The World of Quantum Artificial Intelligence- the Smart and Faster Way to Reach Artificial General Intelligence

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Abstract-Considering the existing Artificial Intelligence (AI) technology in the current scenario has been reaching the ultimate stage where some minor Computers changes won't affect the overall working of the current system. Therefore, we need some different advanced technology that works better than the existing system. That can only be Quantum Computers (QCs) and a replacement to the existing AI can be Quantum AI (QAI). This research or survey paper how QAI can change the way of looking of Machine Intelligence and what betterments the QAI can bring compared to the disadvantages of the existing systems and hence will provide some suitable solutions for the same. It will then go into how we can put our human sense intelligence into QCs to make the Intelligence to feel, taste and smell which cannot be done with Classical Computers. It will go through the disadvantages of vision and hearing in the existing AI and how it doesn't act as human intelligence does it and how it can be overcome by QAI. It will further expand on the changes we need in the current classical systems and find out how we can get faster responsive machines compared to the existing ones.

Keywords: Quantum Artificial Intelligence (QAI), Quantum Computer Vision(QCV), Quantum Computer Science (QCS), Taste with Quantum Computers, Smell with Quantum Computers, Artificial Human Clone (AHC), Quantum Artificial Neural Networks (QANN or QNN), Quantum Machine Learning (QML), Quantum Deep Learning (QDL), Quantum Data Science(QDS), Machine Learning (ML), Deep Learning (DL), Neural Networks (NN), Computer Vision (CV), Data Science (DS), Artificial Intelligence (AI), Quantum Convolutional Neural Networks (QCNN), Quantum Recurrent Neural Networks (QRNN), Quantum Recurrent Convolution Neural Networks (QRCNN), Recurrent Neural Networks (RNN), Convolution Neural Networks (CNN), Recurrent Convolution Neural Networks (RCNN), Natural Language Processing (NLP), Deep Natural Language Processing (DNLP), Quantum Natural Language Processing (QNLP), Quantum Deep Natural Language Processing (QDNLP), Quantum Mechanics (QM).

I. INTRODUCTION

In the world of ML and DL and the overall concept of AI, we are in a phase where we can simulate the computers that it can act as humans, but the fact is that they are cannot clone the actual human brain and reach the ultimate supremacy of the human brain and also can't match the speed of Human Intelligence. With machine learning algorithms we have proven that a machine can learn by itself. According to Alan Turing, in his paper, he talked about how the machines can think, and he proposed the importance of AI in the real world and how actually the system would work using its intelligence. But now, we have reached the implementation of state wherein the paper and his idea has reached into existence. But there are issues with the system. It is impossible for AI to reach the ultimate Human Intelligence. Today's AI is just an approximation of human intelligence and hence we need Quantum AI to reach to the Human Intelligence. Further we will discuss in this paper about how Quantum AI can be used to better the existing Machine Intelligence and give some idea about how it will take up over the existing Classical AI and the quality of it.

Looking on how the demand in the industry of Classical AI is increasing on a large scale, on the evidences that we have, we can say that the Classical AI is not and will not accurately give us the human like thinking because of its classical bit system (0s & 1s). The quantum computer works in a different fashion all together wherein it uses the laws of quantum physics or quantum mechanics, which was originally a concept of Max Planck. QCs use the phenomenon of superposition where the quantum bit can be in a both state (0 & 1) simultaneously. This helps the quantum computers to make the classical computing faster like for example tasks like brute force algorithms which is generally used for some easier tasks or the older version of hacking, used to take N iterations to reach the final goal, but on a QC it takes just 1 iteration to reach its goal. This leads to many limitations in the current computing systems. This paper talks about how QAI will change the phase of how Machine Intelligence will talk over the current disadvantages of it, the main factors or human senses that a Classical AI Algorithms can do and how it could be overcome by using the proposed system.

Talking about the left brain and the right brain in the human system, the existing classical computer are good enough to do work that a human left brain does but, when it comes to creativity the human brain wins because of its most powerful techniques and ability to grasp in certain sectors or situations based on which the creativity should be done. GAN are used for these types of jobs but, it fails when there are more parameters and less are specified and doesn't give what a human intelligence excepts from the system. This can be

overcome with a Quantum GAN wherein we could give them a N dimensional parameter.

