Ryan Zazo

ryan.zazo@hotmail.com · 647-938-3102 · ryanzazo.com

Education

University of Toronto — Toronto, ON, Canada
BASc in Engineering Science, Major in Robotics. GPA: 3.77/4.0. — Sep 2018 - May 2023

- **Deans' Honour List:** 2018 - 2023
- **Relevant courses:** Linear Control Theory, Robot Perception, Robot Modelling and Control, Computer Vision, System's Software, Electronics for Robotics, Microcontrollers and Embedded Microprocessors, Artificial Intelligence and Machine Learning.

Technical Experience

Italian Institute of Technology - Dynamic Legged Systems Lab — January 2024 - Present
Robotics Research Fellow

- Developing new robotics middleware framework based on FastDDS
- Researching novel state estimator using Factor Graphs for legged robots

University of Toronto - Continuum Robotics Lab — September 2022 - April 2023
Bachelor Thesis

- Designed a Novel Conjunctive Collaboration system for Continuum Robots
- Performed iterative design cycles using CAD simulations and 3D printed prototypes
- Designed a repeatable test platform to evaluate the proposed design
- Achieved failure loads 3X that of State of The Art solutions when subject to the same size constraints
- Thesis available at `https://www.ryanzazo.com/thesis`

Martinrea Alfield — May 2022 - August 2022
Robotics Engineering Intern

- Developed and maintained an ORBSLAM3 fork, MORBSLAM increasing the stability and implementing features such as saving and loading maps
- Developed path planning algorithms for a differential drive robot for driving while towing loads
- Optimized local path planning algorithms and the Euclidean Transform using Cuda
- Designed Computer Vision system to detect quality control defects in car parts
- Presented the novel Computer Vision system to the company's investors and managers of 58 international plants

European Space Agency - ESTEC — June 2021 - February 2022
Robotics Engineering Intern

- Upgraded our robot's drive system with CAN controlled motor drivers for improved control
- Programmed CAN interface in C++ to control the new motor drivers
- Tested and improved in-house autonomous navigation stack in C++ to improve turning and braking
- Improved the GPS (GNSS) stack's localization capabilities in C++ to enhance autonomous navigation
- Designed, mounted and machined hardware upgrades to reduce oscillations while driving using SolidWorks
- Designed the mounting and electrical system for Velodyne Lidars to enable autonomous navigation and mapping
- Maintained multiple robotics system hardware by machining and upgrading components to ensure minimal downtime
- Defined and presented design objectives at the ESA Concurrent Design Facility for an upcoming Mars mission

University of Toronto - VuthaLabs — May 2020 - May 2021
Undergraduate Researcher

- Awarded Center For Quantum Information And Quantum Control Undergraduate Summer Studentship to conduct research on high precision measurement of magnetic fields using a robotics system
- Designed, assembled and machined a 3-axis Prismatic Robotic Manipulator using SolidWorks
- Implemented a PID controller to minimize overshoot and oscillations, attaining accuracy on the order of 0.5 mm
- Implemented a magnetic field simulation tool using NumPy and Matplotlib to design magnetic field coils

University of Toronto - VuthaLabs — May 2019 - September 2019
Undergraduate Researcher

- Awarded the Summer Student Program Scholarship to conduct research on designing a remotely operated Atomic Clock
- Designed and built an Atomic Clock that was launched to the stratosphere with researchers (`https://sorce.home.blog`)
- Designed and tested mechanical structure for the Atomic Clock that is able to withstand accelerations upwards of 100Gs
- Designed the thermal system of the clock to maintain a constant temperature of 39°C during flight
- Designed software to remotely operate the Atomic Clocks using TCP and UDP to log data
- Published a conference paper with the results from the experiment at the International Astronautical Congress.

Publications

Conference Papers:

- The Stratospheric Optical Rubidium Clock Experiment K. Cote, S. Jackson, **R. Zazo**, L. Ma, A. Vutha. (2019). 70th International Astronautical Congress (IAC), Washington, DC

Skills

Languages:	Python, C, C++, Java, MATLAB, ARM Assembly
Tools/Frameworks:	Git, Linux, Docker, ROS, ROS2, TensorFlow, OpenCV, Cuda, DDS, CANopen
Mechanical:	Hand Tools, Aluminum/SS Machining, 3D Printing, Laser Cutting, Rapid Prototyping
Electrical:	Soldering, PCB Design, Arduino, Raspberry Pi
Design Tools:	Solidworks, Autodesk Inventor, Fusion360, EagleCAD, Altium Designer

Club Leadership

Robotics For Space Exploration (RSX) September 2019 - November 2023
Science Subteam Lead

