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Human Intelligence vs. Artificial Intelligence: Survey

D. Shanthi
Assistant Professor, CMRIT
dshanthi01@gmail.com

Dr. G. Narsimha
Assistant Professor, JNTUCEJ
narsimha06@gmail.com

Dr. R. K. Mohanthy
HOD IT & Professor, KMIT
ramakanta5a@gmail.com

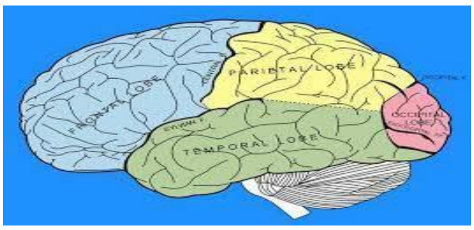
***Abstract* – Research in AIA neural network is an artificial representation of the human brain that tries to simulate its learning process. An artificial neural network (ANN) is often called a "Neural Network" or simply Neural Net (NN). In this paper I provide the survey which I found more interesting facts in my research. That is 1.The brief study of human brain and nervous system 2. What actually an intelligence 3.how this artificial intelligence is differing from human intellectual.**

***Keywords* – Intelligence, Cognitive Functions, Nervous System, Artificial Intelligence, Dendritic Geometry, Neuro Modulators, Axonal Branches.**

I. Introduction

In any field, either profession or education, intelligence is more important. We must have heard the words like Artificial Intelligence in contrast with human intelligence. Technology is emerging day by day, scientists are more and more interested in making something innovative. As Artificial intelligence and robots are not as such joined, computers and machines are created that are synonymous to both humans and animals by efforts employed together. By default robots are coined as "intelligent" as the application for its movement is used, and intelligent robots can be developed by employing Artificial Intelligence (AI). It major function is to add some human like qualities in robotics. We can find this analogy in many things like toys, such as robotic pets. There are other forces that are in favoring of combining these two sources in order to have complete product. To know the difference between Artificial Intelligence and Human Intelligence, let's dig out the roots!Intelligence can be described as a general mental ability for reasoning, problem solving, and learning. Because of its nature, intelligence amalgamates cognitive functions such as perception, attention, memory, language, or planning. By the definition, intelligence can be accurately deliberated by regulated tests with obtained scores predicting several broad social outcomes such as educational achievement, job performance, health, and longevity. In this paper we getting a brief idea of human brain, nervous system,

1. Human brain:



The human brain is the command center for the human nervous system.

Facts about human brain:

- It weighs about 3.3 pounds (1.5 kilograms).
- The brain makes up about 2 percent of a human's body weight
- The cerebrum makes up 85 percent of the brain's weight.
- It contains about 86 billion nerve cells (neurons), the "gray matter".
- It contains billions of nerve fibers (axons and dendrites), the "white matter".
- These neurons are connected by trillions of connections, or synapses
- Our brain uses 20% of oxygen and blood from our body.
- 60% of our brain is fat.
- When we learn something new the structure of brain changes.

The largest part of the human brain is the cerebrum, which is divided into two hemispheres. Bottom of the brain consist of the brainstem, and trailing that sits the cerebellum. The outermost layer of the cerebrum is the cerebral cortex, which consists of four lobes: the frontal lobe, the parietal lobe, the temporal lobe and the occipital lobe.

As all vertebrate brains, the human brain consists of three logical sections known as the forebrain, midbrain and hindbrain. In these three sections contains fluid-filled cavities called ventricles. The forebrain establishes into the cerebrum and hidden structures; the midbrain becomes part of the brainstem; and the hindbrain extends its regions up to brainstem and the cerebellum.

The human brain with its complexity acts like a storage device which always stores safely a person's most memorable memories whenever he want recollect those memories he can. A survey of WHO referred that a baby loses about half their neurons before they are born and also said that when mothers going on speaking with their infants, those children can learn about 300 more words by the age two when comparing with the children whose mothers quite often spoke to them. Here if we measuring of brain activity it show that during the 6th month of baby, the prefrontal cortex, the seat of forethought and logic, forms synapses at huge rate that it consumes double the energy as an adult brain. That furious pace continues for the child's first decade of life. Birdsong and human speech have similar characteristics. Birds, like humans, learn their complex vocalizations early in life and imitate their adult counterparts to acquire these skills. These two species have evolved a complex hierarchy of specialized forebrain areas where motor and auditory areas interact continuously

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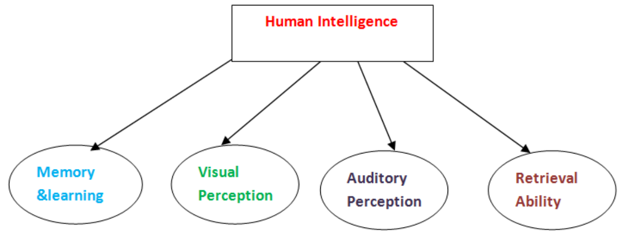
in order to produce detailed vocalizations.

