

# **Reinforcement Learning Project Proposal**

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## **Introduction**

Atari company was a pioneer in arcade games, home video game consoles, and home computers. The company's products, such as Pong and the Atari 2600, helped define the electronic entertainment industry from the 1970s to the mid-1980s. Nowadays, Atari games are one of the coolest games out there and have gained widespread mainstream popularity.

Our team found a paper “Playing Atari with Deep Reinforcement Learning” which brings together deep learning and reinforcement learning to create a system that is able to learn how to play simple computer games. The paper applied a convolutional neural network on seven popular ATARI games – Beam Rider, Breakout, Enduro, Pong, Q\*bert, Seaquest, Space Invaders. The result showed that the system was able to overcome these challenges, outperform all previous RL algorithms on six of the seven games, and play some of them better than an expert human player. A variant of Q-learning algorithm was applied to train the neural network. In this project, our goal is to recreate the system based on the methodologies provided by the paper and extend the experiment to work on other games.

## **Planned Methodology**

### **Part 1: Learning Environment**

We will use ALE(Atari Learning Environment) from OpenAI gym, which will be used to simulate the game by sending player commands and receive the game output. It provides an interface to game environments to compete against human players.

### **Part 2: Deep Reinforcement Learning & MDP**

Reinforcement learning is a machine learning algorithm that learns how to attain a complex objective or maximize along a particular dimension over many steps. The algorithms will be penalized when they make the wrong decisions and rewarded when they make the right ones. We will duplicate the 1-step Q Learning Algorithm used in the paper, and then change the environment so that it can be applied to a new game, such as Pac-Man.