EDITORIAL

Is sentience an algorithm? There has been explosion in research on artificial intelligence. The artificial intelligence is evolving through three stages- Artificial Narrow Intelligence (ANI) to Artificial General Intelligence (AGI) and finally Artificial Super Intelligence (ASI). Mankind is still struggling with building machines with AGI. An AGI will have the general intelligence across the spectrum just like human beings. Scientists are imbuing machines with artificial intelligence by working on the pattern recognition from large number of data and thereafter working out a heuristic tool as an algorithmic process. While intelligence is being considered as the capability of pattern recognition and combination of different algorithms, emotional experiences are being viewed as mere biochemical algorithm. A particular pattern of release and absorption of certain neurotransmitters and chemicals, if can be replicated; scientists are certain that the emotional experience can be generated. Even weeping, piloerection in awe and inspiration is being fully understood as merely a biochemical algorithm. AGI will have the ability of recognition of complex patterns like that of human intelligence, but AGI Machines would be faster and with higher memory storage. Philosopher Yuval Noah Harari talks about decoupling of intelligence from consciousness. Harari writes in his marvellous book, *Homo Deus*(2017), " We are now developing new types of non-conscious intelligence that can perform such tasks far better than humans. For all these tasks are based on pattern recognition, and non-conscious algorithms may soon excel human consciousness in recognition patterns."(pp.361-362).

Consciousness is the power of self-reflection of idea over itself. Indian philosophers have therefore used the simile of mirror image to describe the mechanism of consciousness. When we do typing, sometimes we keep on typing without being conscious. Similarly, several routine works are being performed by us without being conscious. We breath, our digestive system, circulatory system, nervous system, muscular system keep on working continuously without we being aware of their functioning. To be conscious is thus state of being aware or the self-awareness. But consciousness is not always pure consciousness. There are levels of consciousness. From coma to superconsciousness, a proper gradient scale of consciousness has been proposed.

If intelligence is algorithmic whereby machines can be intelligent without being conscious, can consciousness be seen as an algorithm? This can be formulated only when one is able to measure sentience. Two scientists, Marcello Massimini and Giulio Tononi pioneered a technique called "zap and zip" to probe whether someone is conscious or not. This is their consciousness-meter. The team applied mathematics of probability to measure the Perturbational Complexity Index(PCI) in brain when signals are induced inside brain. When 102 healthy and 48 responsive but brain-injured patients were zapped and zipped during both state of conscious and unconscious, it was discovered that when the PCI value was above 0.31, the person was conscious and if below this figure, the person was always unconscious. The PCI in normal awake state was always between 0.31 and 0.70.

Tononi is also the architect of the Integrated Information Theory (IIT). IIT posits that consciousness is a feature of the universe that emerges with the complexity of the network. Just as Einstein postulated in his Theory of General Relativity that gravitational force is a feature of universe arising from geometry of the space-time; IIT brings in geometry of neuronal arrangements as the cause of consciousness. IIT proposes to measure consciousness by a parameter phi, Φ. PCI is an approximation of phi, as of now. In general anaesthesia, PCI is down. Many patients with vegetative state have been found to show PCI above 0.31 which shows that they are experiencing things around.

IIT finds that higher the information integration a system possess, more phi it has, and higher would be the level of consciousness. Cerebellum though has 69 billion neurons is not integrated internally. The neurons work in grids and in sequence in a linear mode. But, it is cerebral cortex with 16 billion neurons where there are complex integration and feedback loop mechanisms. When a person is in deep sleep, even though he has all the cerebral neurons functioning; he is not conscious since the information integration circuit is broken. Similarly, even a conscious person when is applied anaesthesia, his information integration gets broken and he loses the consciousness. IIT explains how with drugs or alcohol intake, the capacity of integration of information gets affected. IIT predicts that the "spatio-temporal grain of the physical elements specifying consciousness is that yielding the maximum Φ." Loss and recovery of consciousness is associated merely with this breakdown and recovery of the capacity for information integration. IIT also explains that consciousness cannot be computed, this must be built into the structure of the system. A simulation of nuclear blast does not kill the person. Similarly, even if human brain is simulated and a digital brain is created, consciousness cannot emerge. Consciousness is property of a network. IIT postulates that any system-architecture similar to topographically organized areas in human cortex (posterior cortex is where the seat of information integration is guessed), the system would be highly conscious even if not engaged in intelligent behaviour.

If consciousness is state of degree of information integration, thence consciousness itself gets dehumanized. Rather than limited to human beings under certain favourable conditions, any system that integrates information can be considered to be sentient to some extent. This brings in the pan-psychism in the forefront of AI philosophy. Consciousness is the causal power of a system which exists in itself and does not depend on observer. Decoupling of intelligence from consciousness which is already occurring in AI machines would have their exact opposites where conscious systems without intelligence would be said to exist.

Consciousness, if is measurable, can be viewed as a bio-physical algorithm. Intelligence on the other hand is postulated as mere a bio-chemical algorithm. Algorithm is what is propelling the acceleration of technological innovation. It is necessary for the current generation of researchers to understand the impact such algorithmic dominance would have on our lives. Sociology should not lag behind technology. Let Humanities walk hand in hand with Technical Sciences.

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