WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Blue Brain Technology

Mohanababu C[1], Yogitha[2]

[1,2]SJC Institute of Technology, Dept. of ECE, Chikkaballapur

ABSTRACT—

""Blue brain" is the world's first virtual brain. It is a computer that works in the same way as the human brain does. The Blue Brain Project, in conjunction with EPFL (Ecole Polytechnique Fdrale de Lausanne), Professor Henry Markram of the Brain Mind Institute, and IBM (International Business Machines), began building the neocortical pillar in July 2005. Scientists are actively working on developing an artificial brain that can think, react, decide, and remember. Even as technology improves, individuals should remain the primary source of knowledge and discovery. People do not live for thousands of years, but they can save and utilise knowledge in their minds for thousands of years.. Blue brain is the useful technology in this operation. The key objective is to upload the human brain. It can be usedfor human society's growth.

Keywords- Blue brain, Machine Learning, EPFL, Neural Networks, Back Propagation Algorithm, AI;

I. INTRODUCTION

The capacity of a person to regulate his environment is what distinguishes him from the other animals. His analytical abilit ies placed him at the highest level of the animal kingdom. Therefore, the basic qualities of intelligence lie underlying all human abilities. Intelligence refers to understanding, thinking, acting, interpreting and predicting future relationships, concepts, etc. It helps to make decisions, to solve problem areas, to understand and to reason. Intelligence therefore plays a crucial role in survival and development beyond today.

Blue brain was the first virtual brain in the world. Blue Brain's primary objective is to develop biomedical simulations. This refers to a computer capable of functioning similarly to a human brain. For this reason, we must upload The human mind into the system. So a computer helps a man think and decide easily. After the body dies, the virtual brain

It looks like the guy. In the virtual brain, we use the reverse engineering phase of the human brain [1]. Nobody ever has. understood human brain complexity. It's complicated than any circuit in the world. Then there might be a question "Can a human brain really be created?" The reply is "Yes." It is possible to upload a human into a device. These robots are sufficiently small to manage the entire circulatory system. Our central nervous system functions and structures can be traced through the spine and brain.

They are capable of communicating at a degree comparable to our minds with computers as long as we maintain our biological structure. Additionally, nanobots will perform a careful scan of our brain's structure to look for similarities. When this data is entered into a machine, the computer immediately starts to operate [2]. This means that the entire contents of the brain are transferred to the machine.

II. CONCEPT OF ARTIFICIAL NEURAL NETWORKS

Every neuron is linked by a connection link to another neuron. Each communication link is associated with a weight with input signal information. This is the most useful knowledge for neurons to solve a particular problem since weight normally stimulates or inhibits the signal. Each neuron's internal state is known as an activation signal. After combining input and activation rules, the produced output signals can be transmitted to other units.

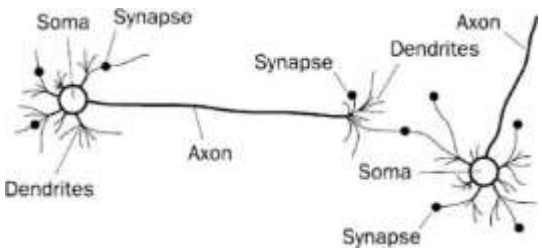

Fig 1:Neural Network in Biology

A neural network that is artificial is a brain model that is highly simplistic [3]. Neurons are considered the constructing elements of the neural networks.A synthetic neuron is a computer model of a real neuron. Synapses on dendrites or the neuron membrane receive signals from natural neurons. The neuron is triggered and sends a signal at When a signal is received at a given level, it crosses a certain threshold through the axon. Each neuron receives entries from a large number of other neurons, modifies its current input status base, and transmits a signal to a large number of additional neurons.

