

Review of Universal Intelligence: A Definition of Machine Intelligence

In this paper, the authors seek to find an answer to the question “what is intelligence?”. To do this, the authors asked several psychologists and compiled all of their answers into a single definition: “Intelligence measures an agent’s ability to achieve goals in a wide range of environments.” This is a very convenient definition for artificial intelligence applications as “agent”, “environment”, and “goal” are all common terminology. The authors expand on how this would be used in an agent-environment framework by formally describing the interaction between the agent and the environment.

The authors also discuss the intelligence of agents and introduce the idea of universal intelligence of an agent. The first of which, also the one with the lowest intelligence, is the random agent; following is a specialized agent, ironically, not significantly more intelligent than a random agent; then a general but simple agent which can learn a lookup table of actions to take; a simple agent with history; a simple forward looking agent; a very intelligent agent which performs well in simple environments and reasonably well in complex ones; and finally a super intelligent agent which would choose the perfect actions in every environment, also known as AIXI. Humans are also considered to be very good at simple environments, but when considering the performance across more complex environments, it is hard to tell how one would perform on a given task.

While this paper does provide contribution by laying the framework for getting closer to having a universal artificial intelligence, it does have some limitations. Namely, the universal intelligence function itself is only applicable to a limited domain. In addition to this,

environments can be more or less complex and the function itself requires nearly perfect scenarios which is beyond practicality.

Despite the limitations of this paper, it provides significant insight into fundamental artificial intelligence theory and gives an introductory opportunity to learn more about the Kolmogorov function/complexity and provided me an opportunity to learn more about the No-Free-Lunch theorem.