Mateo Guaman Castro

+1 (339) 224-7936 | mateo.guaman1998@gmail.com | https://www.mateoguaman.com | https://www.github.com/mateoguaman

Education

Carnegie Mellon University — Pittsburgh, PA
Master of Science in Robotics — *Aug. 2021 – Aug. 2023*
GPA: 4.08/4.00

Tufts University — Medford, MA
Bachelor of Science in Electrical Engineering — *Sep. 2016 – May 2020*
GPA: 3.80 **Honors**: Summa Cum Laude, Member of Eta Kappa Nu (IEEE-HKN)

Experience

AirLab, The Robotics Institute — October 2021 – Present
Graduate Research Assistant. Advisor: Prof. Sebastian Scherer — *Carnegie Mellon University, PA*

- Develop perception algorithms for autonomous navigation for off-road vehicles using self-supervised deep learning.
- Decreased number of interventions by 57% using self-supervised proprioception-based traversability costs [1], and decreased number of interventions by up to 57% using inverse reinforcement learning [2]. Work in submission to ICRA 2023.
- Led three field-testing trips to an off-site location to test our algorithms on a different robot platform and environment.

Multi-Agent Robotic Motion Lab (MARMoT Lab) — May 2020 –August 2021
Research Intern, Remote. Advisor: Prof. Guillaume Sartoretti — *National University of Singapore, Singapore*

- Lead a 4-person research team to develop reinforcement learning-based domain decomposition algorithms for multi-robot distributed search-and-rescue.
- Formulated domain decomposition as a reinforcement learning problem, developed a simulation environment and implemented deep reinforcement learning methods to solve this problem.

Multimodal Learning, Interaction, and Perception Lab (MuLIP Lab) — May 2020 – June 2021
Research Staff. Advisor: Prof. Jivko Sinapov — *Tufts University, MA*

- Developed robot controllers and infrastructure for research in lifelong creative problem solving [3, 4]. Presented our work at the RSS 2021 Workshop on Declarative and Neurosymbolic Representations in Robot Learning and Control [4].
- Developed novelty handling capabilities and infrastructure for our DARPA "Science of Artificial Intelligence and Learning for Open-world Novelty" (SAIL-ON) AI agent. Co-authored a paper published in AAMAS 2021 [5].

Undergraduate Research Assistant. Advisor: Prof. Jivko Sinapov — June 2018 - May 2020

- Developed motion controllers, computer vision methods, and evaluation infrastructure for Baxter and UR5 robots for research in creative problem solving. Co-authored a paper published in ICDL 2019 [6].

Biorobotics Lab, The Robotics Institute — May 2019 – Aug. 2019
Research Intern. Advisor: Prof. Howie Choset and Prof. Guillaume Sartoretti — *Carnegie Mellon University, PA*

- Developed a SLAM-based deep reinforcement learning algorithm for active perception for a hexapod robot.
- Designed a visual simulator in Unity3D and a dynamics simulator in Gazebo for research in shaky perception.

Electrical and Computer Engineering (ECE) Department — Sep. 2018 – Dec. 2018
Teaching Assistant - Introduction to Electrical Systems — *Tufts University, MA*

- Led laboratory sessions for a group of 15 students.

SharkNinja Operating LLC — June 2018 – Aug. 2018
Electrical Engineering Intern — *Needham, MA*

- Designed and assembled a testbed for STM32 ARM Cortex-M0 microcontrollers to decrease future production costs for Ninja kitchen products and Shark cleaning products.

Publications

[1] **Guaman Castro**, M., Triest, S., Wang, W., Gregory, J. M., Sanchez, F., Rogers III, J. G., Scherer, S. (2022) **How Does It Feel? Self-Supervised Costmap Learning for Off-Road Vehicle Traversability**. Submitted to the 2023 IEEE International Conference on Robotics and Automation (ICRA). URL: www.howdoesitfeel.dev

[2] Triest, S., **Guaman Castro**, M., Maheshwari, P., Sivaprakasam, M., Wang, W., Scherer, S. (2022) **Learning Risk-Aware Costmaps via Inverse Reinforcement Learning for Off-Road Navigation**. Submitted to the 2023 IEEE International Conference on Robotics and Automation (ICRA)

[3] Gizzi, E., Lin, W. W., **Castro, M. G.**, Harvey, E., Sinapov, J. (2022) **Toward Life-Long Creative Problem Solving: Using World Models for Increased Performance in Novelty Resolution**. In proceedings of the 13th International Conference on Computational Creativity (ICCC), Bolzano, Italy, June 27 – July 1, 2022.

