

ACHAL PATEL

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SUMMARY OF SKILLS AND QUALIFICATIONS

Platforms: Fusion360 • Visual Studio • VS Code • Platform IO • ESP-IDF • Jira • Jenkins • Docker Compose • SQL • MATLAB • Simulink • KiCad • JetBrains suite.

Programming: C • C++ • Python • Java • VHDL • SystemVerilog • ARM Assembly • YAML

Libraries: PyTorch • TensorFlow • MediaPipe • OpenCV • NumPy • Matplotlib • SciPy • Pandas • FreeRTOS

Others: ROS2(Gazebo & Rviz Simulation) • Control Systems • Docker • Git Bash • Hugging Face • Pytest • 3D Printing • MQTT

Currently ongoing: SLAM • Reinforcement Learning • ML • Sensor Fusion • TinyML • MPC

Languages: English, (Spoken & Written) • French (Beginner A1 certified)

WORK EXPERIENCE

Robotics Research Intern (CUARL — CRAWLR Rover)

May 2025 – Dec 2025

Montreal, QC

Concordia University Aerospace Robotics Lab (CUARL)

- Worked on **CRAWLR (Concordia Robotic Articulated Wheel-Legged Rover)**, an experimental space-rover platform for push–pull locomotion research in unstructured planetary terrain; full-time (May–Aug) then part-time (Sep–Dec)
- Brought up and stabilized ROS2 motion controllers for motor control over CAN (EPOS4), integrating ros2_control/ros2_controllers with Virtual CAN workflow using ros2_canopen to enable hardware-identical testing without the physical rover
- Implemented Xacro conditional plugin loading and launch-time arguments for seamless simulation/hardware switching, removing manual config edits and streamlining development workflow for the entire team
- Built complete Xbox joystick teleoperation package with pipeline: Joy → Twist → diff-drive/skid-steer solver → Float64MultiArray → CAN; validated in Gazebo and on hardware during field trials
- Implemented perception-based position estimation for closed-loop experiments using **ZED2/ZED SDK** and **ArUco markers**, achieving 20–30 Hz estimation with ROS2 message type integration for Simulink control stack

Validation Engineering and Semiconductor design Intern

Sept 2024 – Dec 2024

Microchip Technology Inc.

Montreal, QC

- Validated hardware for **800G Ethernet PHYs** with **112G PAM4 SerDes** for high-speed data centers, designing test scenarios using Pytest to ensure **IEEE standards** compliance
- Gained deep knowledge in Error Detection, Ethernet Frames, and OSI model with focus on MAC & PHY layers, particularly PCS (Physical Coding Sublayer) for encoding/decoding
- Received training on **NASA's HPSC** (High-Performance Spaceflight Computing) project, using SystemVerilog for hardware verification and fault-tolerant systems to mitigate **SEUs** (Single-Event Upsets)
- Gained expertise in large-scale project management, hardware design, fault injection, regression testing, Git with Bitbucket, CI/CD on Jenkins, and extensive Linux experience for deployment, testing, and system management

Undergraduate Teaching Assistant

May 2024 – Present

Concordia University

Montreal, QC

- SOEN/COMP 228** (System Hardware): Taught tutorial classes and project-oriented lab sessions, guiding students in building a 4-bit RISC CPU on a breadboard with logic gates, flip flops, timers, shift registers and a microcontroller.
- COEN 313** (Digital Systems Design II [FPGA]): Conducted lab sessions, teaching VHDL programming, from basic constructs to RT-level design, covering combinational and sequential circuits, FSMs, and FPGA basics.
- MIAE 215** (Programming for Mechanical and Industrial Engineers): Tutored student C++ and embedded programming for microcontrollers in tutorials and guided with an robotics project with in the lab sessions
- Developed websites to educate with curated videos, resources, notes, and exam tips to help students succeed.

PROFESSIONAL ASSOCIATIONS & VOLUNTEER WORK

Vice President of Projects

June 2024 – Present

IEEE Concordia student branch

Concordia University

- Manage multiple project teams as a Project Manager, leading the planning and execution of initiatives created by me to engage students from beginner to advanced levels, ensuring hands-on learning and skill development
- Mentoring less-experienced students in various techniques (programming, electronics, CADing, soldering, circuit design, and IT networking), guiding them through challenges and helping the team achieve tangible results.

- Drive recruitment by creating onboarding materials, conducting interviews, and integrating new recruits efficiently into the team. I also secure critical project funding and ensure all members get the resources needed.

Engineering Workshops Instructor

October 2023 – Present
Montreal, QC

Concordia University

- Created Several Interactive workshops on Intro to Robotics, Intro to 3D Modeling & Printing with Fusion360 and Intro to Microcontrollers with ESP32, teaching university & CEGEP students practical skills in design, Programming and embedded systems.