II. INTRODUCTION TO QUANTUM COMPUTERS

Quantum Computers are computers that work on the principles of Quantum Mechanics. Classical Computers uses bit system for processing but Quantum Computers uses qubits for processing. Classical bits can have only two values and just one value at a given time that is either 0 or 1. The qubit can be either 0 or 1 or in both states at a given time. This phenomenon is called superposition where the qubit can be in multiple states. The next phenomenon that is used by Quantum Computers is Entanglement. Entanglement is when the qubit interacts with another qubit even when they are separated by a large distance. If we want to store a single qubit on classical system than it takes two bits that is 10 and 01 quantum states and if there are two qubits then it takes four classical bits to store its data, hence for n number of qubits it takes 2^n.

III. SURVEY OF THE FIELD SO FAR

The classical computer is not a way to reach the ultimate perfectness of a human being because it lacks the way human thing in a diverse manner. So, we must use quantum computers as to reach the perfectness of a human. There is limited research done in this field where most of the research is particularly for the hardware of the QCs and a very few for software of the QC. In Quantum AI there aren't any research in depth and the recent research by other people only uses the speed limitations of classical intelligence to move it on the Quantum AI.

As far as senses of the human being us concerned, the classical computing has reach only to a extend where they have done for vision and understanding the sound but at a certain limitations or assumptions.

IV. BASIS FOR THE PROBLEM STATEMENT

- **CASE 1**

In 2013, about 23+ students died, and dozens more fell ill at a primary school in the village of Dharmashati Gandaman in the Saran district of Bihar state in India, after eating the poisonous mid-day meal contaminated with pesticide. For the full details and the cause and the reactions of this case refer to 2nd Reference.

- **CASE 2**

Some years ago, in Rajasthan's Bhilwara district above 70 students fell ill after consuming a poisonous mid-day meal which contained a dead lizard in it. This was found by some student in the school. The children of the higher primary school complained of vomiting after having the meal. The officials ordered to examine the meal, after which the school staff found a dead lizard in it. For full details of this case refer to 3rd reference.

IV. PROBLEM STATEMENT

AI is a good way to simulate the human brain, but it lacks the human senses like smelling, tasting or touching and if we see that the classical computer is yet slow to see like a human and also hear and respond. Considering Sophia (The Humanoid Robot), the time taken to reflex is above 3-4 seconds which is not as same as the human do. There are certain problems that occur in our society which can be removed out like dead due to food poisoning or due to unknown obstacles in front of the self-driving cars. This can even have a risk of a life.

Even if we can better the technology, there will be a certain point where we will reach the final stage to reduce it and we will need the alternate better technology for it.

V. DISADVANTAGES OF USING CLASSICAL COMPUTING FOR HUMANOID ROBOTS.

The bot cannot have all senses – As science considers that human have 5 senses (sight, smell, hear, taste & touch), then we can notice that the most popular humanoid robot Sophia, does not seem to be as impressive as a human or neither performing as a human.

Further talking about Sophia, it doesn't even reach the human intelligence or the consciousness of a human being. For example, if a human is hearing then he can speak at the same time and vice versa. This is not support by now a day's robots or humanoids.

- **Sight**

Now if we are just considering the ML and the DL what we have in the industry currently, the analysis made on a video is not on streaming or live videos. The videos are first stored and then it is put on processing hence it's not done on RAM memory; this takes a little time to move it to a permanent stored and then again it takes time to process it.

The videos are captured first and then processed. So, it takes at least 5-10 seconds (just using a CPU, not extending it to a GPU) for any this to get it analyzed. This could lead us to great problem if there is a scenario like for if we have a road for self-driving cars and the same road for human bikers, where the biker accelerates in between of no midst or try to overtake the car, then there could be a big accident caused which can cause a human life.

To overcome this most of the self-driving cars use TPUs to overcome this challenge, hence the cost of the cars increases and this is the major disadvantage because we are using CPU and TPUs at the same time and the cost of the autonomous vehicle also increase.

The classical AI NN or in depth the CNN looks at the image in 2 dimensions and this limits the data to get all its features. While looking an image as a human, the human perceives it as a 3D image but for a computer vision algorithm it just a 2D matrix of having the color related to

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its pixels. This limits the functionality of the perceiving objects in the real world.

