Lindsay M. Smith

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Research Interest: My research focuses on the **science of AI**: I apply techniques and ideas from physics and complex systems to artificial neural networks to understand how they learn. My current research in machine learning/AI includes projects in **mechanistic interpretability, in-context learning, RL, and LLM multi-agent interactions**.

Education

Ph.D., Princeton University — ***Physics*** 2022 - Present (expected 2027)
Research Advisors: Profs. William Bialek (Princeton) and David Schwab (CUNY)

M.A., Princeton University — ***Physics*** 2022 - 2024

B.A., University of Pennsylvania — ***Physics (Honors)*** 2018 - 2022
Research Advisor: Prof. Dani Bassett
Cum Laude, Minors in Mathematics and French and Francophone Studies

Publications

* indicates equal contribution.

5. Jeff Shen* & **Lindsay M. Smith*** (2025). Alice: An Interpretable Neural Architecture for Generalization in Substitution Ciphers. *Under review at ICLR 2026*, https://arxiv.org/abs/2509.07282.

4. Chase Goddard, **Lindsay M. Smith**, Vudtiwat Ngampruetikorn*, David J. Schwab* (2025). When can in-context learning generalize out of task distribution? ***ICML 2025***, https://arxiv.org/abs/2506.05574.

3. **Lindsay M. Smith**, Chase Goddard, Vudtiwat Ngampruetikorn*, David J. Schwab* (2024). Model Recycling: Model component reuse to promote in-context learning. ***NeurIPS 2024*** *Workshop on Scientific Methods for Understanding Deep Learning,* https://openreview.net/forum?id=vWSu8nEURM.

2. Chase Goddard, **Lindsay M. Smith**, Vudtiwat Ngampruetikorn*, David J. Schwab* (2024). Specialization-generalization transition in exemplar-based in-context learning. ***NeurIPS 2024*** *Workshop on Scientific Methods for Understanding Deep Learning,* https://openreview.net/forum?id=D1ui5QwHqF.

1. **Lindsay M. Smith**, Jason Z. Kim, Zhixin Lu, and Dani S. Bassett (2022). Learning continuous chaotic attractors with a reservoir computer, ***Chaos*** 32, 011101, https://doi.org/10.1063/5.0075572. *Selected as an Editor's Pick and publicized with a Scilight summary: https://doi.org/10.1063/10.0009079.*

Honors and Awards

NSF AI Institutes Virtual Organization (AIVO) ARNI Travel Grant	2025
American Physical Society (APS) GSNP Student Speaker Award Finalist	2025
NSF Graduate Research Fellowship Program (GRFP)	2022 - 2027
Charlotte and Morris Tanenbaum *52 Graduate Fellowship in the Physical or Life Sciences	2022 - 2023
Joseph Henry Merit Award	2022
University Scholars Program	2020 - 2022
Applied for and awarded summer research funding in 2020 and 2021.	
National French Honor Society – Pi Delta Phi	2020 - Present
Sister Loretta Thome Scholarship	2018 - 2023

Skills

Python, PyTorch, Jupyter, Git, MATLAB, Java, C++, ROOT, Mathematica, LaTeX, Linux

Selected Presentations

Meta 2025 PhD Forum, Menlo Park, CA 2025
Poster: "ALICE: An Interpretable Neural Architecture for Generalization in Substitution Ciphers"

APS March Meeting, Anaheim, CA 2025
Talk: "Multi-Agent Debate: Analyzing Consensus in Networks of LLM Agents"
(GSNP Student Speaker Award Finalist)

APS March Meeting, Chicago, IL 2022
Talk: "Learning Continuous Chaotic Attractors with a Reservoir Computer"

Conference for Undergraduate Women in Physics (CUWiP), Virtual 2022
Poster: "Learning Continuous Chaotic Attractors with a Reservoir Computer"

Penn Research Expo, Phila., PA 2020, 2021, 2022
Posters: "Development of control in brain networks over temporal and spatial scales using graph models", "Learning Continuous Chaotic Attractors with a Reservoir Computer"

CUWiP, Virtual 2021
Lightning Talk: "Development of control in brain networks over temporal and spatial scales using graph models"

University Scholars Lunch Talk, Phila., PA 2020, 2022
Talks: "Development of control in brain networks over temporal and spatial scales using graph models", "Learning Continuous Chaotic Attractors with a Reservoir Computer"

APS March Meeting, Virtual 2020
Poster: "Development of control in brain networks over temporal and spatial scales using graph models"

Mentoring and Outreach

Princeton Women in Physics Executive Board 2023 - Present

Princeton Physics EDI Events Committee 2022 - 2024

Princeton Physics Mentorship 2022 - Present
Mentored one to two undergraduate physics students each semester. Met at least once a semester to give career and academic advice.

CIS 110 Tutor 2021 - 2022
Tutored two to three students weekly in CIS 110: Introduction to Computer Programming.

Side By Side Agency 2021
Mentored a student on her research project exploring astrophysics, advising her how to create a poster and conduct independent research.