

# Domingo Esteban

ROBOTICS AND MACHINE LEARNING RESEARCHER

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## 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 as a Post-Doc fellow in the Dynamic Legged Systems lab at the Italian Institute of Technology (IIT). My work is focused on researching data-driven methods in order to improve the reaction capabilities of the legged robots in the lab.

## Research Interests

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

## Education

### Università degli Studi di Genova – Istituto Italiano di Tecnologia (IIT)

PHD IN BIOENGINEERING AND ROBOTICS – CURRICULUM: ADVANCED AND HUMANOID ROBOTICS

*Genoa, Italy*

*Nov. 2015 - July 2019*

### Universidad Carlos III de Madrid

M.SC. IN ROBOTICS AND AUTOMATION

*Madrid, Spain*

*Sept. 2012 - July 2014*

### Universidad Nacional de San Agustín de Arequipa

B.SC. IN INDUSTRIAL ENGINEERING

*Arequipa, Peru*

*Apr. 2004 - Apr. 2009*

### Universidad Católica San Pablo

B.SC. IN ECONOMICS AND BUSINESS

*Arequipa, Peru*

*Mar. 2006 - Dec. 2010*

## Publications

<b>2019</b>	<b>Esteban, D.;</b> Rozo, L.; Caldwell, D. “ <i>Hierarchical reinforcement learning for concurrent discovery of compound and composable policies</i> ”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
<b>2018</b>	<b>Esteban, D.;</b> Rozo, L.; Caldwell, D. “ <i>Learning Deep Robot Controllers by Exploiting Successful and Failed Executions</i> ”, IEEE-RAS International Conference on Humanoid Robots (Humanoids)
<b>2017</b>	Delhaisse, B.*; <b>Esteban, D.*;</b> Rozo, L.; Caldwell, D. “ <i>Transfer Learning of Shared Latent Spaces between Robots with Similar Kinematic Structure</i> ”, IEEE International Joint Conference on Neural Networks (IJCNN) – (* Equal contribution)
<b>2014</b>	Martínez, S.; <b>Esteban, D.;</b> Jardón-Huete, A.; Balaguer, C. “ <i>Anticipative Humanoid Postural Control System for Locomotive Tasks</i> ”, IEEE-RAS International Conference on Humanoid Robots (Humanoids)

## Skills

<b>Machine Learning SW</b>	PyTorch, TensorFlow, OpenAI-Gym, scikit-learn, GPy
<b>Robotics SW</b>	ROS, YARP, Gazebo, MuJoCo, PyBullet, RobotStudio, OpenCV
<b>Programming Languages</b>	Python, C, C++, MATLAB®/Octave, Shell scripting, HTML/CSS, Git
	English, Spanish, Italian

## Experience

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### Istituto Italiano di Tecnologia (IIT) – Dynamic Legged Systems (DLS) lab

Genoa, Italy

POST-DOC FELLOW

Aug. 2019 - PRESENT

- Learning foothold and waist adjustments in legged robots based on visual feedback.
- Learning locomotion behaviors with model-free Deep Reinforcement Learning techniques in simulation (pybullet and RAISIM simulators).
- Give support to other members of the group in Machine Learning related topics.

### 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.
- Development of a MATLAB® graphical user interface (GUI) for the generation of whole-body trajectories for TEO humanoid robot.
- Development of shell scripts for GNU/Linux Operating Systems.

### Barrick Gold Corporation – Minera Barrick Misquichilca S.A.

Huaraz, Peru

INTERN

Jan. 2011 - Dec. 2011

- Data analysis and use of data mining techniques to obtain information from the databases of the company.
- Employee personal data update and generation of reports in Oracle R12 System.
- Statistics, indicators and documentation update of the Human Resources Quality Management System according to ISO 9001 standard.

## Professional Activities

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### PAPER REVIEWING

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

2018, 2019

IEEE-RAS International Conference on Humanoid Robots (Humanoids)

2017, 2018

Conference on Robot Learning (CoRL)

2018

## Professional Development

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### Deep Learning and Bayesian Methods

Moscow, Russia

DEEP|BAYES, SAMSUNG RESEARCH, NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS (HSE)

August 2018

### An Introduction to Spatial (6D) Vectors and their use in Robot Dynamics

Genoa, Italy

ISTITUTO ITALIANO DI TECNOLOGIA

March 2017

**Robot Programming**

ISTITUTO ITALIANO DI TECNOLOGIA

*Genoa, Italy**July 2016***REGML: Regularization Methods for Machine Learning**

UNIVERSITÀ DEGLI STUDI DI GENOVA

*Genoa, Italy**June 2016***Machine Learning: A computational Intelligence Approach**

UNIVERSITÀ DEGLI STUDI DI GENOVA

*Genoa, Italy**June 2016***Control of Mobile Robots**

GEORGIA INSTITUTE OF TECHNOLOGY

*Coursera (MOOC)**March 2014***Autonomous Mobile Robots - AMRx**

ETH ZURICH (ETHZ)

*edX (MOOC)**Feb 2014***Machine Learning**

STANFORD UNIVERSITY

*Coursera (MOOC)**July 2013*