The count and use of ANN forms is very high. Hundreds of different models have been developed as ANNs after McCulloch and Pitts' first neural model (1943). The differences may be functions, agreed values, topology, and algorithms for learning and so on. There are also several hybrid models in which every Neurons have more properties than we realise. here[4]. Due to spatial issues, we only present an ANN that learns how to use Because it is one of the most popular ANN models based on numerous others, the back propagation technique is used to learn the corresponding weights. Because ANNs are designed to process data, they are mostly used in the fields in question. Numerous ANNs are used in engineering for pattern recognition, prediction, and data compression, as well as to represent genuine neural networks and to study and monitor animal behaviour..

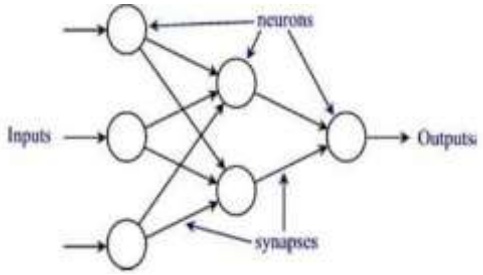

Fig 2: Artificial Neural Networks

THE BACKWARD PROPAGATION ALGORITHM

The back propagation algorithm is based on the well-known Widrow-Hoff theorem. The approach employs supervised learning, which includes network input and output samples. and then calculates the error. Random weights begin with the background propagation algorithm, which is designed to adjust them before the To limit error, ANN learns from the training data [5]. The basic backpack algorithm is a gradient descent technique that negatively alters the network weights and output gradient. The combination of weights that reduce the error function is considered a solution to the learning problem. The back propagation algorithm includes a differentiating activation function, with tan-sigmoid, log-sigmoid, and sometimes linear. One or more secret neuron layers and a linear neuron output layer comprise feedback networks. Between the inputand output vectors, the network can discover both nonlinear and linear relationships. The network's linear output layer enables it to run in the +1 to -1 range.

For the learning process, the training data sets, which are used to quantify error gradients and alter weights, and the confirmation data sets, which are used to identify the ideal number of iterations to prevent overlearning [6], must be divided into two groups. As the number of iterations grows, the exercise error decreases, but the error in the validation data set decreases, then increases. Following a validation error, continuing the learning process leads to overlearning. If the learning process is complete, another data collection (test set) is used to accurately check the prediction. Backprop networks that have been properly trained are intended to produce logical responses to fresh inputs. In ANN approaches, data normalisation is usually required before the train ing phase starts to ensure that the effect of the input variable during model building does not depend on the extent or range of its original values [7]. The standardisation process typically involves a linear transformation of the input/output variables into the range (0, 1).

It is important to reduce the error values in randomly assigned weights and biases to generate the correct output behind the back propagation algorithm [8]. The system is trained in the supervised learning method where the system is faced with an error in between the output and known predicted output to change its internal status. We need to update the weights to minimise global loss. This is how neural network propagation works.

Fig3: Algorithm of Back Propagation

A. THE WETWARE TECHNOLOGY

While the term "wetware" refers to biological components of life, it is taken from the concept of a hardware or software device. The word "wet" refers to the presence of water within living creatures. The hardware and software components of the central nervous system (CNS) and human mind are referred to as wetware.

Wetware's "hardware" component is concerned with thethe central nervous system system's biological and biochemical properties, especiallythe mind. If the sequence of impulses passing through the distinct neurons is software, the individual neurons are referred to as hardware. Physical interactions, as well as chemical and electrical forces, are continually changing in the body, indicating the connection between software and hardware.

A wetware machine is one that is completely made of liv ing neurons [9]. Professor Bill Ditto, the primary researcher at the Georgia Institute of Technology, is in charge of developing these synthetic yet organic brains. A leech neuron prototype can do simple arithmetic operations. While the principles are still being explored and prototyped, synthetic organic brains should be able to recognise basic patterns such as handwriting in the near future, albeit in a much reduced form than animal brains.

Wetware technology, which involves the insertion of a sample of brain cells on a 60-circuit board designed for use as a semi-driver, is now accessible [10]. This circuit and the example above are linked to many sorts of technical computers, either wirelessly or via the internet. This computer is now conscious and capable of reasoning, making its own decisions, and, most impressively, posing a problem that no other technology has ever solved.

