

TAREK IBRAHIM

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RESEARCH INTERESTS

My research interests lie in **systems for machine learning**: the infrastructure that trains and serves large models. I work on **accelerated and heterogeneous computing**, **distributed training and collective communication**, **ML compilers and runtimes**, and the transport and operating-system layers beneath them.

EDUCATION

Carleton University

Bachelor of Engineering, Software Engineering (Co-op)

September 2022 to April 2027 (expected)

PUBLICATIONS

- A. Fuller, Y. Yassin, J. Wen, **T. Ibrahim**, D. G. Kyrollos, J. R. Green, and E. Shelhamer, "LookWhere? Efficient Visual Recognition by Learning Where to Look and What to See from Self-Supervision," *Advances in Neural Information Processing Systems* (NeurIPS 2025), vol. 38, pp. 96710–96748. [doi:10.52202/085713-2910](https://doi.org/10.52202/085713-2910) / [arXiv:2505.18051](https://arxiv.org/abs/2505.18051) / [poster](#)

RESEARCH EXPERIENCE

Undergraduate Capstone Project

Carleton University

Supervisor: Prof. James Green

September 2026 to Present

- Fine-tune and pretrain vision transformers with self-supervision, and investigate test-time adaptation via entropy minimization, for real-time neonatal monitoring.

Research Assistant

CUBIC Lab, Carleton University

Supervisor: Prof. James Green

August 2024 to Present

- Develop deep learning and multimodal methods for real-time embedded healthcare monitoring.
- Built transformer-based peptide property predictors for drug discovery (I-CUREUS, Summer 2026).
- Co-authored a paper on efficient visual recognition via self-supervised attention, accepted at [NeurIPS 2025](#).

Google Summer of Code Contributor

The Apache Software Foundation, Apache HTTP Server Project (powering 24% of global traffic)

Mentor: Jean-Frederic Clere (Apache httpd and Tomcat committer, ASF Member)

May 2026 to August 2026

- Implemented HTTP/3 (RFC 9114) for the Apache HTTP Server as mod_http3, on OpenSSL 3.5 QUIC and nghttp3: 6,409 lines of C, 61 signed releases, integrated with httpd's normal request pipeline. [code](#) / [docs](#)
- Extended httpd's process management so a module can report connections that httpd did not accept itself; graceful stop and restart now drain in-flight HTTP/3 requests. Two patches under upstream review (apache/httpd [#699](#), [#709](#)).
- Built the test and release infrastructure: 56 integration tests against a live server, seven CI workflows, QUIC Interop Runner registration, and packages for Linux and Windows.

Research Student

Advanced Real Time Simulation Lab (ARSLab), Carleton University

Supervisor: Prof. Cristina Ruiz

April 2024 to July 2024

- Built, tested, and validated DEVS (Discrete Event System Specification) simulation models in CADMIUM.

Research Student

Carleton University

Supervisor: Prof. Safa Bidawii

January 2024 to April 2024

- Surveyed state-of-the-art reinforcement learning (DQNs on Gymnasium) and computer vision architectures (CNNs, GANs, SSMs, Transformers) on Digital Research Alliance of Canada compute.

TEACHING EXPERIENCE

Teaching Assistant

Carleton University

September 2024 to Present

- **SYSC 2310 Introduction to Digital Systems** Fall 2024
- **SYSC 3006 Computer Organization and Architecture** Winter 2026
- **SYSC 1006 Foundations of Imperative Programming** Winter 2026

SELECTED RESEARCH PROJECTS

Compute provided by the Google TPU Research Cloud (TRC) program.

Peptide Property Predictor

[Source] | 2026

- Trained a multimodal model that fuses frozen SMILES and ESM2 encoders with self-attention and bidirectional cross-attention for peptide property classification on the PeptiVerse benchmark.
- Built the JAX/Grain data pipeline (ArrayRecord) and ran 16 concurrent experiment slots on a TPU v4-32 pod.

CuMind: Reinforcement Learning Library

[Source] | 2025

- Reimplemented Google DeepMind's MuZero algorithm (Schrittwieser et al.) by combining representation, dynamics, and prediction networks with Monte Carlo Tree Search (MCTS) for model-based planning across Gymnasium domains.

LookWhere? Model Scaling & Deployment

[arXiv] | [Source] | 2024

- Orchestrated the systems-level deployment of Vision Transformers on Cloud TPU pods by optimizing throughput and mesh topologies to maximize hardware utilization (1TB High Bandwidth Memory, 10 petaFLOPs of FP16 compute), including diagnosing and correcting a per-device throughput measurement artifact.

INDUSTRY EXPERIENCE

Software Developer

May 2025 to December 2025

Searidge Technologies (SRT), Ottawa, ON

- Developed a multithreaded C++ microservice for global airport surveillance networks that ingests raw, unsteady camera streams and applies real-time affine transformations via OpenCV and CUDA to output broadcast-ready, stabilized feeds.

Software Developer

January 2025 to April 2025

Agriculture and Agri-Food Canada (AAFC), Ottawa, ON

- Deployed bioinformatics pipelines on national supercomputing clusters and ran LLM inference across $8 \times$ NVIDIA A100 GPUs on the two most powerful supercomputers [in Canada](#).

Software Developer

May 2024 to August 2024

James Evan & Associates (JEA), Victoria, BC

- Developed enterprise web applications for state and provincial governments managing billions in pension funds.

TECHNICAL SKILLS

Languages: C++, C (embedded), Python, Go, TypeScript, Java, SQL, Bash

Libraries and tools: CUDA/HIP, OneAPI, JAX, PyTorch, OpenCV, Boost, GTest, gRPC, CMake, Valgrind, Wireshark, Docker, Conda, SLURM

INVITED TALKS

1. Local AI Deployment with Ollama and Docker, *cuHacking*, 2025.
2. The Importance of AI Reasoning, *CU@Kanata*, 2024.
3. CUAIS Innovation Lab, *Carleton University*, 2024.

AWARDS

Teaching Assistant, Carleton University (\$3,600 each)	2024, 2026
Undergraduate Research Assistant (I-CUREUS), Carleton University (\$2,500)	2026
Google Summer of Code (GSoC) Stipend, The Apache Software Foundation (\$8,300)	2026
Best Ambient / Async Agent (Sponsored by LangChain), "Eh I" Summer Vibe Hackathon (\$1,000)	2025
Best Implementation of MCP in a Coding Agent (Sponsored by Ross Video), "Eh I" Summer Vibe Hackathon (\$600)	2025
Dr. F.W.C. Mohr Entrance Scholarship, Carleton University (\$3,000)	2022

PROFESSIONAL SERVICE

Google TPU Research Cloud (TRC) Researcher	2024, 2025, 2026
Digital Research Alliance of Canada (DRAC) Sponsored Researcher	2024, 2025, 2026
DEV.0 Project Program Mentor, Carleton Systems and Computer Engineering Society	2025
Founding Member, Carleton Artificial Intelligence Society (CUAIS)	2024