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Blue Brain – The Virtual Brain [Tvb]

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Abstract- With advancement in the improved technology nowadays we are able to make a comprehensive endeavour to reverse engineer the mammalian brain. We people usually say "We aren't a computer to store a lot in our mind!" In recent years, it is in process to upload our brain into a super computer, so that it is possible to make decisions without taking much effort. Thus "BLUE BRAIN" – a virtual brain, which means a machine that functions as a human brain, but not an actual brain, which can think, analyse, take decisions and respond. With the help of nanobots, we can able to monitor the ample structure of brain-central nervous system and records the current status of the brain. After the death of a person, the body along with the intelligence will lose. By using BLUE BRAIN, even after the death of the person we will not lose the intelligence, knowledge, feelings and our valuable memories. Thus the scientists are in the research which involves studying of slices of living brain tissue under the microscope and patch clamp. The ultimate aim of this is to upload human brain into a machine.
Keywords - Neocortical column, Nanobots, Virtual brain, cerebral cortex.

I. INTRODUCTION

A project called "BLUE BRAIN PROJECT" [BBP] began in July 2005 as collaboration between Professor Henry Markram and IBM aimed at modelling the neocortical column. The project was founded at the Ecole Polytechnique Fdrale de Lausanne (EPFL) in the Lausanne, Switzerland. The ultimate aim of this project is the understanding of the human brain to achieve better performance between the brain and the computer. The human brain has 100 billion neurons; each neuron is connected to 10 thousand other neurons. Sitting on our shoulders is the most complicated object in the known universe. The human brain is more complex than any other in the world. Because everything in the world depends on the nature. Producing a virtual brain which acts like a natural brain is quite complex. Hence questions may arise in the possibility of building a blue brain. The answer to the question is probably Yes, due to the tremendous increase in the technology. The human brain circuitry is complex and hence it is a challenge to the scientists to crack open the secrets of how the brain does it.

II. VIRTUAL BRAIN

Blue brain is known as the virtual brain. A virtual brain is nothing but an artificial brain which can act as the natural brain and it can take decisions, think, analyse and respond to the feelings as a natural human brain does. Brain: an integrated computer model of a fully functioning human brain. The Virtual Brain simulates how the brain is functioning under various normal conditions, how it changes with the maturing process and how it responds to damage from trauma or disease. In the future, the Virtual Brain model can be used to comp experimental brain therapies on a computer before being tested on humans. The Virtual Brain (TVB) is a computerized model of the brain that captures the intricate details of the structure and function of your brain. It will cart the first real, usable and open simulation platform of the human brain. TVB is a software model of a fully-functioning human brain, and is available to the researchers to download and use on their computers. A cluster of high-performance computers, placed in Marseille, France, stores hundreds of terabytes of brain imaging data for TVB. It is also accessible by downloading the free software from the website, From there;experimenter anywhere in the world can utilize the tool to answer their own questions about the brain.

III. THERAPEUTIC USE

For researchers, surgeons, neuroscientists and therapists, TVB Avowal improved patient outcomes by letting clinicians simulate cognitive interventions directly from a web browser. For example, when uploaded with a stroke survivor's damaged gustatory circuitry, TVB will figure out how to recalibrate and repair itself, offering the clinician a predictive tool that will gauge just how repairable the stroke victim's cognitive damage is and the cognitive rehabilitation regimen that will most likely provide the greatest benefit. TVB advances cognitive rehabilitation one giant step closer to personalized brain care. Stroke, Epilepsy, Alzheimer's disease as well as many other brain-related disorders and diseases. They don't believe that Markram can deliver when it comes to prerogative that their project will make us understand how the brain works and how brain diseases like Alzheimer, Parkinsons alter

normal functioning. Some say that even in the unlikely event that the Blue Brain Project possess in building a human brain in a computer, we won't be able to understand it any better than we understand a human brain. It is believed that Parkinson's disease – a kind of degenerative disorder of the central nervous system. The motor symptoms of Parkinson's disease result from the death of dopamine-generating cells in the substantia nigra, a region of the midbrain

IV. BUILDING A VIRTUAL BRAIN

Neuroscientist Henry Markram's ambitions are far from modest to say the least. His aim is to build a complete simulation of the human brain and sprint it on a super computer. This all-European project is called Blue Brain- virtual brain. At the moment there is no system remotely capable of running such a mega complex model. Markram is unperturbed though that around 2020 there will be enough computing power available. Part of his project is the augment of processor chips that match the flexibility of brain circuits. Of course he doesn´t work stag. He has recruited top neuro and computer scientists at 80 research centres all over Europe. Development is in the second phase now, which involves collecting data from brains with disease, damage or degeneration. The scientific crew is currently building capacity in TVB to model these different states. In March 2012, the first teaser version of TVB software parcel was made available to clinicians and scientists online. This open source version allows researchers anywhere in the world to create large-scale models of the brain from their own neuroimaging data. A major ambition for the next open-source release is to include plasticity in TVB model, so it has the capacity to rewire itself in the face of a lesion or learning, as these types of changes are an important idiosyncrasy of the human brain and its ability to self-repair with the right cognitive rehabilitation.