Vice President of Marketing

Sep 2023 – Apr 2024
Concordia University

IEEE Concordia student branch

- Led the marketing team through a successful rebranding of IEEE Concordia's social media, doubling Instagram followers in 8 months through strategic content creation and event promotion for 20+ workshops/events.

PROJECTS

CRAWLR Rover (CUARL) | ROS2, MoveIt2, Gazebo, CAN, ZED2, OpenCV

May 2025 – Dec 2025

- Developed a reusable simulation->hardware workflow for a wheel-legged space-rover testbed using Virtual CAN and ROS2 control, enabling safer iteration on mobility/control logic.
- Implemented launch-time simulation/hardware switching via Xacro conditional plugin loading; reduced integration friction and improved reliability for lab-wide testing.
- Built and validated a joystick teleoperation stack and perception-based position tracking (ZED2 SDK + ArUco) to support closed-loop experiments and data collection.

6-Axis Robotic Arm using ROS | Personal, IEEE Concordia

Sept 2024 – Ongoing

- Leading a multidisciplinary team of 6, MECH, ELEC, and SOEN students in developing a modular, 3D-printed, 6-DOF robotic arm with a custom cycloidal actuator, overseeing task assignments, project decisions, and ROS setup.
- Developing a ROS2 framework for a precise closed-loop controller, inverse kinematic solver for 3D space retracing and end-effector alignment using ML-based object detection & computer vision on Jetson Nano to optimize real-time inference performance.

Autonomous Forest fire prevention Drone | Personal, IEEE Concordia + Competition

July 2024 – Ongoing

- Building a custom drone featuring GPS-based mission planning & pathfinding, altitude hold using optical flow, and FPV head-tracking gimbal. Integrating , PID tuning, and sensor data filtering for enhanced flight stability.
- Competing in the NARC UAV competition with a focus on creating an autonomous drone designed for forest fire prevention and safety missions, utilizing computer vision with Mediapipe for fire detection & obstacle avoidance.
- Implementing gesture control using TinyML on a Microcontroller as a personal challenge, allowing the drone to switch between FPV head-tracking mode and gesture-controlled mode when not using FPV.

The IoT Automation Project | Personal, IEEE Concordia

Sep 2024 – Dec 2024

- Led the transformation of the club's workshop into a smart lab with a team of 6, developing a fully self-hosted IoT network using WIFI, Zigbee, MQTT, InfluxDB, on our own servers, eliminating reliance on cloud services.
- Made our own Wifi and Zigbee based IoT devices and sensors all connected through a unified automation system on Home Assistant, creating optimized automations through Node-Red, and enabled voice control via Alexa.
- Enhanced lab safety and functionality with an ML object detection Object running on camera feeds and running inference on a CORAL TPU, automating lab routines to control devices like lights, soldering irons, and cabinet locks based on real-time data, while ensuring network security all throughout this smart security system.

Autonomous Sumo Robot | Personal + Competition

Feb – Mar 2024

- Engineered a Sumo robot with precision in design using Advanced CADing and 3D printing for rapid prototyping.
- Proficient in embedded C++ programming, state machine, UART, SPI, I2C protocols, and custom PCB design

Autonomous Hovercraft | Academic + Competition

Jan – Apr 2024

- Led a team of six, overseeing all aspects of the project while also handling Design and Component selection.
- Aided the team in learning GitHub to better ensure version control and seamless collaboration, furthermore implemented maze-solving algorithms in C using US sensor and IMU, achieving a 95% success rate.

EDUCATION

Concordia University

Montreal, QC

Bachelor of Engineering – Computer Engineering Co-op

2022 – 2026 (Expected)

- Relevant courses: C++ OOP • Data structures and algorithms • Computer architecture and Software • Continuous & Discrete Time Signals and Systems • Controls System • Digital Electronics • Probability & Statistics

COMPETITIONS

2nd Place, CQI 2025 – Quebec Engineering Competition (Jan 2025) | **Winner**, Englymics 2024 – Quebec Engineering Competition Qualifiers (Oct 2024) | **3rd Place**, ENGR 290 Competition – Autonomous Hovercraft Class Competition (Apr 2024) | **4th Place**, Robowars 2024 – Autonomous Sumo Robot Competition (Mar 2024)
Winner, MakeUofT 2024 – Hardware-based Hackathon at UofT (Feb 2024) | ConUHacks VIII – Montreal's biggest hackathon (Jan 2024) | **IEEEExtreme** – Global Programming Competition (Oct 2023)

INTERESTS

Autonomous Robotics • Rocket Avionics • Embedded Programming • Drones (UAVs) • Cybersecurity • IoT Systems
Movies • Photography and filmmaking • Personal Finance • Investing • Traveling • Gardening • Eng. Competitions