

Gavin Tranquilino

Mechatronics Engineering Student

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EDUCATION

University of Waterloo

June 2028

Candidate for BASc in Mechatronics Engineering

Waterloo, ON

- **Coursework:** Data Structures, Algorithms, Linear Algebra, Circuits, OOP, Microprocessors, Digital Logic (FPGA, PLC), Mechanics of Deformable Solids, Structure and Properties of Materials, Statistics, Ordinary Differential Equations

EXPERIENCE

Undergraduate Research Assistant

September 2024 – December 2024

University of Waterloo - Engineering IDEAs Clinic

Waterloo, ON

- Instrumented a wearable knee crutch, allowing force readings for gait analysis and material selection via **FEA**.
- Built swarm robots using **Gazebo** and **TurtleBot3**, showcasing **LIDAR** integration and **odometry** in Python.
- Implemented **adaptive cruise control** on physical robots using **PID** controllers in **C++** and **Python** packages.
- Utilized **Docker** to enable robot development across all operating systems, streamlining the deployment of **ROS2** apps.

Mechanical Engineering Associate

January 2024 – April 2024

Sheartak Tools Ltd.

Waterloo, ON

- Designed 15 custom mechanical assemblies with **DFMA** in **SolidWorks** for woodworking machinery to ensure precise fit and function.
- Applied **GD&T** principles to guarantee manufacturing accuracy for custom machine parts.
- Created 25 detailed installation manuals, including parts lists and assembly instructions, ensuring ease of use for customers.
- Developed a **Python** script to upload 2000+ products on Shopify, saving 5 hours of manual work per week.

Robotics Engineering Team Lead

February 2023 – May 2023

Skills Ontario

Etobicoke, ON

- Developed embedded **C/C++** Arduino program to drive 3-phase motors and bluetooth controls.
- Designed custom protoboard assembly using **SMD** and **TH soldering**, saving 30% chassis space.
- Routed electronics using **KiCAD**, resulting in efficient and customized layouts for a custom robot from scratch.
- Drafted aluminum chassis using **AutoCAD**, increasing durability and space in the robot chassis.

PROJECTS

Instrumented Knee Crutch

- Designed a digital CAD twin of an existing knee crutch in **SolidWorks**.
- Developed a **data aquisition** system using **I2C** and Arduino, converting a bathroom scale for real-time load measurements.
- Researched and integrated **strain gauges** and **load cells**, raising load measurement range from 10kg to 50kg.
- Prototyped **3D-printed** mounts and knee platforms for strain gauges, ensuring user comfort.
- Built **Python** scripts for force distribution visualization in **Matplotlib**, with data logging for **gait analysis**.

Self-Balancing Unicycle

- Utilized **C++** and **CMake** to develop a graphical simulator that demonstrates **PID control** to keep the unicycle upright.
- Implemented **Git** submodules to reference third-party **OpenGL** wrappers, to visualize the simulation.

IoT Light Switch Bot/Mount

- Designed a **3D-printed** mount with an integrated web application for remote light switch control.
- Implemented an Ubuntu **Linux** web server, enabling remote **HTTP** access to room lights globally.
- Innovatively enhanced safety by designing a physical light switch mount, eliminating high-voltage work.

TECHNICAL SKILLS

Mechanical: SolidWorks, AutoCAD, GD&T, CAD, FEA, DFMA, 3D Printing, Machine Tools, Onshape, Fusion360

Electrical: KiCAD, I2C, SPI, UART, CAN Bus, Arduino, ESP-IDF, Soldering, Oscilloscope, LiDAR, PLC, LAD, VHDL, FPGA

Software: Python, C, C++, CMake, OpenGL, JavaScript, TypeScript, HTML, CSS, Bash, SQL, LaTeX, ROS2, Docker

Libraries/Frameworks: OpenCV, Mediapipe, Linux, Ubuntu, Git, SSH, Django, Flask, NumPy, Matplotlib, Node.js, React