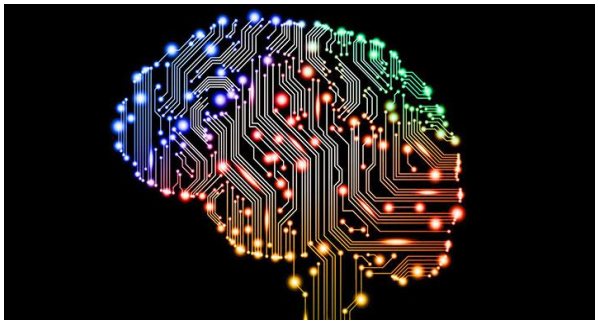

Fig. 4. VIRTUAL BRAIN

A. Hardware & Software Requirements

A supercomputer with large memory and very high processing power.

1) A wide network.
2) Powerful nanobot to act as an interface between the natural brain and the computer
3) 8,096 at 700 MHz to map one or two simulated brain neurons.
4) 256MB to 512MB memory per processor.
5) 100kW power consumption.
6) Linux & C++ software.
7) A program to convert electric impulse from the brain to input of the computer.

V. HOW IT WORKS

Human intelligence is the intellectual capacity of humans. Intelligence enables humans to remember descriptions of things. When a human dies, his body along with his intelligence dies. In order to prevent this Henry Markram and his team had been feeding data into a supercomputer, four vending-machine-size black boxes whirring quietly in the crypt of the Swiss Federal Institute of Technology in Lausanne. The boxes housed thousands of microchips, each programmed to act like a brain cell. Cables carried signals from microchip to microchip, just as cells do in a real brain. This is done with the help of the nanobots. The nanobote range from 0.1-10 micrometres and it could travel wind up our circulatory system, and involved in monitoring the ample structure of the human brain and travel into the spine. These nanobots will provide an interface with the computer. What we need is a super computer with large amount of memory with high processing power and that must be connected to a network.

VI. FUNCTIONS OF HUMAN BRAIN

Some animals in the world like mammals, birds, reptiles have a brain. Among all human brain is quite unique. It gives us the sense to speak and problem solving capacity which makes human being a different organism. Hence our brain performs a lot of task including controlling our body temperature, blood pressure, heart beat rate etc. It accepts a flood of information about the happenings in the world around us by the senses like seeing, smelling, tasting and touching. Our brain is connected to the spinal cord; peripheral nerve makes a complex, integrated information processing and control system known as the Central Nervous System (CNS). The only thing which involves in the function of brain is the neurons. The following example illustrates how the nervous system works.

A. Sensory input

When you grab something hot, the endings of the sensory nerves in the skin detect the heat and send an impulse up through the axon of a sensory neuron to the nerve cell body of the sensory neuron.

B. Integration

The impulse continues through sensory neurons until it reaches an interneuron in the spinal cord. This interneuron determines the appropriate response, which in case would be stimulating the muscle to pull your hand away.

C. Motor output

The excitatory impulse is transferred to the cell body of a motor neuron and travels down the axon of the motor neuron until it reaches muscle tissue. The muscle responds by contracting to pull your hand away from it.

VII. SUPERCOMPUTERS

A. Blue Gene /P

The primary machine used by the Blue Brain Project is a Blue Gene supercomputer built by IBM. The IBM press release did not disclose the terms of the deal but it is agreed to supply Ecole Polytechnique Federale De Lausanne's (EPFL). The computer is used by a number of different research groups, not exclusively by the Blue Brain Project. In mid-2012the BBP was consuming about 20% of the compute time. The brain simulations generally run all day, and one day per week (usually Thursdays). The rest of the week is used to contrive simulations and to analyze the resulting data. The supercomputer regime statistics and job history are publicly available online - look for the jobs labeled as "C-BPP".

