

# Connor Johanson

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## SUMMARY

Passionate mechatronics engineer specializing in **sensor fusion**, **control systems**, and **embedded development**. Skilled in designing and integrating **hardware/software systems** to extract actionable insights from sensor data, with applications in **wearable technology**, **position tracking and control**, and **automation**. Recognized for **critical thinking**, **adaptability**, and **collaborative leadership**.

## TECHNICAL SKILLS

**Programming & Simulation:** Python, C/C++, MATLAB, Simulink, Java, APIs, Git, Databases, SolidWorks, AutoCAD

**Embedded & Hardware:** Microcontrollers (ESP32, ARM Cortex, Arduino), Bluetooth (BLE), Sensors & Actuators, CAN, LIN, Ethernet, Motor Control, I2C, SPI

**Control Systems:** PID, State-Space, Kalman/UKF, Youla Parametrization, System Identification, Nonlinear & Multivariable Dynamics

**Data & Signal Processing:** Signal Filtering, Feature Extraction, NumPy, Pandas, TensorFlow, Keras, Scikit-learn

## EXPERIENCE

### Antenna Positioner Design & Integration

May 2024 – Aug 2024

*UWaterloo EmRG Lab*

*Waterloo, ON*

- Developed a motorized dual-axis antenna positioner by integrating motors, drives, power electronics, and control hardware.
- Designed MATLAB-based control software achieving repeatable angular positioning within  $\pm 0.5^\circ$ .
- Delivered cost-effective solution (\$800) nearing performance of \$15,000 commercial alternatives, now actively used in lab.

### Manufacturing Product and Test System Engineering Designer

Sep 2023 – Dec 2023

*Ford Motor Company*

*Waterloo, ON*

- Devised a validation procedure to analyze ECU manufacturing test stations, reducing assessment time significantly.
- Collaborated with engineers to troubleshoot functional hardware, RF signals, and software integration issues.

### Research Support and Web Development

Jan 2023 – Apr 2023

*UWaterloo VIP Lab*

*Waterloo, ON*

- Developed automated research lab website ([vip.uwaterloo.ca](http://vip.uwaterloo.ca)) and performed SAR data acquisition/analysis.

## PROJECTS

### Rally and Rehab - Award-Winning Capstone Project

Sep 2024 – Mar 2025

*Wearable Motion-Tracking System*

*ESP32, Bluetooth (BLE), IMUs, Python*

- Led team and developed a sleeve embedded with IMU sensors for racket sport biomechanical analysis.
- Implemented Bluetooth Low Energy communication and embedded software on ESP32-S3 for continuous data streaming.
- Applied Kalman filtering, feature extraction, and database integration to deliver real-time and historical performance dashboards.

### Doppler-Based Vehicle Speed Estimation

Feb 2025 – Apr 2025

*Signal Processing & ML*

*Python, MATLAB, TensorFlow/Keras*

- Processed audio recordings of passing vehicles, generating mel spectrograms and identifying Doppler shifts.
- Trained CNN models for speed prediction with average error of 2.7 km/h.

### Inverted Pendulum Ball-on-Beam Control

Sep 2024 – Dec 2024

*Dynamic System Modeling & Control*

*MATLAB, Simulink*

- Modelled nonlinear behaviour and applied discrete control techniques to create a cascaded digital control system.

## EDUCATION

**University of Waterloo**

**Waterloo, ON**

*BASc in Mechatronics Engineering, Co-op - Dean's Honours*

*Sep 2020 – Apr 2025*