Rocco Ruan

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EDUCATION

University of Toronto   **Sept 2018 – May 2023**
Bachelor of Applied Science – Engineering Science, Robotics Engineering   *Toronto, Canada*
- 3.70 cGPA out of 4, 93% average across 6 design project courses, honours in 6 of 7 school terms

RESEARCH EXPERIENCE

Researcher   **Aug 2022 – present**
ESC499 - Undergraduate Thesis (supervised by Prof. Matthew Mackay)   *Toronto, Canada*
- Leading and designing a field experiment investigating methods for robots to request assistance from bystanders
- Performed extensive literature review to identify and scope a unique research contribution
- Developing a mobile robot for experiments, capable of teleoperated locomotion and automated signaling

UI/UX and Embedded Systems Developer   **May 2022 – Sept 2022**
Active and Attentive Vision Lab at York University (Prof. John Tsotsos)   *Toronto, Canada*
- Developing an accessible, touch-friendly UI for an autonomous wheelchair robot using QT
- Implementing embedded code to control all robot parts, including PID speed control, robotic arm control, etc.

Research Assistant   **Dec 2021 – May 2022**
Dynamic Graphics Project (DGP) Lab at University of Toronto   *Toronto, Canada*
- Developing robotic sensors deployed in 3D-printed tubing with a PhD student in Prof. Daniel Wigdor's group
- Implemented Python and OpenSCAD code to generate tubing given areas in space via SVGs, etc.
- Implemented real-time visualizations for robotic sensor data using Unity and C#

Research Intern   **May 2019 – Aug 2019**
Advanced Robotics Centre - National University of Singapore   *Singapore, Singapore*
- Led research project characterizing soft robotic actuators built with dielectric elastomers
- Wrote programs for data collection and analysis using Python, C, and MATLAB
- Produced detailed documentation of objectives, process, and results

TEACHING EXPERIENCE

Studio Teaching Assistant   **Sept 2021 – May 2022**
ESC203 (Engineering Science 2nd Year Capstone Design Course)   *Toronto, Canada*
- Taught mechatronics and engineering design concepts to ~80 2nd year undergraduate students
- Facilitated ~15 student projects designing recycling systems, asset tracking solutions, etc. for global stakeholders
- Mediated student-student and student-faculty conflict through consistent and empathetic communication

WORK EXPERIENCE

Software Engineer Co-op   **Jan 2021 – Aug 2021**
MDA   *Kanata, Canada*
- 1 of only 4 software developers designing and implementing C++ software for a $13M+ LIDAR/imaging system to be used on **Canadarm2 (International Space Station)** and **Canadarm3 (Lunar Gateway)**
- Developed and documented modular test automation software and UI for all subsystems
- Reworked ground software with multithreading to be tolerant of delays caused by long-range communications
- Provided software/systems support for AI tracking research and a NASA-commissioned camera project

Software Developer Intern   **May 2020 – Aug 2020**
Cognitive Systems Corporation   *Waterloo, Canada*
- Designed embedded Micropython software to facilitate motion detection using CFR of WiFi routers

- Optimized runtime performance of a key algorithm by 50%
- Developed features and improvements shipped to the 1000+ users of Plume Motion
- Drove research projects to increase reliability and spatial coverage of motion detection
- Improved documentation and unit testing of a key algorithm, creating ~10 wiki pages and 3 new testing tools

PERSONAL AND COURSE PROJECTS

WeeBowling - Microcontrollers Course Project   **September 2021 – December 2021**
- Designed and built a bowling ball robot controlled through bowling and steering motions from a Wii remote

Cross Control – Video Game Design Course Project   **September 2021 – December 2021**
- Led a team of 3 software developers, 2 music producers, and 2 artists/animators to produce a video game
- Completed a 2.5D action/puzzle game with ability resource bars tied to movement, using C# and Unity
- Incorporated feedback from 10+ industry game developers and 25+ playtesters across many design iterations
- Presented game to representatives from Zynga, Ubisoft, and various indie game studios
- Game and devlog available on colleague's website: https://zorgonia.itch.io/crosscontrol

Accent Classification with Machine Learning - AI Course Project   **September 2020 – December 2020**
- Worked with 3 colleagues to develop an AI accent classifier using convolutional recurrent neural networks
- Achieved 80-95% holdout accuracy on various binary accent classification tasks, comparable to published works

Chess-Playing Robot Arm - Personal Project   **August 2020 – October 2020**
- Built a 4-DoF robot arm to move pieces on a chessboard based on OpenCV computer vision sensing
- Implemented inverse kinematic model in firmware to control arm position
- Project archived as school year began, due to increase in time commitment to design teams

Electric Car Charging Robot - Robotics Design Course Project   **August 2020 – October 2020**
- Designed and began manufacturing for a gantry-style electric car charging robot, in a team of 3

Badminton Shuttle Stacker   **January 2019 – April 2019**
- Worked with a team of 4 on an engineering consulting project
- Produced one of the top 8 RFPs out of a set of >60, based on streamlining competitive badminton training
- Designed a badminton shuttle stacker in consultation with KC Badminton Club

DESIGN TEAM/COMPETITION EXPERIENCE

Robotic Arm Subsystem Lead   **May 2020 – Aug 2021**
Robotics for Space Exploration (RSX) – University Design Team   *Toronto, Canada*
- Supervised ~15 students in mechanical and software redesign of a large robotic arm for a rover
- Mentored team members on mechatronics design, 3D modelling, programming, and robot modelling/control
- Increased member attendance and retention by ~200% by emphasizing subteam-wide learning and involvement

Canadian Winner of NASA Space Apps 2020   **October 2020**
- Developed an educational app on the difficulties of wireless communication in space

Communications/Thermal Team Member   **Sep 2018 – June 2020**
University of Toronto Aerospace Team (UTAT) – Space Systems Division   *Toronto, Canada*
- Drove link budget development for a ~10Mbps data link for an LEO Earth-imaging CubeSat
- Characterized performance of a temperature-sensing system and automated a thermal chamber
- Set up and conducted thermal vacuum chamber tests in collaboration with MDA engineers

AWARDS, SKILLS & INTERESTS

- **Awards:** 2nd place novice team at Cambridge Inter-Varsity Debate Competition 2020, Queen's Venturer Award, UofT Faculty of Applied Science and Engineering Entrance Scholarship
- **Skills:** Software/game development, mechatronics, stakeholder engagement, communication, adaptability, technical writing and documentation, engineering design process, building rapport and knowledge in new contexts, empathy, pitch preparation
- **Interests:** history, philosophy, and literature; video games and game design; anime; rock climbing and sports; education