**CS 370 Module 7-3 Assignment**

Christina Jimenez

[christina.jimenez3@snhu.edu](mailto:christina.jimenez3@snhu.edu)

Southern New Hampshire University

**Analyze the differences between human and machine approaches to solving problems.**

Problem-solving approaches in machines and humans differ significantly, though many machine learning algorithms, like Q-learning, are inspired by biological neural networks that contribute to human learning and decision-making.

When solving a maze, a human typically starts by analyzing the rules and layout. This includes understanding the movement constraints, in this case understanding that the pirate can only move in certain directions, recognizing the goal in this case reaching the treasure, identifying the starting point, and noting any obstacles that must be avoided. With this understanding, humans can use logic and spatial awareness to plan an efficient path, possibly trying multiple strategies if the initial plan fails (Fernandez, 2019).

In contrast, an intelligent agent using Q-learning approaches the problem through interaction and feedback. Initially, the agent knows very little about the environment (Gulli & Pal, 2017, pg.268). It begins by exploring randomly trying various actions without prior knowledge. As it receives feedback in the form of rewards, in this case positive for moving closer to the treasure, negative or neutral for wrong moves, it updates its Q-values, which are numerical estimates of the expected action in each state(pg.267). Over time, this trial-and-error process allows the agent to learn an optimal path by reinforcing actions that lead to higher rewards and avoiding those that do not. Eventually, the agent can navigate the maze with near perfect accuracy(pg.271).

While both humans and intelligent agents follow a process of learning or exploring and adapting, the main difference lies in how they acquire and apply knowledge. Humans tend to rely on abstract reasoning, pattern recognition, and prior experience to plan accordingly (Fernandez, 2019). In contrast, the Q-learning agent depends entirely on feedback from the environment and learns incrementally through repeated trials (Gulli & Pal, 2017, pg.268). However, both approaches share a reward directed structure, where decisions are guided by the desire to reach the end state, in this case, finding the treasure.

**Assess the purpose of the intelligent agent in pathfinding.**

Exploration and exploitation are two key strategies that an intelligent agent uses in reinforcement learning. Exploration is the process of the agent interacting with the environment to gather information by trying out different actions and observing the outcomes (Gulli & Pal, 2017, pg.270). This helps the agent understand the structure of the environment, identify rewards and penalties, and begin to form a basic strategy. Exploitation, on the other hand, involves using the knowledge gained through exploration to make decisions that are more likely to lead to higher rewards (pg.271). In the context of the pathfinding maze, the ideal balance between exploration and exploitation changes over time. At the beginning, the agent should rely heavily on exploration since it has no prior knowledge of the maze. As the agent gathers more experience and updates its Q-values, it can begin to exploit that knowledge to make efficient choices(pg.270). Gradually shifting from exploration-based algorithm to exploitation-based algorithm allows the agent to learn effectively while also improving its decision making over time.

Reinforcement learning helps the agent determine the best path to the goal by using a reward system that provides feedback based on its actions (Gulli & Pal, 2017, pg.265). When the pirate moves in the right direction, avoids obstacles, or gets closer to the treasure, it receives a positive reward. If the pirate takes an unproductive action such as hitting an obstacle or moving away from the goal, it receives a penalty. These rewards and penalties guide the agent’s learning process. As it continues to interact with the environment, the agent updates its Q-values to reflect which actions are most beneficial in each situation(pg.271). This allows it to build a more effective strategy over time, gradually improving its ability to navigate the maze and consistently reach the treasure.

**Evaluate the use of algorithms to solve complex problems.**

The neural network enhances the Q-learning algorithm by approximating the Q-values for a wide range of states and actions, allowing the agent to make more informed decisions based on results. In this case the rewards the agent received updated the Q values, which led to more efficient decision making to find the treasure. Neural networks generalize patterns and learn to predict the expected future rewards for different actions based on experience (Gulli & Pal, 2017, pg.270). This enables the agent to efficiently explore and exploit its environment, finding an optimal balance between exploring new actions and exploiting known strategies, thus improving the efficiency of learning(pg.271). In this case the pirate, the agent, would explore the environment studying obstacles and possible moves and rewards and punishments for such actions, it would then exploit the knowledge to develop effective learning strategies that would lead to high accuracy rates in finding the treasure.

**References**

Gulli, A., & Pal, S. (2017). Deep learning with keras: *Implementing deep learning models and*  *neural networks with the power of python*. Packt Publishing, Limited.

Fernandez, E. (2019, November). *AI Is Not Similar To Human Intelligence. Thinking So Could*  *Be Dangerous*. Forbes. Retrieved April 20, 2025, from [https://www.forbes.com/sites/fernandezelizabeth/2019/11/30/ai-is-not-similar-to-human-](https://www.forbes.com/sites/fernandezelizabeth/2019/11/30/ai-is-not-similar-to-human-intelligence-thinking-so-could-be-dangerous/) intelligence-thinking-so-could-be-dangerous/