

Ali Abosaad

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Summary

- Mechatronics and Robotics Engineer with a recently completed M.Sc. from York University's Spacecraft, Dynamics, Control & Navigation Lab and hands-on experience in mechanical system design, prototyping, controls, and electromechanical integration.
- Experience taking engineering designs from concept to physical implementation, including electric actuators, motor-driven mechanisms, mechanical assemblies, sensors, embedded electronics, control software, and system validation.
- Strong foundation in CAD, dynamic modeling, and engineering analysis using SolidWorks, AutoCAD, ANSYS, and MATLAB/Simulink, complemented by experience in hardware-in-the-loop testing, 3D printing, mechanical assembly, troubleshooting, and iterative design refinement.
- Experienced in integrating mechanical, electrical, embedded, and software subsystems while collaborating across engineering disciplines to develop reliable, testable, and manufacturable mechatronic systems.

Education

York University – Toronto, ON 2024 – 2026
M.Sc. in Earth & Space Science
Spacecraft, Dynamics, Control & Navigation Lab

- Thesis: *Fast, Reliable, and GPS-Free Navigation for Autonomous Quadrotors using Onboard Sensing and Optimized Visual-Inertial Odometry.*

Nile University – Giza, Egypt 2018 – 2023
B.Sc. in Mechatronics Engineering GPA: 3.65/4.0

- Graduation Project: *Autonomous Fire-Fighting Robot* — Led the mechanical and system-level design of an autonomous mobile robot capable of detecting and extinguishing fires.
- Integrated mechanical structures, motor-driven actuators, sensors, embedded electronics, and control software into a functional prototype, followed by iterative testing and design refinement.

Experience

Research Assistant, York University – Space, Dynamics, Control & Navigation Lab May 2024 – May 2026

- Designed and validated dynamic system models and actuator behaviors for robotic and autonomous platforms, supporting control-system development and performance analysis.
- Developed simulation environments in MATLAB/Simulink to evaluate system dynamics, actuator response, control performance, and engineering requirements.
- Integrated sensing, electric actuation, mechanical platforms, embedded computing, and control software into complete operational systems for experimental validation.
- Supported sensor and actuator interfacing, hardware configuration, signal validation, and system-level troubleshooting during prototype integration.
- Collaborated with mechanical, electrical, controls, and software researchers to resolve integration issues and improve system reliability, testability, and real-time performance.

Teaching Assistant – York University May 2024 – May 2026

- Teaching Assistant for undergraduate Control Systems and Physics courses, including PID control, dynamic-system modeling, and laboratory experimentation.
- Supported laboratory instruction, technical troubleshooting, grading, and student mentoring.

Control Engineering Intern, Quanser Inc. – Markham, ON Sept 2024 – Mar 2025

- Developed and assembled mechatronic prototypes combining mechanical structures, electric actuation, sensors, embedded hardware, and real-time control software.
- Integrated dual IMUs, optical-flow sensing, range sensors, onboard cameras, and embedded processing hardware into a lightweight autonomous navigation platform.

- Supported electronics integration through sensor wiring, actuator interfacing, communication configuration, signal validation, and hardware troubleshooting.
- Built dynamic system models and designed control algorithms, validating system stability and performance through simulation and hardware-in-the-loop testing.
- Designed and tested actuator-driven mechanisms for precision event execution, considering mechanical packaging, assembly, functional reliability, and repeatable operation.
- Collaborated with mechanical, electrical, software, and controls engineers to diagnose technical issues and implement improvements across the complete system.

Mechatronics Engineer, Munich for Industries – Egypt

Feb 2023 – Feb 2024

- Designed and tested electromechanical systems used in industrial automation and mechanical product development.
- Developed mechanical assemblies incorporating motor-driven mechanisms, electric actuators, sensors, and embedded control components.
- Prepared designs with consideration for manufacturability, assembly access, component integration, serviceability, and reliable operation.
- Supported fabrication, mechanical assembly, functional testing, component validation, troubleshooting, and engineering design changes during development cycles.
- Collaborated with mechanical, electrical, manufacturing, and controls personnel to refine designs and resolve system-level integration issues.

Mechatronics Engineer Intern, Scania – Cairo, Egypt

Feb 2023

- Assisted in developing and validating vehicle dynamics and actuator-response models for heavy-duty trucks, focusing on steering and braking systems.
- Analyzed actuator commands, vehicle response, and system data to improve simulation-model accuracy for control-system testing and validation.
- Worked with multidisciplinary engineering teams to connect mechanical-system behavior with sensing, actuation, simulation, and control requirements.

