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Beyond the Pixels: Comprehending Neural Networks

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We have come so far in terms of technology in the past decade, relentlessly solving and conquering problems that couldn't be solved before. The buzz words such as Artificial Intelligence, Machine Learning, Neural Network and Deep Learning, that were merely concepts, are now being excessively applied in industries and research.

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Introduction

AI can still be considered an upcoming field which is in a constant state of flux. It proposes and provides an automated approach to carry out a task that can be performed by a human. Therefore, instead of putting human effort and time into a highly tedious process of going through heaps of data, an AI system can get the task done in less time. However, it is important to note that the AI technology that exists in today's time is what is called "narrow AI".

Narrow AI is not conscious, or driven by emotions. They are programmed in a way to perform a single task, working on a specific type of data-

set, and don't perform out of the task. Narrow AI is also known as "weak AI" even though it is able to interact with humans. This is because these AI systems do not have and are far from having humanlike self-awareness. They have a predefined and predetermined range of tasks out of which they don't perform. A good example would be Siri. When we call out Siri's name and ask a question, we are not talking to a conscious machine. Instead Siri is doing what it is designed and programmed to do. It processes the human conversation, enters the query into the search engine and comes back to give us the result it has found. This is why sometimes we are given vague answers or are linked with responses that don't answer the question we present to it. This is

simply because the questions asked are not within the predefined and predetermined range of intelligence inside which Siri operates.

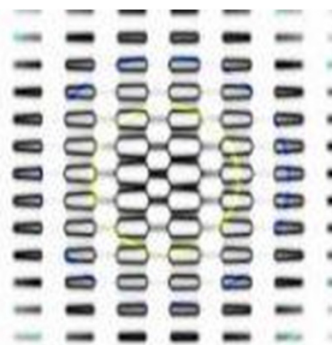
Breaking away from the shackles of these predefined and predetermined rules of design, the idea of Artificial General Intelligence (AGI) systems emerged as an opposing proposal from "narrow AI". It is also referred as "Strong AI" which will stand on expectations that include making judgement, planning, solving problems and making informed decisions just as a human. A paper titled "The Artificial Intelligence Singularity: What It Is and What It Is Not" of scientist Borna Jalsenjak argues that a new phase of AI machines will be seen when AI will be equipped to create its own version of

“life” in the future to come. There have been a number of agreements and disagreements between researchers, scientists and philosophers about the turning point where artificial intelligence will surpass humans and become smarter than ourselves. Stephan Hawking, in his final book, “Brief Answers to the Big Questions” states that if machines continue to follow Moore’s Law, doubling their speed and memory capacity every 18 months, it is likely that computers will overtake us in terms of intelligence in a few hundred years. Mathematician Irving Good introduced the concept of Technological Singularity which will mark the period when AI surpasses humans in terms of intelligence. Hawking also remarks, “When AI becomes better than humans at AI design, so that it can recursively improve itself without human help, we may face an intelligence explosion that results in machines whose intelligence exceeds ours by more than ours exceeds that of snails.”

In a recent paper which is a published collaboration of MIT and UCLA titled “Dark, Beyond Deep: A Paradigm Shift to Cognitive AI with Human Like Common Sense”, the study delves into how a shift can be brought in the current paradigm of computer vision, “big data for small task”, to “small data for big task” by focusing and incorporating five factors (functionality, physics, intent, causality and utility).

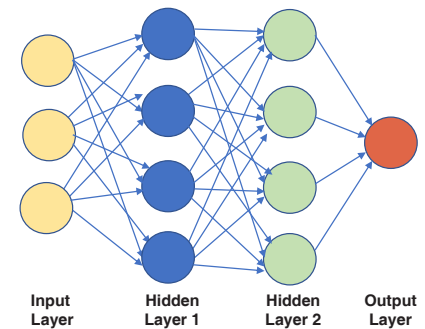
They also argued that the Artificial Systems with intelligence capabilities must address the “dark matter” of computer vision, in a sense to go beyond what is visible in pixels. The change that is needed to be brought in the existing AI systems required the development of a “... computational model for intuitive physics that can support the performance of any task that involves physics, not just one narrow task”.

