My thoughts on Symbolic AI

As much as we may try to convince ourselves otherwise, the term *artificial intelligence* doesn't actually have a concrete, widely-accepted definition yet; it's simply too young and broad a field. Having said that, this means our current interpretations of and capabilities within define the scope of what to us is "artificial intelligence". Therefore, some can say without err that symbolic representation in the late 1900s was a working and defining feature of AI, to what they believed AI was and was needed in then. Today, I believe AI uses behaviors of reasoning to learn, understand and solve what we can't answer without.

Symbolic AI arose as a byproduct of finding ways to attack a problem using human logic. The concept works with symbols and expressions previously defined by us (such as + / z 3 etc.), then uses logic and calculation to derive a solution for the expression. Part of the proposal for symbolic AI questioned whether the human brain worked (strictly) computationally and, if it did, that AI should mimic this characteristic. Hubert Dreyfus, a philosopher, stated in 1979 that "The mind can be viewed as a device operating on bits of information according to **formal rules**". This primitive idea, then, was what AI was speculated to imitate before the definition continued to evolve. With old symbolic practices, there was no inference, no deduction, and machine reasoning (most importantly) was never even considered, despite it being the crux of our artificial intelligence today. However, one of the advantages to symbolic representation was an ease of understanding how a system reached a conclusion. Today, although not intentionally, we've become more interested in solving problems that don't have defined rules, and the methods have shown to often be too complicated for us to understand.

In order to answer whether AI **needs** symbolic representation to grow in the future, we need to ask ourselves what we're using AI for. On one hand, while static, formulated-by-us problems do exist in the real world and can be solved using approaches by symbolic AI, a case could be made that if a perfect system can approach and deal with dynamic situations, then (disregarding the excessive computing power) that same system should be able to effortlessly handle static behavior. An argument for symbolic representation, now, would recommend a merge with non-symbolic AI, to suggest that every aspect of our lives uses us and exists within our reality defined by our rules. While formal rules don't apply to our behaviors, they do in our ideas for ourselves. Pedro Domingos from U Washington attempts to merge symbolic studies of text with deep learning for machine reading. Murray Shanahan from the Imperial College of London is similarly blending both approaches to get AI systems to better understand the concepts of our world. Both researchers have claimed that this may assist pattern recognition.

If there were any impasse, I can only imagine that it would be our lack of understanding of what we've created. Some have claimed (such as Michael Stonebraker, *"What goes around comes around"*) that we've entered a cycle of complexity in data modeling. He says that where we once began with models too complex for us to understand, we attempted to simplify the process over what he calls 'eras' of modeling, but again will fallen victim to "problems with logical data independence and complexity." One could also say that the merge of explicit representation may be necessary from here on if we're to understand organic algorithms, advanced learning, or the human brain. Whether symbolic representation will need to be implemented throughout all of AI or specific functionalities, I honestly cannot tell without knowing what someone tries to use AI for. I can say that the way to determine if we need to use symbolic approaches is based off of its own complexity; the more complex the system, the more I could see the use of symbolic AI to be necessary for our understanding.