



Universidade do Minho

Departamento de Informática

Mestrado [Integrado] em Engenharia Informática

Mestrado em Matemática e Computação

Dados e Aprendizagem Automática

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Practical Exercise no. 11

Theme Reinforcement Learning: Q-Learning vs. SARSA

Exercise Reinforcement Learning is an automatic learning paradigm that allows an agent to learn in an interactive environment, by trial and error, and using feedback from its actions and acquired experiences to choose the next step. Within this paradigm there are multiple techniques, specifically Q-Learning and SARSA techniques.

The aim of this practical statement is to carry out a series of tasks that will give you a better understanding of Q-Learning and SARSA models. To this end, it will be used the “[CartPole-v1](#)” challenge, provided by the OpenAI’s Gym library, whose example is shown in Fig. 1. The goal is to train an intelligent bot using referred techniques to successfully complete the challenge.

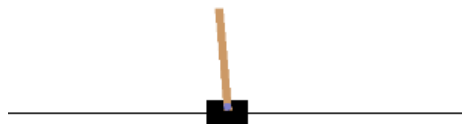


Fig. 1: “CartPole-v1” challenge available in the OpenAI’s Gym library.

Tasks Given the requirements of the problem, the following tasks must be followed to solve the problem:

T1. Follow and implement the steps presented in the lab notes in order to design two reinforcement learning models, trained with the respective techniques: (1) Q-Learning; (2) SARSA.

T2. Critically analyze and compare the results presented by each model in terms of their average reward for each episode in the learning process and list the conclusions.

T3. Try to vary the hyperparameters of the models, such as the number of episodes, the discount factor, the learning rate and the exploration constant. Analyze how each of these hyperparameters influences the convergence process of each model and draw conclusions.