Using RL for Learning Bipedal Robot Locomotion
### Project proposal

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1 Goals

Recently there has been an increasing interest in humanoid robots. One of the first tasks that a developer of such a robot faces is the need to make it walk.

In this project, we want to explore the use of Reinforcement Learning (RL) for making a bipedal robot walk. We will use a simulator for this work, the OpenAI Gymnasium [2]:
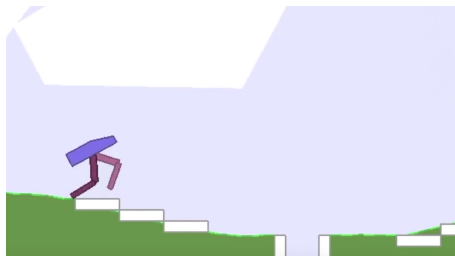
We want to try several different RL approaches (DQN, PPO, C51, SAC, etc.) already available in CleanRL [1], and make a comparison. This will alow the student to gain a better understanding of RL and these algorithms.

2 Work plan

The project has the following tasks:

T1 Introduction to the robotic simulator (2 weeks).

T2 Study RL approaches to bipedal walking (4 weeks).

T3 Implement and make comparative evaluations between the different approaches. (7 weeks).

T4 Write the project's report (2 weeks).

3   Expected Results

- A method that can make the robot learn to walk

- Source code and documentation of all code developed

- Project report

4   References

[1] Shengyi Huang, Rousslan Fernand Julien Dossa, Chang Ye, Jeff Braga, Dipam Chakraborty, Kinal Mehta, and João G.M. Araújo. Cleanrl: High-quality single-file implementations of deep reinforcement learning algorithms. *Journal of Machine Learning Research*, 23(274):1–18, 2022.

[2] Mark Towers, Jordan K. Terry, Ariel Kwiatkowski, John U. Balis, Gianluca de Cola, Tristan Deleu, Manuel Goulão, Andreas Kallinteris, Arjun KG, Markus Krimmel, Rodrigo Perez-Vicente, Andrea Pierré, Sander Schulhoff, Jun Jet Tai, Andrew Tan Jin Shen, and Omar G. Younis. Gymnasium, March 2023.