Quentin Truong
404782322
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Applications of Context in Artificial Intelligence

One outstanding goal in the field of artificial intelligence is to develop machines which may intuitively understand any situation without a comprehensive explanation. For instance, we may ask a robot to retrieve an object and expect it to do so without breaking itself or destroying the object. To accomplish this, the robot needs to understand how to perform many tasks we consider trivial, such as how to find, pick up, and transport the object. While these skills may be considered intuitive to humans, machines lack the knowledge necessary to accomplish these tasks.

Humans understand how to do these sort of 'trivial' tasks as a result of our knowledge of the world. Robots lack this type of knowledge of the world; they only know what they have been programmed to know. For instance, humans understand that when picking up a mug, you should use the handle and a light amount of pressure. The typical robot today has no way of knowing these facts. The robot does not understand what cups truly are – they only know what they have been programmed to know. The robot does not know that the cup will break if you grip it too hard. If the robot had this type of knowledge, it could use various visual and tactile clues as contextual knowledge to achieve higher success rates with picking up cups (Frantz). This is not restricted to picking up objects; the application of contextual knowledge extends to any physical interaction.

Moreover, humans are able to quickly find new solutions to problems through experimentation. This is because humans have an awareness of what is more likely to succeed, allowing them to try the solutions which are most likely to work first, resulting in them trying fewer possibilities. This is because humans can rely on previous experiences and their knowledge of a situation, filtering out irrelevant information and variables (Brezillon). Computers, on the other hand, don't have this intuition for solving problems. This results in computers solving problems through brute-force, where the computer may literally try every possibility until one works.

This contextual knowledge is applied in all areas. In particular, researchers at Brigham Young University explored the problem of noun-verb relationships. More specifically, nouns are logically capable of some verbs but not others. For example, you may dethrone a king, but it does not make sense to harvest a king (Christensen). This intuition is considered implicit for humans; however, computers do not have this type of every-day knowledge. This knowledge allows machines to understand relationships between objects, which is essential to their performance in unstructured environments (Christensen). The researchers at BYU downloaded text from Wikipedia and extracted the noun-verb relationships. This allowed them to improve their performance on text-based games in 12 out of 16 games (Christensen).

These sorts of improvements from contextual knowledge are essential to integrating artificial intelligence and machines into society. Our machines will require an understanding of how objects relate to one another. Giving machines this knowledge

that we consider trivial would allow them higher success rates and higher performance. Our machines must be capable of performance at the level of a human for most tasks; this contextual knowledge will help them achieve this level of performance.

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