WWW.IJRPR.COM

International Journal of Research Publication and Reviews

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

NEURAL NETWORKING

Srinath R[1], Sarvaesh Raam S[2]

Student[1], Department of Computer Science, Sri Krishna Arts And Science College, Coimbatore, Tamil Nadu - 641001.
Student[2], Department of Computer Science, Sri Krishna Arts And Science College, Coimbatore, Tamil Nadu - 641001.
Email: srinathr21bds051@skasc.ac.in[1]
Email: sarvaeshraams21bds042@skasc.ac.in[2]

ABSTRACT

The paper contains a brief explanation of Neural Networking. A Neural Network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. It is inspired by the biological neural networks that constitute animal brains. Here we'll be discussing neural networking - what it is, how it works, and its potential applications in the future. Neural networks are a type of artificial intelligence that is modeled after the human brain, and they have the potential to revolutionize many industries.

Keywords: *Neural, Network, Neural Network, Perceptron, Nodes, layer, Recognition, Artificial.*

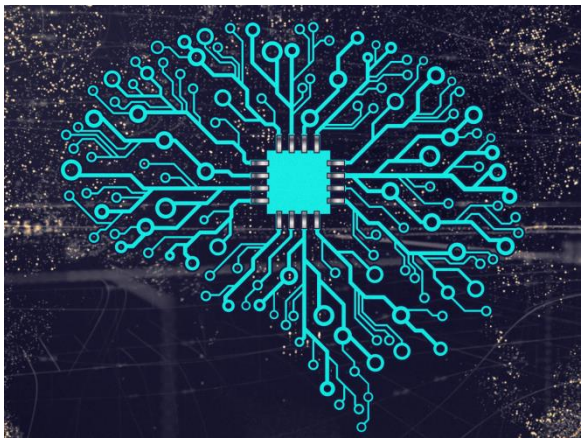

Fig.1 - Neural Network

1. INTRODUCTION - NEURAL NETWORK

A neural network is a series of algorithms that mimic the function of neurons in the human brain. Neural networks are composed of neurons or nodes like the human brain. The nodes of this network are well interconnected with other nodes. They are the reflection of the human brain which allows the computer to recognize patterns and solve problems in the fields of Deep Learning and Artificial Intelligence. They are also known as Artificial Neural Networks or Stimulated Neural Networks, which are the sub-branch of Machine Learning and the heart of Deep Learning algorithms. Their names are inspired by the biological work of the brain's neuronal signals to each other.

2. HISTORY OF NEURAL NETWORKS

- 1943 - Warren McCulloch and Walter Pitts wrote a paper The Logical Calculus of the Ideas Immanent in Nervous Activity on how neurons might work
- 1944 - Joseph Erlanger and Herbert Spencer Gasser discovered several varieties of nerve fiber and the connections between action potential velocity and fiber diameter.
- 1949 - Hebb wrote a book, The Organization Of Behavior, which concluded neural pathways are strengthened each time when they are used.

- 1958 - Rosenblott introduced Perceptrons, an electronic device.
- 1969 - Minsky and Papert wrote the book Perceptrons: An Introduction to Computational Geometry.
- 1972 - Klopf developed learning in Artificial Neurons.
- 1975 - Fukushima wrote Cognitron: A Self-organizing Multilayered Neural Network
- 1976 - Grossberg introduced a theory of Human Cognitive Information Processing.
- 1980s - Kohonen introduced the Kohonen map or Network.
- 1982 - Hopfield of Caltech, described the Artificial Neural Network as a content-addressable memory.
- 1985 - An annual meeting - Neural Networks for Computing by The American Institute of Physics.
- 1988 - The INNS journal, Neural Networks founded.
- 2009 to 2012 - Research group of Schmidhuber developed Deep Feedforward Neural Networks and Recurrent Neural Networks.
- 2014 - Scientists at IBM introduced a processor, with an algorithm similar to the human brain. Where the system can execute from 46 to 400 billion synaptic operations per second.

3. HOW DO NEURAL NETWORKS WORK?

Neural networks are computer systems that are designed to do some sort of work such as identifying the pattern and making predictions. They are used in a variety of applications including image recognition, voice recognition, and Machine Learning.

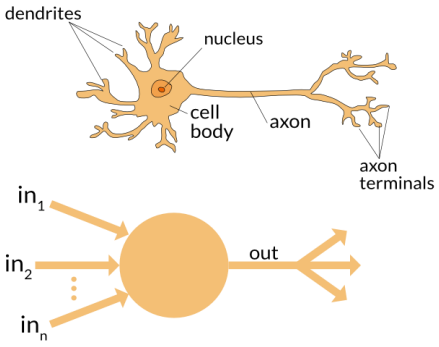

Fig.2 - Neuron and Perceptron

Artificial Neural Networks consist of three main components: Input layers, a Processing layer or Hidden layer, and an output layer. Each Artificial neuron or node is connected to another and has a corresponding weight and threshold. If the output of any single node is greater than the specified threshold, then that node is activated and sends data to the next layer of the network, otherwise, no data sharing is possible to the next layer of the network. Neural Networking involves a large number of processes to execute the output. The first tier or input layer gets the raw data or information and each other following tier receives the output from the tier that preceded it. Every single node in the network has its own small sphere of knowledge. The last tier or output layer provides the final output. That's how neural networks work.

