**SNHU**

**CS – 370**

**7 – 3 Project Two Submission**

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* **Analyze the differences between human and machine approaches to solving problems.**
  + Describe the steps a human being would take to solve this maze.

If a person were to solve this maze, the initial approach would be trial and error if the person was a kid that had never seen a game like this. The kid would likely find a solution in the first few tries if it is not a complex maze. If it was an adult, they would likely come up with the correct solution in one or two iterations just by looking at the maze, it could not be the shortest path, but they would be able to optimize it through trial and error in one or two more iterations.

* + Describe the steps your intelligent agent is taking to solve this pathfinding problem.

The intelligent agent, in this case, is working through trial and error, it knows the starting and end points, and then randomly selects where to go next, receiving a reward or a penalty depending on how good that decision was, and if the endpoint is reached. Through several iterations and the use of reward/penalty points, the agent can learn how to find the shortest path.

* + What are the similarities and differences between these two approaches?

The main similarity between these two approaches is the use of a trial and error method to find the optimal solution. There are some differences in the approaches, a human will not pick the route in a completely random way, for example, a human will not try to pick a cell that is out of the borders of the maze or go in the opposite direction if it does not make sense. We also have the use of rewards and penalties to indicate to the agent if the decision was good or not.

* **Assess the purpose of the intelligent agent in pathfinding.**
  + What is the difference between exploitation and exploration? What is the ideal proportion of exploitation and exploration for this pathfinding problem? Explain your reasoning.

The difference between exploitation and exploration is that in exploitation, the agent repeats decisions that have worked well so far, while in exploration it tries to make novel decisions in hopes of a greater reward (Lindwurm, 2021). The ideal proportion of exploration and exploitation for this pathfinding problem is to exploit more than explore, this is due to the way we set up the rewards, if a path works, then it is not necessary to try a different path as these could lead to the agent going out of bounds. But the agent is still able to explore in order to optimize the existing path.

* + How can reinforcement learning help to determine the path to the goal (the treasure) by the agent (the pirate)?

Reinforcement learning helps the agent determine the path to the goal by the use of trial and error, where the agent tries a path, and through the reward/penalty score it learns to optimize the decisions it makes.

* **Evaluate the use of algorithms to solve complex problems.**
  + How did you implement deep Q-learning using neural networks for this game?

I implemented the Q-learning algorithm for this game by:

* Understanding the rules of the game and the code given.
* Setting up the needed variables and reward system.
* Having the agent randomly move to a cell and determine if this movement leads to a ‘win’/’lose’ status or if the game can continue, then keep moving to other cells and store this as an episode.
* Store the episodes, optimize, and evaluate the results.

**References**

Lindwurm, E. (2021, December 12). *Intuition: Exploration vs Exploitation - Towards Data Science*. Medium. https://towardsdatascience.com/intuition-exploration-vs-exploitation-c645a1d37c7a