography,* in preparation under Dr. Emily Greenwood

Honors and Awards

Coolidge Scholar June 2021 – May 2026
Calvin Coolidge Presidential Foundation, awarded a four-year, full-ride merit-based scholarship to any US college

Best Poster Award, Kranium Summer Research Program August 2024
Kempner Institute at Harvard University

Kempner Institute Research Fellowships May 2024 – May 2025
Kempner Institute at Harvard University, selected for Summer 2024, Fall 2024, and Spring 2025 Kempner Institute research cohort

John Harvard Scholar September 2023 – September 2024
Harvard University, awarded to the top 5% of the class by GPA

Publications and Manuscripts

Finn, E, Wang, B., Keller T. A., Ba, D.E. *A Wavelet View of Diffusion*. AISTATS 2026, under review.

Finn, E. *"Not by Reason Alone:" Plato's Phaedrus and Fictionality*. Alexandria: The Oxford Undergraduate Classics Journal, under review.

Finn, E, Wang, B., Keller T. A., Ba, D.E. *Where the Score Lives: A Wavelet View of Diffusion*. NeurIPS 2025, Structured Probabilistic Inference and Generative Modeling: Probabilistic Inference in the Era of Large Foundation Models, accepted.

Wang, B., **Finn, E**, and B. Liu. *When Rule Learning Breaks: Diffusion Fails to Learn Parity of Many Bits.* NeurIPS 2025, Structured Probabilistic Inference and Generative Modeling: Probabilistic Inference in the Era of Large Foundation Models, accepted (oral).

Finn, E., Keller T. A., Theodosis, M., and Ba, D.E. *Origins of Creativity in Attention-Based Diffusion Models.* 3rd ICML Workshop on High-dimensional Learning Dynamics, accepted.

Finn, E., Keller T. A., Theodosis, M., and Ba, D.E. *Learning Artistic Signatures: Symmetry Discovery and Style Transfer*. arXiv:2412.04441, 2024, preprint.

Guo, L., Torii, S., Fernandez, R., … **Finn, E.,** … Finn, A. V. *Genetic variants associated with unexplained sudden cardiac death in adult White and African American individuals*. JAMA Cardiology, 2021, 6(9): 1013–1022.

Expository Work

Finn, E. *Score and Structure*. Author of an ongoing blog that explores the connections between algebra, probability, and ML, while making advanced theory accessible. emmafinn314.github.io/blog.

Hartnett, M. AGON: Introduction to Ancient Greek. Edited by **Finn, E.** and Preston, C. Phillips Exeter Academy, 2021.

Finn, E. "Ruth Hale's Fight for Her Name." Women at the Center (New-York Historical Society), Aug 12, 2021.

Research and Work Experience

CRISP Lab Cambridge, MA
Undergraduate Researcher December 2023 – Present

- Clarified how diffusion models organize information and proposed a simpler representation to make them more transparent, interpretable, and trustworthy (NeurIPS '25 workshop; AISTATS '26 under review).
- Demonstrated a concrete failure case (oral at NeurIPS '25 workshop) and explored how attention mechanisms can improve rule learning, while restricting creativity (ICML '25 workshop).
- Mentored a freshman on first research experiences, scoped projects for her, and introduced coding workflows
- Organized lab socials among PhD students, postdocs, and visiting researchers to build inclusive research culture

Harvard Statistics Department Cambridge, MA
Course Assistant September 2024 – Present

- Courses: STAT 110 (Intro to Probability, Fall '24), STAT 111 (Intro to Statistical Inference, Spring '25) and STAT 210 (Graduate Probability I, Fall '25)
- Wrote original review content and hosted two review sessions with combined attendance of 150+ students; achieved score of 4.95/5 across student evaluation metrics, including effectiveness and engagement

Harvard Math Department Cambridge, MA
Course Assistant August 2023 – May 2024

- Facilitated teaching of multivariable calculus (Fall 2023) and linear algebra (Spring 2024) to undergraduate students
- Led student workshops to illustrate applications of course material, hosted office hours, and graded homework

Federal Reserve Bank of St. Louis St. Louis, MO
Government Relations Intern May – August 2023

- Directed a project to analyze data from 300+ meetings with federal and state officials over four years to identify underrepresented constituencies in the 8th district of the Federal Reserve and support more equitable outreach

Service and Leadership

Statisticians Without Borders Remote
Volunteer Statistician July 2025 – Present

- Selected to join the pro-bono arm of the American Statistical Association, consulting for Scholars at Risk on databases to defend academic freedom

Boston Diffusion Day Cambridge, MA
Founder and Co-organizer October 2025 (upcoming)

- Co-founded a regional research conference to build community among Boston-area diffusion model scholars; secured funding, developed programming, and led outreach to local academics and industry researchers

Kempner Institute Editorial Board Cambridge, MA
Reviewer and Editor July 2025 – Present

- Provided scientific review for the Kempner Institute's public communications, ensuring all published articles and explainers were technically sound and scientifically rigorous

Kempner Institute Lunch and Learn Series Cambridge, MA
Organizer and Presenter August 2024 – Present

- Coordinated weekly forum for researchers to discuss machine learning and neuroscience; led outreach to undergraduates, fostered inclusive dialogue across disciplines, and helped speakers to make their work accessible; delivered three talks
- Doubled overall attendance through outreach and tripled the number of undergraduates who presented work

Partners Empowering Neighborhoods Cambridge, MA
ESL Instructor December 2022 – May 2023

- Ran a weekly ESL class of 40+ adults; explained grammar, vocabulary, and skills like filing taxes and healthcare forms

Cambridge Rindge and Latin School Cambridge, MA
Volunteer Teaching Assistant September – December 2022

- Worked with high school seniors in honors economics class, teaching lessons, designing class activities, running debates, writing assessments and answer keys as well as mentoring students interested in pursuing collegiate economics

Welcome Neighbor St. Louis, MO
Volunteer June – September 2023

- Supported refugees new to the St. Louis area with volunteer recruitment, providing hands-on support at charity dinners, and assisting with the development of a new ESL curriculum

Center for Public Service and Engaged Scholarship Cambridge, MA
First-Year Public Service Representative September 2022 – May 2023

- Selected as one of ten representatives to serve in Harvard's civic engagement network; organized a symposium on Cambridge-based community organizing and developed programming to connect peers with local service opportunities

Programs and Workshops

Mathematics and Machine Learning Program Cambridge, MA
Workshop Participant September – November 2024

- Selected to attend a program at the Center of Mathematical Sciences and Applications at Harvard focused on applications of ML to open mathematical problems; fostered collaboration across mathematicians and ML researchers

Harvard Math Department Cambridge, MA
Directed Reading Program Participant January – December 2024

- Wrote an expository paper on stochastic branching processes and applications to modeling ecology and immigration
- Presented on combinatorial optimization algorithms as part of an independent study of algebraic graph theory

Athletics

Distance Running – completed the Providence Half Marathon (May 2025) September 2022 – Present
Horseback Riding – trained and competed (Interscholastic Equestrian Association) January 2010 – June 2022