Eric Elmoznino

Artificial Intelligence
Cognitive Neuroscience

Contact
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Websites

Education

PhD | Computer Science
Mila (Université de Montréal)
2022-Now

MA | Cognitive Science
Johns Hopkins University
2019-2020

BASc | Computer Engineering
University of Toronto
2014-2019

DCS | Health Sciences
Dawson College
2012-2014

Skills

Languages/Frameworks
Python, PyTorch, TensorFlow, sklearn, Matlab, C++, C, C#, Swift/iOS, JavaScript, HTML, CSS, Flask, LaTeX

Subjects/Techniques
ML, Deep learning, MVPA, Computational modeling, Human vision, Linguistics, Full-stack web

Spoken Languages
English, French (Fluent in both)

Interests

Mind, Brain, and AI
Consciousness, Causal reasoning, Knowledge representation, Rapid OOD generalization, Lifelong learning, Modularity/compositionality, Vision

Public Speaking
Technical presentations, Teaching

Other Disciplines
Data Science, Genetics, Astrophysics, Philosophy of mind, Epistemology

Hobbies
Reading, Piano, Snowboarding, Tennis, Basketball, Ice hockey

Research Positions & Work Experience

2022-Now **AI Researcher** Mila (Université de Montréal), Montreal, QC
Development of AI with inductive biases from conscious high-level cognition, supervised by Profs. Guillaume Lajoie and Yoshua Bengio

2020-Now **Data Science Instructor** Lighthouse Labs, Toronto, ON
Teach lectures on machine learning topics at a full-time data science bootcamp to students with no coding background

2019-2022 **Cognitive Science Researcher** Johns Hopkins University, Baltimore, MD
Research on information representation and algorithms in the visual system of the human brain with Prof. Michael Bonner

2021 **Computational Neuroscience TA** Neuromatch Academy, Remote
Lead groups of students through tutorial exercises ○ Review lecture material and answer student questions

2017-19 **Machine Learning Researcher** ModiFace, Toronto, ON
Work on computer vision machine learning models for the beauty industry ○ Research papers on makeup rendering and skin condition diagnostics using deep learning

2018 **Computer Vision Contractor** Precious, Remote
Work on computer vision machine learning models related to facial perception for a mobile app that automatically makes photo albums of babies for new parents

2016 **Software Developer Intern** Orbis Investments, Vancouver, BC
Full-stack web development using AngularJS, Angular Material, ASP.NET MVC, Web API, and SQL Server in order to improve internal workflow efficiency for financial reporting

2012-14 **Private, Infantry Division** Canadian Armed Forces (Reserves), Valcartier, QC
Discipline and weapons training ○ Participation in combat and reconnaissance exercises

Highlighted projects

2023-Now **Compositional attractor models of human thought**
Learning discrete and compositional models of human thought using neural network attractor dynamics

2022-Now **Sampling compositions of modular neural networks**
Jointly learning a set of neural network modules and how to sample context-conditioned compositions of them using GFlowNets

2021-22 **Dimensionality and Manifold Geometry of Visual Representations**
Quantifying the relationship between a) the geometry of representations in a CNN and b) its similarity to visual cortex

2020-21 **Multiplicative Feature Interactions as Neural Computations**
Investigation into multiplicative interactions between features as a canonical neural computation ○ Use in models of neural data

2019-20 **Computational Modeling of Human Scene Representation**
Design of deep neural networks to model how humans represent environments ○ Comparisons to behavioural and neural data

2019-20 **Stimulus Synthesis for Brain Region Manipulation**
Generative model of images that would elicit a desired pattern of brain activity in a given region ○ Behavioural experiments

2020 **Language Model With Compositional Grammar Inductive Bias**
Tree-RNN provided part-of-speech tags and sentence parses in order to learn compositional representations of language

2018-19 **The History of You (human memory augmentation)**
Mobile app and algorithms to record, transcribe, and store your conversations, as well as later retrieve their content through search

Publications

2023 **Sources of Richness and Ineffability for Phenomenally Conscious States.** Eric Elmoznino, Xu Ji, George Deane, Axel Constant, Guillaume Dumas, Guillaume Lajoie, Jonathan Simon, Yoshua Bengio *Preprint*

2023 **Scene context is predictive of unconstrained object similarity judgments.** Caterina Magri, Eric Elmoznino, Michael F. Bonner

2022 **High-performing neural network models of visual cortex benefit from high latent dimensionality.** Eric Elmoznino & Michael F. Bonner *Preprint*

2020 **Visual representations derived from multiplicative interactions.** Eric Elmoznino & Michael F. Bonner *NeurIPS Workshop SVRHM*

