HPS255 First Paper

The Problems with Defining Intelligence

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Throughout the history of artificial intelligence (AI), we have tried to construct an exact definition of intelligence. Similarly, we have also struggled to provide tests for intelligence. It is not a surprise that we have not yet succeeded. However, this raises questions of whether or not there can be a well-defined concept of intelligence. The following arguments will underline the problems with defining and testing intelligence from a historical and philosophical point of view. In particular, there cannot be a well-defined concept of intelligence due to the multiple realizability property of intelligence, the issues of finding necessary and sufficient conditions, and the contingency of the term 'intelligence' on ontology and other historical factors.

To examine if there can be a well-defined concept of intelligence, I will start by looking at the concept of multiple realizability. The multiple realizability thesis was introduced by Putnam in his Psychological Predicates. The thesis states that a mental state (such as pain) can be represented or realized by more than one distinct physical states (such as the firing of different types of neurons in different animals) [1]. This opposes the brain-identity theory which states that every distinct mental state is realized by the same distinct brain state or process [2]. Although whether this thesis is true is still in debate, it seems like the concept of multiple realizability is still applicable to intelligence. Consider two scenarios, the first is a crow bending a wire to retrieve a reward, the second is a child learning how to speak his or her first language. Most would agree that the subjects in both scenarios displays some intelligence. From this it follows that the ability to use tools and the ability to learn a language are both showcases of intelligence, which suggests that intelligence is multiple realizable.

If intelligence has the property of being multiple realizable, then the well-defined concept of intelligence must be broad enough to cover all these instances of multiple realizability, that is if it exists. Most would think of intelligence as a single general ability, yet it also seems that intelligence is a range of more specific functions or abilities – such as creativity or the ability to use tools. Here I must clarify that the term intelligence in this paper refers to a general sense of intelligence, for the following reasons. Domain specific intelligence, opposed to general intelligence, can be well-defined. For instance, one can say that AlphaGo – the AI program that beat a reigning world champion at the game of Go in 2016 [3] – has domain specific intelligence within the realm of Go games. However, most do not believe that AlphaGo possesses general intelligence, as even the smallest change to the board size can largely impact AlphaGo's ability to

play – let alone the ability to do anything else besides Go playing. Philosophers argue that a human Go player would instantly be ready to play on a size reduced board, and this is one difference between general intelligence versus domain specific intelligence.

Not only are there issues with defining intelligence, there are issues with testing for intelligence. The famous Turing test was one of the first proposed tests for intelligence, stating that a sufficient condition for a machine to be considered as intelligent is the ability for a machine to fool a human moderator into believing that it is indeed human, through a conversation [4]. The main critique of this test was that the machine, though it may have fooled a human moderator, does not understand any semantics or meaning about almost anything in a conversation. Given that the machine outputs logical and grammatically correct sentences, there is the possibility that the machine is intelligent enough to have a conversation. However, it may also be the case that the machine only assembles words into sentences following some preprogramed rules with no understanding at all, as demonstrated in Searle's Chinese room thought experiment [5]. Searle's argument highlights the view that a behaviour such as speaking languages cannot be a sufficient condition for intelligence, since the same behaviour can happen without the presence of intelligence.

Testing for intelligence is highly relevant to defining the concept of intelligence. Testing for intelligence focuses on finding a sufficient condition for being intelligence, while defining the concept of intelligence focuses on the necessary conditions for being intelligence. When trying to find a sufficient condition of intelligence, most would attempt to ascribe a certain behaviour that represents intelligence. However, we cannot know whether a behaviour can be indicative of intelligence, because there could be other factors (that is not intelligence) that are responsible for those behaviours such as speaking language. On the other hand, most struggle to find any non-behavioural indications for intelligence which makes it difficult to bypass this problem. If finding behaviours that are indicative of intelligence is not possible, it seems that using other non behavioural indicators of intelligence is also not feasible, then it makes one wonder if a test that is indicative of intelligence can exist. The question follows immediately: if we cannot find sufficient conditions of intelligence, is it possible to find necessary conditions for intelligence?

