Psychometric Artificial General Intelligence: The Piaget-MacGuyver Room

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Psychometric AGI (PAGI) is the brand of AGI that anchors AGI science and engineering to explicit tests, by insisting that for an information-processing (i-p) artifact to be rationally judged generally intelligent, creative, wise, and so on, it must pass a suitable, well-defined test of such mental power(s). Under the tent of PAGI, and inspired by prior thinkers, we introduce the Piaget-MacGyver Room (PMR), which is such that, an i-p artifact can credibly be classified as general-intelligent if and only if it can succeed on any test constructed from the ingredients in this room. No advance notice is given to the engineers of the artifact in question, as to what the test is going to be; only the ingredients in the room are shared ahead of time. These ingredients are roughly equivalent to what would be fair game in the testing of neurobiologically normal Occidental students to see what stage within Piaget’s theory of cognitive development they are at. Our proposal and analysis puts special emphasis on a kind of cognition that marks Piaget’s Stage IV and beyond: viz., the intersection of hypothetico-deduction and analogical reasoning, which we call analogico-deduction.

3.1 Introduction

Psychometric AGI (PAGI; pronounced “pay guy”), in a nutshell, is the brand of AGI that anchors AGI science and engineering to explicit tests, by insisting that for an information-processing\(^1\) (i-p) artifact to be rationally judged generally intelligent, creative,

\(^1\)By using ‘information-processing’ rather than ‘computational’ we leave completely open the level of information-processing power — from that of a standard Turing machine, to so-called “hypercomputers” — the artifact in question has. Note that we also for the most part steer clear of the term ‘agent,’ which is customary in

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wise, and so on, the artifact must be capable of passing a suitable, well-defined test of such mental power(s), even when it hasn’t seen the test before. (PAGI is built upon PAI, psychometric AI; see Bringsjord and Schimanski, 2003.) For example, someone might claim that IBM’s i-p artifact Deep Blue is really and truly intelligent, in light of the fact that if you test it by seeing whether it can prevail against the best human chessplayers, you will find that it can. And someone might claim that natural-language-processing artifact Watson, another i-p artifact from IBM (Ferrucci et al., 2010), is really and truly intelligent because it can vanquish human opponents in the game of Jeopardy!. However, while both of these artifacts are intelligent \textit{simpliciter}, they most certainly aren’t \textit{general}-intelligent. Both Deep Blue and Watson were explicitly engineered to specifically play chess and Jeopardy!, nothing more; and in both cases the artifacts knew what their final tests would be.

Inspired by PAGI, and by a line of three thinkers (Descartes, Newell, and esp. Piaget) who gave much thought to the hallmarks of \textit{general} intelligence, we define a room, the \textit{Piaget-MacGyver Room} (PMR), which is such that, an i-p artifact can credibly be classified as general-intelligent if and only if it can succeed on any test constructed from the ingredients in this room. \textit{No advance notice is given to the engineers of the artifact in question as to what the test is going to be.} This makes for rather a different situation than that seen in the case of both Deep Blue and Watson; for in both of these cases, again, the AI engineering that produced these i-p artifacts was guided by a thorough understanding and analysis, ahead of time, of the tests in question. In fact, in both cases, again, all along, the engineering was guided by repeatedly issuing pre-tests to both artifacts, and measuring their performance with an eye to making incremental improvements. This is particularly clear in the case of Watson; see (Ferrucci et al., 2010). Of course, we happily concede that both Deep Blue and Watson \textit{are} intelligent; we just don’t believe that either is \textit{general}-intelligent.\footnote{Our attitude is anticipated e.g. by Penrose, who for instance pointed out that Deep Blue would be paralyzed if challenged on the spot to play variants of chess; see (Penrose, 1994). In the case of Watson, questions based on neologisms would paralyze the system. E.g., “Supposing that bloogering! is to take a prime and blooger it (add it to itself), and then blooger thrice more times, what is bloogering! ??”}

As we say, only the \textit{ingredients} in PMR are shared ahead of time with the relevant engineers. These ingredients are equivalent to what would be fair game in the testing, by Piaget, of a neurobiologically normal Occidental student who has reached at least Piaget’s \texttt{Stage III} of cognitive development. If you will, Piaget is in control of the ingredients in the AI. We do so because ‘agent’ is usually taken to imply a function that is Turing-computable or easier; e.g., see the use of ‘agent’ in (Russell and Norvig, 2002).