Hunter Ma

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Education

BASc in Engineering Physics — Vancouver BC, Canada
The University of British Columbia, 4^{th} year — *Sept 2022 - May 2026*

- Specializing in robotics and autonomous systems

Skills Summary

Programming: Python, C/C++, Linux, ROS 1/2, PyTorch, OpenCV, TensorFlow, MATLAB, Java, Assembly, Git
Electrical: Oscilloscope, spectrum analyzer, vector network analyzer, function generator, digital multimeter

Research/Work Experience

Machine Learning Research Assistant — Vancouver BC, Canada
Robotics and Control Lab - University of British Columbia — *Sept 2024 - Present*

- Developing and fine tuning echocardiogram image segmentation pipeline using Florence 2 and SAM 2.
- Incorporating semantic representation and Kalman Filter to assist video object segmentation and tracking.

Computer Vision and Robotics Research Scholar — Waterloo ON, Canada
Computer Vision for Smart Structure Lab - University of Waterloo — *May 2024 - Aug 2024*

- Applied spatial and semantic deep learning (SAM) computer vision methods for structural health monitoring.
- Integrated monocular depth estimation and saliency object detection to accelerate training of Gaussian Splatting neural volume rendering as well as improving camera pose estimation.
- Incorporated LiDAR SLAM into Gaussian Splatting to aid in UAV autonomy mission.

Robotics Software Engineer — Vancouver BC, Canada
UBC Rover Design Team - Software subteam — *Sept 2024 - Present*

- Implementing visual SLAM in ROS2 using RGBD camera for autonomous rover navigation and obstacle avoidance.
- Developing simulations in Gazebo and Isaac Sim and applying reinforcement learning to control the rover's robotic arm.

Control System Lead — Vancouver BC, Canada
UBC Orbit Satellite Design Team - Attitude and Orbit Control System (AOCS) subteam — *Sept 2021 - Present*

- Co-developed a Python simulator for satellite attitude control in low Earth orbit, including magnetic actuator model, low-pass filter for onboard sensors, sensor fusion, and satellite system integration.
- Developed optimized firmware for embedded systems using the TMS570 microcontroller, leveraging high-performance DSP library for signal analysis, filtering, and transformation, as well as advanced algorithms such as the Extended Kalman Filter and Sun Model.

Technical Projects

PuckPilot Air Hockey Table — Vancouver BC, Canada
UBC ENPH 459 Engineering Physics Capstone Project — *Sept 2024 - Present*

- Developing computer vision algorithms for simultaneous puck and mallet tracking using high-speed camera.
- Software system integration using ROS2 and sim-to-real reinforcement learning for human vs machine gameplay.

Deep Learning-based Dynamical System Solver — Vancouver BC, Canada
UBC CPEN 355 Machine Learning with Engineering Applications — *Sept 2024 - Dec 2024*

- Successfully modeled dynamical systems using CNN and Mamba state space model to simultaneously learn the spatial and temporal features respectively, proposing an alternative approach to traditional numerical PDE solvers.
- Compared to SOTA NeuralPDE, our model achieves competitive mean squared error at half the training time.

Autonomous Vehicle Competition — Vancouver BC, Canada
UBC ENPH 353 Engineering Physics Project — *Sept 2023 - Dec 2023*

- Engineered a self-driving vehicle with ROS and performed simulation in Gazebo, incorporating advanced computer vision and machine learning for dynamic text recognition and response to road conditions.
- Implemented imitation learning and real-time camera-based vision systems in the vehicle, enabling sophisticated autonomous navigation and decision-making in complex simulation environments.

Autonomous Robot Competition — Vancouver BC, Canada
UBC ENPH 253 Introduction to Instrument Design — *May 2023 - Aug 2023*

- Implemented advanced sensor fusion algorithm using IMU for precise robot orientation determination.
- Engineered reaction wheel system by designing, manufacturing, and integrating mechanical, electrical, and software components for mid-air robot balance functionality.