Eric Elmoznino

Cognitive Neuroscience
Artificial Intelligence

Contact
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Websites

Education

PhD | Computer Science
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, Matlab, C++, C, C#, Swift/iOS, PyTorch, TensorFlow, JavaScript, HTML, CSS, Flask, LaTeX

Subjects/Techniques
Machine 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** — 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

Projects

2021-Now **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

2017 **Music-Generating AI**
Music generating machine learning model that uses DBN's conditioned on the state of LSTM's to probabilistically play different notes

2017 **Spatially-Aware AI**
Machine learning model that uses CNN's to predict it's own position and orientation, trained using synthetic data from my ray tracer

Publications

2020 **Visual representations derived from multiplicative interactions.** Elmoznino E., & Bonner M. F. *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) 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

2020 How does the brain work? Cognitive science research — SABES
2020 Introduction to Programming with Python — UofTHacks

Patents

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. 20200160153(A1)*. 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. 20200170564(A1)*. 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

Advising

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)

Honors & Awards

2021 Elsevier/Vision Research Virtual Travel Award
2016 Class of 4T3 Engineering James Ham Award
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 McGill Science Award and Scholarship
2012 A.J. Grant Shield and Scholarship
2012 Royal Bank of Canada Shield
2012 Davies Family Shield
2012 Eakeley Shield
2011 Quebec French Public Speaking (Provincial Finals) — Silver Medal