4. HOW DO NEURAL NETWORKS LEARN?

It's not easy to get an output in a Neural Network because it is fed by a very huge amount of data. So, training on a Neural Network is a must to get a relevant output. Neural Networks are trained by providing input and telling the network what the output should be. Rules are also provided to the network to help the network learn. For example, Facial Recognition systems might be instructed, "mustaches are found below the nose and above the mouth" or "Eyebrows are found above the eyes". These are all the preloaded rules which help the network to make training faster and to give the output sooner.

Facial recognition may be taught to recognize a mask on the face. During the training, the network will be fed with the picture of people wearing the mask and without wearing the mask and telling the network which is the picture wearing masks. It might also be instructed, "Masks are below the eyes and cover the nose and mouth". Rules like this can make the training faster and get an expected outcome.

5. DEEP LEARNING IN NEURAL NETWORK

Neural networks have been used since the 1960s by scientists and developers to learn patterns from data. However, it wasn't until 2012 that deep learning networks emerged that are now dominating the scene. Deep learning refers to a type of neural network architecture where multiple layers of neurons process information with extremely long (often hundreds or thousands of) connections. Deep learning networks use sets of sophisticated algorithms that can make calculations very quickly, which enables them to work through huge amounts of data very quickly. Instead of using a few neurons for each set of weight values, deep learning networks often include thousands or millions. The incredible processing power and speed are what allow these networks to be so powerful. Deep learning networks are more similar to biological brains than traditional neural networks

6. TYPES OF NEURAL NETWORK

Neural Networks are classified into many types and they are used for different purposes. Some of the types of Neural Network is listed below:

- Perceptrons
- Multi-Layer Perceptrons
- Convolutional Neural Network
- Recurrent Neural Network

6.1. Perceptrons:

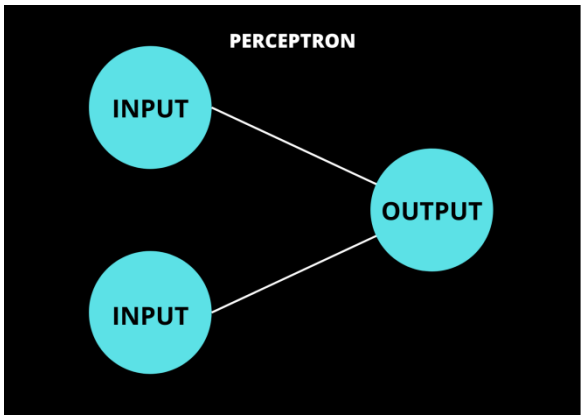

Fig.3 - Perceptron

Perceptrons are all the oldest and simplest types of Neural Networks, proposed by Minsky Papert. It has only one Neuron. Perceptrons are consists of two layers,

- Input Layer
- Output layer

Perceptrons usually take input and apply activation function to give the output has an outcome

6.2. Multi-Layer Perceptron:

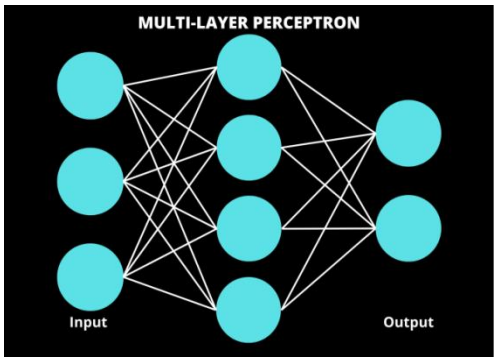

Fig.4 - Multi-Layer Perceptron

Multi-Layer Perceptrons (or) FeedForward Neural Networks are completely connected networks. Each neuron is connected to all other neurons in the next layers hence it is more powerful than Perceptrons. Multi-Layer Perceptrons are consists of three layers,

- Input Layer
- Hidden Layers
- Output layer

They pass the information in uni-direction through the various input nodes until it reaches the output layer. Between this path the node layer may or may not have some hidden layers.

