THE INVINCIBLE COMPETENCE OF THE HUMAN BRAIN

Researchers say, the brain may be an even more powerful computer than thought before. The microscopic branches of brain cells that were once thought to basically serve as mere wiring may actually behave as minicomputers. The most powerful computer known today is the human brain. The human brain possesses about 100 billion neurons. Neurons each act like a relay station for electrical signals. The heart of each neuron is called the soma - a single thin cable like fiber known as the axon that sticks out of the soma carrying nerve signals away from the neuron, while many shorter branches called dendrites that project from the other end of the soma carry nerve signals to the neuron. On the same lines if we compare the mechanism of the brain with the computers certain differences can be predominantly seen, which if diluted, the computers will replace humans resulting in the rise of a new era of computation.

Let's glance through some of the contrasting factors that isolate human brain from the rapidly developing computing systems. To begin with brains are analogue and computers are digital. It's easy to think that neurons are essentially binary, given that they fire an action potential if they reach a certain threshold, and otherwise do not fire. This superficial similarity to digital "1's and 0's" belies a wide variety of continuous and non-linear processes that directly influence neuronal processing. Another prominent factor is that the brain uses content-addressable memory. In computers, information in memory is accessed by polling its precise memory address. This is known as byte-addressable memory. In contrast, the brain uses content-addressable memory, such that information can be accessed in memory through "spreading activation" from closely related concepts. For example, thinking of the word "fox" may automatically spread activation to memories related to other clever animals, fox-hunting horseback riders, or attractive members of the opposite sex. The end result is that your brain has a kind of "built-in Google," in which just a few clues are enough to cause a full memory to be retrieved. Unlike computers, processing and memory are performed by the same components in the brain. Computers process information from memory using CPUs, and then write the results of that processing back to memory. No such distinction exists in the brain. As neurons process information they are also modifying their synapses which are themselves the substrate of memory. As a result, retrieval from memory always slightly alters those memories. The brain is a self-organizing system. This point follows naturally from the previous point experience profoundly and directly shapes the nature of neural information processing in a way that simply does not happen in traditional microprocessors. For example, the brain is a self-repairing circuit something known as "trauma-induced plasticity" kicks in after injury.

Consider the case study of the example mentioned above; let's see how it relates to the computing world. When we think of the word "fox", our brain actually triggers its database and collects the entire information relating to the word "fox". The brain synchronizes the data collected from different compartments of the brain such as the image of "fox", the qualities relating to the animal, the habitat in which the fox resides, the entire picture flashes at the back of our mind. Now, coming to the computing aspects, the above example can be viewed technically as well. Consider we are having a table in the database which holds all the details relating to the "fox" i.e. habitat, qualities, etc. If we pass a (select *) query to this database, entire data concerning the "fox" will be displayed within split seconds. If the database includes the image of the entity, that image will be fetched too. Thus it is apparently seen that the computers are operational analogous to the human brains. But in case of human brain the database is huge, beyond the computer's capacity (at the moment) and the processing speeds are the concern too for the computational devices to achieve. Significant aspect to be looked at here is of the approach taken by the human brain in grabbing the essential information from the memory, the systematic synchronization of the various sections of the brain such as image, data, etc and at the end clubbing the data from various compartments into single separate chamber under the roof "fox" (in the above example) within a blink of an eye.

On a whole if we compare the stats, the computational power of the human brain cannot be defined. The reason being, the human brain never runs out of memory. The question circling the researchers and great minds today is that, can computers emphasize upon and develop the capacity as that of the human brain? Can computers possess the processing speeds as that of the human brain? We talk about artificial intelligence, intelligent machines, etc today; the intelligence is being incorporated into machines ruling out the above two factors. If the competence of the human brain is thoroughly analyzed, we might end up developing a smarter world at a brisk rate.

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