Cairo University

Faculty of computers and Artificial Intelligence

Reinforcement Learning (AI424)

Assignment 2

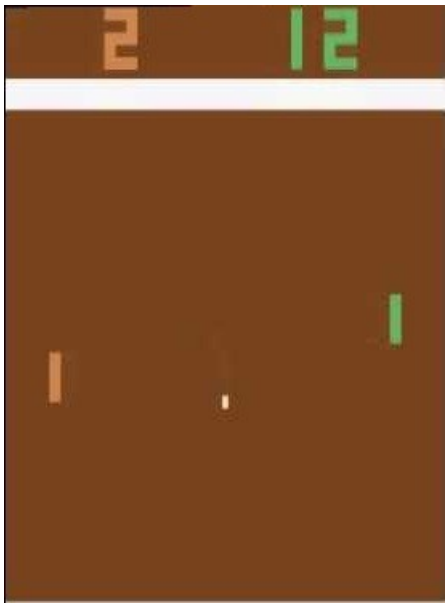
- **Assignment objective**

  The objective of this assignment is to learn:
  - How to use open AI gym Atari environments.
  - The implementation Deep Q_Learning algorisms.
  - Comparing Between Q_Learning and Deep Q-Learning

- **Assignment Rules**
  - Due date is Monday 23th.
  - The assignment **must** be delivered in groups of 3 students.
  - Your file name should be 1ID_2ID_3ID.py
  - Any cheats will get zero.

- **Assignment Description (Pong env)**

  In this game you control the right paddle, you compete against the left paddle controlled by the computer. You each try to keep deflecting the ball away from your goal and into your opponent's goal.



- **Environment Description**
  - **Observations**

    By default, the environment returns the RGB image that is displayed to human players as an observation. So we can assume that the respective observation spaces are:

    - Box([0 ... 0], [255 ... 255], (128,), uint8)
    - Box([[0 ... 0] ... [0 ... 0]], [[255 ... 255] ... [255 ... 255]], (250, 160), uint8)

  - **Actions**

    By default, all actions that can be performed on an Atari 2600 are available in this environment. However, if you use v0 or v4 or specify (*full_action_space=False*) during initialization, only a reduced number of actions (those that are meaningful in this game) are available.

    Type: Discrete (6)

Num	Action
0	NOOP
1	Fire
2	Right
3	Left
4	Right+Fire
5	Left+Fire

  - **Reward**

    You get score points for getting the ball to pass the opponent's paddle. You lose points if the ball passes your paddle.

- **Assignment Requirements**

You are required to deliver the following:

- An implementation in python Deep Q_Learning algorithms based on the Pong-v4 environment.
- Compare between Q-Learning and Deep Q-Learning in terms of training time and conversion time.

- **Tips and Hints**
  - For more details for the environment see (https://www.gymlibrary.ml/environments/atari/pong/)
  - Atari_wrapper.py file will be add on BB you will need this file during the assignment, for details about wrappers see(https://www.gymlibrary.ml/content/wrappers/)
  - For importing the environment use (`gym.make('PongNoFrameskip-v4')`)
  - Train the model and save the trained model before the discussion, because it probably take several hours for training.
  - Take screenshots or record your laptop screen to save your results.
  - You can use CartPole environment for the comparison.