[4] Gizzi, E., **Castro, M. G.**, Lin, W.W, and Sinapov, J. (2021) **A Framework for Creative Problem Solving Through Action Discovery**. Presented at the Declarative and Neurosymbolic Representations in Robot Learning and Control Workshop at the Robotics: Science and Systems Conference (RSS). Virtual. July 2021.

[5] Muhammad, F., Sarathy, V., Tatiya, G., Goel, S., Gyawali, S., **Guaman, M.**, Sinapov, J., Scheutz, M. (2021) **A Novelty-Centric Agent Architecture for Changing Worlds**. In Proceedings of the 20th International Conference on Autonomous Agents and MultiAgent Systems (AAMAS), London, UK, May 3-7, 2021.

[6] Gizzi, E., **Castro, M. G.**, and Sinapov, J. (2019) **Creative Problem Solving by Robots Using Action Primitive Discovery**. In proceedings of the Joint IEEE 9th International Conference on Development and Learning and Epigenetic Robotics (ICDL-EpiRob), Oslo, Norway, Aug. 19-22, 2019.

Projects

Fall Prediction using Anomaly Detection in Gait Patterns | *Senior Design Project* Sep. 2019 – May 2020
Machine Learning, Biosensors, Python Tufts University, MA

- Created a smart capacitive insole to watch for abnormal gait patterns to help prevent falls before they happen.
- Developed PCA-based and deep learning-based time-series anomaly detection algorithms using recurrent autoencoders.

Stable Locomotion in Unstructured Terrain Using Reinforcement Learning Sep. 2018 – Dec. 2018
Reinforcement Learning, Robotics, Locomotion, C/C++, Python Tufts University, MA

- Used deep reinforcement learning to adapt the gait of a hexapod robot online in multiple custom-made Gazebo environments with varied topographies.

Semantic Autonomous Mapping Jan. 2018 – May 2018
Robotics, Navigation, Computer Vision, Python, C/C++ Tufts University, MA

- Developed an algorithm (using ROS) for a Turtlebot robot to create a semantic map of a building by performing optical character recognition to save semantic information while the robot navigates a building.

Smart Bike Lights | *MakeHarvard Make-athon* Feb. 2018
Filtering, Electronics, IoT, MATLAB, Python Harvard University, MA

- Led a team of five that built automatic turning and braking lights using a Kalman filter by reverse engineering a set of bike lights to interface with a Raspberry Pi
- Won Reverse Engineering and Documentation Award

Skills

Languages: Python, C/C++, MATLAB, Julia, HTML/CSS
Frameworks and Libraries: Robot Operating System, Tensorflow, PyTorch, Scikit, OpenCV, Unity3D, Gazebo, PyBullet
Developer Tools: Git, Linux, Docker, SLURM, Google Cloud Platform, Raspberry Pi, Arduino
Crafting: Soldering (Through-hole and SMD), Laser Cutting, Circuitry
Languages: Spanish (native)

Activities

Field Robotics Center Activities Committee 2022
Chair The Robotics Institute, Carnegie Mellon University, PA

- Organized weekly FRC Tea Time, a social event with food for all students, staff, and faculty of FRC, with attendance of about 30 people per event.
- Organized the FRC Summer BBQ, a large social event attended by 110 members of FRC, including students, staff, and faculty.

CMU AI Undergraduate Mentoring Program 2022
Mentor Carnegie Mellon University, PA

- Mentored a Latino undergraduate student in different topics in AI.

ICLR and ICML Virtual Conferences 2020
Volunteer Virtual Format

- Moderated three poster presentations and helped to make sure virtual platforms run smoothly.

ECE Department Sep. 2017 – May 2018
Member of Electrical Engineering student board Tufts University, MA

- Appointed by the department chair to provide semesterly student feedback about classes and the EE and CompE programs to a board of ECE professors.

IEEE Club Jan. 2018 – May 2020
Class of 2020 Representative Tufts University, MA

- Organize events relevant to the EECS community at Tufts and outreach