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SNHU

Design Defense

**Analyze the differences between humans and machine approaches to solving problems**

When humans start to solve a problem, they go through three steps. The first step is abduction, or reasonable intuition. The second step is induction, identify the pattern and match it to a previously seen pattern. The last step is deduction, apply solutions iteratively until one that works is found. During the problem-solving process humans will apply general cognitive skills learned throughout their life and better these skills to solve the problem.

While artificial intelligence typically is trained specifically for the problem using one of several ANN architectures or a combination of architectures. Training can consist of thousands of samples solving said problem or could run training simulations where it learns from trial and error. Artificial intelligence can also simulate thousands or millions of potential next steps when solving a problem to choose the best in the moment.

Humans and artificial intelligence both learn through trial and error and use patterns to find potential solutions. Where things start to differ is how they learn to find the solution. As stated above, humans use cognitive skills learned throughout their life to solve problems. While AI are designed to solve a specific problem and usually are trained on examples of how to solve the problem.

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

The difference between exploration and exploitation is the amount of risk associated with each choice. Exploration is considered to carry a lot of risk, while exploitation is considered to have extraordinarily insignificant risk associated with it. Exploration is when the AI considers the known knowledge and rewards are inadequate and believes the unknown choices contains a higher reward. Exploitation is when the AI considers all known knowledge and rewards to be enough and always choices one of the known choices.

Ideally when choosing between how often an AI should choose exploration over exploitation it is best to use a method that changes over time. If such as greedy or e-greedy is chosen, the amount of exploitation and exploration never changes, and the AI will be stuck in a feedback loop. If a method such as decaying e-greedy, Optimistic Initialization, Upper Confidence Bound, or Thomas Sampling is chosen, the amount of exploitation and exploration is varied.

Reinforced learning plays directly into each of the methods above that use changing values to find the solution. With each iteration of one of the above methods, the ANN will learn the real reward value of each choice tested. Overtime, as the ANN gathers enough information, can accurately choice the correct rewards with a high confidence level.

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

Q-Learning was implemented by creating a q-table consisting of the previous environment state, actions taken, rewards, and game status. This q-table would be updated for each test and used to assist in the current tests. As the q-table is updated, the neural network gets more confident and starts to explore less and exploit more, causing the eventual find of the shortest path.

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