

Machine Learning Model Implementation for Legged Robots

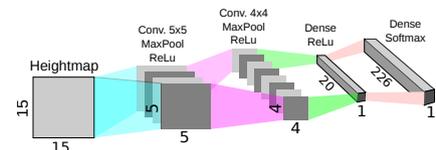
Keywords

Machine Learning, Neural Networks, Deep Learning, Legged Robots.

1 Description

The Dynamic Legged Systems Lab (**DLS**) is currently working on the implementation of machine learning algorithms for a range of diverse applications for quadruped locomotion (vision, model reduction, navigation, feasibility constraints handling) to adapt to complex environments. Some examples comprise learning gait parameters to reduce energy consumption [1] or the implementation of fast foothold adaptations based on Convolutional Neural Networks (CNNs) [2].

We are currently looking for a highly motivated, full-time candidate to do an internship working on the implementation, evaluation and further development of learning algorithms into our locomotion framework.



2 Tasks

- Implement the already developed algorithms in order to increase computation efficiency, code readability and reusability
- Explore ways to improve the learning algorithms based on factors such as the given task, data structure and implementation
- Integrate the learned capabilities into an optimization-based motion planning algorithm
- Experimental verification

3 Requirements

At the moment of application, the candidate must have earned at least a bachelor degree in computer science, systems and control, robotics or related.

Requirements also include:

- Strong mathematical background
- Experience with basic machine learning and optimization techniques
- Strong programming skills in C++ and Python
- Knowledge of a machine learning framework such as TensorFlow, Keras or PyTorch
- Experience with ROS

- Strong communication skills (written and spoken) in English language
- Strong team player
- Willingness to integrate into a multidisciplinary, dynamic, international research group

Further desirable skills:

- Knowledge about robot kinematics and dynamics
- Programming skills in Matlab/Simulink
- Hands-on experience in robotic systems is a big plus

4 Duration

Minimum 6 months, with the possibility of extension depending on achieved results.

5 How to apply

To apply send an e-mail including your detailed CV, university transcripts and cover letter outlining motivation, experience and qualifications for the position to **octavio.villarreal@iit.it** and **romeo.orsolino@iit.it**, stating "[Intern2019] Machine Learning Position" in the subject of the e-mail.

References

- [1] E. Heijmink, A. Radulescu, B. Ponton, V. Barasuol, D. G. Caldwell, and C. Semini, "Learning optimal gait parameters and impedance profiles for legged locomotion," in *2017 IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)*, pp. 339–346, Nov 2017.
- [2] O. Villarreal, V. Barasuol, M. Camurri, M. Focchi, L. Franceschi, M. Pontil, D. G. Caldwell, and C. Semini, "Fast and Continuous Foothold Adaptation for Dynamic Locomotion through Convolutional Neural Networks," *ArXiv e-prints*, Sept. 2018.