Jaskaran Pabla

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About

Engineering Systems and Computing student building autonomous robotics systems across embedded software, computer vision, simulation, and hardware integration. View project demos, technical documentation, and development updates at jas.ca.

Education

University of Guelph Sept 2024 – April 2029
Bachelor of Engineering, Engineering Systems and Computing *Guelph, ON*

Experience

EMR Integration Consultant June 2026 – Aug 2026
D2Type *Canada*

- Analyzed the Canadian EMR integration landscape across major platforms, evaluating available APIs, technical requirements, and integration workflows.
- Developed integration plans and began work toward connecting D2Type's AI clinical documentation platform with existing EMR systems.

Embedded Software Engineer March 2025 – June 2025
Pocket Clinic *Waterloo, ON*

- Designed and implemented an offline voice-command system in C for embedded hardware and microcomputers, focusing on low-latency execution and minimal memory usage.
- Developed embedded C modules for real-time audio capture, signal preprocessing, and command parsing under strict CPU and memory constraints.
- Implemented a fuzzy word-matching algorithm to tolerate accent-related pronunciation variation and background noise, significantly improving command recognition reliability.
- Built and demonstrated working prototypes directly to the founder, iterating on system behavior based on real-world testing and feedback.

Projects

Autonomous Multi-Tool Drone | *Python, MAVSDK, ArduPilot, OpenCV/YOLO, Gazebo, ROS2* Jan 2026 – Present

- Developing a custom autonomous quadrotor with modular tool-swap capability, serving as the sole software engineer on a 3-person team and leading flight software, autonomous perception, simulation, and electrical integration.
- Developed a computer-vision pipeline using OpenCV for ArUco marker detection and camera pose estimation with `solvePnP`, enabling precision landing on stationary and moving targets.
- Integrated Ultralytics YOLO with VisDrone weights for real-time object detection and autonomous target tracking, feeding bounding-box coordinates into the flight-control loop for closed-loop vision-guided flight.
- Built a two-node perception architecture using a Raspberry Pi for latency-sensitive onboard fiducial detection and a laptop for computationally intensive YOLO inference, communicating over WiFi.
- Built the flight-control layer in Python using MAVSDK and asyncio, sending offboard position and velocity commands to ArduPilot and using task cancellation to transition from scripted flight to vision-driven target tracking upon detection.
- Built a Gazebo Harmonic and ArduPilot SITL simulation environment with a custom drone model, calibrated downward-facing camera, and moving targets, enabling development and validation of the full autonomy stack before hardware testing.
- Integrated, wired, and validated the drone's flight-control and power systems, resolving firmware, communication, motor-control, and power-distribution issues through systematic testing with QGroundControl and Mission Planner.
- Migrating the system to ROS2 to support additional cameras, sensors, and distributed compute as the platform scales, replacing hand-managed shared state with structured inter-node messaging.

3D-Printed Multi-Axis Robotic Arm | *Solidworks, Embedded C, Arduino, Servo* June 2025 – Sept 2025

- Designed and fabricated a multi-axis robotic arm, using Solidworks to model a 20+ part mechanical system with joint geometry defined by servo torque limits and range of motion.
- Used motion studies and stress analysis to identify high-stress regions and joint interference, driving geometry changes that reduced component mass by 25% while maintaining structural strength.
- Developed embedded C firmware on an Arduino microcontroller to control 6 servo motors, translating joystick input into coordinated multi-joint motion.