Fig. 7.1 Blue Gene /P

B. JuQUEEN

JuQUEEN is an IBM Blue Gene/Q supercomputer that was introduced at the Jülich Research Center in Germany in May 2012. It presently performs at 1.6 peta tumbles and was positioned the world's eighth speediest supercomputer in June 2012. It's likely that this machine will be utilized for BBP simulation beginning as a part of 2013, if financing is allowed through the Human Cerebrum Project. In October 2012 the supercomputer is because of be extended with extra racks. It is not known precisely what number of racks or what the last preparing pace will be. The JuQUEEN machine is likewise to be utilized by the exploration activity. This expects to build up a three-dimensional, practical model of the human brain.

Fig. 7.2 JuQueen

VIII. METHODOLOGY

A. Wetware

Wetware is derived from the computer related thought of equipment or programming, yet connected to organic life frames. We used prefix "wet" is a reference to the water found in livinganimals. Wetware is utilized to portray the components comparable to equipment and programming found in a man and woman, in particular the Central Nervous System (CNS) and the human personality. The term wetware discovers use both in works of fiction and in insightful distributions. The "hardware" component of wetware concerns the bioelectric and biochemical properties of the CNS, particularly the mind. On the off chance that the succession of driving forces that bridging different neurons is thought typically as programming, then the physical neurons would be the equipment. The amalgamated connection of this product and equipment is showed through constantly changing physical associations, what's more, synthetic and electrical impacts that spread over the body.

B. Fuzzy logic

It is method where you can deal with approximate value and answer. Humans and animals often operate using fuzzy guesstimation in many everyday situations. In the case where someone is inserting an object into a container from a distance, the person does not compute exact values for the object weight, substantiality, distance, direction, container height and width, and air resistance to ordain the force and angle to toss the object. Instead the person instinctively applies quick "fuzzy" estimates, based upon previous perspicacity, to determine what output values of force, direction and vertical angle to use to make the toss. The Japanese were the first to utilize fuzzy logic for practical applications. The first preeminent application was on the high-speed train in Sendai, in which fuzzy logic was able to improve precision. It has also been used in cognizance of hand written id in Sony pocket computers, flight aid for helicopters, controlling of subway systems in order to improve driving comfort, precision of halting, and power economy, improved fuel dissipation for automobiles, automatic motor control for vacuum cleaners with recognition of surface condition and degree of soiling, and prognosis systems for early recognition of earthquakes by the Institute of Seismology Bureau of Meteorology, Japan.

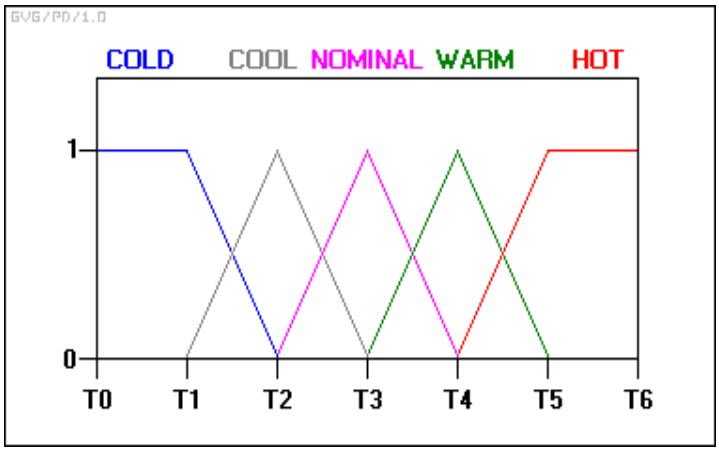

Fig. 8.2 Fuzzy Logic

C. Nanobots

Nanobots are nothing but small robots. This nanobots travel throughout our circulatory system. While traveling they will monitor the activity and structure of central nervous system. They will also provide an interface with the computer while residing into the system. They would scan the structure of our brain and provide a complete read out of the connection between each neuron. When this information is entered into the computer. All the data will be uploaded into the computer. Nanobots will carefully scan the structure of our brain, providing a complete read out of the connections between each neuron. They would also record the current state of the brain.

