Ghadi Nehme

ghadi-nehme | ghadinehme.wixsite.com/portfolio | ghadi@mit.edu | +1(650)250-9208

Education

Doctor of Philosophy in Artificial Intelligence | **MIT** Sep 2024 - Expected Dec 2027

GPA: 5.0/5.0. **Advisor:** Prof. Faez Ahmed.

Master of Science in Mechanical Engineering | **Stanford University** Sep 2022 - Jun 2024

GPA: 4.0/4.0. **Specialization:** Robotics and Kinematics, Artificial Intelligence.
Courses: Machine Learning, Computer Vision, Decision Making Under Uncertainty, Principles of Robot Autonomy.

Bachelor of Science in Mathematics & Physics | **Ecole Polytechnique, France** Sep 2019 - Jun 2022

GPA: 4.22/4.0, Class Valedictorian, Summa Cum Laude mention.
Minor: Biology, **Organizations:** President of the Robotics club, Mathematics club and Arts club.

Exchange Semester | **University of Toronto** Sep 2021 - Dec 2021

GPA: 4.0/4.0, **Engineering courses:** Mechanical Engineering Design, Circuit Analysis, Solid Mechanics.

Summer School: Introduction to Artificial Intelligence | **CentraleSupélec** Jul 2021

Research and Work Experience

Graduate Research Assistant | **CHARM Lab** Sep 2023 - Apr 2024

- Designing the system and control of a neurosurgery robot combining an endoscope, exoscope, and robotic arms.
- Training the Da Vinci robot to achieve the retraction of tissues of various stiffnesses autonomously.

Graduate Teaching Assistant | **Stanford University** Sep 2023 - Jun 2024

- MATH 104: Applied Matrix Theory, Organized weekly office hours and review sessions for more than 100 students.

Hardware Engineering Intern | **Google** Jun 2023 - Sep 2023

- Performed reliability competitor benchmarking study of tablets. Conducted failure analysis and formulated actionable design guidelines such as water ingress resistance and battery to carrier clearance design guideline.
- Analyzed the correlation between reliability robustness and system integration features.

Co-Founder & CTO | **Aries, AI startup for automating CAD** Oct 2023 - Jun 2024

- Built an AI model, automating 2D sketch to CAD conversion with customizable timelines, optimizing design processes.

Graduate Research Assistant | **School of Medicine, Stanford University** Jan 2023 - Jun 2023

- Built a real-time choice decoding of the decision of a monkey playing at iterative Battle of Sexes using the neural spikes.
- Achieved an accuracy of 90% on decoding monkeys decision by training a regression model on the neural data, using Python.

Research Projects

Sketch-to-CAD: Generating CAD Models from Hand-Drawn Sketches | **MIT** Sep 2024 - Dec 2024

- Built a dataset with 166255 hand-drawn sketches and 3D models of parts from the DeepCAD dataset.
- Developed a Sketch-to-CAD framework using a CNN encoder and Transformer decoder, leveraging transfer learning to enhance spatial feature extraction for accurate CAD command prediction.
- Achieved high accuracy on the DeepCAD dataset, demonstrating effective geometric clustering in latent space for generating CAD models from hand-drawn sketches. Links: [Report]

LLM-Driven Adaptive Robotic Manipulation for Complex Tasks | **MIT** Sep 2024 - Dec 2024

- Developed an LLM-driven robotic system for high-level task planning in a simulated kitchen using Vision-Language Models.
- Designed a modular execution framework enabling a robotic arm to perform stacking, sorting, and table setup tasks.
- Optimized grasping strategies in object manipulation tasks by developing new techniques based on bounding boxes and antipodal methods. Link: [Report], [Video]

A Multi-Objective Optimization Framework for Robots Design | **Stanford University** Apr 2024 - Jun 2024

- Developed a multi-objective optimization framework using genetic algorithms and gradient descent to optimize robotic design for efficiency and safety in medical applications.
- Validated the framework with case studies, achieving enhanced manipulability and precision in robots designed for complex surgical and dental tasks. Link: [Report]

Enhancing Robotic Manipulation: Harnessing the Power of Multi-Task Reinforcement Learning and Single Life Reinforcement Learning in Meta-World | **Stanford University** Apr 2023 - Jun 2023

- Developed a novel multi-task RL algorithm, Multi-Task Q-Weighted Adversarial Learning (MT-QWALE), that enables robotic arms to complete tasks from the MetaWorld, within a single trial, even in the presence of novel distribution shifts.
- Compared to MT-SAC, MT-QWALE achieved near 100% success rates on the tasks when object positions were randomized.
- Conducted an ablation study by masking the end goal position, finding that MT-QWALE can still accomplish tasks relying solely on reward feedback. Links: [Report], [Code], arXiv preprint arXiv:2311.12854

Safe Navigation: Training Autonomous Vehicles using Deep RL | **Stanford University** Jan 2023 - Mar 2023

- Developed deep reinforcement learning models using DQN architecture to enable autonomous vehicles to navigate urban environments safely in the CARLA simulator, achieved 94% success rate in navigating unseen test trajectories
- Implemented sensor data preprocessing of segmentation and depth images to extract relevant state information like obstacle distance and reduce state space complexity. Links: [Report], [Code], arXiv preprint arXiv:2311.10735

Skills

Software	Python, C++, OOP, MATLAB, Julia, Git, TensorFlow, PyTorch, SolidWorks (CSWA), AutoDesk Fusion 360, Onshape, MuJoCo, ROS
Hardware	Arduino, Raspberry Pi, 3D Printing, Prototyping, Hand Drafting

Leadership & Volunteering Experience

General Secretary | **L'ORE: Student's Government of the Bachelor Program** Jun 2020 - Jun 2021

- Lead a team of nine members, organized monthly social events, collected funds for the construction of a water fountain in Laos in collaboration with the organization Safe Water Cube.

Team Leader | **SSCC Missionary group** Jun 2017 - Jun 2022

- Organized activities for poor children and elderlies, helped people affected by the 4th of August explosion in Beirut.

Awards

- Awarded the Jamieson Presidential Fellowship at MIT, 2024
- Outstanding Student Distinction, Ecole Polytechnique: "distinguished himself through his dedication to the École Polytechnique community and/or to the welfare of society.", 2019-2022
- Bronze medalist at the International Mathematics Competition 2021.
- Recipient of the "Excellence scholarship" from the École Polytechnique Foundation in 2020.
- Recipient of the highly selective "Excellence-Major scholarship" from the French Government in 2019.
- First prize in the Science Fair organized by the USJ in 2018, for building an autonomous delivery car.

Languages & Hobbies

Languages	French, English, Arabic, Japanese (Limited)
Hobbies	Drawing, Painting, Playing the piano, Soccer, Tennis, Squash, Pickleball, Prototyping