Yousef **Emam**

SENIOR MACHINE LEARNING ENGINEER — AUTONOMY BEHAVIORS

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Experience

Zoox
Foster City, CA

Senior Machine Learning Engineer – Autonomy Behaviors — *June 2022 – Present*

- Develop machine learning methods for planning and decision making in autonomous driving.

GT Institute for Robotics and Intelligent Machines (IRIM)
Atlanta, GA

Graduate Research Assistant — *Aug 2018 - May 2022*

- Developed adaptive task-allocation and execution algorithms for heterogeneous multi-robot teams, validated in hardware on the Robotarium; published at ICRA 2020/2021 and in T-RO 2020.
- Developed safe reinforcement-learning methods for uncertain dynamical systems using robust control barrier functions, embedding the safety framework as a differentiable layer for sample-efficient policy learning; published in T-RO 2021 and RA-L 2022.
- Extended the Robotarium, the first remotely accessible swarm-robotics testbed, with autonomous quadcopter experiment execution and charging; published in RA-L 2021.
- Designed and prototyped SlothBot, a solar-powered, wire-traversing robot built for persistent, ultra-low-power environmental monitoring, and deployed it at the Atlanta Botanical Garden; published in RA-L 2019.

Exyn
Philadelphia, PA

Intern - Autonomy and Mapping — *May 2021 - Aug 2021*

- Developed a C++ algorithm to automate drone hover-stabilization parameter tuning during initial vehicle setup, replacing a manual process that previously required hours.
- Validated the automated tuning procedure in flight tests, achieving comparable stability to manual tuning in a six-minute flight and integrating the workflow into the field-engineering GUI.

Siemens
Princeton, NJ

Graduate Intern - Automatic Planning and Scheduling for Autonomous Systems — *May 2019 - Aug 2019*

- Extended Siemens' Receding Horizon scheduling planner to support cooperative tasks across heterogeneous agent teams and built a search-and-rescue simulation environment to benchmark the planner; published at IFAC 2020.

European Organization for Nuclear Research (CERN)
Geneva, Switzerland

Superconductor and Devices (SCD) Intern — *May 2017 - June 2017*

- Surveyed thermal sensors for the superconducting lines feeding the Large Hadron Collider's magnets and ran stress-strain and thermal-expansion analysis on superconducting wires in MATLAB.

GT Capstone Project
Atlanta, GA

Team Member — *Jan 2018 - May 2018*

- Won Best Mechanical Engineering Project for CARGOS, a Compact Active Response Gravity Offload System that offloads light payloads to simulate reduced-gravity environments for astronaut training, designed for integration with NASA's ARGOS.

Skills

Programming C++, Python, JAX/PyTorch, CUDA, Bazel, Spark/Databricks, ML training/evaluation, autonomy simulation

Languages Arabic (Native), French (Native), English (Native)

Education

Aug 2018 - May 2022 **Ph.D. in Robotics,** Georgia Institute of Technology — Advisors: Profs. Magnus Egerstedt & Zsolt Kira — *Atlanta, GA*

Aug 2018 - May 2021 **M.S. in Computer Science,** Georgia Institute of Technology — Specialization: Machine Learning — *Atlanta, GA*

Aug 2014 - May 2018 **B.S. in Mechanical Engineering,** Georgia Institute of Technology — Focus on Automation & Robotics — *Atlanta, GA*

Selected Publications

Journal Articles

[J1] **Y. Emam**, G. Notomista, P. Glotfelter, Z. Kira, M. Egerstedt. 'Safe Reinforcement Learning Using Robust Control Barrier Functions'. *2022 IEEE Robotics and Automation Letters (RA-L)*.

[J2] S. Wilson, P. Glotfelter, G. Notomista, S. Mayya, **Y. Emam**, X. Cai, M. Egerstedt. 'The Robotarium: Automation of a Remotely Accessible, Multi-Robot Testbed". *2021 IEEE Robotics and Automation Letters (RA-L)*.

[J3] **Y. Emam**, P. Glotfelter, S. Wilson, G. Notomista, M. Egerstedt. "Data-Driven Robust Barrier Functions for Safe, Long-Term Operation". *2021 IEEE Transaction on Robotics (T-RO)*.

[J4] G. Notomista, S. Mayya, **Y. Emam**, C. Kroninger, A. Bohannon, S. Hutchinson M. Egerstedt. "A Resilient and Energy-Aware Task Allocation Framework for Heterogeneous Multi-Robot Systems". *2020 IEEE Transaction on Robotics (T-RO)*.

[J5] G. Notomista, **Y. Emam**, M. Egerstedt. "The SlothBot: A Novel Design for a Wire-Traversing Robot". *2019 IEEE Robotics and Automation Letters (RA-L)*.

Conference Papers

[C1] **Y. Emam**, G. Notomista, P. Glotfelter, M. Egerstedt. "Data-Driven Adaptive Task Allocation for Heterogeneous Multi-Robot Teams Using Robust Control Barrier Functions". *2021 IEEE International Conference on Robotics and Automation (ICRA)*.

[C2] **Y. Emam**, S. Wilson, M. Hakenberg, U. Muenz, M. Egerstedt. "A Receding Horizon Scheduling Approach for Search & Rescue Scenarios". *2020 International Federation of Automatic Control (IFAC) World Congress*.

[C3] **Y. Emam**, S. Mayya, G. Notomista, A. Bohannon, M. Egerstedt. "Adaptive Allocation for Heterogeneous Multi-Robot Teams with Evolving and Unknown Robot Capabilities". *2020 IEEE International Conference on Robotics and Automation (ICRA)*.

[C4] **Y. Emam**, P. Glotfelter, M. Egerstedt. "Robust Barrier Functions for a Fully Autonomous, Remotely Accessible Swarm-Robotics Testbed". *2019 IEEE Conference on Decision and Control (CDC)* .

Service & Outreach

Peer Reviewer

- IEEE Transaction on Robotics (T-RO)
- IEEE Transactions on Control of Network Systems (TCNS)
- IEEE Control Systems Letters (L-CSS)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE International Conference on Robots and Systems (IROS)
- IEEE Conference on Decision and Control (CDC)
- IEEE Conference on Automation Science and Engineering (CASE)
- IEEE International Symposium on Multi-Robot and Multi-Agent Systems (MRS)

Session Chair

- 2021 IEEE International Conference on Robotics and Automation (ICRA)

Teaching Practicum

- ME 3017 - System Dynamics at the Georgia Institute of Technology