6.3. Convolutional Neural Network:

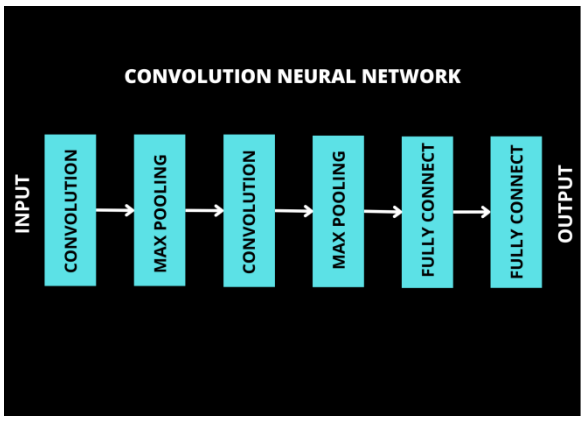

Fig.5 - Convolution Neural Network

Convolutional Neural Network is similar to FeedForward Neural Network. This computational network model uses a variation of Multi-Layer Perceptrons. It has a three-dimensional arrangement instead of the usual two-dimensional arrangement. Convolutional Neural Network consists of one or more convolutional layers that are connected. The first layer is known as the Convolutional layer. In this network, input is taken in a bunch. Convolutional Neural Network shows efficient results in Image Recognition, Visual fields, Facial Recognition, and image classification.

6.4. Recurrent Neural Network:

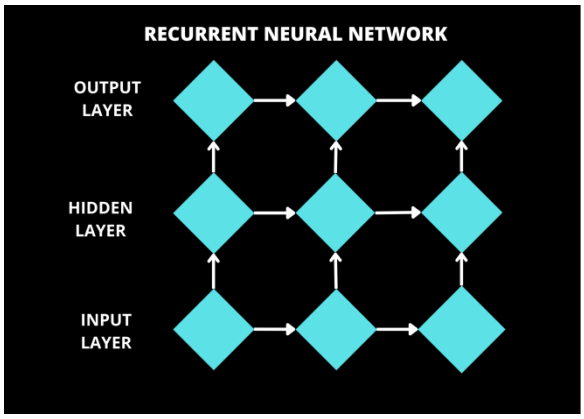

Fig.6 - Recurrent Neural Network

A recurrent Neural Network is designed to save the output of a layer. Each node in the Recurrent Neural Network acts as a memory unit and does computation and implementation of an operation. Recurrent Neural Network remembers all processed data in order to reuse in the future. If the prediction done by this neural network is incorrect then it will relearn and make some small changes in it and execute the correct prediction during Backpropagation. A recurrent Neural Network is effectively used in analyzing time series data and event history.

7. Benefits of Neural Network:

There are many benefits of neural networking, including the ability to perform complex tasks, the ability to learn from data, and the ability to generalize from data. Neural networks are also very efficient at parallel processing, which makes them well suited for applications such as image recognition and pattern recognition.

One of the main benefits of neural networks is their ability to perform complex tasks. Neural networks are able to learn from data and generalize from data, which means they can learn to recognize patterns and make predictions. This makes them well suited for applications such as image recognition and pattern recognition.

8. Challenges of Neural Network:

The biggest challenge of neural networking is the high degree of complexity involved. This can make it difficult to design and train neural networks, and to understand how they work. Additionally, neural networks can be sensitive to changes in their environment, which can make them difficult to deploy in real-world applications.

9. Application of Neural Network:

Neural Networks are widely used in,

- Face recognition
- Pattern recognition
- Chatbots
- Natural Language Processing
- Translation and Language Generation
- Delivery Route Planning
- Business Analytics
- Fraud detection
- Stock market prediction
- Voice recognition

7. CONCLUSION

Neural networking is an exciting field of study with a vast amount of potential applications. In this article, we have explored some of the basics of neural networks and how they work. We have also looked at a few examples of where neural networks are being used today and what the future holds for this technology. Neural networks are sure to play a big role in shaping the future as we move into an increasingly digital world.

REFERENCE

[1] Neural Networks By IBM Cloud Education, 17 Aug 2020.

[2] https://www.ibm.com/cloud/learn/neural-networks#toc-types-of-n-YgdI1-Kt

[3] Neural Network By Mark Chen, reviewed by: Michael J Boyle, fact-checked by Katrina Munichiello, Investopedia, 08 Dec 2021.

[4] https://www.investopedia.com/terms/n/neuralnetwork.asp#:~:text=A%20neural%20network%20is%20a,organic%20or%20artificial%20in%20nature.

[5] What is a neural network? Explanation and examples. By: Ed burns, Executive Editor, John Burke, Nemertes Research, TechTarget

[6] https://www.techtarget.com/searchenterpriseai/definition/neural-network

[7] Neural Networks – State of Art, Brief History, Basic Models and Architecture By Bohdan Macukow, Faculty of Applied Mathematics and Information Science, Warsaw University of Technology, Poland, Springer, Cham 09 Sep 2016, LNISA, Vol. 9842.

[8] https://link.springer.com/chapter/10.1007/978-3-319-45378-1_1#Sec2

[9] Types of Neural Networks and Definition of Neural Network, By Great Learning Team - 25 Sep 2021

[10] https://www.mygreatlearning.com/blog/types-of-neural-networks/#Perceptron

[11] 6 Types of Neural Networks Every Data Scientist Must Know by Ramya Vidiyala, Towards Data Scientist, 18 Dec 2020

[12] https://towardsdatascience.com/6-types-of-neural-networks-every-data-scientist-must-know-9c0d920e7fce

[13] YouTube - Eye on Tech: https://youtu.be/-8se4mWn058