The question of artificial intelligence being “alive” and what it would take for it to come alive has been a common discussion in the past decade. However, scientists today are trying to find out what the machines perceive and how they think. Not knowing why, a machine behaved in an unlikely manner leaves a strange mark and makes us wonder if there’s a way we can make sure that it does not happen again. In a paper titled “Deep Neural Networks are Easily Fooled: High Confidence Predictions for Unrecognizable”, the Clune and his coauthors write about how deep neural networks have come a long way but still display a massive difference while labeling a given input. The designed system was giving successful results. However, it also mislabeled some of the images. Some of the odd balls include the pictures given below. It declared the pictures to be a remote control (left) and a starfish (right) respectively with a certainty greater than 99.6%. In fact, the same inputs were given to different systems and succeeded in fooling the systems. Clune remarked, “It means that these neural networks all kind of agree (with each other)”.



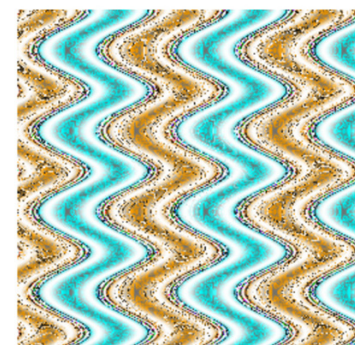
AI is coming in action to carry out most of the important and tedious jobs. Tasks like discovering new medicines, finding the best suited candidate for a job, driving a car, prediction of earthquakes etc. are being done with the help of Neural networks. Neural networks consist of neurons which have been inspired by the behavior of

the human neurons in the human brain. The architecture of these networks mimics the human brain and with the help of the collaboration of Computer Vision, we are effortlessly producing intelligence that can reproduce the capabilities of human vision. Neural networks execute the algorithm in hand, and the result is obtained.



However, it has been noticed that the neural nets give vague outputs. The algorithm which is being applied in the neural net has been designed by humans, yet sometimes the output received is unusual- not right, but also not wrong, in a certain understanding that scientist can grasp.

It can almost be said that artificial intelligence is “weirdly inhuman”, as stated by the author of “Us and



Them: The Science of Identity”, David Berreby. These glitches in the result of the neural nets aren’t random and they might even seem extraterrestrial.

When humans write algorithms, they tend to humanize everything and

interpret the outputs in a way that comes in a line of existent reasons and way of thinking. But we need to prepare ourselves to accept that even though the algorithms are human-made, the tasks being performed by the computers are being performed very differently. The occasional unexpected results of the machine might just be a teaching moment for humankind.

Of course, a system that mislabels a remote control and a starfish is not a hazard. Although it may be a problem if a self-driving car mistakes school buses on the road as rugby jerseys. As we are progressing, we are depending more on AI. Therefore, there is an immense need for it to be predictable. Scientists are still trying to understand why such oddball results appear from time to time but there has not been any possible fix to the problem.

Galileo proved that there exist other planets and Earth is not the only planet in the Universe. Darwin proved that our species isn't the only one to evolve and arise. To that extent, maybe Neural Nets might just open a window for us to know how intelligence works outside the limitations of our species comprehension. After all, neural networks are probably the most apt non-human thinkers we know.



Poorvika S. Negi is a final year student pursuing Bachelors in Computer Science and Engineering from Amity University, Noida. She holds a keen interest in Machine Learning and Computer Vision. She has published papers in the National and International Journals. She actively participates in sports events held in the university. She is the captain of the department Football and Squash Team. She was awarded the All Rounder Trophy in Sanghatan Sports Meet 2019. She is in anticipation of a chance to innovate and develop new technologies that can be implemented in different sectors at a global level, simultaneously creating avenues to enhance business opportunities all the over the world.

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Annexure I

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Reviewers Comment

Reviewer's Comment 1: The article is well structured and the information provided on the neural network covers all the major concerns regarding the working applications.

Reviewer's Comment 2: The article gimmicks the information about the NLP and AGI in a manner so that the hypothetical aspect is properly described by this.

Reviewer's Comment 3: The article gives insights of the Neural networks which is a topic of discussion in the current situation with AI and other technologies in the boon period.



Editorial Excerpt

The article has 04% of plagiarism which is accepted percentage for publication the finding related to this manuscript "Neural Networks". A neural network is a sequence of algorithms that goes-on to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sagacity, neural networks refer to systems of neurons, either organic or artificial in nature. It has been earmarked finalized for publication under the category of "Scrutiny Tip (ST)".

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Disclaimer

All Views expressed in this paper are my own, which some of the content are taken from open source websites for the knowledge purpose. Those some of I have mentioned above in references section.



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