In reality when a human looks at an image he looks at it as a 3 dimensional image, but when a computer sees it, it's just a 2 dimensional matrix for it, where the dimensions are rows and columns of the images as horizontal and vertical respectively which contains a Hexadecimal value of which color the pixel has in it. This limits down the functionality of the pure image.

When we work with images on a NN we use compressed images like JPEG or PNG file formats. But it would be better if we work with RAW images. The simple fact is that images captured by a has more information, but since it cannot be seen, the JPEG compression algorithm throws out some certain frequency of human invisible information, this is certainly good for storage if we are using this information just for viewing purpose. But in this paper, we are talking about image processing, so we can use raw images for processing some important features out of it, and these features will not be available on a compressed image.

Now processing raw images on a classical computer will take a more time then compressed images because the size of each image is larger, like for example on a Sony camera a JPEG image size is almost around 5-10MB but, a raw image file is almost around 30MB of size. This is the reason why we compress up images with the human seen features only. Normally a JPEG image file takes around 1 second on a neural network (having a certain number of layers and certain number of neurons each layer, the detailed research and solutions will be published in the future.

- **Hear**

Hearing sense in computing is mostly done on audio data and is mostly not done in a real time, that is on the RAM memory directly, while looking in the audio scenario it's the same case like video, wherein the audio is taken in batches and then the analysis is done. In the current AI industry if we are looking into the humanoids of today, then we notice that it takes a lot of time to process the audio and then understand it and put it in text form and give the output according to what is said in the audio. And even if there are systems there are near a real time, they fail to give a good accuracy of understanding all words.

Taking the scenario of Sophia Robot and it non-human like act, it doesn't argue with a human or any other robot, only once the human speaking is done it responds hence it doesn't give a human like approach to some situations. Even we can notice that while it speaks it can hear and this limits the whole functionality of a human intelligence.

We know that the QC can be in a super positional state at given time and hence can work as a human clone. The in detailed solutions and research will be published in the future.

- **Natural Language Processing**

Looking to the classical NLP or DNLP we can see that there are many researches done on it but no researcher has reached the ultimate stage where they can at least identify out how to generalize it to all languages and hence we don't get an all-purpose NLP algorithm. Also speaking about the processing time then, the classical computer takes more time to process the data. Hence, we need QC and QDNLP algorithms to do a faster and better processing of the same.

As mentioned in image processing that raw image processing is difficult with classical computers, same as image we have the same limitation with audio and its compression where the human can hear on 20k Hz sound beyond that a human ear can't hear. So, audios are compressed but for a computer it can perceive it and we can definitely try for understanding the language in it and process it. The in detailed solutions and research will be published in the future.

- **Taste, Touch & Smell**

Classical computer cannot process the information of neither taste touch or smell, because it doesn't have that particular sensors which makes it to have this sense. It is difficult to process this type of information into classical bits wherein we have just 1s and 0s in it.

Looking on the researches done on how the taste, touch smell is related to QM, we can purely say that these functions can be easily translated to QC understanding program.

Looking into the problem statement both those cases took place because there was not a device to check a food where it's good for consumption or not, or whether the food is having the actual taste or not and then categorize it as harmful and suggest that it couldn't be used for consumption.

In India we find these types of cases most of the times in schools and other government provided scheme foods. If there was a system that could detect it, before it was consumed then there wouldn't be such a loss of life. People in poor areas depend on these facilities and if we provide a system that detects a particular food is good or bad will save the loss of human life.

Also speaking about ayurvedic medicines then there many other plants that have not been tested yet for human consumption, it the above proposed tasting system putting it on a neural network could detect if the plant is useful for a medicinal purpose or not. Talking about another important thing then it is the veterinary food. For tasting the veterinary food humans are used, and this can be sometimes dangerous for a human if by mistake it gets consumed. Hence to remove the human interference and the risk of life we can use the purposed tasting system to do this task.

Research on how a human taste, feel and smell with the functionality of QM, is done by many researchers. And it

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just needs to be implemented on a QANN. The in full detailed solutions and research will be published in the future.

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