

# Chris Peng

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## Education

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### University of Toronto

Sept 2025 – Present

*BASc, Engineering Science* (Transferring to Electrical & Computer Engineering, Sept. 2026)

*Toronto, ON*

- Cumulative GPA: **3.63**/4.00 | **Dean's Honour List** (Fall 2025)

## Research & Projects

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### Autonomous Game-Playing AI Agent | *Python, YOLOv8, OpenCV, ONNX, NumPy*

Nov 2025 – Present

- Architected a **multi-threaded producer-consumer pipeline** with daemon threads (YOLO, template matching, OCR) communicating via `queue.Queue(maxsize=1)` and non-blocking reads, decoupling AI inference from the main game loop to sustain **30+ FPS**.
- Built a three-branch **perception engine**: **YOLOv8/ONNX** for enemy unit detection; **OpenCV Canny edge template matching** against a multi-variant card library for hand tracking; **EasyOCR** with a preprocessing pipeline (300% upscale, binary threshold) for tower health OCR.
- Applied **homography perspective transformation** (`cv2.getPerspectiveTransform`) to map screen pixels to an **18×30 isometric tile grid**; implemented a **TTL state cache** (1.5s threshold) to suppress flicker-induced false negatives; tracked elixir via **sub-pixel HSV contour measurement** with morphological noise filtering.
- Engineered a **multivariate kinematic threat model** scoring active units by damage potential, mass, and **Euclidean distance** to friendly targets; computed **predictive interception coordinates** for AoE spells from unit velocity vectors and deployment latency, resolved to screen space via **inverse perspective transform**.

### Automated Robertson Screw Sorter | *Python, YOLOv8, OpenCV, C++, Arduino*

Jan 2026 – Present

- Built a **computer vision pipeline** using **YOLOv8/ONNX** to classify screw head shape and rust presence, paired with an **OpenCV** dimensional analysis module calibrated at **30.0 px/cm** to derive real-world screw length from bounding box geometry.
- Developed a **serial communication bridge** between a Python CV host and an Arduino microcontroller; byte-level sort commands dispatched to a **servo gate** and **NEMA stepper motor** for bin selection, with an **IR obstacle sensor** synchronizing screw arrival with pipeline processing time.
- Decoupled vision inference from hardware actuation via **multithreaded architecture**; applied **Design for Maintainability** and **Safety** frameworks per the ESC102 PraxisII RFP for operator-safe deployment.
- Curated a rust-positive training dataset by **chemically accelerating oxidation** on Robertson screws under controlled conditions; annotated samples and fine-tuned the **YOLOv8** classifier to distinguish active corrosion from surface discolouration across varied lighting conditions.

### Matboard Bridge Design | *Python, Statics, Engineering Design*

Nov 2025 – Dec 2025

- Designed a truss bridge through 5+ iterations using **load-path analysis** and a **Python** bending moment simulator, achieving a **1250 N** failure load (3× requirement) at optimal strength-to-weight ratio.

## Leadership & Work Experience

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### City of Mississauga

Sept 2023 – Present

*Aquatic Deck Supervisor (Leadership, Crisis Management, Operations)*

*Mississauga, ON*

- Supervise 14 staff and 200+ daily patrons; coordinate emergency response and safety protocols.
- Contributed to the facility becoming one of the **top five revenue-generating centres** citywide.

## Technical Skills & Awards

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**Programming:** Python (OpenCV, YOLOv8, ONNX, EasyOCR, NumPy, PyTorch, Threading, Queue), C/C++, MATLAB, React, Node.js

**Engineering:** Embedded Systems (Arduino, Serial Comms, Stepper/Servo Control), Homography Transforms, Kinematic Modelling, Multi-threaded Pipelines

**Languages:** English (Native), Mandarin Chinese (Native), French (DELFB2)

**Awards:** IB Score 43/45 | RCM Level 10 Piano, RCM Level 8 Violin