

Deep Reinforcement Learning for Simple Games

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Background

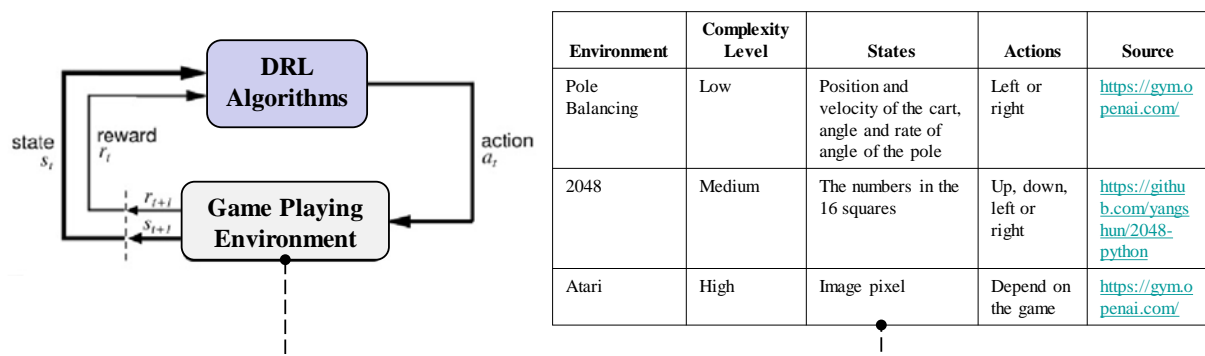
Recently, Deep Reinforcement Learning (DRL) has gained a lot of attentions after Alpha Go, a computer program developed to beat best human experts in the game of Go. The main reason for its success lies in the application of deep learning and reinforcement learning techniques or Deep Reinforcement Learning in short. DRL has the ability to make good decisions without explicitly knowing the nature of the planning tasks involved. It can be applied to different domain specific tasks and is able to perform excellently after massive amount of trainings. For example, the application of DRL to achieve high scores in playing different Atari games without any knowledge of the game rules can be achieved after weeks of trainings.

Objective

In this project we aim to develop *deep neural network architecture* and investigate its performance when applied to reinforcement learning problem, i.e. playing games with different level of complexity.

Scope

The game playing environments that we planned to experiment with consist of (1) classical pole balancing, (2) 2048, and (3) Atari game. The figure below shows the level of complexity for the 3 games based on the number inputs and its interaction with the DRL algorithms. The input to the DRL algorithms includes the current state variables while the output is the recommended action. The error can be computed given the reward and the new state variables as a result of executing the recommended action.



The followings are some examples (but not limiting to) of the questions that we planned to study while executing this project.

- How does the neutral network architecture affect the performance?
- How does the complexity of the problem (game playing environments) affect neutral network architecture?
- How does the neutral network architecture affect the training time required to achieve the same performance?
- What are the advantages and disadvantages of applying DRL as compared to existing RL algorithms in game playing environments?