Joel Andrew Miller

(905) 933-7920 | joelmiller0430@gmail.com | joelandrewmiller.com

M.E.Sc. Software Engineer with a Collaborative Specialization in Artificial Intelligence. Passionate about leveraging data-driven technology to build machines and applications designed for people, with hands-on experience in industry research and development.

WORK EXPERIENCE:

R&D Aerospace Software Engineer — **ITPS Canada** London, Ontario — Feb 2024 – Present

- Built a helmet mounted display project from scratch, including an outside-in optical tracking pipeline, and co-designing in-house display.
- Designed all software for head tracking and sensor-fusion algorithms, achieving ~2° spatial accuracy in cockpit environments.
- Implemented a Kalman filter to correct IMU drift and maintain stable, long-duration tracking under high-motion and vibration conditions.
- Architected and implemented the distributed system enabling fully wireless operation suitable for aircraft with ejection seats.
- Engineered/optimized UDP networking layer, to ensure high-frequency, low-jitter pose transmission. Achieving ~3 ms end-to-end latency.
- Designed and executed calibration workflows to align helmet, optical, and aircraft coordinate frames for consistent head-pose reconstruction.
- Collaborated directly with pilots, test engineers, program stakeholders, and leadership to translate operational needs into clear technical requirements and deliverables.

R&D Engineering Intern — **National Research Council Canada** London, Ontario — Sept 2023 – Dec 2023

- Researched and designed a pipeline to transform real-world sensor data (LiDAR, camera, GPS) collected from a vehicle to simulated environments for autonomous vehicle development and testing.

Software Engineer/DevOps Intern — **IBM** Markham, Ontario — May 2021 – Sept 2022

- Developed automated testing frameworks for IBM's Order Management System, reducing testing time, enhancing efficiency and ensuring system reliability; Setup a Dockerized virtual machine integrated with a web application, to execute and monitor automated test cases; Mentored/onboarded interns; Developed frontend components, to improve the user's interaction and experience.

EDUCATION:

M.E.Sc Software Engineering with Collaborative Specialization in Artificial Intelligence — **Western University** — 2023 – 2024

- Submitted research findings to three journals for publishing, completing program four months early with a 4.0 GPA.
- Worked towards human-centered autonomous vehicles by researching conditionally autonomous takeover requests.
- Employed signal processing, data fusion, time series analysis, and deep learning to model and understand driver's cognitive behaviour through their physiological signals (ECG, EDA, RSP).

B.E.Sc Software Engineering with Co-op — **Western University** — 2018 – 2023

- Achieved Dean's Honor list and completed a 16 month internship @ IBM between my 3rd and 4th year of study.

PROJECTS and LEADERSHIP:

Peer Reviewed Studies

- **Published:** "*Navigating the Handover: Reviewing Takeover Requests in Level 3 Autonomous Vehicles*" (IEEE Open Journal of Vehicular Technology): A comprehensive review of Takeover Requests (TORs) in autonomous vehicles, emphasizing safe human-centered transitions from automation to manual control.
- **Published:** "*At the Heart of Intersections: Analyzing Their Influence on Driver Heart Behaviour*" (Springer Data Science for Transportation): Investigated intersections' impact on driver heart rates to inform safer urban traffic designs and autonomous vehicle technologies.
- **Under Review:** "*Modelling Takeover Requests in Conditional Autonomy Using Machine Learning and Driver Physiological Signals*" (IEEE Transactions Intelligent Transportation Systems): Developed adaptive machine learning models using physiological data to enhance driver takeover quality during autonomous transitions.

CARLA Reinforcement Learning Agent (*Masters Project)*

- Designed and implemented a reinforcement learning agent for autonomous vehicle navigation in the CARLA simulation environment, leveraging Deep Q-Learning and PPO algorithms.
- Fine-tuned reward functions to balance efficiency and exploitation, improving learning rates and decision-making accuracy.

FoodSnap (*Capstone Project)*

- Engineered a machine learning application to analyze the nutritional content of meals from single images, integrating image segmentation, depth estimation networks, and the USDA API.
- Achieved accurate identification of food types and volume estimation, enabling precise calorie and macronutrient calculations.
- Demonstrated the project's scalability and potential impact in nutrition tracking through real-world testing scenarios.

Western AI Club (*Project Manager)*

- Led a team of five developers to design, train, and deploy an iOS image classification app for waste categorization, promoting sustainable disposal practices.
- Implemented transfer learning techniques to optimize the model, achieving 98% accuracy in classifying waste types.
- Oversaw project milestones, ensuring timely delivery and seamless integration of app features.

Skills: python, OpenCV, PyTorch, Kalman filtering, sensor fusion, optical tracking, IMU processing, camera calibration, real-time systems, UDP networking, distributed systems, signal processing, reinforcement learning, Docker, Git, human-machine interfaces, biometric data, machine learning, computer vision, image processing.