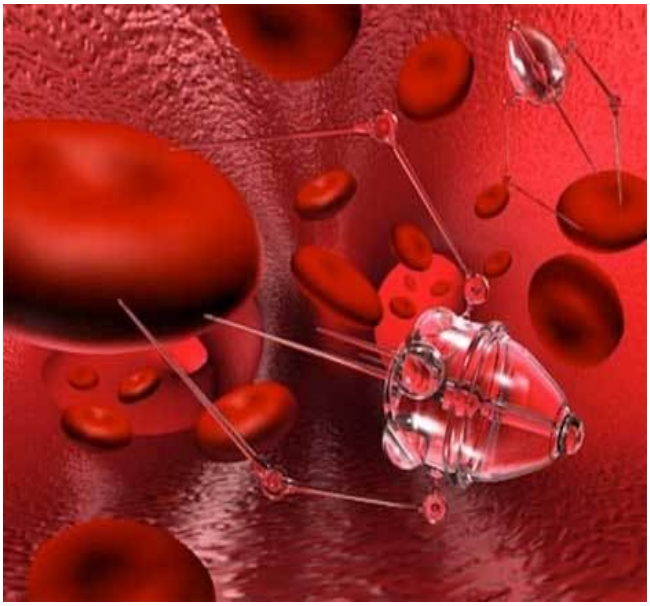

Fig. 8.3 Nanobots

1) Advantages

a) With the help of this technique we can gain the followings:

b) We can remember birthdays, anniversary etc. without any effort

c) We can make decisions from the advice of the experienced one's without the presence of that person.

d) We can use the intelligence of renowned persons like Bill Gates, Satya Nadella even after their bereavement.

e) One of the important and the most useful is, it allows physically challenged persons like deaf to hear through the nerve which is

simulated.

2) Feature Enhancement

Although the technology is mounted, some of them need enhancement to perform better

a) We should prevent hacking of others technical knowledge against us.
b) Uploading into the supercomputer will face computer virus and increasing critical thread.
c) The important thing which is to be noted is cloning. It is an offensive act which is banned due to the new technology which can reproduce person like Steve Jobs
d) It is mandatory to prevent using this technique for unnecessary harassment on peoples.
e) Still some improvements needed to prevent ourselves dependent on computers.

IX. DEEP - DYNAMICAL EXASCALE ENTRY P LATFORM

DEEP (deep-project.eu) is an exascale supercomputer to be built at the Jülich Research Center in Germany. The project started in December 2011 and is capitalized by the European Union's 7th framework program. The three-year archetype phase of the project has received €8.5 million. The Blue Brain Project simulations will be sported to the DEEP prototype to help test the system's performance. If successful, a future exascale version of this machine could provide the 1 exaflops of performance required for a complete human brain sham by the 2020s.The DEEP prototype will be built using Intel MIC (Many Integrated Cores) processors, each of which contains over 50 cores fabricated with a 22 nm process.

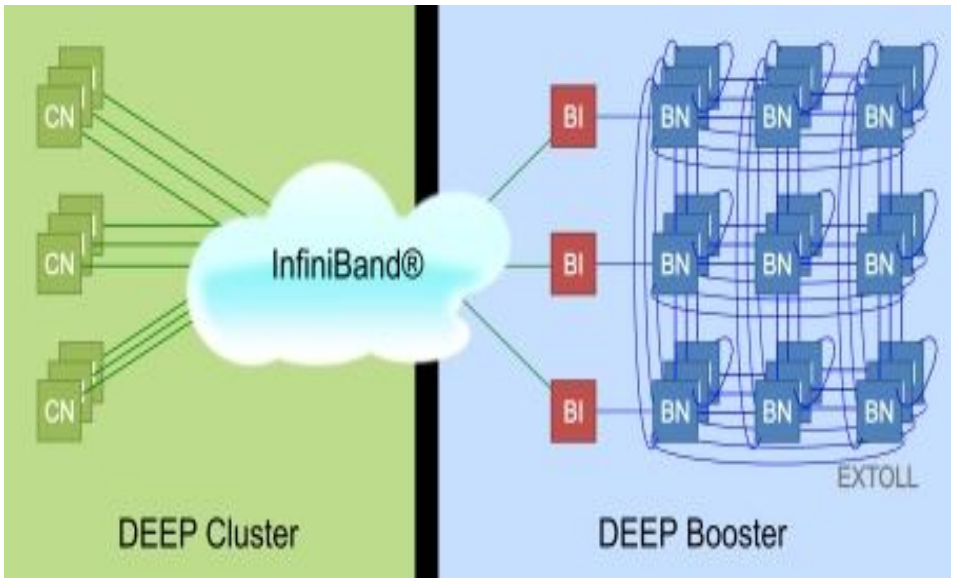

Fig. 9 DEEP - Dynamical Exascale Entry P Latform

X. FUTURE WORK

Blue brain technology can be used in fully paralyzed people to communicate with the world. The very famous scientist William Hawking who has a motor neuron disease and is entirely paralyzed. It require further time for the technology to increase the efficiency. We believe that the connection with blue brain and soul catcher may exceed human intellectual capacity by around 2017, and we believe it is possible to download human brain at 2020.

