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A Study on Aspect of Artificial Neural Networks for Machine Learning

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Abstract: *Artificial Neural Network (ANN) uses the processing of the brain as a basis to develop algorithms that can be used to model complex patterns and prediction problems. In our brain, there are billions of cells called neurons, which processes information in the form of electric signals. External information/stimuli is received by the dendrites of the neuron, processed in the neuron cell body, converted to an output and passed through the Axon to the next neuron. The next neuron can choose to either accept it or reject it depending on the strength of the signal. Neural network architecture is presented as one approach to the design and implementation of intelligent control systems. Neural networks can be considered as massively parallel distributed processing systems with the potential for ever-improving performance through dynamical learning. The nomenclature and characteristics of neural networks are outlined. Two simple examples are presented to illustrate applications to control systems: one is fault isolation mapping, and the other involves optimization of a Hopfield network that defines a clock less analog-to-digital conversion. Deep learning is one of the types of artificial intelligence and machine learning; basically, deep learning behaves like a human brain, or we can say that it processes the data like the human brain. In deep learning, we collect data from different resources in different complex patterns, such as photos and text, and make predictions as well. As we are also able to automate the different tasks which require the human brain.*

Keywords: Artificial neural networks

I. INTRODUCTION

Neural networks are systems that perform tasks performed by neurons in the human brain. Neural networks include machine learning as part of artificial intelligence (AI) and are the systems in which we develop neurons and brain functionality that replicate the way humans learn.

A neural network (NN) forms a hidden layer that contains units that change the input from output to output so that the output layer can use the value. This transformation is called a neural layer and is called a neural unit. Input to the next level is used by a series of features, called features, which in turn are used as input to the next levels in a series of transformations, each of which has a different value for each level.

Artificial neural networks are biologically inspired computer programs designed to simulate the way in which the human brain processes information.

ANNs gather their knowledge by detecting the patterns and relationships in data and learn (or are trained) through experience, not from programming. An ANN is formed from hundreds of single units, artificial neurons or processing elements (PE), connected with coefficients (weights), which constitute the neural structure and are organized in layers.

The power of neural computations comes from connecting neurons in a network. Each PE has weighted inputs, transfer function and one output. The behavior of a neural network is determined by the transfer functions of its neurons, by the learning rule, and by the architecture itself. The weights are the adjustable parameters and, in that sense, a neural network is a parameterized system.

The weighed sum of the inputs constitutes the activation of the neuron. The activation signal is passed through transfer function to produce a single output of the neuron. Transfer function introduces non-linearity to the network. During training, the inter-unit connections are optimized until the error in predictions is minimized and the network reaches the specified level of accuracy.

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Once the network is trained and tested it can be given new input information to predict the output.

Many types of neural networks have been designed already and new ones are invented every week but all can be described by the transfer functions of their neurons, by the learning rule, and by the connection formula.

ANN represents a promising modeling technique, especially for data sets having non-linear relationships which are frequently encountered in pharmaceutical processes. In terms of model specification, artificial neural networks require no knowledge of the data source but, since they often contain many weights that must be estimated, they require large training sets. In addition, ANNs can combine and incorporate both literature-based and experimental data to solve problems.

The various applications of ANNs can be summarized into classification or pattern recognition, prediction and modeling. Supervised associating networks can be applied in pharmaceutical fields as an alternative to conventional response surface methodology. Unsupervised feature-extracting networks represent an alternative to principal component analysis. Non-adaptive unsupervised networks are able to reconstruct their patterns when presented with noisy samples and can be used for image recognition.

1.1 Working with a Neural Network

We know that a neural network has different layers, and each layer can perform a specific task or function. If we have a complex structure, then we require more layers. So this is one of the reasons why we call it a multi-layer perceptron.

The node layer is the purest form of the neural network, which contains the three different types of the layer as below.

1. Input layer
2. Hidden layer
3. Output layer

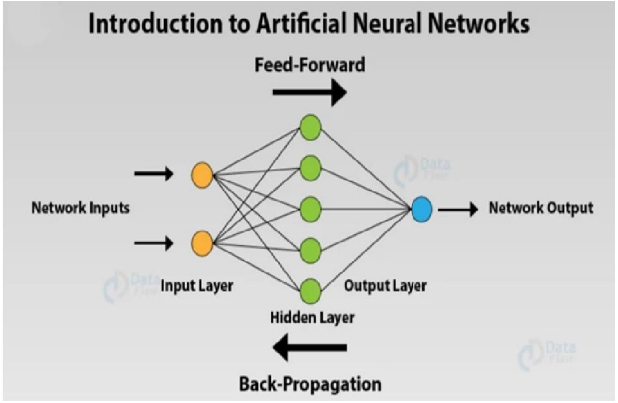
(i) **Input Layers**- The input layer is the first layer of an ANN that receives the input Information in the form of various texts, numbers, audio files, image pixels, etc.

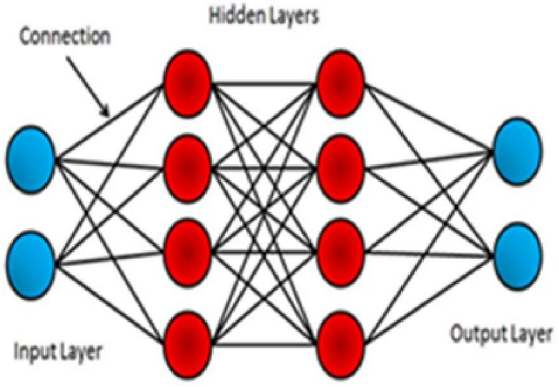
(ii) **Hidden Layers** - In the middle of the ANN model are the hidden layers. There can be a single hidden layer, as in the case of a perceptron or multiple hidden layers. These hidden layers perform various types of mathematical computation on the input data and recognize the patterns that are part of.

