

# Lyndon Duong

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## ABOUT

I model how neural networks flexibly adapt to dynamic sensory information. Through my research, I seek to: 1) develop unsupervised machine learning models for improved lossy data compression; and 2) create new tools for statistical inference from scientific data.

**Coding languages:** Python (PyTorch, TensorFlow, NumPy, matplotlib); C; C++; MATLAB.

**Technical expertise:** Machine learning; signal processing; visual perception; Bayesian statistics.

EDUCATION **PhD, Neural Science** (Expected) Aug 2023

New York University, New York, NY, USA

Thesis: Statistical adaptation and gain control in neural networks

Advisors: Eero Simoncelli, David Heeger

**MSc, Physiology and Pharmacology** Jun 2018

Western University, London, ON, Canada

Thesis: A normalization circuit of attention in primate lateral prefrontal cortex

Advisor: Julio Martinez-Trujillo

**BSc, Physics and Physiology** May 2014

McGill University, Montreal, QC, Canada

• Dean's Multidisciplinary Undergraduate Research List

EMPLOYMENT **Software Engineering Intern, PhD** May 2022 – Aug 2022

Open Codecs Team, Google LLC, Mountain View, CA, USA

- Researched neural networks for transform coding in next-gen video codecs (Python, C)
- Improved perceptual reconstruction quality for intra-frame AV2 video compression

**Graduate Teaching Assistant** Sep 2019 – Jan 2020

Center for Neural Science, New York University, New York, NY

Mathematical Tools for Neural and Cognitive Science (Graduate-level)

**Manager, Projects and Operations** Sep 2016 – Jun 2018

Ben Graham Centre for Value Investing, Ivey Business School, London, ON, Canada

- Performed equity valuations and wrote financial reports for endowed investment fund
- Analyzed retail banking datasets for large-scale behavioural finance study

**Graduate Teaching Assistant** Sep 2015 – Apr 2016

Dept. of Physiology and Pharmacology, Western University, London, ON, Canada

Physiology Laboratory (Undergraduate-level)

- Nominated for teaching award

OPEN-SOURCE **plenoptic.py (Python)**

CONTRIBUTIONS A PyTorch library to compare between machine and human visual perception

- Contributed neural network architectures modeling the human early visual system
- Developed scalable randomized algorithms for approximating large matrices

**Stan programming language (C++)**

A popular statistical library for Bayesian modeling and inference

- Developed efficient auto-diff function templates for low-level **stan/math** library
- Optimized numerical linear algebra functions to speed up matrix factorizations

RESEARCH  
ARTICLES

1. Zhou, J. **Duong, L.**, Simoncelli, E.P., “A common framework for discriminability and perceived intensity of sensory stimuli.” bioRxiv; doi:10.1101/2022.04.30.490146. (Under review, 2022.)
2. Roussy, M., Luna, R., **Duong, L.** et al. “Ketamine disrupts naturalistic coding of working memory in primate lateral prefrontal cortex networks.” Molecular Psychiatry, 2021.
3. Gulli, R.A., **Duong, L.**, Corrigan, B.W., et al. “Flexible coding of memory and space in the primate hippocampus during virtual navigation”, Nature Neuroscience; 23: 103–112, 2020.
4. Doucet, G., Corrigan, B.W., Gulli, R.A., **Duong, L.**, Martinez-Trujillo, J.C. “Modulation of local field potentials and neuronal activity in primate hippocampus during saccades.” Hippocampus; 30: 192– 209, 2020.
5. **Duong, L.**, Leavitt, M.L., Pieper, F., Sachs, A., Martinez-Trujillo, J.C. “A normalization circuit in the lateral prefrontal cortex facilitates competitive interactions between neurons during the allocation of attention.” eNeuro; 6 (2), 2019.
6. Klotz, A.R., **Duong, L.**, Mamaev, M., de Haan, H., Chen, J., Reisner, W. “Measuring the confinement free energy and effective width of single polymer chains via single molecule tetrils.” Macromolecules; 48 (13), 4742-4747, 2015.
7. Klotz, A.R., Mamaev, M., **Duong, L.**, de Haan, H., Reisner, W. “Correlated Fluctuations of DNA Between Nanofluidic Entropic Traps.” Macromolecules, 48 (14), 5028-5033, 2015.

CONFERENCE  
PRESENTATIONS

1. **Duong, L.**, Bredenberg, C., Heeger, D.J., Simoncelli, E.P., “Gain-mediated statistical adaptation in recurrent neural networks”, Computational and Systems Neuroscience, Lisbon, Portugal, March 2022.
2. Zhou, J. **Duong, L.**, Simoncelli, E.P., “Fechner and Stevens can co-exist under Fisher’s roof.” Vision Sciences Society. St. Pete Beach, FL, USA. November 2021.
3. **Duong, L.**, Leavitt, M.L., Pieper, F., Sachs, A., Martinez-Trujillo, J.C., “Ensemble coding of spatial working memory and attention in primate lateral prefrontal cortex.” Society for Neuroscience. San Diego, CA, USA. November 2018.
4. **Duong, L.**, Gulli, R.A., Corrigan, B.W., Leavitt, M.L., Doucet G., Sachs, A., Martinez-Trujillo, J.C. “Lateral prefrontal cortex single neuron and ensemble activity during associative learning in virtually navigating primates.” Society for Neuroscience. Washington D.C., USA. November 2017.
5. **Duong, L.**, Abbass, M., Pieper, F., Sachs, A., Martinez-Trujillo, J.C. “Neural network properties are dynamically modulated by attention in primate lateral prefrontal cortex.” Society for Neuroscience. San Diego, CA, USA. November 2016.
6. **Duong, L.**, Leavitt, M.L., Pieper, F., Sachs, A., Martinez-Trujillo, J.C. “Construction of neural ensembles for optimal decoding of attention in primate prefrontal cortex.” Center for Visual Science Symposium: The Future of Attention. Rochester, NY, USA. May 2016.
7. **Duong, L.**, Pieper, F., Sachs, A., Martinez-Trujillo, J.C. “Effects of neural ensemble size and composition on the decoding of attention in primate lateral prefrontal cortex.” Vision Sciences Society. St. Pete Beach, FL, USA. May 2016.
8. **Duong, L.**, Abbass, M., Pieper, F., Sachs, A., Martinez-Trujillo, J.C. “Attention and normalization in area 8a of the primate dorsolateral prefrontal cortex are cell type dependent.” Society for Neuroscience. Chicago, IL, USA. October 2015.