

Paul Choi

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Third-year Engineering Science student at the University of Toronto with hands-on experience in vision-based robot manipulation, object localization, and learned control. Skills spanning camera calibration, closed-loop inverse kinematics, and reinforcement learning for simulated locomotion, backed by strong Python/PyTorch fundamentals and the full robotics stack: mechanical design, embedded control, and simulation (Isaac Sim, MuJoCo).

Education

University of Toronto, Bachelor of Applied Science and Engineering

Sep 2024 – Apr 2029

B.A.Sc in Engineering Science + P.E.Y Co-op

Toronto, ON

- Robotics Engineering Major; Artificial Intelligence Minor; cGPA: 3.58
- Relevant Courses: Data Structures & Algorithms (ESC190, C), Programming Fundamentals (ESC180, Python), Digital and Computer Systems (ECE253, SystemVerilog/FPGA), Linear Algebra (MAT185, MATLAB)
- Extracurriculars: UTRF Driverless Mapping Team Member

St. Michael's College School

Sep 2020 – Jun 2024

High School Diploma

Toronto, ON

- Graduated with a 98.3% average; moderated the Computer Science and VEX Robotics clubs
- Outdoor camp leader and peer tutor

Experience

UTFR Driverless Mapping Team Member

Sep 2025 – Present

- Developed autonomous mapping and localization software using FastSLAM and ROS, integrating multi-sensor telemetry streams to improve high-speed state estimation on an autonomous racecar.
- Processed and analyzed real-world sensor data to construct environment representations for navigation, diagnosing sensor orientation errors to improve tracking reliability.
- Built visualization tooling in Foxglove Studio to inspect data pipelines and debug algorithm performance from live and recorded vehicle telemetry.
- Collaborated with a multidisciplinary robotics team via Git/GitHub for version control and code review to iterate on algorithm design and system architecture.

St. Michael's Hospital Biomedical Volunteer

Aug 2026 – Present

- Diagnosed and repaired electro-mechanical and sensor-level faults in clinical medical devices alongside hospital clinical engineering staff in a fast-paced environment.
- Executed preventive maintenance and electrical safety validation protocols, ensuring full regulatory compliance and minimal downtime for critical clinical equipment.

AI Camp - Predictive Modeling Team

Aug 2024

- Developed supervised machine learning models on large, real-world datasets, performing feature engineering, preprocessing, and model evaluation.
- Analyzed model performance and limitations to guide iterative improvements, strengthening data-driven modeling skills applicable to learning-based robotics systems.

Projects

BracketButler | Team Hackathon Project — Battle of the Schools

Sep 2026

- Built an autonomous robotic waiter on the pre-existing BracketBot platform in a 24-hour hackathon, designing a custom docking station and tray to enable fully autonomous pickup and delivery with zero teleoperation.
- Implemented ArUco-tag-based visual navigation with a calibrated fisheye camera and OpenCV PnP pose estimation, driving a closed-loop visual-servo controller to locate and approach the tray, docking station, and user.
- Solved smooth, spill-free two-arm tray lifting using the bbos pub/sub framework for coordinated dual-arm control with preset pose interpolation (“ramping”), backed by a retry-with-verification loop that cross-checks real motor encoder positions against target commands until convergence.
- Integrated on-device speech recognition (faster-whisper over WebSockets) for hands-free voice commands, and won 2nd place in the Robotics Track (Best Use of Next-Gen Robots) among 200+ participants at Battle of the Schools, a UofT × Waterloo hackathon.

Autonomous 4-DOF Pick-and-Place Robot | Personal Project

Aug 2026 – Present

- Designed a custom 4-DOF parallel-linkage robotic arm in Fusion 360 and built a URDF pipeline to model its physics, closed-loop kinematics, and joint limits inside NVIDIA Isaac Sim for high-fidelity simulation ahead of hardware deployment.
- Engineered an overhead OpenCV vision pipeline that segments and localizes target objects in real time, applying intrinsic/extrinsic camera calibration to unproject 2D pixel coordinates into precise 3D world coordinates.
- Implemented a closed-form analytical inverse kinematics (IK) solver in Python to translate 3D visual targets into real-time joint actuation, closing the perception-to-actuation loop for fully autonomous, vision-guided pick-and-place execution.

Humanoid Bipedal Robot | *Personal Project*

Jun 2026 – Sep 2026

- Designed, CAD-modeled, and fabricated a 15-DOF bipedal humanoid robot from scratch using Fusion 360 and FDM 3D printing.
- Modeled robot kinematics and dynamics by exporting assemblies into custom URDF and MuJoCo XML simulation environments with tuned physical and inertial properties.
- Programmed and deployed Python-based control software onto an onboard Raspberry Pi to interface with servo drivers and execute autonomous locomotion routines.
- Developed and trained reinforcement learning policies (PyTorch, Stable Baselines3) for dynamic walking gaits and balance recovery, iterating entirely in simulation before hardware deployment.

Custom 6-Axis Robot Arm | *Personal Project*

Jul 2025 – Sep 2025

- Designed, CAD-modeled, and built a complete 6-DOF robotic arm from scratch using Fusion 360 and FDM 3D printing to study kinematic modeling and coordinated motion.
- Applied forward and inverse kinematics and implemented command-based control abstractions in C++ to separate motion planning from actuation.
- Implemented tuned PID feedback loops for closed-loop position control, damping mechanical oscillation to achieve ± 1.0 mm end-effector repeatability at full reach.
- Explored system-level trade-offs between accuracy, complexity, and control robustness.

Autopiloted RC Plane | *Personal Project*

Feb 2024 – May 2024

- Designed and implemented a PID-based control system for autonomous flight stabilization, tuning control parameters experimentally using real-time sensor feedback.
- Analyzed system stability and responsiveness under changing environmental conditions, gaining hands-on experience with real-time embedded systems and control theory.

Skills

Robotics & Controls: ROS/ROS2, SLAM (FastSLAM), PID Control, URDF & Kinematic Modeling (Forward/Inverse Kinematics), NVIDIA Isaac Sim, MuJoCo, Foxglove Studio, Embedded Systems, FPGA & Digital Logic Design (SystemVerilog)

Computer Vision: OpenCV, Camera Calibration (Intrinsic/Extrinsic), Object Segmentation + Localization

Machine Learning & AI: PyTorch, Feature Engineering, Reinforcement Learning (Stable Baselines3), Generative AI, LLM-based Systems, Basic NLP

Programming & Software Engineering: Python, C/C++, Java, Data Structures & Algorithms, Git/GitHub, Linux/Bash

Systems & Hardware: Raspberry Pi, Arduino, Actuator & Motor Control (PWM, Servos, Steppers), Communication Protocols (I2C, SPI, UART, Wi-Fi), Sensor Interfacing

Backend & AI Tooling: REST APIs, FastAPI, Vector Databases

Mechanical Prototyping: Fusion 360, AutoCAD, MATLAB, Rapid Prototyping (FDM 3D Printing, DFM)

Professional: System Debugging, Technical Communication, Team Collaboration