

AML proposal Group 29

The idea

The project's goal is to learn how reinforcement learning works by applying it to a simple but still complex Atari game. Using the Gym environment from OpenAI, we will be able to focus on the learning part and not the technical details related to the game.

The environment allows to work either with screen of the game as input or directly the RAM of the game.

Link to gym.openai:

<https://gym.openai.com/>

Approach

We will use deep learning to teach our AI to play pacman. This will allow us to extract the features from the input without defining them ourselves. Deep learning architecture will learn those relevant features itself.

For this it will be necessary to find an appropriate reward function and teach a neural network to extract actions given the state of the game. This will form our policy for playing.

For example, if we chose to work with the image of the game as input, we would probably use convolutional layers combined with ReLu activation function to properly extract abstract features from the image as the character, object and ghosts.

Technologies

In addition to the Gym environment, we plan to use machine learning libraries as Tensorflow and Keras which is implemented in Tensorflow.

This project is perfect to learn a machine learning framework and implement our algorithm with those libraries.

Related projects

Training pacman has already been done quite a few times. Our challenge will be to enhance the results. Here are some related projects and articles on the use of RL for Pacman.

<https://towardsdatascience.com/advanced-dqns-playing-pac-man-with-deep-reinforcement-learning-3ffbd99e0814>

<http://cs229.stanford.edu/proj2017/final-reports/5241109.pdf>

<https://esc.fnwi.uva.nl/thesis/centraal/files/f323981448.pdf>

<https://github.com/prasoon2211/pacman-RL>
<https://github.com/tychovdo/PacmanDQN>

Expectations

Reinforcement learning is a very powerful approach to building AI for games. Therefore, we expect the final version of our AI to play the game at levels comparable to human players in the best case.