IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Converging Paths of Neuropsychology, Positivism and Artificial Intelligence

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Abstract

There have been enormous debate upon Artificial Intelligence being a friend or foe to humankind. But a statement by Yann LeCun in which he said – " Our intelligence is what makes us human, and AI is an extension of that quality" has very clearly pointed out that the concept of Artificial Intelligence is for the up gradation of human race and not for its end.

In this paper an effort has been made to understand how Neuropsychology, Positivism and Artificial Intelligence work for a similar objective which is enhancement of human life, with so much difference within the mechanisms of these three disciplines.

For this, we studied and explored a no. of articles associated with all these three domains and examined their working in order to gain a better understanding. We scrutinized some specific aspects and analyzed their behaviour in these three fields.

From the review of studies it is pretty evident that AI does train the systems that can mimic human brain, carry out almost every function that a human brain does, and thus the concept of AI goes parallel to Neuropsychology, Neuroscience and the theory of Positivism which is about learning by sensation and interpretation from the environment.

Keywords : Artificial Intelligence, Neuropsychology, Positivism, Human race.

Introduction

What are the ways a human being learns anything ? A human being learns from being exposed to instances and repetitive behaviors or practices which is the same way a system in Artificial Intelligence is trained.

There is no field of study and research worldwide which is gaining as much as spotlight, funding and also some remarkable results as Artificial Intelligence at present. From healthcare to robotics, this exponentially developing sphere of computer science has applications everywhere.

S J Gershman, et al. in 2015 have examined how AI is being a part of other branches of study and promoting interdisciplinary researches. The discussion goes towards the reasonability and logicality of the fields like computational neuroscience, which are expected to give more and more concepts which are even more accurate and efficient than the present ones.

AI was founded in 1956, however it has flourished in the 21st century. Using this we can invent such accomplished and skilful technology which is capable to perform actions synthetically just as we human being do naturally. It has bought in a considerable boost in numerous sectors and has contributed a lot in a no. of accomplishments.

Demis Hassabis, Darshan Kumaran et al. in a study in 2017 tried to explain that Biological brains will be really helpful in order to understand and create new technology. In this study, they also threw light upon the breakthrough enhancements in the field of Artificial Intelligence which are influenced by the biological brains.

Although there are many scientists and thinkers who've said that AI will destroy the human race. Much has been said about the relation of human race with AI for example some scientists have also said that we'll be subordinates to robots in the time to come.

A Verghese, N H Shah et al. in 2018 critically evaluated the Electronic Medical Records(EMRs), which were the automated systems as the replacements of medical practitioners earlier in the country. It was basically focused on EMRs unable to be the leading edge asset in radiology because of the lack of dialogue between the medical practitioner and the patient.

V.C.Muller and N Bostrom, in 2016 investigated through the professionals of the arena of AI upon the fear related to the advancements of the systems resulting in the destruction of humankind. What they found was most of the scientists and people who were proficient in AI were sure that these are just the initial stages of development in AI and we'll reach up to a phase of super intelligence. About the fear of advancement, it was said that the probability of situations to go in the negative directions were only 1/3rd.

M H Huang and R T Rust in 2018, did an analysis which included both positive aspects and critical evaluation of AI as how AI models are capable of performing tasks more in number as well as much more efficiently than human workforce. But this, as looks as a positive can still be criticised as in this situation any firm will pick systems and not the manual worker. The machines will soon be so much developed as to execute humane and sympathetic task as well, making things worse.

But leaving all these positive and negative possibilities aside, let us first go back and try to understand what were the reasons, why did we wanted these machines, systems to come in our lives.

Earlier, we were dealing only in technology and that too was exceptionally successful milestone for us but now we have effectively created almost a computational system of human brain, network of neurons in our enormous nervous system, which we termed as the neural networks, a model of single brain cell, perceptrons and what not.

We, the human being have successfully created the machines behave like us by using various methods such as Deep learning, Machine learning, Reinforcement learning etc under the umbrella of Artificial Intelligence. The intellectual AI systems are built using certain algorithms through which we obtain the required solution of a problem and they show their sensory nature by being able to improve and learn from the observations of the world to make enhancement based on those observations. For example, if you ask, these systems can tell you the temperature, details of what's going on in an image etc.

