Joaquin Philco

416-939-6577 | joaquinphilco@gmail.com | LinkedIn | GitHub | Website

Experience

Tsotsos Lab — Active and Attentive Vision Toronto, ON
Research Assistant *May 2025 – Present*

- Implemented **surface normal estimation** algorithms within a binocular fixation system, using principles of **stereopsis** and **projective geometry** to analyze disparity gradients obtained from stereo pairs.
- Working with **binocular stereo systems** to extract and refine detailed 3D geometric features for forming an accurate ground truth dataset of surface normal vectors.
- Conducting research on computer vision topics such a surface normal estimation on binocular systems that have a fixation point, helping the goal of the **Laboratory for Active and Attentive Vision** of modeling human vision.

Canadian Space Incubator Toronto, ON
Affiliated Software Developer *December 2024 – May 2025*

- Collaborated on a payload integrated into the **BEXUS** program with the **European Space Agency**, designed to track **Resident Space Objects** during a sub-orbital weather balloon flight.
- Prepared and presented a **Critical Design Review** at **ESA**, informing key project decisions.
- Developed software for the ground station module for the SOBER BEXUS mission, enabling reliable telemetry data retrieval, command routing, and health monitoring.
- Derived a photometric model and calibration plan for an **infrared camera**, improving measurement precision.
- Implemented a centroid-detection algorithm for the mission's data processing pipeline
- Enhanced computational-photonics workflows and performed star-image registration to align celestial data.

Royal Bank of Canada Toronto, ON
Software Developer *January 2023 – August 2023*

- Worked with **Spring Boot** framework and other **REST API tools** for developing features for Royal Bank of Canada's Chorus API, automating employee's work and services.
- Led a Certificate Authorities migration project for the Chorus application's API, Which helped maintain and improve the security integrity of RBC employee's network.
- Contributed to the successful migration of the application to the cloud, transitioning from OCP3 to OCP4. Acquired knowledge in continuous integration tools, cloud computing software, and concepts such as **Helios**, **OCP4**, **Kubernetes**, and **Postman functional tests**.
- Analyzed connections between API servers and client requests using **Wireshark**, a networking tool.

Education

York University, Lassonde School of Engineering Toronto, ON
Honours-Bachelor of Engineering in Computer Engineering *September 2020 – May 2025*

Technical Skills

Languages: Python, Java, C++, Bash, C, MATLAB, CMake, SystemVerilog
Frameworks: JUnit, ROS2, Spring Boot, Qt, GTK, LibAdwaita
Developer Tools: Git, Postman, Docker, Visual Studio Code, Excel
Platforms & Hardware: Linux, NVIDIA Jetson, Arduino
Miscellaneous: Terminal & Shell, LaTeX, Microsoft Office, GNU Radio

Extracurricular

Software Co-Team Lead and Senior Member Toronto, ON
York University Robotics Society - York University *September 2022 - Present*

- Established a **Linux** development environment using **Ubuntu** to manage the project's entire code-base.
- Led a group of students in charge of developing the core's systems code for controlling a six-wheeled lunar rover using **Nvidea's Orion Nano** and **Xavier NX Jetson** computers, within the software team.
- Developed a low-level double-step PID controller for a six degrees of freedom robotic arm in **Python** and **C++**, alongside it's implementation for the **ROS2** framework.

Open Source Contributions

FuriLabs

- ***Camera Application for FuriOS*** *(GitHub Link)*
  * Main maintainer responsible for UI overhaul and feature expansion of the native camera app for FuriOS.
  * Enabled QR code scanning and processing directly from video frames.
  * Integrated GeoClue D-Bus client to automatically tag photos with GPS metadata.
  * Optimized app launch time by 30%, significantly improving startup performance.
- ***Gallery Application for FuriOS*** *(GitHub Link)*
  * Built a performant system-wide media gallery app for browsing and managing photos/videos.
  * Developed a system daemon and file observer to generate thumbnails for all media files.
  * Reviewed and merged contributions from various open-source developers.
  * Utilized GTK 4 and LibAdwaita for a modern, responsive UI on mobile Linux.

Droidian

- ***Camera Application Maintenance*** *(GitHub Link)*
  * Actively maintained and debugged the stock camera app used across Droidian-based devices.
  * Fixed bugs related to camera initialization, frame capture, and GStreamer pipeline handling.
  * Redesign Droidian's camera UI and implemented it using the QT framework.
  * Collaborated with the community to track issues and implement feature requests.

Academic Papers

Cube-Sat Communication Testing Tool *(Published Academic Paper)* | *Phython, C++, Arduino, I2C, UART*

- Designs and implemented a communication framework utilizing **I2C** and **UART** protocols on a **Raspberry Pi Pico**, enabling integration of multiple sensors and peripherals for real-time data acquisition in embedded systems.
- Developed a continuous data mirroring system that streams live sensor data from the testing platform to the base station via **radio frequency communications**, ensuring real-time monitoring and analysis of system performance.
- Conducted an analysis of the collected data, culminating in a comprehensive research paper submitted to the **International Astronautical Congress 2024 in Milan - Italy** that detailed findings and insights, contributing to the understanding of communication system performance and reliability in Cube-Sat applications.

Projects

FPGA-VGA-Game *(Github Link)* | *SystemVerilog, DE10-Lite, VGA*

- Developed a "Flappy Bird"-style game utilizing an FPGA on the DE10-Lite board, effectively integrating a VGA display for real-time graphics rendering and user interaction.
- Architected the game's design using finite state machines, translating the logic and functionality into efficient SystemVerilog code, ensuring smooth gameplay and responsiveness.
- Displayed the game onto a screen using a VGA connection and a controller made on the FPGA with SystemVerilog

Arm Control ROS2 Package *(Github Link)* | *Python, CMake, C++, ROS2, Bash*

- Designed and implemented a control system for a 6 degrees of freedom robotic arm with precise PID control.
- Developed a networking configuration utilizing UDP channels to facilitate real-time replication of sensor data between the robotic arm and control center.
- Encapsulated the code within a ROS2 package, ensuring seamless integration and compatibility in **ROS2** environments for enhanced usability.

QRS Complex Detection Algorithm *(Github Link)* | *Python, NumPy, SciPy, scikit-learn, ECG Signal Processing*

- Developed a QRS complex detection algorithm using a custom signal processing pipeline on ECG time-series data.
- Designed a mathematical model that computes the first and second derivatives of the ECG signal, combines their absolute values, and applies a frequency-domain low-pass filter to enhance QRS features.
- Engineered a binary encoding method to detect QRS complexes based on maximum value thresholds computed from randomly sampled windows.
- Constructed a machine learning pipeline using **scikit-learn**, training a Support Vector Classifier on the dataset.
- Validated model performance on a secondary dataset, demonstrating generalizability and robustness of the approach.