# LINGHAI LIU

(401) 347-4178 ◇ linghai.liu@yale.edu ◇ https://lliu58b.github.io/

## EDUCATION

**Yale University** 2023 - Present

Ph.D. in Statistics & Data Science

**Brown University** 2019 - 2023

B.S. in Applied Mathematics - Computer Science (*Honors*) | B.A. in Mathematics

## SELECTED RESEARCH EXPERIENCES

**Topological Representations for Neural Networks** May 2022 - Present
*Advisor: Stuart Geman* *Brown University*

· Design generative models capable of learning a richer collection of abstract relationships using a multinomial idealization of biological neurons while ensuring model hierarchy and reusibility.
· Implement the above models. Develop statistics that exploit the patterns of neuronal activities with topological structures such as cycles that can potentially be used to represent relationships.

**Jacobian-free Backpropagation in Inverse Problems** May 2022 - Present
*Advisor: Samy Wu Fung* *REU Researcher, Emory University*

· Compared classical optimization, standard feed-forward networks (Denoising CNN), Deep Unrolling methods, and implicit deep learning with applications to inverse problems in imaging.
· Trained implicit networks to denoise images using Jacobian-free Backpropagation with fixed memory costs, which yielded comparable results with current models.

**Noise Correlations for Task Learning** Jan 2021 - Aug 2021
*Advisor: Matthew Nassar* *Brown University*

· Explored biologically plausible approaches to generate beneficial noise correlations, i.e. passing back information from the decision layer, that make learning a discrimination task faster and more robust.

## TEACHING & MENTORING

**Teaching Assistant at Brown University**

· CSCI1952Q: Algorithmic Aspects of Machine Learning (TA) Spring 2023
· APMA1660: Statistical Inference II (TA) Spring 2023
· APMA1690: Computational Probability & Statistics (TA) Fall 2022
· APMA1740/2610*: Recent Applications in Probability & Statistics (TA) Spring 2022
· DATA1010*: Probability, Statistics and Machine Learning (TA) Fall 2021
· CSCI1470/2470*: Deep Learning (Head TA) Fall 2021
· APMA1650: Statistical Inference I (TA) Spring 2021

* Courses at graduate level

**Peer Advisor, Meiklejohn Peer Advising Program** 2020 - 2021

· Advised 5 freshmen on academic and career development jointly with a faculty member.

## HONORS & AWARDS

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| Magna Cum Laude, Brown University | 2023 |
| Sigma Xi, Brown University | 2023 |
| Senior Prize in Computer Science, Brown University | 2023 |
| Emory REU/RET Computational Mathematics for Data Science, Emory University | 2022 |
| Second place, Henry Parker Manning Mathematical Prizes, Brown University | 2022 |
| BrownConnect SPRINT Undergraduate Teaching & Research Awards, Brown University | 2021 |
| Second place (tied), Hartshorn-Hypatia Freshman Math Contest, Brown University | 2019 |

## TECHNICAL STRENGTHS

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| **Computer Languages** | Python, Matlab, R, LaTeX, Stata, Java, C |
| **Languages** | English, Chinese, French |

Date of Preparation: July 20, 2023