The brain cell sample grows on the circuit board and adapts to the new body by modifying neuronal and electrical networks. Indeed, scientists now observe a brain expanding and growing in real time, shedding fresh light on how our brains work and repair. This technology would also reveal insights on decades of mental disease, transforming our perception of machinery and unmanned devices.

Wetware is just the interface of the actual neurons to the

artificial neurons. A "Neuron" app is the blue brain wetware. It was also suggested that anyone could purchase their own living technology in 10 years.

B. FUZZY LOGIC

Fuzzy logic is characterised as a multi-value logic, which can have actual variables values between 0 and 1 in any real number. It 's the partial truth principle. We can find in real life a situation in which we cannot decide if the statement is right or wrong. Fuzzy logic offered very useful reasoning versatility at that time.

Fuzzy logic algorithm [11] helps to solve a problem by taking all available data into consideration. The best option for the input is then chosen. The FL process mimics how a person decides to evaluate all options between the digital T and F values.

C. Fuzzy Logic Architecture

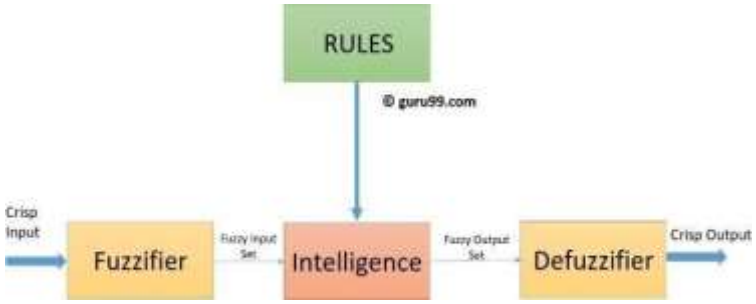

Fig 4: Fuzzy Logic Architecture

Rule Base: It includes all the instructions and the requirements for the experts to monitor the decision -making process. The latest update on Fuzzy Theory provides Fuzzy controllers with different design and tuning methods [12]. This change reduces the number of fugitive laws substantially.

Fuzzification: The fluzzification stage allows inputs to be converted. The crisp numbers can be converted into fuzzy sets. Crisp inputs were calculated by sensors and transferred for further processing to the control system. Pressure, etc., like room temperature.

Inference Engine: It helps you to evaluate to what degreethe fluffy feedback and rules match. Based on the percentagestage, it determines which rules the region must apply. Thelaws are then merged in order to establish the control steps.

Defuzzification: Finally, the disfusion method is used to transform the fuzzy sets into a narrow value. There areseveral different types of methods, so you have to pick theones are suitable for an expert programme.

People's thinking is essentially smooth. The way we experience the world is constantly changing and cannot be expressed in erroneous or true claims. Take every apple and apple kernel on the planet. Take one of these apples; it comes with every apple bundle [13]. Is it still the appropriate apple if you take a dick from it? If that's the case, it's still in the apple collection. You've left an apple core, which belongs in the box of apple cores after several

additional bites. How far did the apple travel from the apple to the apple's heart? Would you move it to another set if you could get a bite out of the middle of the apple? A hazy

The mechanism is the regulated system that cannot normally be modified. Then the controllerThe procedure must be determined by taking the input. The decision is made from the standpoint of the past.

III. THE BLUE BRAIN

The analysis includes the study of sections of living brain tissue by microscopes and electrodes in patches. All the many forms of different neurons are collected. These data are used to create biologically accurate neuronal models and neuronal networks in the brain cortex. The simulations are performed on an IBM-built Blue Gene supercomputer. This is why the name is "Blue Brain." Michael Hines and the other custom components use the NEURON simulation software [14]. The project aims to gain full understanding of the brain and to increase and speed up the development of treatments for brain disease.

The success of mind uploading is still dubious to typical scientists, impending researchers and science journalists. Important mainstream research is performed in the animal brains to compare, contrast and simulate, build quicker supercomputers.

