

# LINGHAI LIU

Mail 6583, 69 Brown St  $\diamond$  Providence, RI 02912  
(401) 347-4178  $\diamond$  linghai.liu@brown.edu

## EDUCATION

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### Brown University

To be completed: May 2023

B.S. in Applied Mathematics - Computer Science

B.A. in Mathematics

Overall GPA: 4.0/4.0

## RESEARCH

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### Undergraduate Researcher

May 2022 - Present

*Brown University*

*Providence, RI*

- Mentor: Prof. Stuart Geman
- Implement generative models by embedding a discrete-state system of multinomial units into a continuous-state system with the goal of building a complex and multinomial idealization of biological neurons while ensuring model hierarchy and reusability.
- Design suitable objective (loss) functions and nonlinear mappings (layers) for existing neural networks and observe neural collapse effects over layers.

### REU Researcher

May 2022 - July 2022

*Emory University*

*Atlanta, GA*

- Mentor: Prof. Samy Wu Fung
- Compare classical optimization, standard feed-forward networks (Denoising CNN), Deep Unrolling methods, and implicit deep learning with applications to inverse problems in imaging.
- Train implicit networks to denoise images using Jacobian-free Backpropagation with fixed memory costs, which yield comparable results with current models.
- Attend midterm and poster presentation. Give a seminar on GPU usage.

### Undergraduate Research Assistant

January 2021 - August 2021

*Learning Memory & Decision Lab, Brown University*

*Providence, RI*

- Mentor: Prof. Matthew Nassar
- Continued with previous research on how noise among input neurons would induce correlation structures that make learning a discrimination task faster and more robust.
- Explored other biologically plausible approaches to generate beneficial noise correlations, i.e. passing back information from the decision layer to other layers.

## PROJECTS

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### Brown University Mathematics Project

Summer 2020

- Advised by Ph.D. student Juniper Cocomello, investigated the randomizing speed of Markov chains and proved the long-term probabilities of a finite-state Markov chain.

## TEACHING

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### Brown University

- 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

## MENTORING

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### Meiklejohn Peer Advising Program

Fall 2020 - Spring 2021

*Peer Advisor*

*Providence, RI*

- Together with a faculty member, advised 5 freshmen on academic and career development, and provided them with mental guidance and support.

## AWARDS & HONORS

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Second place, Henry Parker Manning Mathematical Prizes, Brown University 2022

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 Languages

Python, Matlab, R, L<sup>A</sup>T<sub>E</sub>X, Stata, Java, C  
English, Mandarin, French