Projects

Learning-Enhanced GPS-Free UAV State Estimation – York University

2025

- Developed a real-time GPS-free UAV navigation system combining onboard sensing, embedded processing, state estimation, and control-oriented system integration.
- Integrated mechanical, electrical, sensing, and software subsystems within the real-time hardware and packaging constraints of an aerial robotic platform.
- Improved robustness of state-estimation pipelines under sensor noise, motion, lighting variation, and resource constraints.
- Validated system performance through simulation, hardware-in-the-loop testing, and physical platform experiments.

FullThrottle Autonomous Racing Team – ACC 2025 First Place

2025

- Member of York University's multidisciplinary autonomous racing team, contributing to high-speed vehicle-system development and validation.
- Collaborated with perception, localization, controls, and vehicle-hardware team members to integrate and test autonomous driving functions.
- Supported experimental testing, system debugging, and performance evaluation in preparation for competitive operation.

Autonomous Fire-Fighting Robot – Nile University

2023

- Led the mechanical and system-level design of an autonomous fire-detection and suppression robot.
- Designed the chassis, motor-driven locomotion system, electric aiming mechanisms, actuator mounts, sensor supports, and water-delivery assembly.
- Integrated motors, motor drivers, sensors, microcontroller-based electronics, wiring, power components, computer vision, and navigation control.

- Considered component accessibility, assembly, fabrication constraints, structural reliability, and maintainability throughout the design process.
- Built and validated the complete prototype through iterative testing, troubleshooting, and system-performance analysis.

Self-Balancing 2 D.O.F. Twin-Rotor Aerospace System

2022

- Designed and controlled a twin-rotor electromechanical system using electric motors, rotary encoders, embedded electronics, and real-time control.
- Modeled the coupled nonlinear dynamics and developed MIMO control strategies for pitch and yaw stabilization.
- Integrated the mechanical structure, motor actuation, sensing hardware, signal interfaces, and control software into a complete laboratory platform.
- Validated system response and stability through simulation and physical hardware experiments.

Achievements

- **First Place – ACC 2025**, Denver, Colorado: Member of York University's **FullThrottle** autonomous racing team, contributing to the perception subsystem for high-speed navigation. (2025)
- Awarded **3rd Place** in the **Research Evaluation Conference (REC)**, Earth and Space Science Engineering Program, York University, among all master's thesis students, for the thesis: "*Lightweight Learning-Based Feature Selection for Real-Time Optical Flow Navigation on a Quadrotor Platform*" (2025).
- **3rd Place – Egypt Industry 4.0 Challenge** for the Autonomous Fire-Fighting Robot. (2022)
- **5th Best Graduation Project in Egypt – Cairo International Innovation Exhibition**. (2023)

Certifications

- Advanced Kalman Filtering for Navigation Systems – Udemy (2025)
- Computer Vision for Autonomous Systems – Udemy (2025)
- AWS Machine Learning Foundations – Udacity (2022)
- Embedded Systems Hardware and Software – NilePreneurs (2022)
- Artificial Intelligence Foundations – DotPy (2021)

Skills

Mechanical Design: SolidWorks, AutoCAD, mechanical assemblies, GD&T, tolerance considerations, design for manufacturability, design for assembly

Electric Actuation & Mechanisms: Electric motors, motor-driven mechanisms, actuator integration, steering and braking actuators, gears, linkages, mechanical transmission systems

Embedded Electronics Integration: Sensors, motor drivers, embedded controllers, wiring, signal interfaces, component integration, hardware troubleshooting

Fabrication & Prototyping: CNC (basic), 3D printing, mechanical assembly, rapid prototyping, test fixtures, iterative design validation

Simulation & Analysis: ANSYS, MATLAB/Simulink, dynamic system modeling, actuator modeling, control-system simulation, basic CFD

Controls & System Integration: PID control, MIMO systems, hardware-in-the-loop testing, sensor integration, real-time control, mechatronic system validation

Programming Languages: Python, MATLAB, C++, C/Embedded C

Cross-Functional Engineering: Mechanical, electrical, embedded, controls, software, manufacturing, system testing, technical troubleshooting

Languages: English (Fluent), Arabic (Native)

Publications

- A. Abosaad, J. Shan, *Lightweight Learning-Based Feature Selection for Real-Time Optical Flow Navigation on a Quadrotor Platform*, IEEE International Conference on Robotics and Automation (ICRA), 2026.