Sensitivity is a natural component of the climate. We believe that comprehension is based on physical, chemical, and biological laws, as well as mathematics and logic [15]. This mechanistic understanding of the mind is centred on the concept of mind uploading. Such intelligence may offer the necessary computer substrate for uploading..

A. NEED OF AN ARTIFICIAL BRAIN

Today, we are the source of our wisdom. Intelligence is an innate, uncreated characteristic. Certain individuals possess this trait, rendering others incapable of thinking. Such wisdom and intelligent brain are still essential in human society. But after death, intelligence and the body are lost. The virtual brain solves this problem. And after death, brain and intelligence will be alive. We also have problems recalling items such as names of individuals, birthdays and word orthography, the right pronunciation, significant dates, history details and so on. Everyone needs to rest in the busy life. A better alternative would be the virtual brain.

B. POSSIBILITIES OF ARTIFICIAL BRAIN

It is useful to exp lain the simple ways an individual can be uploaded to a machine. Recently Raymond Kurzweil gave an interesting paper on the subject. It defines invasive as well as non- invasive techniques. Very s mall robots or nanobots are the most promising. These robots are tiny enough to fly through all of our circulatory systems. To track the function and structure of our central nervous system, you move to the spine and brain. You should strive to obtain a computer interface as soon as possible while we are still biological. Nanobots may also perform a detailed scan of our brain structure and read the association of each neuron. Additionally, they document the brain's current state. And, when you meet a machine, this e xperience operates similarly to ours. What you need is a room- and computer-richcomputer. Many people assume that we are alive, and quantity forces contribute to our consciousness. But now wemust logically remember.

C. BUILDING A BLUE BRAIN

The following measures are included:

Step 1: Data Collection

The microscope and the shape and the electrical behaviour of each neuron are the part of the brain. This is a well-established, globally recognized approach to neuron analysis and catalogue. Neurons are categorized based on structural properties. The findings are translated into accurate algorithms describing the mechanism, purpose and position of the neuron. The algorithms are then used to produce biologically plausible and simulated virtual neurons.

Step 2: Data Simulation

The simulation stage entails the generation of virtual neurons using real-neuron algorithms. The algorithms and parameters of the simulated animal are calibrated according to age, species and disease. Each protein is simulated and approximate ly one billion are in one cell. For each synthesized neuron, an initial network skeleton is created. The cells are then bound according to the laws observed experimentally. The neurons are now in good health, and the simulation has been restored. Emerging behavioural patterns are visualized using the given resources.

D. SOFTWARE DEVELOPMENT KIT D.BLUE BRAIN

The Blue Brain SDK is a C++ library wrapped in Java/Python. The current brain simulation application is NEURON. This software simulates neuronal cells through various ion channels by simulating ion fluxes in and out of the cell. These motions provide an electric potential difference between the inside and outside of the neuronal membrane, allowing neurons to interact with one another. Michael Hines of Ya le and John Moore of Duke University invented this in the early 1990s. Open source software is available for free. The website offers unrestricted access to anything, including code and binary data. In partnership with the BBP crew, Michael Hines carried the gear into the enormous parallel Blue Gene in 2005.

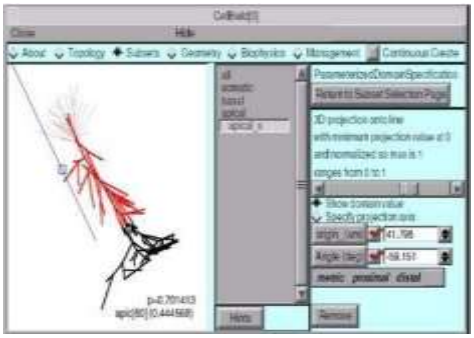

Fig 5: NEURON cell binder window

IV. VISUALIZATION

The Blue Brain Project's primary application for visualizing neural simulations is RT Neuron. This software was developed internally by the BBP team. C++ and OpenGL are password- protected. RT Neuron is a custom software created for neural simulations that is not applicable to other simulations. RT Neuron may use Huxley's output from the Hodgkin simulation as the input to NEURON in order to deliver it in 3D. This enables programmers and scientists to visualize the propagation of the activation potential between or around neurons. Researchers can communicate with the model by pausing, restarting, and zooming in on the animations. The views include several dimensions. Commodity PC clusters were used to visualize the RT Neuron machine