Human Intelligence:

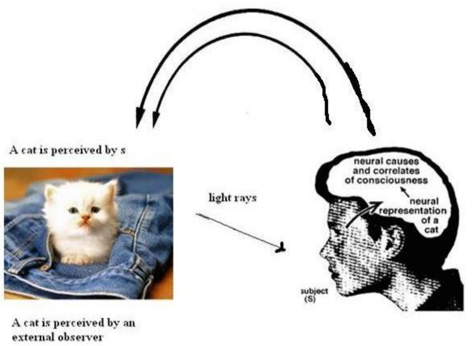


Human intelligence depends on 4 various stages, that is 1. Memory and learning 2. Visual perception 3. Auxiliary perception 4. Retrieval ability. All these 4 stages are nested with one another. Memory and learning is what we remembered and from which what we learned. Basically memories are two types' a. Short term memory and b. long term memory. Short term memories will not be remembered long time example actions of our childhood; but the actions were present in unconscious mode and that was linked with the task which we will do in our future. Sometimes when we are doing some task are when we seen a people then we are started thinking that like same task or the person which we have done or seen previously. Coming to long term memory means we won't forget the data for long time I.e., our parents, our names, our friends, and the actions which we are doing regularly. Every action which we are doing now is learned from somewhere else i.e. it may be from our own experiences or from imitating the others.

1. Memory and Learning:

Learning and memory is the thing starts from the sensory inputs(what we hear, see, feel, and smell), these sensory inputs enters into our body and within a fraction of seconds we may lose the received information. And if it is sent to the working memory, it will process the information which you received from the sensory memory, their it retrieve what you already know and checks whether the new information matches or not, then it will encode the whole information which means you learned it, now you have learned the new thing and it stores into the long term memory, it is available here and when the next time you faced the same thing then the process starts or if you learned a new thing also the same

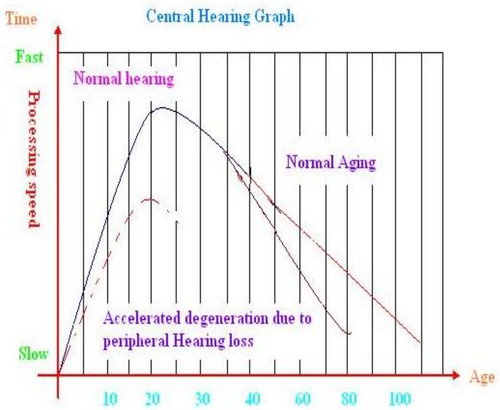
2. Visual Perception:



Visual Perception is the ability interprets the surrounding environment by processing information that present in visible light. Lehar says that the visual experience can be holistic, and at the same time the heaviness of visual perception may be less deception, sensory data may access the brain states that feature is very important project of perceptual institution. Like this functional representation would be very useful, smooth the way for information retrieval from visual and auditory cortex, present in attractor neural networks after termination of direct sensory inputs (Amit 1994). Pertinacious brain activity may be responsible for visual imagery, filling in, subjective contours and other such circumstances. This internal representation, of the brain being a physical state,is interpreted and focused by another brain area, getting it to the working memory and clear the way for conscious perception.

3. Auditory Perception:

Auditory perception refers to how the brain interprets what we hear. This may include speech sounds as well as environmental sounds. Auditory perception fits under the broad umbrella of CENTRAL AUDITORY PROCESSING SKILLS. According to the various surveys auditory based learning and visual based learning are most effective learning, we can learn easily based onthese perceptions brain can easily grasp information and easily remember it. Because the nerves present at ear will sends the signals to the brain and it is easy to the brain to maintain the same information in it. Auditory based learning having a great impact on the brain.



In general we have 10 major differences to explain the differences between human intelligence and artificial intelligence.

