

# Reinforcement Learning Project

## Learn Atari game *Gopher* through Deep Reinforcement Learning

Ivan Bergonzani

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### Abstract

In this project were tested different deep Q network architectures against the Atari 2600 game 'Gopher'. Base Deep Q network from [1] [2] together with Double Q network [3] and Dueling DQN [4] were trained on the environment provided by OpenAI Gym for a total of 2 million frames each. Despite the smaller training time with respect to the original articles, the three network were able to learn the game. They were tested over a 1000 episodes scoring respectively a mean reward of 150, 152, 1521.

## 1 Introduction

The very important physical effect has applications to astronomy, nuclear physics, condensed matter, and more.

## 2 Deep Reinforcement Learning

### 2.1 Double Q Learning

### 2.2 Dueling Q network

## 3 Experiments

## 4 Conclusion

## References

- [1] Volodymyr Mnih, Koray Kavukcuoglu, David Silver, Alex Graves, Ioannis Antonoglou, Daan Wierstra, and Martin A. Riedmiller. Playing atari with deep reinforcement learning. *CoRR*, abs/1312.5602, 2013.
- [2] Volodymyr Mnih, Koray Kavukcuoglu, David Silver, Andrei A. Rusu, Joel Veness, Marc G. Bellemare, Alex Graves, Martin Riedmiller, Andreas K. Fidjeland, Georg Ostrovski, Stig Petersen, Charles Beattie, Amir Sadik, Ioannis Antonoglou, Helen King, Dharmashan Kumaran, Daan Wierstra, Shane Legg, and Demis Hassabis. Human-level control through deep reinforcement learning. *Nature*, 518:529 EP –, Feb 2015.
- [3] Hado van Hasselt, Arthur Guez, and David Silver. Deep reinforcement learning with double q-learning. *CoRR*, abs/1509.06461, 2015.

- [4] Ziyu Wang, Nando de Freitas, and Marc Lanctot. Dueling network architectures for deep reinforcement learning. *CoRR*, abs/1511.06581, 2015.