Gavin Tranquilino

Mechatronics Engineering Student

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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**.
- Led a **ROS2** workshop for 100+ students, introducing fundamental concepts and streamlining **Docker** installations.
- Built wall-following and swarm robots using **Gazebo** and **TurtleBot3**, showcasing **LIDAR** integration and sensor interfacing in Python.
- Implemented **PID** control algorithms in **C++** and **Python** packages, providing practical demos for 100+ attendees.

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**.
- Established **I2C** and serial comms via 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

- Derived equations of motion using linearization techniques to estimate and optimize trigonometric calculations.
- 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.

Computer Vision Enabled Hospital App

- Mobile app to help promote physical activity for geriatric patients to prevent symptoms of hospital-induced delirium.
- Built the backend with **Python**, **OpenCV**, and **MediaPipe** for real-time pose estimation and exercise tracking.
- Awarded by the Grand River Hospital's Tech Innovation Challenge as having "Most Impact".

Technical Skills

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

Electrical: KiCAD, I2C, SPI, UART, Arduino, ESP-IDF, Soldering, Oscilloscope

Software: Python, C, C++, ROS2, Docker, CMake, OpenGL, OpenCV, Mediapipe, Linux, Ubuntu, Git, OOP

Education

University of Waterloo — **June 2028**
Candidate for BASc in Mechatronics Engineering — *Waterloo, ON*

- **Coursework**: Data Structures, Algorithms, Linear Algebra, Circuits, Structure and Properties of Materials, OOP