1: Brains are analog; computers are digital

In general neurons catch any signal from sensory systems then they fire on the other neurons and that neuron firing on the other neuron this process continues till they reaches the information to the brain. Whereas the coming to artificial intelligence similarity to digital "1's and 0's" belies a wide variety of continuous and non-linear processes that directly influence neuronal processing, and stored in the whatever the information format of

Artificial intelligence is an digital format. In Minksy & Papert's are described about that in their publication in detail, For example, one of the primary mechanisms of information transmission appears to be the rate at which neurons fire – an essentially continuous variable. Similarly, networks of neurons can fire in relative synchrony or in relative disarray; this coherence affects the strength of the signals received by downstream neurons. Finally, inside each and every neuron is a leaky integrator circuit, composed of a variety of ion channels and continuously fluctuating membrane potentials. Failure to recognize these important subtleties may have contributed to Minksy & Papert's infamous mischaracterization of perceptions, a neural network without an intermediate layer between input and output. In linear networks, any function computed by a 3-layer network can also be computed by a suitably rearranged 2-layer network. In other words, combinations of multiple linear functions can be modeled precisely by just a single linear function. Since their simple 2-layer networks could not solve many important problems, Minksy & Papert reasoned that those larger networks also could not. In contrast, the computations performed by more realistic (i.e., nonlinear) networks are highly dependent on the number of layers – thus, "perceptions" grossly underestimate the computational power of neural networks.

2: The brain uses content-addressable memory

Computer access the data or information through its precise memory address, it also called as byte-addressable memory. But whereas the brain uses content memory addressable memory because it access the memory through spreading activation from closely related things I.e., if you are thinking about an "apple" then the activation starts in memory about the color the shape and the taste. Finally the human brain is just like a Google search by giving a few key-words or clues are enough to retrieve the total information on that particular object. Although this may seem like a rather minor difference between computers and brains, it has profound effects on neural computation. For example, a lasting debate in cognitive psychology concerned whether information is lost from memory because of simply decay or because of interference from other information. In retrospect, this debate is partially based on the false assumption that these two possibilities are dissociable, as they can be in computers. Many are now realizing that this debate represents a false dichotomy.

3: The brain is a massively parallel machine; computers are modular and serial

An unfortunate legacy of the brain-computer metaphor is the tendency for cognitive psychologists to seek out modularity in the brain. For example, the idea that computers require "memory area," memory has led some to seek for. One consequence of this over-simplification is that we are only now learning that "memory" regions(such as the hippocampus) are also important for imagination, there presentation, spatial navigation, and other diverse functions. Similarly, one could imagine there being a "language module" in the brain, as there might be in computers with natural language processing programs. Cognitive psychologists even claimed to have found this module, based on patients with damage to a region of the brain known as Broca's area. More recent evidence has shown that language too is computed by widely distributed and domain-general neural circuits, and Broca's area may also be involved in other computations

4: Processing speed is not fixed in the brain; there is no system clock.

The speed of neural information processing is subject to a variety of constraints, including the time for electrochemical signals to traverse axons and dendrites, axonal myelination, the diffusion time of neurotransmitters across the synaptic cleft, differences in synaptic efficacy, the coherence of neural firing, the current availability of neurotransmitters, and the prior history of neuronal firing. Although there are individual differences in something psychometricians call "processing speed," this does not reflect a monolithic or unitary construct, and certainly nothing as concrete as the speed of a microprocessor. Instead, psychometric "processing speed" probably indexes a heterogeneous combination of all the speed constraints mentioned above. Similarly, there does not appear to be any central clock in the brain, and there is debate as to how clock-like the brain's time-keeping devices actually are. To use just one example, the cerebellum is often thought to calculate information involving precise timing, as required for delicate motor movements; however, recent evidence suggests that time-keeping in the brain bears more similarity to ripples on a pond than to a standard digital clock.

5 : Short-term memory is not like RAM

Although the apparent similarities between RAM and short-term or "working" memory emboldened many early cognitive psychologists, a closer examination reveals strikingly important differences. Although RAM and short-term memory both seem to require power (sustained neuronal firing in the case of short-term memory, and electricity in the case of RAM), short-term memory seems to hold only "pointers" to long term memory whereas RAM holds data that is isomorphic to that being held on the hard disk. Unlike RAM, the capacity limit of short-term memory is not fixed; the capacity of short-term memory seems to fluctuate with differences in "processing speed" (see Difference #4) as well as with expertise and familiarity.

6: No hardware/software distinction can be made with respect to the brain or mind

For years it was tempting to imagine that the brain was the hardware on which a "mind program" or "mind software" is executing. This gave rise to a variety of abstract program-like models of cognition, in which the details of how the brain actually executed those programs was considered irrelevant, in the same way that a Java program can accomplish the same function as a C++ program. Unfortunately, this appealing hardware/software distinction obscures an important fact: the mind emerges directly from the brain, and changes in the mind are always accompanied by changes in the brain. Any abstract information processing account of cognition will always need to specify how neuronal architecture can implement those processes – otherwise, cognitive modeling is grossly under constrained. Some blame this misunderstanding for the infamous failure of " symbolic AI."

