

David Courtis

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Fields of Interest

- Reinforcement Learning
- World Model Building
- Mechanistic Interpretability / XAI
- Verifiable Formal Reasoning
- Continual learning
- NLP/CV in Neural Space

Education

University of Toronto, Masters of Applied Science (MASC) 2025 – Current

- GPA: 4.0/4.0 — LLM Reasoning, Embodied AI, Reinforcement Learning

Queen's University, Bachelor of Computing (Hons.) 2020 – 2025

- GPA: 3.95/4.0 — Mathematics and Artificial Intelligence Specialization

Industry & Research Experience

AI/ML Graduate Researcher Dec 2025 – Present

University of Toronto, Data-Driven Decision Making Lab

- Major Publication - ICLR 2026 introducing a neurosymbolic agentic planning framework that enforces sound and deterministic reasoning for LLM-based agents in open-world environments, improving previous baselines by 373% and attaining state-of-the-art across central benchmarks.
- Design and build autonomous LLM-driven neuro-symbolic RL agents that discover mechanics in open world, partially observable, unknown environments through systematic experimentation and world model learning.
- Architected a multi-phase agentic pipeline with independent LLM reasoning calls per action cycle (analysis, modeling, exploration), each producing structured JSON via Pydantic schema-enforced outputs.
- Designed MCP-based tool server architecture decomposing the system into discoverable, pluggable services: game environment interaction, perceptual analysis, knowledge store, and symbolic verification.

AI Systems Developer

Osler Health Solutions

Dec 2023 – Sep 2024

- Designed and deployed to production a multi-stage agentic data processing pipeline for hospital surgical block schedule optimization into an existing client facing product involving a novel time-constrained optimization ML model, generating an additional ~C\$300 million in surgical revenues at Quincy, Belleville, and Trenton Hospitals.
- Created EDAs of hospital client data pre/post-surgical optimization, work used in stakeholder collaboration pitch to managers at EY, KPMG, and Ontario Hospital Association Board of Directors, securing government approval for hospital use in Canada.

Software Developer

Distributive

May 2023 – Dec 2023

- Maintained and reviewed 500k+ lines in a Node.js distributed computing platform; managed GitLab CI/CD pipelines and resolved 100k+ lines of technical debt.

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- Led the frontend refactor efforts behind a product for distributed AI inference, rewriting 50k+ lines of legacy React and enabling training, reinforcement/finetuning, LORA, and distributed inference of common architectures via ONNX (LLM, VLM, VLA, Diffusion, CNN).
- Designed client-facing demos raising over \$1M+ in VC funding, demonstrating on-demand distributed compute.
- Data and backend architect behind a PostgreSQL system created to store, maintain and access up to 4 petabytes of length 117 legendary pair search space data created through 1000+ core distributed computing.

Software Test Automation Intern**Government of Canada**

May 2022 - Sep 2022

- Lead the development on automation of manual tests for an employee management portal using Selenium WebDriver and the Oracle Testing Suite to reduce the time of testing by 98%.
- Overhaul entire employee management portal UI testing solutions, leading to achievable test traceability and improving detection quality.
- Establishing and implementing solutions for Oracle-compatible automation and testing libraries into CI/CD pipeline.

Leadership & Projects

Assistant Researcher**Queen's University, Machine Intelligence & Biocomputing Lab**

May 2024 – May 2025

- Invented a dictionary learning methodology using sparse autoencoders to extract personality traits directly from LLM latent spaces, enabling direct steering of LLM behaviours by modulating neuron activation rather than through widely used prompting.
- Identified universal latent features between differing LLM architectures and training sets, and found ways to interpret extracted features, enabling 2+ orders of magnitude more efficient feature quality evaluation for personality classification.

Consulting Project Manager**Queen's University, QMIND Design team**

May 2022 – May 2024

- Identified latent features through Gated SAEs in Pytorch and expanding on research progress by modifying the architecture for extracting higher-dimensional representations using a stacked architecture.
- Oversaw 4 project managers and 15+ design team members across 8 months, mentoring, onboarding members onto Git, research methodologies, and ensuring development progress for national conference deadlines.

Lead of Computer Vision**Queen's University, QMIND Design team**

May 2022 – May 2024

- Recreated code from paper in tiny object detection in Pytorch and expanded on research progress by modifying the CNN architecture for application specific limitations for non-local yield and disease detection.

- Worked with client University of Nairobi to reduce labour time taken by 5+ orders of magnitude of local farmers by automating yield forecasting of maize fields through regressive density-based CNNs.
- Deployed a full stack application in React and Flask for a live demo of ML pipeline for client fundraising. Presented and won the Sustainable Technology award at CUCAI23.

Lead of Full-Stack Development

Queen's University, Computing Student's Association

May 2022 – May 2023

- Replaced external hosting and outsourced frontend development for the official Queen's Computing Association's website, eliminating 90% of total costs while keeping 1800+ monthly students connected to required university resources.
- Slashed critical path time by 20% by managing and providing adequate training for 3 first-year developers in fullstack web and professional development, encouraging the use of agile methodologies to newcomers, and enabling contingency plans to ensure the continuation of services.

Talks and Volunteering

Coding Camp Organizer

2024

Camp QMIND, Queen's University

- Competitive event director, introducing and helping manage over 90 students in a pitch-style competitive coding and research event to PhD panel of judges for prizes.

Workshop Host

2024

QMIND Summer Workshops, Queen's University

- Presented a guide to CI/CD and Version Management workshop to 40+ students.

Professional Development Weekend Guest Speaker

2023

Queen's Arts and Science Undergraduate Society, Queen's University

- Presented guidance on how students can create an impressive and effective LinkedIn profile to 20+ students.

Orientation Leader

2021

Computing Student's Association, Queen's University

- One of 12 orientation leaders for the whole computing cohort of 2021 and 2022.

First Year Mentor

2021

Computing Student's Association, Queen's University

- Coached incoming first year students through bi-weekly meetings focusing on PD and general advice for their first year.

Teaching Experience

Teaching Assistant	Queen's University
Winter 2026	MIE 223 Data Science
Winter 2023-2024	CISC 352 - Artificial Intelligence
Fall 2023	CISC 235 - Data Structures
Winter 2023	COGS 100 - Introduction to Cognitive Science
Fall 2021-2022	CISC 101 - Introduction to Computer Programming

Technical Skills

- Python + ML libraries/tools (Pytorch, Sklearn, Pandas, Huggingface)
- Training, reinforcement/finetuning, LORA, and distributed inference of common architectures (LLM, VLM, VLA, Diffusion, CNN).
- Agentic and MCP Stack (Pydantic/AI/Langchain + FastAPI + OpenTelemetry/Logfire)
- Deep Learning Architectures (Transformers, Diffusion, Flow, LSTM, Mixture of Experts, GAN)
- DevOps & Tools, Git/GitLab CI/CD, ONNX, JWT, production ML deployment, code review

Extensive Project Experience: and [active in 6+ national hackathons](#) with application to AI and fullstack distributed computing.