2019 **A new procedure, free from human assessment that automatically grades some facial skin structural signs. Comparison with assessments by experts, using referential atlases of skin ageing.** Jiang R., Kezele I., Levinshtein A., Flament F., Zhang J., Elmoznino E., Ma J., Ma J., Coquide J., Arcin V., Omoyuri E., Aarabi P. *International Journal of Cosmetic Science*

Conference Talks & Posters

2022 **(Talk) High-performing neural network models of visual cortex benefit from high latent dimensionality.** Elmoznino E., & Bonner M. F. *Montreal AI Symposium*

2022 **(Poster) High-performing neural network models of visual cortex benefit from high latent dimensionality.** Elmoznino E., & Bonner M. F. *Cognitive Computational Neuroscience*

2022 **(Talk) Latent dimensionality scales with the performance of deep learning models of visual cortex.** Elmoznino E., & Bonner M. F. *Vision Sciences Society*

2021 **(Talk) Model dimensionality scales with the performance of deep learning models for biological vision.** Elmoznino E., & Bonner M. F. *Neuromatch 4.0*

2021 **(Poster) High-performing computational models of visual cortex are marked by high effective dimensionality.** Elmoznino E., & Bonner M. F. *Vision Sciences Society*

Invited Talks

2023 Why can't we describe our conscious experiences? An information theoretic attractor dynamics perspective of ineffability — Computational Phenomenology Group

2023 Why can't we describe our conscious experiences? An information theoretic attractor dynamics perspective of ineffability — Active Inference Institute podcast

2023 Why can't we describe our conscious experiences? An attractor dynamics perspective of the ineffability of qualia — University of Toronto guest lecture

2020 How does the brain work? Cognitive science research — SABES

2020 Introduction to Programming with Python — UofTHacks

Supervision

2023 **Maitreyi Swaroop** Mila, Montreal, QC
Masters (Mathematics and Computing)

2021-22 **Atlas Kazemian** Johns Hopkins University, Baltimore, MD
Masters (Cognitive Science)

2020-21 **Adyant Balaji** Johns Hopkins University, Baltimore, MD
Undergraduate (Computer Engineering & Cognitive Science)

2019-20 **Maro Maged Doce** Johns Hopkins University, Baltimore, MD
Undergraduate (Neuroscience)

Patents

2022 **System and method for image processing using deep neural networks.** Levinshtein A., Chang C., Phung E., Kezele I., Guo W., Elmoznino E., Jiang R., Aarabi P. *U.S. Patent No. 11216988*. Washington, DC: U.S. Patent and Trademark Office

2021 **Image-to-image translation using unpaired data for supervised learning.** Elmoznino E., Kezele I., Aarabi P. *U.S. Patent Application No. 17096774*. Washington, DC: U.S. Patent and Trademark Office

2020 **System and method for augmented reality using conditional cycle-consistent generative image-to-image translation models.** Elmoznino E., Ma H., Kezele I., Phung E., Levinshtein A., Aarabi P. *U.S. Patent Application No. 16683398*. Washington, DC: U.S. Patent and Trademark Office

2020 **Machine image colour extraction and machine image construction using an extracted colour.** Elmoznino E., Aarabi P., Zhang Y. *U.S. Patent Application No. 16854975*. Washington, DC: U.S. Patent and Trademark Office

2020 **Automatic image-based skin diagnostics using deep learning.** Jiang R., Ma J., Ma H., Elmoznino E., Kezele I., Levinshtein A., Charbit J., Despois J., Perrot M., Antoinin F., Flament R.S., Parham A. *U.S. Patent Application No. 16702895*. Washington, DC: U.S. Patent and Trademark Office

Other Activities

2018 **Instructor for ECE1780** University of Toronto, Toronto, ON
Taught lectures for a graduate course on DNNs deployed to mobile devices under Prof. Parham Aarabi

2015-16 **Finance Chair** Electrical and Computer Engineering Club, Toronto, ON
Elected by peers at the University of Toronto to manage the club budget and plan social activities

2014-15 **Class Representative** Electrical and Computer Engineering Club, Toronto, ON
Elected by peers at the University of Toronto to represent student interest at faculty meetings

Scholarships

2023 Vanier Canadian Graduate Scholarship ($150,000 value)
2022 UNIQUE Neuro-AI Excellence Scholarship ($15,000 value)
2016 Class of 4T3 Engineering James Ham Award ($10,000 value)
2015 Class of 5T6 Award of Merit ($15,000 value)
2012 McGill Science Award and Scholarship
2012 A.J. Grant Shield and Scholarship

Honors & Awards

2015 Class of 5T6 Award of Merit
2013 First Choice Science Award
2012 Quebec English Public Speaking (Provincial Finals) — Bronze Medal
2012 Governor General of Canada Academic Medal
2012 Royal Bank of Canada Shield
2012 Davies Family Shield
2012 Eakeley Shield
2011 Quebec French Public Speaking (Provincial Finals) — Silver Medal