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 • MongoDB • MATLAB • Simulink • KiCad • JetBrains suite.

Programming | C • C++• C# • Python • Java • VHDL • SystemVerilog • ARM Assembly • YAML

Libraries | Media Pipe • TensorFlow • Hugging Face • Open CV • NumPy • Matplotlib • SciPy • Pandas • Free RTOS

Others | ROS2(Gazebo & Rviz Simulation) • Docker • Git Bash • Pytest • 3D Printing • MQTT • Node-Red •

Currently ongoing | SLAM • Reinforcement Learning • ML • Sensor Fusion • TinyML • PID Control Systems

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

EDUCATION

Bachelor of Engineering – Computer Engineering Co-op **2022 - 2026 (Expected)**
Concordia University, Montreal, QC

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

WORK EXPERIENCE

Validation Engineering and Semiconductor design Intern **Sept 2024 - Dec 2024**
Microchip Technology Inc., Montreal, QC

- Collaborated with engineers in validating hardware for **800G Ethernet PHYs** with 112G PAM4 SerDes used for high-speed data centers, and designing test scenarios using Pytest to ensure compliance with IEEE's standards.
- Gained in-depth knowledge in Error Detection, Ethernet Frames and the OSI model, with a strong focus on the **MAC** & **PHY** layers, particularly the **PCS** (Physical Coding Sublayer) for encoding/decoding of the data.
- Received comprehensive training on **NASA's HPSC** (High-Performance Spaceflight Computing) project, involving **SystemVerilog** for hardware verification, and **fault-tolerant** systems to mitigate **SEUs** (Single-Event Upsets)
- During this internship, I gained expertise in large-scale projects, hardware design, fault injection, regression testing, Git, CI/CD pipelines and extensive Linux experience for deployment, testing, and system management.

Undergraduate Teaching Assistant **May 2024 - Present**
Concordia University, Montreal, QC

- **SOEN 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 | IEEE Concordia student branch, Concordia University **June 2024 – Present**

- 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 | Concordia University, Montreal, QC **October 2023 – Present**

- Created two Interactive workshops on **Intro to 3D Modeling and 3D Printing** with **Fusion360** and **Intro to Microcontrollers** with **ESP32**, teaching university students practical skills in design and embedded systems.

Vice President of Marketing | IEEE Concordia student branch, Concordia University **Sep 2023 – Apr 2024**

- 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

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.

COMPETITIONS

- **2nd Place - CQI 2025** (Quebec Engineering Comp.)
- **Winner - Englymics 2024** (CQI Qualifiers)
- **3rd Place - Autonomous Hovercraft Class Comp.**
- **Winner - MakeUofT 2024** (Hackathon)
- **4th Place - Robowars 2024** (Auto. Sumo Robot)
- **IEEExtreme -** (Global Programming Comp.)

INTERESTS

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