Carol (Xuan) Long

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Education

Harvard University   **Cambridge, MA**
Ph.D. in Applied Mathematics, School of Engineering and Applied Sciences (SEAS)   *Sep. 2021 – Present*
Advisor: Flavio du Pin Calmon

Harvard University   **Cambridge, MA**
M.S. in Applied Mathematics, School of Engineering and Applied Sciences (SEAS)   *Sep. 2021 – Sep. 2023*
GPA: 3.78/4.0

New York University   **New York, NY**
B.A. in Mathematics and Computer Science, Courant Institute of Mathematical Sciences   *Sep. 2018 – May 2021*
GPA: 4.0/4.0, Summa Cum Laude, Phi Beta Kappa Honor Society, Graduated in 3 years

Research Interests

Areas: Information Theory, Statistical Learning Theory
Topics: Algorithmic Fairness, Model Multiplicity

Publications

C. X. Long, H. Hsu*, W. Alghamdi*, and F. P. Calmon, "Arbitrariness Lies Beyond the Fairness-Accuracy Frontier,"
in *Advances in Neural Information Processing Systems (**NeurIPS**)*, 2023. **Spotlight Paper.** *Equal contribution.

L. M. Paes*, **C. X. Long***, B. Ustun, and F. P. Calmon, "On the Epistemic Limits of Personalized Prediction," in
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2022. *Equal contribution.

Awards, Honors, and Scholarships

Harvard University Kao Fellowship   *2022*
(for exceptional graduate students at Harvard SEAS)

North America School of Information Theory (NASIT) Travel Award   *2022*

Courant Institute Mathematics Award for Academic Achievement   *2021*
(presented to graduating seniors for excellence in mathematics)

NYU Alumni Award   *2021*
(presented to a graduating senior for scholarship and general attainments in Science)

NYU Women in Science Fellowship   *2020-2021*
(∼ 10 students/year)

Singapore Ministry of Education Senior-Middle 1 Scholarship   *2013-2017*
(∼ 200 Chinese students/year, full scholarship to attend high school in Singapore)

Professional and Research Experiences

Graduate Research Assistant/ Teaching Fellow   **Cambridge, MA**
Harvard University, Advisor: Prof. Flavio P. Calmon   *Sep. 2021 – Present*
– Demonstrate that model arbitrariness is orthogonal to fairness and accuracy in ML models
– Characterize the information-theoretic limit of ensuring "Fair Use" of group attributes in ML models
– Teaching Fellow for Fall 2022 ENI-SCI 250: Information Theory

Meta Platforms (formerly Facebook)   **Menlo Park, CA**
Software Engineering Intern, Ads ML Infra Team   *May 2021 – Aug. 2021*

– Design a mechanism that improves stability and reliability of the feature pipeline for the Ads ranking ML system

– Implement the design using C++ to optimize the algorithm and ensure efficiency during real-time delivery

Undergraduate Summer Research   **New York, NY**
NYU Courant SURE Fellowship, PI: Yunan Yang   *Jul. 2020 – Oct. 2020*

– Modify the K-Means algorithm to enhance its ability to capture geometry in data by replacing Euclidean centroid with Wasserstein barycenter

– Benchmark algorithms for computing Wasserstein distance by investigating regularized and sliced Wasserstein distance against the traditional Kantorovich formulation

– Apply the augmented algorithm on the 99 Shapes Dataset and demonstrate significant visual improvement

Undergraduate Research Assistant   **New York, NY**
NYU Department of Psychology, PI: Elena Sizikova   *Sep. 2019 – May 2020*

– Investigate the existence of human vision's physiological phenomena in CRNN, a deep neural network, to shed light on the root cause of Dyslexia

– Exposed CRNN's limitations in modeling noise adaptation and crowding in human vision, as well as its low efficiency, as measured by the signal-to-noise ratio of the images

– Generate images similar to human perception by applying Gaussian-noise techniques with Numpy and Matplotlib

– Explore a new method to model reaction time in dyslexia by measuring FLOPs (Floating Point Operations per Second) in networks

Teaching Experiences

ES 250: Information Theory – Graduate Level Course   *Fall 2022*
Engineering and Applied Sciences — Harvard University
Teaching Assistant
Hold weekly office hours to address students' concerns and questions. Guide 10+ students on their final projects.

NYU Courant Undergrad Tutor   *2020-2021*
Cover classes including Discrete Math, Linear Algebra, and Calculus I, II,III.

Professional Service and Activities

Conference Reviewer
○ Neural Information Processing Systems (NeurIPS), 2022, 2023
○ International Conference on Machine Learning (ICML), 2023
○ ACM Conference on Fairness, Accountability, and Transparency (FAccT), 2023, 2024

Conference and Workshop Attendance
○ International Conference on Machine Learning (ICML), 2022
○ Neural Information Processing Systems (NeurIPS), 2022, 2023
○ North America School of Information Theory (NASIT), including a poster presentation, 2022

Skills and Interests

Technical Skills:
○ Programming Languages: Python, C/C++, MATLAB
○ Software and Packages: PyTorch, Jupyter Notebook, Matplotlib, Numpy, Pandas, Scikit-Learn
○ Other: HPC, terminal, git

Languages: English, Mandarin, Cantonese

Interests: Dancing (ballet, contemporary, hip hop), Long-distance running (half-marathon), Music (classical, piano, pop), Travel