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Mechatronics Engineering Student

PROJECTS

100 Projects in 100 Days Challenge
- ➤ Built **50**+ hardware and software projects across Arduino, ESP32, STM32, and Python, covering embedded systems, IoT, and automation, with complete documentation and source code published on GitHub.

Low-Power Embedded System | STM32, CubeMX, CubeIDE, C
- ➤ Implemented Run, Sleep, Stop, and Standby power modes using STM32 HAL and CubeMX.
- ➤ Reduced CPU active time from ~**100%** to ~**1-2%** by using RTC-based STOP mode wakeups every ~3 seconds.
- ➤ Verified power state transitions using LED patterns and event counters.

Real-Time ADC Data Acquisition System | STM32, CubeMX, CubeIDE, HAL, DMA, UART
- ➤ Built a timer-triggered, DMA-driven ADC data acquisition pipeline sampling analog signals at **1 kHz** using STM32F446, achieving **zero** CPU polling during capture
- ➤ Implemented circular DMA buffering with **1024**-sample frames and interrupt-driven completion callbacks for continuous real-time acquisition, enabling uninterrupted streaming and deterministic buffer handoff under sustained sampling conditions
- ➤ Streamed sampled data over UART at 115200 baud to PC for live visualization and debugging using a non-blocking data pipeline
- ➤ Reduced CPU usage to near-idle by offloading sampling and memory transfers to hardware peripherals (TIM2, ADC, DMA)
- ➤ Designed a deterministic real-time data path (TIM2 TRGO → ADC → DMA → IRQ → UART) ensuring stable, jitter-free sampling over long runs under sustained continuous acquisition workloads with no sample loss or timing drift

ESP32 WiFi Analyzer & Interference Scanner | ESP32, Arduino, Python
- ➤ Built an ESP32-based Wi-Fi scanning system that detects **10–40**+ nearby networks and extracts signal strength (RSSI), channel usage, visualizing congestion patterns and interference to support network optimization and troubleshooting.
- ➤ Designed a Python desktop application to visualize, rank, and analyze networks using a custom scoring algorithm based on signal quality, channel congestion, and security metrics in real time.
- ➤ Developed a network congestion analysis metric (channel crowding) that counts up to **10**+ networks per channel and applies a penalty of up to 25 points in the overall ranking score calculation.

Anti-Procrastination Study Monitor | Arduino, Ultrasonic Sensor, LCD, Embedded C/C++
- ➤ Built a proximity-based study enforcement system using an ultrasonic sensor to detect user presence within **30** cm, triggering a buzzer alert and on-screen warnings when the user leaves their desk.
- ➤ Implemented a real-time countdown study timer (~90 minutes / 5,400+ seconds) displayed on an LCD, with automatic reset logic and button-controlled restart for repeated focus sessions.
- ➤ Designed a state-driven control loop running at **1** Hz with distance filtering, debounced input handling, and continuous serial diagnostics, achieving reliable operation over **100**+ continuous test cycles without crashes.

LEADERSHIP & EXTRACURRICULARS

Mechatronics Course Union (MCU) — Director of Events | Toronto Metropolitan University
- ➤ Led and delivered hands-on Arduino, Raspberry Pi, and SumoBot workshops for mechatronics students.
- ➤ Designed and delivered embedded systems workshops covering hardware integration, coding, and debugging.
- ➤ Coordinated logistics, scheduling, and materials for multi-session events with **30**+ attendees per workshop.
- ➤ Collaborated with the executive team to plan the technical event calendars and manage event operations.

EDUCATION
- ➤ Toronto Metropolitan University - B.eng, Mechatronics Engineering (Expected graduation 2029)
- ➤ Focus - Embedded Systems & Microcontrollers

TECHNICAL SKILLS
- ➤ Programming: Python, C, C++ (Arduino), Embedded C, MATLAB
- ➤ Embedded Systems: STM32 HAL, CubeMX, GPIO, Timers, RTC, Low-Power Modes, UART, SPI, ESP32, Arduino
- ➤ Software: OpenCV, API Integration, OAuth, Data Processing, Data Analysis
- ➤ Hardware: Circuit Design, Breadboarding, Soldering, Sensors, Actuators, Power Management
- ➤ CAD & Simulation: SolidWorks, AutoCAD, Simulink, Isaac Sim