

Emanuel Munoz

emunoz@andrew.cmu.edu | emanuelsamir.com | github.com/EmanuelSamir | linkedin.com/in/emanuelsamirmp

EDUCATION

Carnegie Mellon University, Robotics Institute

Master of Science in Robotics

- *Relevant coursework: Embodied Safe AI, Computer Vision, Robot Learning*

Pittsburgh, PA
Expected graduation: August 2026

University of Engineering and Technology, UTEC

Bachelor of Science in Electrical Engineering | GPA: 4.0/4.0

- *Thesis: Curiosity-driven AI for mobile robotics exploration.*

Lima, Peru
December 2021

EXPERIENCE

Carnegie Mellon University, Robotics Institute

Graduate Research Assistant

- Developed a hierarchical safe drone navigation framework using HJ reachability and MPPI control to bridge long-horizon planning with low-level control.
- Integrated a physics-based behavior predictor for safe navigation in dynamic, smoke-dense environments.

Pittsburgh, PA
August 2024 – Present

Noteworthy AI

Machine Learning Engineer Intern

- Improved production Vision Transformer (ViT) models on imbalanced datasets, boosting F1 scores to ~90%.
- Prototyped an Out-of-Distribution (OOD) detector for ViT models in development and deployment, achieving up to ~70% recall in initial experiments.
- Curated and evaluated ~15k-sample datasets to benchmark ViT classifier performance in deployment.

Connecticut, CT | Remote
May 2025 – August 2025

Noteworthy AI

Machine Learning Engineer

- Designed and deployed C++ ROS2 nodes for stereo depth estimation and pole localization across a fleet of 9 production devices, enabling automated inspection workflows.
- Developed a low-latency, event-triggered image capture pipeline driven by pole tracking to ensure high-resolution imagery for AI-based defect analysis and grid monitoring.
- Streamlined automated edge deployment with Docker, Bash, and Git, cutting rollout time from ~10 minutes to seconds and enabling reliable fleet-wide launches.
- Built cloud-based ML pipelines for training, inference, and evaluation of ViT-based defect detection/classification using PyTorch, AWS, and W&B.

Connecticut, CT | Remote
March 2022 – August 2024

Carnegie Mellon University, Robotics Institute, RISS Program

Research Scholar

- Developed an adaptive safe control framework for autonomous driving based on control barrier function and extreme machine learning to mitigate model uncertainty effects.
- Validated the safety framework in a vehicle simulation environment, demonstrating greater robustness to uncertainty; results published at *IROS 2022*.

Pittsburgh, PA | Remote
May 2021 – July 2022

University of Engineering and Technology, UTEC - CONCYTEC

Research Assistant

- Designed a multi-camera 3D perception framework for sensing and feedback, contributing to the development of a surgical robotics platform.
- Developed a hybrid learning controller for torque-position mapping in manipulators; published at *CDC 2020*.
- Benchmarked and analyzed robust trajectory controllers on a surgical robot, improving understanding of tracking performance; results published at *ICCAD 2020*.

Lima, Peru
March 2020 – April 2021

Relevant publications

- E. Munoz, D. Kalaria, Q. Lin, and J. Dolan. "Online adaptive compensation for model uncertainty using extreme learning machine-based control barrier functions." *IEEE/RSJ IROS, 2022*.
- G. García, E. Munoz, et al. "Torque control in position-controlled robots using an inverse dynamic task." *CDC, 2020*.
- J. Charaja, E. Munoz, et al. "Trajectory tracking control of UR5 robot: a PD with gravity compensation and sliding mode control comparison." *ICCAD, 2020*.

SKILLS

Programming & ML: Python, PyTorch, TF, C++, ROS2, Computer Vision, RL, Safe Control (CBFs, Reachability).

Deployment & Tools: AWS, Docker, GCP, Weights & Biases, Git, Shell, SQL