VISUALIZATION

The Blue Brain Project's primary application for visualizing neural simulations is RT Neuron. This software was developed internally by the BBP team. C++ and OpenGL are password- protected. RT Neuron is a custom software created for neural simulations that is not applicable to other simulations. RT Neuron may use Huxley's output from the Hodgkin simulation as the input to NEURON in order to deliver it in 3D. This enables programmers and scientists to visualize the propagation of the activation potential between or around neurons. Researchers can communicate with the model by pausing, restarting, and zooming in on the animations. The views include several dimensions. Commodity PC clusters were used to visualize the RT Neuron machine.

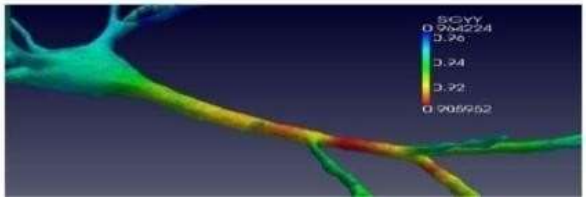

Fig 6: Visualization of NEURON

V. HARDWARES /COMPUTERS USED

- A great machine.
- Memory with a very wide storage space.
- Very high power processor.
- A rather wide network.
- A programme for converting the brain electrical impulses to the input signal obtained on the screen, and vice versa.
- Ve ry strong nanobots to connect the natural brainwith the machine

Blue Gene/P

The Blue Brain Project's main machine is IBM's Blue Gene supercomputer. The word "Blue Brain" comes from here. In June 2005, IBM agreed to supply Blue Gene/ L to EPFL as 'technology proof' The contract terms were not disclosed in the IBM press release.

Fig.6 Blue Gene/P Supercomputer

JuQUEEN

JuQUEEN is a supercomputer developed in May 2012 for IBM Blue Gene/Q at the German Jlich Research Center. At 1.6 petaops, in June 2012, it was the world's 8th fastest supercomputer. If funding is obtained from the Human Brain Project, this computer could be used to simulate BBP in 2013. Additionally, the JuQUEEN machine is used in the JuBrain research project (Jlich Brain Model). This is used to create a three- dimensional model of a realistic brain.

Fig.7 JuQUEEN Supercomputer

DEEP- Dynamical Exascale Entry Platform

DEEP has been established at the Jlich Research Center in Germany as an exascale supercomputer. The project'sthree-year prototype phase earned 8.5 million. A supercomputer prototype will be designed by the end of 2014 at 100 pet flops.

The simulations of the Blue Brain Project are transferredto the DEEP prototype to test the results of the device. A future exascal version of this computer could provide a complete simulation of the human brain for the 1 e xpected performance exaflops in the 2020s.

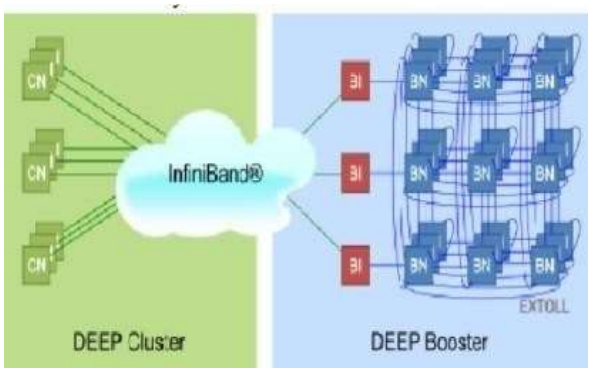

Fig.8 DEEP Supercomputer

ADVANTAGES:

- Without effort, we can recall stuff.
- Decisions may be taken without a person's presence.
- His wisdom can be used well after a man's death.
- The behaviour of various animals is understandable. That means that their reasoning can be easily understood by interpreting the electrical impulses from the animals' brains.

