# Domingo **Esteban**

Robotics and Machine Learning Researcher

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## Summary


PhD candidate and research fellow 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.

Carrying out the doctoral research activities in the Department of Advanced Robotics at the Italian Institute of Technology (IIT). The goal of my PhD program 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 have research experience both in academia and industry in machine learning, robot control and robot simulation.


## Research Interests

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| **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** | Whole-body motions with various tasks, multi-contact motion, locomotion, 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 - Exp. 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*

## Publications

**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) – *(Accepted)*

**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

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

# Experience

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

Affiliated Researcher — *Nov. 2015 - PRESENT*

- 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*

ROBOTICSLAB - Humanoids Group Research Collaborator — *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 Development

### 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
*Genoa, Italy*

Istituto Italiano di Tecnologia — *July 2016*

### REGML: Regularization Methods for Machine Learning
*Genoa, Italy*

Università degli Studi di Genova — *June 2016*

### Machine Learning: A computational Intelligence Approach
*Genoa, Italy*

Università degli Studi di Genova — *June 2016*

### Control of Mobile Robots
*Coursera (MOOC)*

Georgia Institute of Technology — *Mar. 2014*

### Autonomous Mobile Robots - AMRx
*edX (MOOC)*

ETH Zurich (ETHx) — *Feb 2014*

### Machine Learning
*Coursera (MOOC)*

Standford University — *July 2013*