**Different Reinforcement Learning Approaches to Solve Grid World**

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**Abstract**

Reinforcement Learning is widely used in different research area’s such as resources management in computers[[1]](#footnote-1), traffic light control[[2]](#footnote-2), agents in entertainment games such as chess[[3]](#footnote-3) and many others. In this project, we tackle the much simpler problem of solving a two-dimensional maze, given a specific starting point. This problem is most commonly referred to as Grid World. To accomplish this, three different policies were developed based off; one-step SARSA, Q-Learning, and n-step SARSA methods. Each learning method has its theoretical tradeoffs from one another and thus we are comparing their performances using by evaluating their Mean-Squared Error, their average training time and average number of episodes until they reach optimality. Out of the 3 policies, conclude…

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**Introduction**

Reinforcement learning is learning what to do - how to map situations to actions - so as to maximize a numerical reward[[4]](#footnote-4).

In other words, reinforcement learning is all about discovering what is the best action given your current state based off an objective that is designed as a numerical reward by learning from an environment. Most reinforcement learning problems can be expressed as sequential decision problems, as they must include a set of the possible states of the environment, a set of possible actions and an objective[[5]](#footnote-5).

Our objective is to solve a two-dimensional maze given a specific starting point most commonly referred to as Grid World. Our problem is a sequential decision problem as the set of states is the possible positions in the maze, the set of actions is deciding which direction to go (up/down/left/right), and the objective would be to find the exit of the maze.

1. https://towardsdatascience.com/applications-of-reinforcement-learning-in-real-world-1a94955bcd12 [↑](#footnote-ref-1)
2. https://towardsdatascience.com/applications-of-reinforcement-learning-in-real-world-1a94955bcd12 [↑](#footnote-ref-2)
3. https://deepmind.com/blog/alphago-zero-learning-scratch/ [↑](#footnote-ref-3)
4. Slides Chapter 1 Page 4 [↑](#footnote-ref-4)
5. Slides Chapter 1 Page 6 [↑](#footnote-ref-5)