- Received perfect scores for the Science SAR Evaluations for the University Rover Challenge in 2022 and 2023
- Competed at the Canadian International Rover Competitions in 2022 and 2023
- Designed a set of science experiments to detect for signs of life in soil on a moving rover
- Developed computer vision algorithms to autonomously detect for signs of life
- Developed Software and Hardware to optimize autonomous sample retrieval
- Designed and manufactured a novel 3d-printable core drill system to minimize cost and weight
- Website available at `https://rsx.skule.ca/`
- Currently advising the team for future competitions

Awards and Honours

Winter Dean's Honour List April 2023
Honour that highlights academic excellence in the last term at the University of Toronto

Fall Dean's Honour List December 2022
Honour that highlights academic excellence in the last term at the University of Toronto

Winter Dean's Honour List April 2021
Honour that highlights academic excellence in the last term at the University of Toronto

Fall Dean's Honour List December 2020
Honour that highlights academic excellence in the last term at the University of Toronto

CENTER FOR QUANTUM INFORMATION AND QUANTUM CONTROL UNDERGRADUATE SUMMER STUDENTSHIP (CQIQC) February 2020
Award for undergraduates students with excellent GPAs pursuing research with a member of the Center for Quantum Information and Quantum Control at U of T

Winter Dean's Honour List April 2020
Honour that highlights academic excellence in the last term at the University of Toronto

Fall Dean's Honour List December 2019
Honour that highlights academic excellence in the last term at the University of Toronto

SUMMER STUDENT PROGRAM (U OF T DEPARTMENT OF PHYSICS) April 2019
Award to fund undergraduate students undertaking research in the Department of Physics at U of T during the summer of 2019

Winter Dean's Honour List April 2019
Honour that highlights academic excellence in the last term at the University of Toronto

Fall Dean's Honour List December 2018
Honour that highlights academic excellence in the last term at the University of Toronto

UNIVERSITY OF TORONTO SCHOLAR September 2018
Awarded to Outstanding incoming undergraduate students at the University of Toronto

Community Service and Leadership

University of Toronto 2019-2021
Engineering Science Ambassador

- Answered the questions of prospective students and parents during campus open-house and tour events about engineering at the University, academics and extra-curriculars
- Prepared the venues for the faculty lunches
- Hosted activities at the university clubs fairs directing students to clubs, along with facilitating recruitment events for my club, Robotics for Space Exploration

Student Ambassador at CSViamonde 2018-2020
Engineering Ambassador

- Gave presentations to grade 11 and grade 12 students at Etienne-Brule, a french public high school in Toronto about engineering at the University of Toronto and fielded questions about adapting to an English university program when coming to a french school.
- Presentations focused on STEM-related fields and was hosted by the Physics dept. at Etienne-Brule.

Engineering Science Education Conference (University of Toronto) 2018-2020
Videographer and Audio/Visual Specialist

- Recorded the lectures given by guest lecturers for the conference
- Controlled and maintained the various Audio/Visual equipment (microphones, cameras, projectors) for the guest lecturers and resolved any problems during the lectures.

Projects

Autonomous Drone *Python, ROS, Embedded Systems* `https://rb.gy/f6780`

- Worked on a team of 4 to make a drone capable of autonomously navigating within an environment with randomly placed obstacles
- Obstacle Avoidance performed using an RGB camera and computer vision algorithms to estimate obstacle orientations

Rover Core Drill *Arduino, Fusion360, 3D printing, Aluminum Machining* `https://tinyurl.com/p254hrm6`

- Designed a novel core drill design based on an ESA-designed granite core drill
- Design utilized at the CIRC 2023 competition to collect core samples of the soil at the Alberta Badlands
- Design features independent suspension system for each drill, a self-aligning system to mitigate for obstacles

Autonomous Car Charging Robot *Arduino, EagleCAD* `https://bit.ly/3oEG73E`

- Designed and assembled the electrical system of an autonomous robot that charges an electric car, using EagleCAD
- Designed and constructed an omni-wheel drive system enabling accurate motion in a 2D plane
- Implemented a PID controller that corrects the robot's driving in straight lines using gyroscope data

REROUTE *C, Arduino and Python*

- Created a Wi-Fi Positioning System to locate dementia patients with $\pm$ 0.25 m accuracy
- Presented solution at the Schlegel Villages Innovation Summit in Kitchener in June 2019

M4i-6622 Python Interface *Python, C* `https://bit.ly/2KdfjXn`

- Created an interface to allow the generation of arbitrary functions on the M4i-6622 Arbitrary Waveform Generator

Chess Solver *Python* `https://bit.ly/3nF1xu9`

- Created a chess engine and chess solver that uses a minmax algorithm and alpha-beta pruning

Conway's Game of Life *Java, JavaFX* `https://bit.ly/39sqJPD`

- Implementation of Conway's Game of Life with a GUI, customizable game rules, save states and drag-and-drop cells