Linghai Liu

(401)347-4178 | linghai_liu@brown.edu | https://lliu58b.github.io/

Education

Brown University *2019-2023*

Bachelor of Science in Applied Mathematics – Computer Science

Relevant coursework: Real Analysis, Linear Algebra, Probability, Mathematical Statistics, Machine Learning, Deep Learning, Operations Research, Differential Equations.

Research Interests

Machine learning, statistical learning, mathematical statistics, stochastic processes.

Research Experience

Undergraduate Research Assistant, Learning Memory & Decision Lab *Spring 2021 - present*

Department of Neuroscience, Brown University

- A continuation to the work on how noise among input neurons would induce correlations structures that makes learning a discrimination task faster and more robust.
- Explore other biologically plausible approaches to generate beneficial noise correlations, i.e. passing back information from the decision layer to other layers.

Student Researcher, Brown University Mathematics Project *Summer 2020*

Department of Mathematics, Brown University

- Co-author a 19-page final report with two other undergraduates advised by a Ph.D. student on the topic of randomizing speed of Markov chains.
- Proved the long-term probabilities of a finite-state Markov chain.
- Use MATLAB & Python packages (*pandas, matplotlib, NumPy, scipy*) to simulate and visualize data.

Research Assistant, Rural Education Action Program *Summer 2020*

Center on China's Economy & Institutions, Stanford University

- Member of quality control. Clean and analyze recordings with survey forms received on a daily basis.
- Develop a front-end academic website to assist a Stanford postdoctoral scholar.

Research Assistant, Land Degradation Neutrality Project *Fall 2020 – Spring 2021*

Population Studies and Training Center (PSTC), Brown University

- Collect and analyze DHS data; propose ways in which DHS data can be used to realize the strategic objectives (SO-2) addressed in the United Nations Convention to Combat Desertification.
- Co-authored Tools4LDN (Tools for Land Degradation Neutrality) Technical Report on Monitoring Progress Towards SO-2: *To Improve Living Conditions of Affected Populations*.

Teaching & Mentoring Experience

Undergraduate Teaching Assistant, Recent Applications in Probability and Statistics *Spring 2022*

Department of Applied Mathematics, Brown University

- Mathematical foundations for applied statistics, including Gibbs ensembles, large deviations, exponential models, information theory, statistical estimation and classification, graphical models, MCMC, etc.
- Prepare course materials for undergraduate and graduate versions; hold office hours; grade homework.

Head Teaching Assistant, Deep Learning *Fall 2021*

Department of Computer Science, Brown University

- A course on various applications of neural networks using large datasets. Models and techniques included stochastic gradient descent, convolutional neural networks, N-gram models, recurrent neural networks, transformers, variational autoencoders, and reinforcement learning.
- Assisted professor Chen Sun with recruiting teaching assistants, instructing both undergraduate and graduate versions of the course (total enrollment: 329), and creating new homework assignments.
- Mentored graduate group projects; held weekly TA meetings; allocated teamwork; graded homework; maintained online platforms (EdStem and Gradescope).

Teaching Assistant, Probability, Statistics, and Machine Learning *Fall 2021*
Data Science Initiative, Brown University

- Double-credit graduate-level course on computational exploration, visualization, and theory. Topics included scientific computing basics, numerical linear algebra, probability, mathematical statistics, and various topics in machine learning.
- Maintained online platforms (prismia); prepared homework and exam problems; held office hours.

Undergraduate Teaching Assistant, Statistical Inference I *Spring 2021*
Department of Applied Mathematics, Brown University

- Course contents covered probability spaces, discrete and continuous random variables, methods for parameter estimation, confidence intervals, and hypothesis testing. Enrollment: 222.
- Answered questions in live lectures; held weekly office hours; grade weekly assignments.

Peer Advisor, Meiklejohn Peer Advising Program *Fall 2020 – Spring 2021*
The College, Brown University

- Advised 5 freshmen with a faculty member; arranged regular group meetings; advised mentees on course selection, learning habits, and internship and research opportunities; provided resource and support.

Awards

Henry Parker Manning Mathematical Prizes (for Juniors): 2nd place, Brown University, Spring 2022
Undergraduate Teaching & Research Awards, Brown University, Summer 2021
Hartshorn-Hypatia Freshman Math Contest: 2nd place (tied), Brown University, Fall 2019

Other Activities

President, Brown Chinese Students & Scholars Association (CSSA) *Fall 2021 - present*

- Connect and cooperate with companies, institutions, and organizations to provide member students and scholars at Brown with various opportunities for career and academic development.
- Organize joint festive and art events and career fairs with other Ivy League universities and other US institutions.

Skills

- Programming: Python, Matlab, Java, R, C, STATA, LaTeX, Tensorflow, Pytorch
- Languages: Mandarin (native); English (proficient); French (conversational)

References

Stuart Geman
James Manning Professor of Applied Mathematics
Brown University
stuart_geman@brown.edu

Justin Holmer
Associate Professor of Mathematics
Brown University
justin_holmer@brown.edu