7: Synapses are highly complex compared to electrical logic gates

Another pernicious feature of the brain-computer metaphor is that brains operate on the basis of electrical signals (action potentials) traveling along individual logical gates. Unfortunately, this is only half true. The signals which are propagated along axons are actually *electrochemical* in nature, i.e. they travel much more slowly than electrical signals in a computer, and that they can be modulated in myriad ways. For example, signal transmission is dependent not only on the putative "logical gates" of synaptic architecture but also on the variety of chemicals in the synaptic cleft, the relative distance between synapse and dendrites, and many other factors. This adds to the complexity of the processing taking place at each synapse – and it is therefore profoundly wrong to think that neurons function merely as transistors.

8: 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 processed results back to memory. But there is **no such distinction exists in the brain**. As neurons process information they modify their synapses – which are themselves the substrate of memory. As a result, retrieval from memory slightly alters those memories

9: 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. This can lead to a variety of interesting changes, such as it sometimes seems to unlock unused potential in the brain (known as acquired savantism), and others that result in profound cognitive dysfunction (as is unfortunately far more typical in traumatic brain injury and developmental disorders).

One consequence of failing to recognize this difference has been in the field of neuropsychology, where the cognitive performance of brain-damaged patients is examined to determine the computational function of the damaged region. Unfortunately, because of the poorly-understood nature of trauma-induced plasticity, the logic cannot be so straightforward. Similar problems underlie work on developmental disorders and the emerging field of "cognitive genetics", in which the consequences of neural self-organization are frequently neglected .

10: Brains have bodies

This is not as trivial as it might seem: it turns out that the brain takes surprising advantage of the fact that it has a body at its disposal. For example, despite your intuitive feeling that you could close your eyes and know the locations of objects around you, a series of experiments in the field of change blindness has shown that our visual memories are actually quite sparse. In this case, the brain is "offloading" its memory requirements to the environment in which it exists: why bother remembering the location of objects when a quick glance will suffice? A surprising set of experiments by 'Jeremy Wolfe' has shown that even after being asked hundreds of times which simple geometrical shapes are displayed on a computer screen, human subjects continue to answer those questions by gaze rather than rote memory. A wide variety of evidence from other domains suggests that we are only beginning to understand the importance of embodiment in information processing.

11: The brain is much, much bigger

Accurate biological models of the brain has around 225,000,000,000,000,000 (225 million billion) interactions between cell types, neurotransmitters, neuro modulators, axonal branches and dendritic spines, and it doesn't include the influences of dendritic geometry, or the approximately 1 trillion glial cells which may or may not be important for neural information processing. Because the brain is nonlinear, and because it is so much larger than all current computers, it seems likely that it functions in a completely different fashion. (The brain-computer metaphor obscures this important, though perhaps obvious, difference in raw computational power.

II. Conclusion

I have discussed in this paper about human brain nervous system and about human brain, facts of human brain, difference between human intelligence and Artificial intelligence. Based on Artificial Intelligence ordinary people can improve their own human intelligence. So that common man can express his thoughts more clearly and coherently, and it can help them to select better choices. I believe that the application of such techniques is a fruitful direction of research for the future, and a promising area for collaboration between researchers in AI and researchers in more humanistic disciplines.

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AUTHOR'S PROFILE

D. Shanthi

from Hyderabad and my date of birth is 22 Aug 1985.I completed my B.Tech and M.Tech in Computer Science and Engineering at Jawaharlal Nehru Technical University, Hyderabad, Telangana , India. I am the research Scholar in JNTU Hyderabad. published many papers in national conferences and international conference .

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Dr. Ramakanta Mohanty

he is completes his Ph.D In Software Engineering Berhampur University, Berhampur,Orissa in 2011. He was presented and published many papers in national and international conferences and journal

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6. 3. Dr.G.Narsimha,Associate Professor, CSE department, B.Tech., M.Tech., Ph.D. B. E in Electronics and Communication Engineering, University College of Engineering, Osmania University Hyderabad, A.P. India. Passed in 1996. ; M.Tech in Computer Science and Engineering, University College of Engineering, Osmania University Hyderabad, A.P. India. Passed in 1999.; Ph.D in Computer Science and Engineering, University College of Engineering, Osmania University Hyderabad, A.P. India. July 2009.

He has about 10 years 6 months of teaching experience Presently, he is Assistant Professor in Computer Science and Engineering Department at JNTUH College of Engineering, Nachupally, Karimnagar.Papers Published/Presented in National and International Conferences

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