

Ethan Fung

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EDUCATION

University of Waterloo

Sep. 2025 – Present

Bachelor of Software Engineering

Waterloo, ON

- \$20,000 Scotiabank Software Engineering Entrance Scholarship; GPA 3.9/4.0

EXPERIENCE

Toronto Metropolitan University

Jun. 2024 – Jul. 2025

Robotics Junior Research Assistant

Toronto, ON

- Co-authored **peer-reviewed papers** comparing analytical vs. deep-learning **inverse kinematic pipelines**.
- Presented full-stack **6-DOF manipulation system** at IC-MSQUARE 2024, covering IK and control accuracy.
- Achieved ± 3 mm end-effector accuracy via 5th-order torque trajectory control in MATLAB/Simulink.
- Integrated custom actuation hardware with AprilTag + OpenCV for **autonomous pose estimation**.
- Published in **JPCS 2024** (doi:10.1088/1742-6596/3027/1/012039) and **IJSES 2024**.

FIRST Tech Challenge Teams 16417 & 19446

Sep. 2023 – Jun. 2025

Robotics Team Captain

Markham, ON

- Built **Java-based** autonomous pipelines with OpenCV perception, **odometry**, and multithreaded PID control.
- Directed **30+** members across programming, mechanical, and outreach subteams to deliver award-winning robots.
- Achieved World Championship ranks **#6** (2023) and **#8** (2024) out of 7,000+ global teams; won 3 consecutive Provincial Championships and Control Awards.

International Olympiad in Artificial Intelligence

Jul. 2025 – Aug. 2025

Team Canada Competitor

Beijing, China

- **Highest scorer on Team Canada**; ranked in the top 50% among 280+ competitors from 40+ countries.
- Solved time-constrained **multimodal ML tasks** (retrieval, classification, vision) under **offline compute** limits.
- Designed end-to-end ML pipelines (preprocessing, modeling, evaluation) in a competitive, research-style setting.

TECHNICAL PROJECTS

Satellite Rainfall Segmentation (GOES-16) (IOAI) | *Geospatial ML, Data Pre-processing*

- Built **SE-ResNet** encoder + **U-Net** decoder for 18-channel rainfall segmentation with patch-stitch inference.
- Boosted **imbalanced rainfall signal** via spectral re-weighting and fusion of precipitation-sensitive IR bands.
- Improved model robustness through domain-consistent augmentations, achieving **0.86 IoU** on validation.

Hint-to-Word Semantic Retrieval (IOAI) | *Retrieval Pipelines, Clustering*

- Implemented an **SBERT** embedding-based retrieval using k-NN cosine similarity for top-*k* candidate ranking.
- Built alternative **retrieval heads** and **UMAP+KMeans** clustering under **offline <1B param** constraints.
- Applied **contrastive fine-tuning** on hint-label pairs, achieving **0.83 NDCG@10** on the validation set.

MooseTrax — Biomechanics Evaluation | *Computer Vision, Temporal Signal Analysis*

- Stabilized pose keypoints from raw exercise videos with **confidence pruning** and temporal filtering.
- Quantified and segmented reps via **ground-truth-aligned joint-angle kinematics**, measuring form deviations.
- Built **confidence-gated** analytics to prune unreliable links and produce structured metrics for LLM feedback.

Video-Based Motion Analysis for Badminton | *Computer Vision, Object Tracking, Sequence Modeling*

- Mapped YOLOv8 player/shuttle detections to **court coordinates** via Canny/Hough geometry and homography.
- Applied **Kalman filtering** to recover smooth player and shuttle trajectories from noisy observations.
- Trained a **GRU** on temporal sequences to predict shot-response patterns and produce actionable training insights.

Text-to-Motion Reinforcement Learning for 6-DOF Robot | *Embodied AI, Motion Planning, Unity*

- Developing a physics-based **6-DOF manipulation simulator** for reinforcement learning motion planning.
- Investigating **text-to-motion grounding** by mapping language embeddings to goal-conditioned RL policies.
- Integrating **PyTorch** policy networks with Unity via closed-loop inference for low-level joint-space control.

TECHNICAL SKILLS

Languages: Python, C++, Java, MATLAB, C

ML / Modeling: PyTorch, TensorFlow, Transformers, Sequence Models, Reinforcement Learning

Systems / Tooling: ROS2, Unity, Simulink, Linux, Docker, Git