

 $\frac{gavintranquilino.com}{gtranqui@uwaterloo.ca}\\ github.com/gavintranquilino\\ linkedin.com/in/gavintranquilino$ 

### **EDUCATION**

### University of Waterloo

June 2028
Waterloo, ON

Candidate for BASc in Mechatronics Engineering

• 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

# **Humanoid Robotics Engineering Co-op**

May 2025 - Present

Waterloo, ON

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• Designing and prototyping dexterous humanoid arms with the goal of autonomous keyboard typing.

- Developing software interface to bridge high-level ROS2 control and low-level embedded systems over a CAN bus.
- Containerizing ROS2 system in **Docker**, mounting CAN transceivers to enable communication between subsystems.
- Creating voxel maps from point clouds acquired via ROS wrapper for Intel RealSense to enhance 3D modeling.

### 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.

### 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.

# Projects

### Autonomous LiDAR Navigation for Mobile Robot

- Developed C++ ROS2 nodes to convert LiDAR data into a 2D costmap for obstacle detection and perception.
- Generated a world model from costmap and odometry data to represent the current environment.
- Implemented A\* algorithm to compute obstacle-aware paths through the mapped environment.
- Applied Pure Pursuit to follow planned paths for smooth differential drive navigation.
- Dockerized the system and integrated with Gazebo and Foxglove for simulation, debugging, and real-time visualization.

#### **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.
- 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.

## 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