

Emanuel Muñoz

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Interested in **autonomous robotic systems** field including specifically **motion planning, end-to-end learning, and computer vision applications**. Worked on projects related to surgical robotics, autonomous vehicles, reinforcement learning, and non-linear control such that they resulted on [seven IEEE indexed publications \(available here\)](#).

EDUCATION

Carnegie Mellon University, Robotics Institute | MS in Robotics

Expected Start: Fall 2024 | Pittsburgh, Pennsylvania

Universidad de Ingeniería y Tecnología - UTEC | Electrical Engineering

March 2016 - December 2021 | Lima, Perú

Awarded with Full Academic Scholarship

Cum. GPA: 4.00 | GPA in Peruvian scale: 15.75/20.00 | Thesis project: **AI-curiosity-driven exploration** in mobile robots.

Relevant courses: Foundations of Robotics, Image Processing, Machine Learning, Neuroscience, Autonomous Robotics.

RESEARCH AND INDUSTRIAL EXPERIENCE

Noteworthy AI, Freelance | Machine Learning Engineer

March 2022 - Present | Remote

- Developing **C++ code** to enhance, maintain, or fix the **computer vision** and **motion planning** framework for an edge device attached to an in-motion vehicle. Tech: **ROS2, Python, C++, OpenCV, Docker**.
- Designing and implementing algorithms for pole geolocation based on stereo depth estimation and motion tracking.

Carnegie Mellon University - Robotics Institute, RISS Program | Robotics Researcher

May 2021 - July 2022 | Remote

- Developed an **adaptive safe control** framework for autonomous vehicles diminishing the effects of model uncertainty based on **control barrier function** and **extreme machine learning**.
- Advised by [Qin Lin](#) and [John Dolan](#). Published paper at top conference **IROS 2022**.

UTEC - CONCYTEC | Robotics Research Assistant

March 2020 - April 2021 | Lima, Perú

- Contributed to building a surgical robotics platform funded by the government by developing a camera framework for feedback sensing using multicamera 3D estimation.
- Implemented a **hybrid learning controller** for torque-position transformation in manipulator robots. Published at top conference **CDC 2020**.
- Compared the tracking performance of robust trajectory controllers in a surgical robot. Published at **ICCAD 2020**.

Yale University - Schroers Lab | Research Assistant

Jan - March 2020 | New Haven, CT, US

- Sponsored by [Research Experience for Peruvian Undergraduates](#) | Supervised by [Jan Schroers](#) and Sungwoo Sohn.
- Designed and developed two new alloys with potential mechanical properties for industrial applications.

ISA REP | Digital Image Processing Intern

Jun - Dec 2019 | Lima, Perú

- Designed and developed two methods for corrosion detection based on **computer vision** and machine learning methods: SVM, Random Forest, Neural Networks.
- Launched the first phase of automatic supervision of **+1000 km powerlines** using **drones** and **supervised learning**.
- Developed framework for **semantic labeling**, classifier training, and GUI prototype. | Tech: **scikit, Keras, OpenCV**

PERSONAL PROJECTS

End-to-end navigation and exploration robotics | [Code](#), [Link](#)

- Developed a deep reinforcement learning agent implemented in a mobile robot with a LiDAR sensor for exploration and navigation tasks based on actor-critic agents. | Tech: **Gym, Torch**

Autonomous Mobile Robotics | [Code](#)

- Designed and implemented algorithms for **autonomous motion planning and exploration** on mobile robots in real and simulated environments. | **Tech: ROS, Python, Gazebo**
- Built complete frameworks for mobile robotic applications and **published four papers** showing results.

PUBLICATIONS

- [1] Emanuel Munoz, Dvij Kalaria, Qin Lin, and John Dolan. Online adaptive compensation for model uncertainty using extreme learning machine-based control barrier functions. In *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)*.
- [2] Gabriel García, Emanuel Muñoz-Panduro, and Oscar E Ramos. Torque control in position-controlled robots using an inverse dynamic task. In *2020 59th IEEE Conference on Decision and Control (CDC)*.
- [3] Jhon Charaja, Emanuel Muñoz-Panduro, Oscar E Ramos, and Ruth Canahuire. Trajectory tracking control of ur5 robot: a pd with gravity compensation and sliding mode control comparison. In *2020 International Conference on Control, Automation and Diagnosis (ICCAD)*.
- [4] Eddy Denegri, Emanuel Muñoz-Panduro, and Oscar E Ramos. Step-by-step development of an omnidirectional mobile robot. In *2019 IEEE Sciences and Humanities International Research Conference (SHIRCON)*.
- [5] Jose-Maria Muñoz, Emanuel Muñoz-Panduro, and Oscar E Ramos. Autonomous motion of a mobile robot based on potential fields and polar control. In *2018 IEEE XXV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)*.
- [6] Emanuel Muñoz-Panduro and Oscar E Ramos. Random exploration framework for an autonomous real-time generation of a map. In *2018 IEEE XXV International Conference on Electronics, Electrical Engineering and Computing (INTERCON)*.
- [7] G Garcia-Chavez and E Munoz-Panduro. Global control for the furuta pendulum based on partial feedback linearization and stabilization of the zero dynamics. In *Conference on Automation Science and Engineering (CASE 2017)*.

HONORS AND AWARDS

Selected out of 700+ applicants to participate in CMU's Robotics Institute Summer Scholars (RISS) program	2021
Accepted to participate on Eastern European Machine Learning Summer School 2021	2021
Selected out of 300+ students by REPU to work on nano science research internship at Yale University	2020
Awarded a travel international grant by UTECH GO to conduct a research internship	2019
Accepted with financial support in the International Summer School on Deep Learning for Robot Vision at Chile	2019

COMMUNITY AND LEADERSHIP

Group of Innovation, Research, and Technology

- Led academic group oriented to encourage technology and robotics research at Universidad de Ingeniería y Tecnología - UTEC. Members: +50 students and alumni.
- Started project "New Ocean", a collaborative project to stop ocean pollution using robotics and biotechnology.
- Mentored students on Machine Learning and Computer Vision topics.

Research Experience for Peruvian Undergraduates (REPU)

- Collaborated with REPU to enhance the organization and the yearly academic program. REPU is a STEM organization with +100 doctoral and undergraduate students network.
- Presented journal work in the yearly [REPU SEMINAR 2020](#).

ENGINEERING AND TECHNICAL SKILLS

- **Robotics:** ROS, Gazebo, OpenAI Gym, Linux.
- **Programming Languages:** Python, Linux Shell Scripting, C, C++, Matlab, Javascript.
- **Frameworks and Tools:** Keras, PyTorch, Keras, scikit-learn, scikit-image, OpenCV, Pandas, Numpy, Spicy, Git, Jupyter.
- **Database and Infrastructure:** SQL, Pandas, Docker, Kubernetes, GCP, AWS.
- **Soft Skills:** Effective communication, Effective Time Management, Personal Branding.

OUTSIDE INTERESTS

Decentralized tech, science divulgation, start-up and moonshots, table tennis, Sherlock Adventures, science cooking