Jonathan Spraggett

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Education

2023 April **Bachelor of Applied Science in Engineering Science** University of Toronto
Major in Robotics with a Minor in Artificial Intelligence
Courses: Mobile Robotics & Perception, Robot Modeling & Control, Probabilistic Reasoning & Learning

Selected Experience

2023 May - Current **Robotic Software Engineer** Mostavio

- Leading the development of autonomy, motion planning, and sensor fusion systems for a 250 kg electric Vertical Take-Off and Landing (eVTOL) platform using ROS2, Python, C++, and Gazebo.
- Designed and implemented multi-sensor fusion (Stereo Cameras, GPS, UWB, LiDAR) with residual-based filtering for real-time sensor selection, improving localization accuracy and system reliability.
- Optimizing control systems to improve eVTOL stability, trajectory tracking, and fault tolerance through flight testing and data-driven analysis.
- Implemented real-time trajectory optimization and autonomous flight planning using Pure Pursuit Navigation, Dynamic Window Approach, and A* search algorithms.
- Developed high-fidelity SITL/HITL simulations in Gazebo, integrating CI/CD pipelines with Docker to streamline software validation and deployment.
- Winner of Stage 1 in the GoAero contest for innovations in autonomous eVTOL technology.

2021 Sept - 2023 May **Research on Reinforcement & imitation Learning for Soccer Skills (Github)** UTRA

- Developed a novel approach for training humanoid robots in soccer-specific tasks using Deep Reinforcement Learning (RL), Proximal Policy Optimization (PPO), and Adversarial Motion Priors (AMP).
- Trained a neural network in a simulated environment (Isaac Gym) to perform walking, jumping, and kicking, improving stability, accuracy, and performance.
- Leveraged AMP to enable motion imitation from reference datasets, reducing the need for complex reward functions and increasing flexibility.
- Applied domain randomization to fine-tune the trained model for real-world deployment, addressing discrepancies between simulation and physical execution.
  Supervisor: Professor Michael Guerzhoy .

2019 Aug - 2023 May **Robotic Software Team Lead** (Github, Website) University of Toronto Robosoccer Team

- Led a team of 30 engineers under faculty advisors Prof. Jonathan Kelly and Prof. D'Eleuterio, securing 4th place at RoboCup 2023 in Bordeaux, France.
- Developed an Iterative Closest Point (ICP) algorithm for visual odometry, integrating field line detection via OpenCV and ROS2, and fused data with an Unscented Kalman Filter (UKF) for precise localization.
- Applied YOLOv5 for real-time object detection (balls, robots, field markers, goalposts), optimizing performance with a diverse simulated dataset and successfully transferring the model to real-world conditions.

2020 June - 2022 Dec

Software Developer Quanta Technology, LLC

- Optimized sorting and search algorithms, reducing time complexity (from $O(n^2)$ to $O(nlogn)$)), and reducing execution time by 50%.
- Implemented the A* algorithm to improve the efficiency of topological search in power grid analysis, improving accuracy and performance.
- Designed a scalable database schema for substations, power lines, and related entities, importing 50 million records using SQL for efficient data retrieval.

2021 Jul - 2021 Sept

Machine Learning Undergraduate Researcher (Paper) UofT

- Developed an entropy-based metric to quantify model-dataset complexity for computer vision models and applied it to track CO_2 emissions from the CV community using Python, TensorFlow, OpenCV, and Numpy.
  Supervisor: Professor Mahdi S. Hosseini.

Technical Skills

Programming Languages: Python, C/C++, Typescript, Rust, C#, SQL, LaTeX
Software: ROS/ROS2, Docker, OpenCV, Pytorch, Git, Linux, Android, FreeRtos
Hardware: Fusion 360, PCB, EagleCad, Stm32, 3D Printing