Axel Pena Hernandez

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# Education

## University of Toronto | Bachelor of Applied Science in Mechanical Engineering + PEY (Coop) | Minor in Robotics and Mechatronics September 2024 - May 2028

Dean’s List.

GPA: 3.53/4.0

# Project Experience

## University of Toronto Neural Networks and Deep Learning Group Project (Member) May 2025 - Present

* Built a **CNN-based computer vision system** **in PyTorch/Google Colab** using 25K balanced images from the Gaze360 dataset; achieved **87% test accuracy and 0.86 recall** on a reserved 20% unseen dataset, validating generalization to real-world scenarios.
* Engineered a full **machine learning pipeline** (data labeling, class balancing, grayscale preprocessing, feature extraction, checkpointing, hyperparameter tuning), reducing worst-case training time from **4+ hours to ~50 minutes** through input resizing and architecture optimization.
* Collaborated in a **team of 4** to deliver proposal, status report, final report, and final presentation; presented **quantitative and qualitative evaluations, ablation studies, and ethical analysis**, earning recognition for clarity and technical rigor.

## University of Toronto Chemical Vehicles Mechanical Division (Member) Sep 2024 - Present

* Iterated reaction injection mechanism to be integrated with mechatronic components using SolidWorks and 3D printing prototypes. Syringe injection percentage increased by 13%.
* Contributed to the second-place position in the 2025 American Institute of Chemical Engineers Chem-E-car Performance Competition.

## University of Toronto Aerospace Team (Aerodynamics, Rocketry) (Member) Sep 2024 - Present

* Conducted flying simulations on Open Rocket to improve the design of fins. Determined the optimal dimensions to obtain the maximum flight apogee through repeated alteration of fin dimensions within constraints.
* Learned aerodynamics and engineering of rockets by participating in group meetings, reading past team reports and documents allowing me to work with other subsystems and perform my role effectively.

## International Baccalaureate Physics and Chemistry Extended Essay (Researcher) Sep 2022 - Dec 2024

* Explored the relationship between physical features of electrodes and how they affected the conductivity of an electrolyte by conducting secondary research to form a testable hypothesis.
* Designed experiments to test the alteration of physical features of electrodes. Allowed me to generate three reliable and targeted experiments, obtaining at least 150 unique data points.
* Compiled, graphed and analysed experimental data in Excel. Generated error bars, maximum and minimum curves and regression lines to evaluate and draw conclusions on my findings and achieved coefficients of determinations 0.9452 or higher.

# Leadership Experience

## University of Toronto Engineering Strategies and Practice Group Project (Leader) Sep 2024 - May 2024

* Practiced engineering industry necessities including creating a project requirements and conceptual design specifications documents; and presenting our design’s measures of success. This improved the quality of skills including idea generation, prototyping and secondary research.
* Received professional communication education, worked under an engineering manager and operated with project management tools including Gantt Charts and status reports. This enabled members to meet deadlines and provided the necessary communication between the team and a real client.
* Practiced presenting engineering information, using techniques such as non-verbal gestures and varying tone and speaking speed, achieving a final mark of 93% on our presentation of our Measures of Success.

## Haileybury CubeSat Team (Propulsion Division Leader) Sep 2023 - Jun 2024

* Led and managed students varying in experience and age in the propulsion subsystem by allocating work and deadlines. Resulted in the propulsion subsystem having consistent progress towards completing the overall project requirements documents.
* Researched international space regulations for objects allowed in space and the detailed project requirements for satellites. Allowed me to implement relevant information for project requirements for related for the propulsion system for the CubeSat.
* Persuaded school governors by collaborating with the leaders of other subsystems to present the ambition and explanation of the CubeSat project. This resulted in us securing financial support for our project to proceed.

# Skills and Qualifications

* Python, C#, C++, MATLAB, and Unity, with experience in deep learning and neural networks using PyTorch, NumPy, Matplotlib, and Google Colab.
* CAD software including SolidWorks and Fusion 360, as well as rapid prototyping methods such as 3D printing and laser cutting.
* Circuit analysis, mechanical design, and data visualization, with hands-on experience in project management and version control (GitHub).
* SQL, API integration, and basic web development.
* Bilingual in Spanish (native) and French (DELF B1 certified).
* Certified in Arc and Gas Welding, Smart Serve, and trained in the use of hand/power tools, soldering, and machine shop equipment.