Domingo **Esteban**

Researcher/Engineer in Machine Learning for Robotics

mingo.esteban@gmail.com | domingoesteban.com | domingoesteban | domingoesteban

Summary

PhD in Advanced and Humanoid Robotics; with an M.Sc. in Robotics and Automation, a B.Sc. in Industrial Engineering and a B.Sc. in Economics and Business. The goal of my research is to endow robots with the ability to autonomously acquire motor skills through a better use of the data obtained from its interaction with the world. My research is mainly supported by the design and application of (deep) reinforcement learning, optimal control and supervised/unsupervised learning techniques.

I am currently working in the Locomotion and Manipulation Group at ANYbotics AG, developing machine learning-based motion control systems for legged robots navigating challenging terrains.

Research Interests

Robot Reinforcement Learning	Model-free and model-based algorithms that scale to robotics problems (high-dimensional, continuous states and actions, hierarchical and multi-task problems)
Optimal Control	Control with learned models, control with inaccurate models, Stochastic Optimal Control, MPC
Humanoids and Legged Robots	Whole-body motions with various tasks, multi-contact motion, locomotion, loco-manipulation
Imitation Learning	Inverse reinforcement learning, shared human-robot representations, behavioral cloning

Education

Istituto Italiano di Tecnologia (IIT) - Università degli Studi di Genova — *Genoa, Italy*

PhD in Bioengineering and Robotics – Curriculum: Advanced and Humanoid Robotics — *Nov. 2015 - July 2019*

Universidad Carlos III de Madrid — *Madrid, Spain*

M.Sc. in Robotics and Automation — *Sept. 2012 - July 2014*

Universidad Nacional de San Agustín de Arequipa — *Arequipa, Peru*

B.Sc. in Industrial Engineering — *Apr. 2004 - Apr. 2009*

Universidad Católica San Pablo — *Arequipa, Peru*

B.Sc. in Economics and Business — *Mar. 2006 - Dec. 2010*

Experience

ANYbotics AG — *Zurich, Switzerland*

Robotics Software Engineer — *Oct. 2021 - PRESENT*

- Development of Machine Learning-based Motion Control Software for Legged Robots.

Istituto Italiano di Tecnologia (IIT) – Dynamic Legged Systems (DLS) lab — *Genoa, Italy*

Post-Doctoral Researcher — *Aug. 2019 - Sept. 2021*

- Learning and deploying neural networks for predicting foothold and base adjustments in legged robots based on visual feedback.
- Learning locomotion behaviors with model-free Deep Reinforcement Learning techniques in simulation (pybullet, RAISIM simulators, and NVIDIA Isaac Gym).
- Give support to other members of the group in Machine Learning related topics.
- Writing research project proposals for EU and national funding.

Istituto Italiano di Tecnologia (IIT) – Department of Advanced Robotics (ADVR) — *Genoa, Italy*

PhD Candidate — *Nov. 2015 - July 2019*

- Member of the Learning and Interaction group.
- Research focused on robot learning in humanoid robots:
  - (Deep) reinforcement learning for continuous control tasks: Soft Actor Critic (SAC), Guided Policy Search (GPS), Deep Deterministic Policy Gradients (DDPG), Proximal Policy Optimization (PPO), Normalized Advantage Functions (NAF), REPS, PILCO, PI2.
  - Hierarchical and multi-task reinforcement learning in robotics.
  - Exploiting failed executions to improve efficiency and safe-exploration in Reinforcement Learning of robotics tasks.
  - Transfer learning of skills between humanoid robots.
  - Behavioral cloning of whole-body movements

IXION Industry and Aerospace *Madrid, Spain*

Robotics Engineer *June 2013 - Oct. 2015*

- Design, programming and implementation of locomotion, perception, localization, SLAM and motion planning algorithms for the autonomous robots of the company: unmanned multi-rotors vehicles (UAS), unmanned ground vehicles (UGV) and autonomous underwater vehicles (AUV), in ROS.
- Simulation of autonomous mobile robots.
- Programming of navigation algorithms for autopilot systems in real-time embedded systems.
- Programming and implementation of Hardware-in-the-loop (HIL) simulation systems for the navigation of autonomous robots.
- Development and wrapping of sensor drivers in real-time embedded systems.

Universidad Carlos III de Madrid *Madrid, Spain*

Research Collaborator – ROBOTICSLAB - Humanoids Group *Mar. 2013 - July 2015*

- Design, programming and implementation of whole-body trajectory generation algorithms for TEO, the full-size humanoid robot of the Humanoids group.
- Simulation of a humanoid robot in Gazebo simulator.
- Design and development of ROS nodes in C++ and Python.

Publications

2022 Fahmi, S.; Barasuol, V.; **Esteban, D.**; Villarreal, O.; Semini, C. *"ViTAL: Vision-Based Terrain-Aware Locomotion for Legged Robots"*, IEEE Transactions on Robotics 39 (2)

2020 **Esteban, D.**; Villarreal, O.; Fahmi, S.; Semini, C.; Barasuol, V. *"On the Influence of Body Velocity in Foothold Adaptation for Dynamic Legged Locomotion via CNNs"*, International Conference on Climbing and Walking Robots (CLAWAR)

2019 **Esteban, D.**; Rozo, L.; Caldwell, D. *"Hierarchical reinforcement learning for concurrent discovery of compound and composable policies"*, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

2018 **Esteban, D.**; Rozo, L.; Caldwell, D. *"Learning Deep Robot Controllers by Exploiting Successful and Failed Executions"*, IEEE-RAS International Conference on Humanoid Robots (Humanoids)

2017 Delhaisse, B.*; **Esteban, D.***; Rozo, L.; Caldwell, D. *"Transfer Learning of Shared Latent Spaces between Robots with Similar Kinematic Structure"*, IEEE International Joint Conference on Neural Networks (IJCNN) – (* Equal contribution)

2014 Martínez, S.; **Esteban, D.**; Jardón-Huete, A.; Balaguer, C. *"Anticipative Humanoid Postural Control System for Locomotive Tasks"*, IEEE-RAS International Conference on Humanoid Robots (Humanoids)

Skills

Machine Learning SW PyTorch, TensorFlow, scikit-learn, OpenAI-Gym, NVIDIA Isaac Gym, GPy

Robotics SW ROS, Gazebo, NVIDIA Isaac Sim, PyBullet, MuJoCo, OpenCV, YARP, RobotStudio

Programming Python, C++, C, Shell scripting, MATLAB®/Octave, HTML/CSS, Git, Docker

Languages English, Spanish, Italian

Professional Activities

Reviewer for international journals and conferences

IEEE Robotics and Automation Letters (RA-L)	*2020, 2021, 2023*
SN Applied Sciences	*2021*
International Conference on Robotics and Automation (ICRA)	*2021, 2022, 2024*
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	*2018, 2019, 2020, 2021*
IEEE-RAS International Conference on Humanoid Robots (Humanoids)	*2017, 2018*
Conference on Robot Learning (CoRL)	*2018*