Huimin Lu, Yujie Li et al. in 2018, stated that advanced as well as the expanding and progressive nations of the world have been banking on Artificial Intelligence for their financial growth, social wellbeing etc.

They also talked about the further development of these systems of AI making it even more advanced by operating it at the level of being able to imagine. It was proposed that the AI model at present uses the data

set in order to learn and respond to a stimulus, but now new systems would be created that can bring out with new innovative thoughts even when they aren't exposed to such examples.

AI technology is now being used for small and specific tasks, such as separating the spam messages or mails, while it can also be used for complex ones such as diagnosing the cases of eye problems by scanning the retina.

F Jiang, Y Jiang et al. in 2017 said that AI has bought in truly significant change in the healthcare scenario because of its enormous implications. They analysed and discussed about using various methods for structured and non-structured data, which includes various learning concepts and also mentioned how various diseases can be prevented, diagnosed and treated by the use of these concepts.

The next giant leap which was taken by us was Bionics. Bionics is a perfect model for the explanation of this parallelism amongst Neuro, Positivism and AI. It came into existence in 1993, truly amazing, bionics can be called as a fusion of biology and technology as it designs the machines based on the actual and natural parts of living organisms in order to mimic any certain limb. Also this field of research does align with positivism because of its models being able in sensory learning over the time and having the ability of analysis .

This parallelism has actually made far reaching changes in the concept of science for example, we are now so capable that we've made an "artificial synapse", which works just as the one in our nervous system. "Synapse" is again a term which was usually used in biology, Neuropsychology etc but, it is just because of the interdisciplinary nature of undergoing research and development that we can look up to a single aspect from numerous ways.

D Helbing, B S Frey et al. in an 2019 article have fairly explained that the era of AI has made us change the way we used to think, perceive and live our lives. It is evident that we are going ahead with a great pace towards a changed world and human civilisation altogether. The systems now are so advanced that they don't need to be instructed for any improvements, but they can revive themselves again and again, the programming part has become different from what it used to be one decade earlier. However, they've also said that these systems will soon surpass the intelligence possessed by us, who have created them.

Positivism is a philosophical belief in which it is said that whatever is learnt , it is learnt by receptive experiences which goes exactly with the concept of deep learning which is a particular type of machine learning, which is again under the umbrella of AI. Basically, we have to program these machines in a way to " learn how to learn" and eventually by the experiences they do become trained and also improvise themselves with the time and according to the requirement. Positivism always emphasises on working on logics and mathematics just as any system designed in AI is worked out by algorithms just to figure out any answer.

Most realistic example of AI having sensory abilities that align with positivism is the "voice recognition" feature in the android, where you are able to communicate with a computer and it senses, perceives and responds accordingly.

A.Konar, in 1999, in his book has tried to explain the behavioural outlook of the comprehension which takes place in human being along with discussion of various AI concepts.

AI has also been used by top automobile industries by introducing the concept of Neural networks to make the cars being driven automatically, and the AI machines are found to be outperforming their human equivalent. So if we look at the brighter side, that means, we have been able to create more number of as well as much more intelligent brains for our development. AI is not the threat to human race, in fact, a blessing that be it a medical test, navigation, research, manufacture and almost everything today, we can have considerably more accurate results by using it.

D Li and Y Du, in 2017 in their book have discussed the neurological challenges faced, the affects upon the insight and the applications of AI in coping up with these difficulties. The book emphasises on the neutrality as well as a lot of aspects of our brain, also it talks about distinctive attributes, systems etc of Artificial Intelligence.

So, be it neural synapse or learning by receptive experiences, today we are advanced enough to work out things artificially if not possible naturally and this is eventually making us more and more efficient. Also, we have been successful to make these AI based models sensitive enough as to support and converge the three concepts of Neuropsychology, Philosophical concept of Positivism and Artificial Intelligence.

E J Topol, in 2019 describes in his article how AI is now not only limited to machines, robots etc. but can have a huge positive impact in other branches such as medicine. He has in particular focused upon deep learning concept through which relevant data can be fed and the system will show much better performance than we can expect from a human being. Also, he has also stated the improvements which can be made to further make AI even better for implication.

There are cases when there's a damage in a person's brain, be it just a small damaged blood vessel, but even these kind of damage in the brain devastates the life of that person, may make the person paralysed and even if alive for few years, the person will be on bed or would require support. Here, the question arises that why can't we cure these kind of problems in our brains as we can solve or renovate things in any computer.

