Mostafa Lotfy

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EDUCATION

Northeastern University Sep 2024 – Jun 2026
Master of Science in Robotics; Computer Engineering Concentration; GPA: 3.70/4.0 *Boston, MA*
Courses: *Sensing and Navigation, Mobile Robotics, Reinforcement Learning, Musculoskeletal Biomechanics*

The American University in Cairo Sep 2019 – Jun 2024
Bachelor of Science in Computer Engineering; Minor in Mathematics; GPA: 3.72/4.0 *Cairo, Egypt*
Study Abroad: *University of Edinburgh, Scotland, UK* Sep 2022 – Dec 2022

SKILLS

Languages: Python, C, C++, C#, Rust, JavaScript, Verilog

Miscellaneous: TensorFlow, Pytorch, Keras, OpenCV, ROS1, ROS2, Socketio, AirSim, Unity, Docker, Gazebo, React

EXPERIENCE

Silicon Synapse Lab, Northeastern University Nov 2024 – Present
Graduate Researcher *Boston, MA*

- Enhanced the flight control of a bio-inspired flapping bat robot by refining a PID controller that integrates real-time pose estimation from ORB-SLAM3, achieving stable closed-loop hovering and precise stabilization
- Developed a testing framework for the bio-inspired flapping bat platform in MuJoCo, integrating it with ROS2 and designing custom environments to simulate real-world flight dynamics and scenarios and collect synthetic data
- Rewrote camera and IMU sensor drivers in C++ using a multithreaded approach to ensure precise time synchronization, minimizing serial transmission delays for accurate state estimation

Know Center GmbH Jun 2024 – Dec 2024
Applied Scientist *Graz, Austria*

- Programmed and calibrated AlienGo quadruped robot to mirror user movements on the Omnideck, a 360 treadmill to facilitate remote teleoperation
- Incorporated quadruped dog robot, drone, and humanoid camera feeds into Unity for VR control, allowing users to stream selected perspectives at 30 FPS in near real-time
- Established a robust communication architecture between robots using a dockerized private cloud, enabling remote robot control across networks with an average latency of 21ms

Siemens EDA Oct 2023 - May 2024
R&D Intern (Bachelor's Thesis) *Cairo, Egypt*

- Led SDK implementation to automate communication layer generation for digital twin systems in Python, enabling remote simulation, testing, and deployment of robotic digital twins for Siemens' internal use
- Assembled and programmed a PX4 drone and its digital twin, achieving a communication latency of 30ms between the physical drone and its virtual counterpart
- Built a high-fidelity simulation in AirSim and Unreal Engine, integrating bidirectional feedback with the physical drone via a cloud networking architecture for real-time scenario simulation

Nethermind Jul 2023 – Oct 2023
Artifical Intelligence Intern *London, United Kingdom*

- Improved natural language-to-SQL translation by integrating Retrieval-Augmented Generation (RAG) to refine LLM outputs with relevant context retrieval, achieving 81% accuracy in querying 70M Ethereum transactions
- Created a liquid neural network to analyze multiple factors affecting Ethereum price trends and presented findings in a report for investors to inform in decision-making

PROJECTS

Self-Driving Car Modules Development

- Refined a monocular ground-texture-based SLAM algorithm for map-free navigation in feature-sparse and low-visibility environments, resulting in 90% trajectory overlap with ground truth
- Implemented a dead reckoning module using sensor fusion of IMU and magnetometer data for emergency navigation in GPS-challenged conditions by applying an Extended Kalman Filter (EKF), achieving 73% trajectory alignment

Distributed P2P Image Sharing Service in Rust

- Engineered a distributed data processing pipeline in Rust utilizing Tokio for asynchronous networking; achieved a 95% uptime and reduced data processing latency by 40% compared to a Python implementation
- Developed a fault-tolerant leader election and load-balancing mechanism to efficiently distribute computational tasks
- Implemented secure P2P data transmission with steganographic encryption, ensuring controlled access and data integrity