Synthesis vs. Analysis: Why Machines Cannot Think

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Today's world is one of technology. Machines do many things that were, until recently, only possible for humans. Machines can beat mankind's best players at chess, perform staggering computations in a remarkably short time and help man advance technology at an ever increasing rate. Machines can do so many things that it is nigh unto impossible to even keep track of their collective abilities. One must wonder if the machines have become more capable than the men who created them. The answer is no: for machines, as of yet, cannot think.

To explore the matter fully, we must first define what is meant by "machine" and "think". A machine is best described as something contrived or manufactured by man. This includes everything from very simple machines, like a screwdriver, up to the most advanced supercomputer. Machines cannot be said, however, to include things of nature which are harnessed by man, such as animals. This stems from the fact that man did not design the animal, he merely utilized it. Things already occurring without man's influence are better classified as natural phenomena than machines. This does not mean to say that such elements cannot be employed in a machine, such as dogs pulling a sled, but rather that man can only claim the sled as a machine but not the dogs themselves.

Thinking is somewhat harder to define, since what we call thinking can include many parts and processes. It is most instructive to split what we commonly call "thought" into two categories, analysis and synthesis.

Analysis is examining an object and acting upon the object in a way prescribed by a given set of parameters. Under this definition, analysis is well within the grasp of machines. For example, a machine which sorts coins performs analysis: this type of machine examines coins for

physical attributes and sorts the coins into categories. However, this analysis involves no creation of new thoughts; the machine requires commands from a previously created algorithm in order to perform its analysis. Thus, analysis is less of an independent action and more of a reaction, more analogous the dilation of the eyes in response to decreased light than to actual thinking. As such, analysis by itself does not constitute "thinking" in the fullest sense of the word.

Synthesis denotes the creation of new ideas or the combination of existing ideas in new ways. This includes the creation of a new scientific theory, work of art, or method of production. Synthesis is not limited to solely that; whenever you "put two and two together" or have an epiphany, synthesis has occurred. This mental synthesis exists nowhere in machines, and for precisely that reason machines cannot be said to be able to think (at this time).

One of the main opposing views to this conclusion suggests that everything has already been thought of, said or done before; nothing humans do is new. While it is undeniably true that nearly everything we currently say or do has been said or done before by someone else, this has no bearing on the reality of synthesis. Simply because a man in Greece created something 2,500 years ago does not mean that one cannot go through the same process of creation now. Such an argument is equivalent to saying that if two people are placed in separate rooms with a pencil and paper and both draw a picture of a tree that the first one to finish was drawing, and the second was not drawing, but copying the first person's drawing, even though the two could not see each other. Just because others have performed synthesis previously does not negate the possibility of synthesizing again in a similar manner.

As a further example, compare computers and humans in their respective approaches to mathematical computation. If you write a program which tells a machine how to perform any

mathematical computation, the machine will execute the program's commands from start to finish and perform the computation. If you were to input the same program into another computer, it would be equally capable of performing the computation because the outcome is determined by the skill of the programmer, not the computer. Were there to be no program input, computers would be unable to do math. No computer would be able to synthesize, that is to say create internally, the ability to do math.

Conversely, every human who learns to do math does so by synthesis. Rather than running through a prewritten script in order to solve a particular problem, all humans must come to recognize and mentally assemble the patterns and rules which exist in addition, subtraction, et cetera. Most students need some form of help (very specific, targeted presentations) from teachers or parents. This almost appears to be an analogue to the input for machines. However, there is a crucial difference; with the student learning and creation of new ideas happens internally, but the machine only does whatever external forces input. That is, all the inputs are combined internally by the student, but the machine cannot combine inputs to create new concepts. If a student makes a mistake it is because they have not correctly combined the concepts in their head, but when a computer makes an error it is because it received faulty orders. Furthermore, some children can manage to, without instruction, figure out (synthesize) how to do math. Similarly, people can sometimes create entirely new mathematical processes. Machines, however, are limited to following orders. These orders can be extensive and complex, but in the end machines cannot create new orders.

Programming and computing capability has grown sufficiently large that machines can currently mimic aspects of thought. Machines have beaten chess grandmasters at chess, a game which is traditionally held to involve great amounts of thinking. Despite appearances, this does

not mean that machines can think. When a computer plays chess, it is more like baking a cake from a recipe than actual thought. The computer is given explicit instructions in the form of a program. Using those instructions it evaluates every possible move, and chooses the one that scores highest on the desirability scale it has been given. This is a reaction and not an independent action. A computer being acted upon by a program is no different than a rock being acted upon by gravity: neither the rock nor the computer, but gravity and the programmer determine the outcome. While the computer program can beat the human at chess, it is really the programmer using the machine as a tool that beats the chess grandmaster. The computer doesn't think its way to victory any more than a hammer designs a house which it is used to build.

Ultimately, machines do what they are told. Programmers lack the programing language to order a machine to synthesize. This owes to a larger problem; we as humans cannot describe what gives us the ability to think. We know that we have this ability, but we have no way of adequately expressing how exactly we combine, how we choose what to combine, or when a combination is successful or correct. Without the ability to describe this, there is no way to order a machine to do it. Should we ever develop the ability to accurately and fully describe the mechanism of mental synthesis, we would be able to program machines to think. Until then, even the most advanced of machines remain in the same category as the hammer, a tool incapable of thought, which only can do what a human makes it do.