# Hassan M. Hammoud

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## Education

**American University of Beirut (AUB)** Aug. 2021 – Jun. 2026

- B.E. Mechanical Engineering (Control & Robotics) GPA: 4.0/4.0, High Distinction
- B.S. Applied Mathematics | Minor: Computational Science GPA: 4.0/4.0, High Distinction
- USAID Higher Education Scholarship & Education Above All Qatar Scholarship
- Dean's Award for Creative Achievement (Best Final-Year Project)

*Coursework:* Machine Learning, Probabilistic Graphical Models, Data Structures & Algorithms, Stochastic Models, Nonlinear Optimization, Numerical Computing, Nonlinear Systems, System Analysis & Design.

## Professional Experience

**American University of Beirut (AUB)** Oct. 2026 – Present
*Robotics Research Engineer* *Beirut, Lebanon*

- Implemented NDI and INDI flight controllers in ArduPilot C++ for an eight-actuator tiltrotor guidance, navigation and control (GNC) system.
- Developed a constrained weighted least-squares allocator for four motor thrusts and four rotor tilt angles.
- Built repeatable MuJoCo simulation tests to compare control performance and actuator motion.

**ToTssy Robotics** May 2025 – Present
*Robot Perception Engineer* *Tabarja, Lebanon*

- Built a zero-shot deep learning pipeline on Zivid 2+ RGB-D for a 400-SKU pilot (<0.6 s, 8–10 picks/min).
- Developed depth-geometry and neural-segmentation algorithms, raising pick success from below 60% to 97%.
- Built data and training pipelines for deep learning failure prediction, reaching ∼99.3% accuracy at ∼5 ms.
- Built ML data infrastructure on AWS with OpenTofu, running GPU SageMaker Processing jobs with alerts.
- Built an offline ML evaluation and A/B testing framework automating regression testing before deployments.
- Implemented CI/CD automating testing, signed Docker releases, and deployments for app and infrastructure.
- Developed production services using FastAPI/BentoML and Docker, with OpenTelemetry observability.
- Co-authored a patent application covering proprietary computer-vision technology developed in-house.

## Selected Research & Projects

**Context-Aware Autonomous Navigation for Complex Environments** Dean's Award – Best FYP

- Developed a DL perception pipeline (ZED + parallel YOLO) enabling context-aware scene understanding.
- Designed a POMDP planner for safe decision-making under uncertainty with < 50 ms latency.

**Autonomous Targeting of Pine Processionary Moth (PPM) Nests via a Multirotor Drone** Research

- Mapped experimental data into a five-stage force profile to engineer for depth control (2–4 mm).
- Built a ROS/PX4 Gazebo autonomy stack with a hierarchical FSM and ArUco/PnP visual servoing.
- Integrated and tuned a MINCO trajectory planner for real-time replanning at 2 m/s on a 7.5 m horizon.

**Octomap-python** Open-Source Contributor

- Contributed to Python bindings for OctoMap, a probabilistic 3D occupancy-mapping library for robotics.

**Analysis of Networked SIRSV & SAIRS Epidemic Models on Contact Graphs** Research

- Derived a spectral stability threshold for a network model, proving global stability via Lyapunov analysis.
- Contributed to parameter learning on Lebanese COVID-19 data; SAIRS manuscript in preparation.

**High Energy Particles / Signal Classifications** Project

- Feature-engineered a 600K dataset into 28 discriminative signals for Higgs–vs–background classification.
- Analyzed different architectures (LR, SVM, XGBoost, MLP) with 5-fold CV to identify the most robust one.

**Stochastic Modeling of Customer Purchase Behavior** Project

- Feature-engineered customer states from 100K+ transactions to represent key shopping behaviors.
- Performed empirical Markov chain statistical analysis showing a potential 6.9% increase in conversion rate.

## Skills & Interests

**Programming:** Python, SQL, MATLAB, Java, C++.
**Libraries:** PyTorch, TensorFlow, OpenCV, Ultralytics, scikit-learn, NumPy, Pandas.
**Tools:** Linux, Git, GitHub Actions, CI/CD, Docker, AWS, OpenTofu, ROS, PX4/ArduPilot, MuJoCo/Gazebo, FastAPI, BentoML, OpenTelemetry, Grafana, PostgreSQL/Alembic, UV/Conda, Make, MkDocs, Ansys, Solidworks, MS Office.
**Languages:** English [Fluent] | Arabic [Native] | French [Beginner].