Higher school of economics

Faculty of computer science

Data sciences program

Report for research internship:

Solving the game of Pong using Reinforcement learning

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Introduction:

In this report, I will explain my attempt to solve the Atari game Pong using Reinforcement Learning (RL), this task is one of the tasks required in my thesis, in which I am trying to find an interpretable approach to solve the same game using Reinforcement learning. First, I will provide a small introduction to the game “Pong”, then introduce the

To study the problem of interpretable Reinforcement Learning, we need first to decide on a suitable environment where we can test our interpretable model, and for that purpose, we will check the environments that are available in the gym Library (Gym Documentation, n.d.) and specifically we will choose Pong Atari environments (Pong, n.d.), the following figure, shows the environment’s frame:

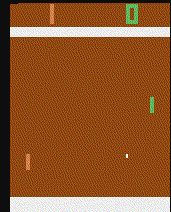


Figure 6: Pong-v4 frame

Since we know that the environment is determined by several attributes, we mentioned before, that the environment gives observations, and a reward to the agent and it can receive actions, so in the following, we will show these attributes:

|  |  |
| --- | --- |
| The attribute | The value |
| Observation | Frames with the dimensions (210,160,3) ==(height, width, 3 colors) |
| Action Space | Discrete(6)  ['NOOP', 'FIRE', 'RIGHT', 'LEFT', 'RIGHTFIRE', 'LEFTFIRE'] |
| Reward | Scalar value (1) for a winning rally  Scalar value (-1) for a losing rally |
| Episode terminating | The player reaches a score of 21  Episode length > 400000 |
| Solved Requirement: | The average score of 17 over 100 consecutive trials |

Finally, we need to note that both actions 2,4 or “RIGHT, RIGHTFIRE” and the actions (3,5) or “LEFT, LEFTFIRE” Are the same movements with different amplitudes.