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, **Computational Neuroscience** — (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 CONTRIBUTIONS

plenoptic.py (Python)
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 tetris." 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.