DISADVANTAGES:

- We are reliant on computer systems.
- Others can use against us technical knowledge.
- Computer viruses are becoming more and more important.
- However, the real challenge is the fear of people having new technology. This fear can lead to widespread resistance. There is clear evidence of this kind of concern today about human cloning

VI, CONCLUSION

We think the time has come to start assimilating the wealth of data collected in the last century and to construct biologically realistic brain models from initial concepts, which will help us to grasp the role and malfunction of our brains. In conclusion, at some stage we should s witch to machines. The majority of claims against this result seem to be easy to bypass. Either you are simple-minded or take additional time to upgrade technology. Additionally, the only significant risks associated with the integration of biological and digital technologies are addressed. By 2017, we anticipate that the interaction between the Blue Brain and Soul Catcher will transcend human intellectual capability, and that by 2050, we will be able to download a human being's mind.

REFERENCES:

[1] R. Pandey and T. Mukherjee, "Fuzzy QFD for Decision Support Model in Evaluating Basic Cause of Children Falling Into Blue Whale Ga me," 2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT), 2018, pp. 108-110, doi: 10.1109/ICALT.2018.00032.

[2] S. Sharma, N. Payal, A. Kaushik and N. Goel, "Blue Brain Technology: A Subway to Artificial Intelligence," 2014 Fourth International Conference on Communication Systems and Network Technologies, 2014, pp. 1106-1109, doi: 10.1109/CSNT.2014.226.

[3] M. Gidwani, A. Bhagwani and N. Rohra, "Blue Brain - The Magic of Man," 2015 International Conference on Computational Intelligence and Communication Networks (CICN), 2015, pp. 607-611, doi: 10.1109/CICN.2015.319.

[4] M. Lu and F. Li, "Survey on lie group machine learning," in Big Data Mining and Analytics, vol. 3, no. 4, pp. 235-258, Dec. 2020, doi: 10.26599/BDMA.2020.9020011.

[5] Yi Tan and Guo-Ji Zhang, "The application of machine learning algorithm in underwriting process," 2005 International Conference on Machine Learning and Cybernetics, 2005, pp. 3523-3527 Vo l. 6, doi: 10.1109/ICMLC.2005.1527552.

[6] Jongmin Yu, Jeonghwan Gwa k, Sejeong Lee and Moongu Jeon, "An incremental learning approach for restricted boltzmann machines," 2015 International Conference on Control, Automation and Information Sciences (ICCAIS), 2015, pp. 113-117, doi: 10.1109/ICCAIS.2015.7338643.

[7] K. Pahwa and N. Agarwal, "Stock Market Analysis Using Supervised Machine Learning," in 2019 International Conference on Machine Learning, Big Data, Cloud, and Parallel Computing (COMITCon), pp. 197-200, doi:10.1109/COMITCon.2019.8862225.Readers.

[8] RC Chakraborty, Fundamentals of Neural Networks. artificial intelligence.html, June 1, 2010

[9] Artificial Neural Network Limitations and Disadvantages from the website http://www.ncbi.nlm.nih.gov/pubmed/8892489

[10] Forbes, 6 June 2005, IBM Aims To Simulate A Brain.

[11]]Fire Up the Blue Brain - "We Are 10 Years Away From a Functional Artificial Human Brain" McKinney, Luke, July 2009

[12] TED Conference, July 2009. Henry Markram constructs a brain in a supercomputer.

[13] Reconstructing Mammalian Intelligence's Heart Henry Markram's March 4, 2008 Lecture.

[14] The Blue Brain Project, Hil, Sean: Markram Henry, IEEE 2008 International Conference.

[15] An Indian startup will assist india 2009