Ethan Daugherty

SNHU

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7-3 Project Two

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**Design Defense**

Though there are many ways to solve a maze weather its following along with one hand or another constantly on a wall, starting at the exit, or only making left turns, they all rely on trial and error to find a solution. Trial and error learning is a method of learning described as being any attempts at meeting a situation in various ways until the correct responses are found accidentally. (Mondal, 2020) An intelligent agent attempts to solve this problem by using any number of random paths or solutions to discover the best steps to solve the maze. Where a human may attempt any method to solve a maze, with both an AI and a human having a start and an end point an AI solves a bit more methodically as an AI would run through steps to solve a pathfinding puzzle, starting first by collecting the input data and analyzing the start point and target points. Following this the agent will analyze the many paths until finding an optimal solution to the target and finally output the optimal path of the maze.

Exploration and Exploitation though used similarly are quite different when working with an Ai. Exploration can be defined as thorough analysis of a subject or theme, with the biggest part being about learning from what you have studied. Exploitation refers to making the full use of a resources with the most important part being about how one can benefit the most from a resource. Though both functions are necessary for an AI to function an even balance between the two needs to be made as too much exploration and the agent takes too long to find the solution. Alternatively, too much exploitation and the Ai never learns from exploration. (Butvinik, 2022) Reinforced learning can help to determine the path to the goal by maximizing the reward when the shortest path is found. By testing the possible solutions and finding the shortest path an AI can maximize the reward granted for each state it moves into.

To implement deep Q-learning using neural networks for this pathfinding puzzle I first ensured that the correct libraries were imported in Python. Next, I used python to build an environment for the neural network to be trained on. A learning agent was created following this with a reward system and algorithm used to train the agent. Finally, the agent was tested to ensure that it followed the rules and restrictions imposed by the environment used.

# References

Butvinik, D. (2022, May 14th). *Medium.com*. Retrieved from Fraud Prevention: Exploration-Exploitation Tradeoff in AI-based Systems: https://medium.com/analytics-vidhya/fraud-prevention-exploration-exploitation-tradeoff-in-ai-based-systems-fbd41c87c592#:~:text=There%20is%20a%20relationship%20between%20the%20level%20of,is%20a%20disbalance%20between%20exploration-exploitation%20over%20a%

Mondal, P. (2020, 06 20). *www.yourarticlelibrary.com*. Retrieved from Trial And Error System of Learning | Principles of Teaching: https://www.yourarticlelibrary.com/learning/trial-and-error-system-of-learning-principles-of-teaching/6052