Nathan Duncan

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EDUCATION

Bachelor of Applied Science — Kingston, ON | Expected Spring 2026
Queen's University
Specialization in **Mechatronics and Robotics Engineering**. Holding a **3.9/4.3 CGPA**.
Coursework: Automatic Controls; Signals and Systems; Data Structures and Algorithms; Mechatronics Design I-III

WORK EXPERIENCE

DEFENCE RESEARCH AND DEVELOPMENT CANADA | Control Intern — Ottawa, ON | May 2024 – Present

- Conducted a **literature review** of over **155** academic publications discussing teams of unmanned aerial systems, to create an internal reference document and provide background research for subsequent projects.
- Created a robust hierarchal event-triggered **linear MPC controller** for online management of **multi-UAV missions**.
- Assisted in the experiments of other defence scientists, operating RADAR and sensing equipment, collecting and analyzing wide-band radio signals, and preparing technical documents.

ROBORA LAB | Undergraduate Student Researcher — Kingston, ON | July 2023 – May 2024

- Coauthored ***Distributed Model Predictive Control for Cooperative Multirotor Landing on Uncrewed Surface Vessel in Waves***, presenting a novel control solution to the rendezvous problem of two agents in an open-water environment.
- Programmed a **custom Python simulation tool** to display state outputs and enable inter-agent communication.
- Contributed to a project to create **spatiotemporal maps** of semi-static shoreline environments via **unmanned aerial vehicles (UAV)** and **unmanned surface vehicles (USV)** for safe ship-to-shore connections.
- Coordinated and performed large set data collections with a custom UAV sensor suite using **ROS** for task execution.

UTILITIES KINGSTON | Geographic Information Systems Student — Kingston, ON | May 2023 – July 2023

- Developed, edited and maintained **GIS data** and other GIS output products to reflect the current state of assets.
- Conducted analysis of spatial information, generated data queries and summarized statistics within the City of Kingston's **largest geographic database** while supporting the Utilities Engineering Department and GIS Team.

PROJECTS

MREN 303 COURSE PROJECT | Queen's University — Kingston, ON | Jan 2024 – Apr 2024

- Designed, created, and programmed a mobile platform to compete in a head-to-head robotics competition.
- Modeled the platforms chassis and four-wheel differential drive train in **SolidWorks** before being fabricated with **laser cut** medium-density fiberboard and **3D printed** ABS plastic components.
- Mapped Gamepad inputs to wheel and manipulator actions for manual operation and programmed an autonomous line following routine using a base mounted color sensor in Python regulated with a **PID controller**.

SAE AUTODRIVE CHALLENGE | Queen's University — Kingston, ON | Oct 2022 – July 2023

- Worked as a member of the **Systems Integration** sub team and liaison to the Controls sub-team on a project to bring a Chevrolet Bolt to **Level 4 autonomy** (5 hr/week commitment).
- Tasked to program 5 publisher-subscriber nodes in **C++** using **ROS2**, to manage the input and output data of the control team and allow programs to execute with optimized time complexity.
- Installed and maintained Chevorlet's Ushr map in **QGIS** using a **PostgreSQL** database to identify superficial road elements and supplement **navigation**.

MREN 203 COURSE PROJECT | Queen's University — Kingston, ON | Jan 2023 – Apr 2023

- Tasked with creating an **unmanned ground vehicle (UGV)**, designed for mobile **autonomous monitoring** of irritant air chemicals circulating indoor environments.
- Presented a minimum viable product which could navigate a small room using **LiDAR**, camera and proprioceptive sensors and create a live web-based heatmap of CO_2 levels that can be monitored remotely.

SKILLS

Languages: C, C++, Python, NIOS II Assembly
Libraries: ROS, ROS2, TensorFlow, OpenCV, Django
Technologies: Linux, QGIS, Git, SolidWorks, LaTeX, MATLAB/Simulink
Licenses: G, sRPAS (Basic Operations)

ACHIEVEMENTS

DEAN'S SCHOLAR | Obtained an Engineering Sessional GPA of 3.5 while taking at least 30 units. 2022-2024
GOVERNOR GENERAL'S ACADEMIC MEDAL | Awarded to the top graduate of a secondary school. 2021