M Poo, J Du et al. in 2016 explained the China Brain Project in which they pointed out the remarkable increase in the area of exploration related to Neurological diseases in developed nations. They stated that the ultimate objective of neuroscience is to get to know how does the brain comprehends and the neural pathway of this comprehension. The rising prevalence of numerous brain related problems requires much more interventions from the side of Artificial Intelligence.

There are n no. of neurological, neurodegenerative and psychological diseases faced by billions of people in the world like Alzheimer's disease, Parkinson's disease, Stroke, Epilepsy, Depression etc. most of which have no cure at all and their prevalence is increasing at an alarming pace. If we are heading to fix these diseases then, to start off, we must focus upon how does each and everything like the single and smallest unit of brain, their networks etc work in order to elicit our behaviour and examine what goes wrong. Only if we get to know how things go in our brain, we might be someday successful to chase down the diseases of our brain. But, it's not easy as it sounds. Till now we do not have any solution to this because this is just the right place to state "easier said than done", reasons :

1. Skull : a protective cage surrounding the brain, but for examining brain from inside it doesn't even allow sophisticated microscopic equipments.
2. Inside the brain : Even when you sneak peek inside the brain, the problem only rises because of enormously difficult to study structure of the brain.

3. Nervous system : Things become most terrible here as you must keep in mind that there are around a hundred billion different kinds of neurons in the nervous system having networks with other hundreds of thousands of neurons which is beyond imagination to study.

So, this becomes really evident that how much difficult it is to study the brain. But, to solve this what computational scientists have been doing is that they are practicing Neuro-computational simulation. Optogenetics stimulation technology , a new AI based method which enables cell type specific activation has also been evolved recently. This technology is then blend with functional MRI methods (ofMRI), in which a specific cell type can be controlled in a live subject with temporal precision.

E J Lee, Y H Kim et al. in 2017 focused upon the area of applications of systems and machinery related to stroke medicine. It states that through concepts of AI we can instruct our systems to examine the patterns, also different algorithms can be used to perform various tasks, AI can also be used for imaging purposes and till now the performance results of AI models have been better than that of we, human being performing that task.

It becomes clear that we are trying and improving upon the machinery for examination of the brain using AI and sometimes we may just figure out and fix some problems inside the complex structure of brain. We can develop technologies to replace the movement control in the nervous system. But for that, we must have a proper understanding of every function of the brain in depth. Though neural implants have been in practice at practice but there is a requirement of them being more towards a natural angle.

P Hamet and J Tremblay in 2017 focused on the implications of Artificial Intelligence in the field of medical science, also gave a brief about the new branches and techniques being introduced in medical sciences because of the influence of AI. They stated how the modern AI based machinery mimics the practices of human being in tasks such as surgery etc. Along with this, they discussed further improvements like building in the moral significance, human consideration and future collaborations of AI with other fields.

Conclusion

This remarkable feat of Artificial Intelligence to blend with different branches like Neuropsychology and Positivism is the outcome of the intensive research of more than a decade, the effortless work that was done in order to build smart machines that were a bit more handcrafted which took enormous ideas and understanding plus scientists had to really think about the particulars of the systems. It was due to lack of much of the relevant information to process, and thus we had to go through our own intuition upon how the system needs to be constructed. However, now as we are able to reach up to the information more and more, we are now substituting the human intuition with the data as much as possible in order to provide stability to the operations carried out by the AI systems.

Basically, AI was created in order to execute rational efforts just as human beings. So, under the umbrella of AI, we eventually started designing and building machines which could make us, the human race more efficient. For example, these machines prepared under AI are fully able to sense and understand information just like the human brain. In fact, in some cases computational neuroscientists have been succeeded in creating machine based systems that can exactly mimic the human brain. This will ultimately lead to behavioural aspects, such as sensory processes and interpretation which belong to psychology, positivism etc which are also being carried out by the AI based systems.

And this is just the beginning, every single industry, every single domain is going through a extraordinary transformation due to this revolutionary concept of Artificial Intelligence. The models we have built, the machinery developed so far under the umbrella are just small “drops of water in a mighty ocean” to be explored in the time to come.

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