XI. ACHIEVEMENTS

Typical scientists, impending research funders and scientific journalists are still doubtful on success of mind syncing. It is tested in animal brain. Brain simulation is unbelievably inter-disciplinary search. Institute recently used Blue Brain modelling and optimization tools to cast neurons from mouse visual cortex. Blue Brain gives an unprecedented opportunity to simulate synaptic plasticity — the process through which brain activity shapes synaptic connections.

XII. CONCLUSION

Hence with this technology we can preserve our valuable memories with the knowledge for several thousand years. At some point we are completely able to transfer ourselves into a supercomputer. Simulating a cat brain and a rat brain has completed while simulating a human brain is a challenge taken by the researchers along with the neurologists. It is in progress to simulate human brain as mentioned about that the scientists and young engineers are able to beat the challenge. Finally the combination of biological and digital technologies is noteworthy.

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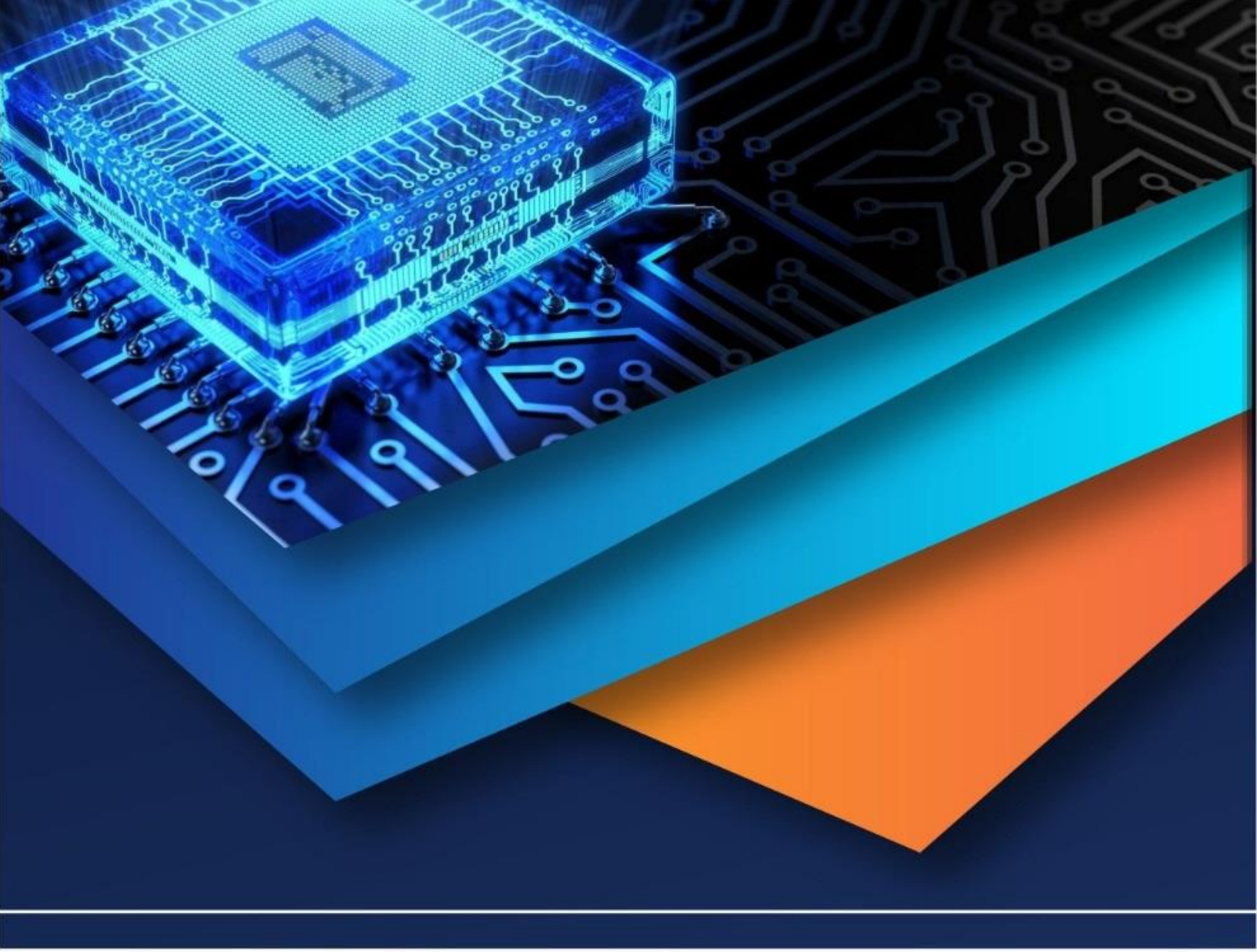

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