It would seem highly unlikely for us to find necessary conditions for intelligence. Knowing that intelligence can be multiple realizable, then the necessary conditions for intelligence must be

broad enough to include all these instances of intelligence. Consider the following claim: a necessary condition of intelligence is having a wet brain. This claim is very broad, but it still rules out some possibilities such as intelligent robots. Although robots with general intelligence do not exist, many still believe there is a possibility of intelligent robots existing in the future. From this it follows that the condition of having a wet brain is still too narrow, thus we need to make it even broader. Then we would end up with something too broad to be meaningful, such as: a necessary condition of intelligence is existing. Suppose this is true and we have successfully found a necessary condition for intelligence, is it meaningful enough to help us with defining intelligence? To summarize, even if we can find necessary conditions for intelligence, it would likely be too broad and obsolete in helping us find a well-defined concept of intelligence.

Another factor that makes it difficult to define intelligence is the ever-changing ontologies adopted by each scientific mosaic. A scientific mosaic refers to a set of all accepted theories, methods, and ontologies of a specific time period, while ontology refers to a branch of metaphysics that deals with the nature of things. A related example of a changing ontological belief is as follows. During the Cartesian period, an element of the mosaic was Dualism – the ontological belief that mind and matter are two independent substances that populates the universe. Nowadays, dualism has been mostly replaced by materialism in our contemporary mosaic. Materialists believes that mind is not independent of material, that is, mind cannot exist without matter. The change from dualism to materialism is an example of an ontological change, but the concept of intelligence also shiftes with this change. The Cartesians believed that possessing mind is a necessary condition for intelligence. Consequentially, animals were not considered as intelligent because they do not posses' mind. On the other hand, the Cartesian concept of mind does not exist as far as today's scientists are concerned. Moreover, nowadays most scientists do believe that animals are considered intelligent. From this we see that as our scientific or ontological views change over time, and so does our concept of intelligence. Since it is likely that our beliefs will keep changing, our concept of intelligence will also change. It follows that the concept of intelligence is contingent on our ontological beliefs which change through time, and this adds another dimension to the challenge of defining the concept of intelligence.

Finally, the value-ladened concept of intelligence should also be acknowledged. A value-ladened term is a term associated with a judgment, and it seems like the concept of intelligence is

such a term. Stephen Cave identified this issue and argues that we should be aware of the historical aspect of the concept of intelligence. In his work, he described a range of normative and political context that caused the concept of intelligence to become value-ladened. Throughout history, the concept of intelligence has been associated with dominance, power, and privilege. We see this in Plato's philosopher kings, Aristotle's socio-political hierarchy, Descartes' claim that rationality is for minds, only to list a few [6]. In numerous historical occasions have men believed that intelligence should be related to the right to rule. Moreover, intelligence has also been treated as ideology. This was evidenced by various acts of colonialism in the 18th century, as well as the eugenics movement. The concept of intelligence was used as a post hoc explanation to legitimize the racist and sexist beliefs that white males were the elite social class, as well as the numerous atrocities committed during colonialism, imperialism, and the eugenics movement [6]. Attaching these political and social factors to the concept of intelligence only make it more difficult to be defined, thus they pose even more challenges for the existence a well-defined concept of intelligence.

In summary, we face many difficulties when trying to define and test the concept of intelligence. For one, the multiple realizability of intelligence makes the concept broad and difficult to pin down. Consequentially, finding necessary and sufficient conditions of intelligence seems impossible. In addition, the meaning of intelligence changes when accepted ontologies change. Inevitably, any attempt to define intelligence would be outdated when the accepted ontologies change. Furthermore, the term intelligence itself is value-ladened, as shown with its historical, political, and social aspects. This only dilutes the clarity of the concept itself, making it even harder to be defined. Unless there is a way to bypass each of these arguments, it would be undoubtedly difficult for us to construct a well-defined concept of intelligence. To finish, one should beware of all these issues surrounding this concept we call intelligence.

References

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