

ALEX HEYMAN (they/them)

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PhD candidate researcher at York University

Education

York University (York U)

Lassonde School of Engineering

PhD in Electrical Engineering & Computer Science (2023-present; completion expected around December 2027)

Master of Sciences in Computer Science (2021-2023)

University of Toronto (U of T)

Faculty of Arts & Science

Innis College

Honours Bachelor of Science with Specialist in Computer Science with Focus in AI, Major in Cognitive Science, Minor in Philosophy (2017-2021)

Publications

Reasoning Large Language Model Errors Arise from Hallucinating Critical Problem Features

Published on arXiv on 2025-05-19; under review at NeurIPS 2025

<https://arxiv.org/abs/2505.12151>

Work summary: I (the lead author) designed and ran experiments in which I procedurally generated reasoning problems and prompted several reasoning LLMs with them via their APIs, then statistically analyzed their answers and exposed chains of thought to draw conclusions about their failure modes.

Evaluating the Systematic Reasoning Abilities of Large Language Models through Graph Coloring

Published on arXiv on 2025-02-11

<https://arxiv.org/abs/2502.07087>

Work summary: I (the lead author) designed and ran experiments in which I procedurally generated reasoning problems and prompted several LLMs with them via their APIs, then statistically analyzed their answers to draw conclusions about their failure modes.

Fine Granularity Is Critical for Intelligent Neural Network Pruning

Published in *Neural Computation* Volume 36, Issue 12 (December 2024)

<https://direct.mit.edu/neco/article/36/12/2677/124823/Fine-Granularity-Is-Critical-for-Intelligent>

Work summary: I (the lead author) designed and ran experiments in which I trained ResNet-20 on

CIFAR-10 and CIFAR-100 and a small multilayer perceptron on MNIST under various pruning conditions, then statistically analyzed their accuracy and hidden-layer representation dimensionality to draw conclusions about the effects and efficacy of pruning at different granularities.

Information Utilitarianism

Published in *Perspectives on Ethics* (Journal of the University of Toronto Centre for Ethics)

Presented at “Ethics, Intersections, Reflections: C4E Undergraduate Research Conference” on 2021-07-17

<https://c4ejournal.net/2021/07/23/ethics-intersections-reflections-c4e-undergraduate-research-conference-2021-c4ej-33/>

Work summary: I (the author) describe a concern with standard total utilitarianism as a normative ethical theory, propose a modification to it intended to address the concern while preserving the theory’s primary virtues, and explore the implications of this modification.

Honours and Awards

York U (MSc)

Vector Scholarship in Artificial Intelligence (2021-22)

Lassonde Graduate Entrance Scholarship (2021)

AI-EGS (AI Systems: Engineering, Governance, and Society) Trainee Funding Award (2022)

U of T

President’s Scholar of Excellence

Innis College Exceptional Achievement Award (2019)

Innis College Alumni Association Scholarship (2020)

Skills

Machine learning

- Experience with TensorFlow, PyTorch, scikit-learn, and LLM API use
- York U EECS 6322 – Neural Networks and Deep Learning
- York U EECS 6127 – Machine Learning Theory
- York U EECS 6327 – Probabilistic Models and Machine Learning
- York U EECS 6415 – Big Data Systems
- U of T CSC413 – Neural Networks and Deep Learning
- U of T CSC412 – Probabilistic Machine Learning
- U of T CSC311 – Introduction to Machine Learning

General computer programming

- High familiarity with Java, Python
- Moderate familiarity with C, Lua, JavaScript
- Some familiarity with C++

Video game design and programming

- 10+ years of amateur experience

Web design, including use of HTML, CSS, and JavaScript

Mathematics up through linear algebra (U of T MAT223 & MAT224)
and multivariable calculus (U of T MAT237)

Symbolic logic (University of Chicago PHIL20100, U of T CSC240)

Selected Projects

Research with Prof. Jimmy Ba: Population-based training of neural networks in TensorFlow

Code link: <https://github.com/AlexHeyman/PopulationBasedTraining>

Undergraduate 2nd year

Cell2D – Java 2D game development library

Website: <http://www.cell2d.org/>

Development began 12th grade; ongoing/intermittent

Echo – short puzzle-platforming video game made in 38 hours

Website: <http://alexheyman.itch.io/echo>

Undergraduate 1st year