Written Response - Explore Task

Provide information on your simulation and computational artifact. Name the simulation that is represented by your computational artifact. Describe the simulation's intended purpose and function. Describe how your computational artifact illustrates, represents or explains the simulation's intended purpose, its function or its effect. (100 words)

The computing innovation I researched was Alpha Zero by Deepmind(1). The intended purpose of Alpha Zero is to explore the limits of what machines are capable of doing and also show that machines are not bound by the limits of human knowledge. To be able to do this, the function of Alpha Zero is to be able to learn chess from scratch and continuously build upon its knowledge of the game by playing many games against a mirror image of itself. My artifact illustrates this by displaying the main theme of machine learning, the company's name, and the results of the innovation.

Describe your development process, explicitly identifying the computing tools and techniques you used to create your artifact. Your description must be detailed enough so that a person unfamiliar with those tools and techniques will understand your process. (Approximately 100 words)

I created my artifact on google classroom because it offers many tools more easily get our point across. First, I found pictures depicting machine learning. Next, I decided to add a picture of Deepmind, the company that developed Alpha Zero, because it is well known in the chess community. Lastly, I took a picture of results and how much machines have advanced in the past few years in terms of self-learning. After I finished that, I added a text of Alpha Zero in the center to clearly display the innovation in the artifact.

Explain at least one beneficial effect and at least one harmful effect the simulation has had, or has the potential to have, on society, economy, or culture. (Approximately 250 words)

Currently, Alpha Zero, based off previous version AlphaGo Zero, can adapt based on new information stored by playing chess games; it can learn without human intervention. What this simulation has shown society is that machines are not bound by the limitations of human knowledge.(2) It also allows machines to be able to correctly identify hazards, problems, and even make predictions given enough time. Two potential ways reinforcement learning can be useful is in self-driving cars and protein folding. In self-driving cars, code can be written to learn

from previous crashes and errors and correct itself in the future.(3) Similarly, programs can be created to plan protein structures, where each structure takes a lot of energy to make.(4)

There is also a drawback of utilizing innovations of Alpha Zero, which is based off AlphaGo Zero, in society. Using the self-learning principle of Alpha Zero in the workplace would mean that not only is it potentially more effective than a human worker at a specific task, but it would not need any training to operate at the level of a human worker. This could lead to job loss and an increase in unemployment.(2)

Using specific details, describe: The data your simulation uses. How the simulation consumes (as input), produces (as output), and/or transforms data. At least one data storage concern, data privacy concern, or data security concern directly related to the simulation. (Approximately 250 words)

In Alpha Zero, unlike older versions of AlphaGo Zero, where the machine based its own decisions off of human data (5), doesn't use data that has already been gathered. It trained itself by playing many chess matches and would use these games as reference. Alpha Zero starts off with a blank slate and is trained by playing against itself, initially using random moves (5). In this way, it generates its own data that it uses in future games. When it trains against itself, Alpha Zero plays a game to the end using random moves and uses the final result to describe how strong each move it played was.(4) This is very similar to how AlphaGo Zero was engineered and uses the same themes and elements in how they both operate. This technique is called a Monte Carlo Tree Search, and it is central to the performance of both Alpha Zero and AlphaGo Zero. After it finishes a match, the machine uses reinforcement learning by adjusting a neural net in order to alter its gameplay.(5) Gradually, Alpha Zero, similarly to AlphaGo Zero becomes smarter and stronger and is able to learn from its previous matches. In fact, AlphaGo Zero was able to learn classical tactics without any human input, demonstrating the ingenuity it was able to gain, which is also implemented and shown in Alpha Zero (4).

One concern related to Alpha Zero is that it starts off not knowing anything about the game of chess. The version of AlphaGo that surpassed all other Go-playing AI's took 40 days to train. If the previous data is lost, then the AI would revert back to a random method of play. Although there is no limit as to how well AlphaGo Zero could master the game, it would require the computers to run continuously. In fact, DeepMind had to unplug the computers running the simulation because the computers were needed elsewhere (6). This is also the case with Alpha Zero and poses a great concern that if something were to happen to the power of the computers and neural network, all knowledge Alpha Zero previously stored would have to be reacquired.

Citations and Sources

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In-text:

1) https://deepmind.com/
2) https://www.theguardian.com/science/2017/oct/18/its-able-to-create-knowledge-itself-google-unveils-ai-learns-all-on-its-own
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