(iii) **Output Layer** - In the output layer, we obtain the result that we obtain through rigorous computations performed by the middle layer

In a neural network, there are multiple parameters and hyper parameters that affect the performance of the model. The output of ANNs is mostly dependent on these parameters. Some of these parameters are weights, biases, learning rate, batch size etc. Each node in the ANN has some weight.

As the name stands, we can easily understand each layer performs a specific function, and this all layer helps to the node. There can be different hidden layers in a neural network as per the necessities. The info layer gets the info signals and moves them to the following layer. On the off chance that you know all about the direct relapse model, it will be a lot simpler for you to comprehend how a brain network works, as every one of the singular hubs can measure up to an interesting straight relapse model. The hidden layer plays out all the back-end undertakings of computation. An organization could have zero hidden layers. Nonetheless, a brain network has something like one hidden layer. The resulting layer sends the end-product of the hidden layer's computation.





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Now understand the working of a neural network in short.

1. Data is taken care of into the info layer which moves it to the secret layer
2. The interconnections between the two layers relegate loads to each info haphazardly
3. An inclination is added to each contribution after loads are duplicated with them separately
4. The weighted aggregate is moved to the actuation capability
5. The enactment capability figures out which hubs it ought to fire for include extraction
6. The model applies an application capability to the result layer to convey the result
7. Loads are changed, and the result is back-engendered to limit mistake

Main Points related to the architecture:

1. The network architecture has an input layer, hidden layer (there can be more than 1) and the output layer. It is also called MLP (Multi-Layer Perceptron) because of the multiple layers.
2. The hidden layer can be seen as a "distillation layer" that distills some of the important patterns from the inputs and passes it onto the next layer to see. It makes the network faster and efficient by identifying only the important information from the inputs leaving out the redundant information

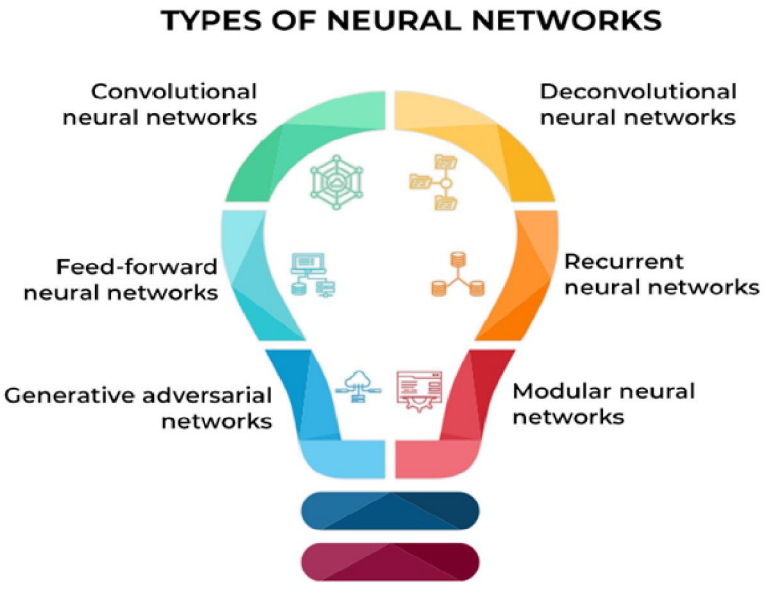
1.2 Types of Neural Networks

There are several types of neural networks that have emerged; basically, there are five different types of neural networks as below.

- Single-layer feed-forward network
- Multilayer feed-forward network
- Single node with own network
- Single-layer recurrent network
- Multiplayer recurrent network

But the most basic type, neural networks, are so-called "migratory information networks." The most common type of network is a neural network in which data flows linearly from one part of the network to the other.

An artificial neural network (ANN) is similar, but a computing network in science that resembles the properties of the human brain. ANN can model the original neurons of the human brain, so its processing parts are called "artificial neurons."



The terms "neurons" and "artificial neurons" are equivalent units and imply a close connection to biological neurons. ANN consists of interconnected neurons that are inspired by the way the brain works but has different characteristics and traits.

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At the micro-level, the term "neurons" is used to explain deep learning as an imitation of the human brain. However, "deep learning" has little to do with the neurobiology of the human brain, but rather with neural networks.

Neural networks are a method of machine learning in which a computer learns to perform a task by analyzing training examples. At the macro level, neural networks can be considered machines used by human intelligence.

Neural networks are loosely modeled on the human brain and consist of simple processing nodes that are closely connected.

Most neural networks today are organized in layers of nodes, and each node moves meaningfully within and outside the network. For example, an object recognition system could be fed a series of visual patterns in an image that consistently correlates with a particular label. She would find that the visual pattern in the image matches the labels.

1.3 Advantages of Neural Networks

ANNs have some advantages that make them most suitable for certain problems and situations:

1. ANNs have the ability to learn and model non-linear and complex relationships, which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex.
2. ANNs can generalize — after learning from the initial inputs and their relationships, it can infer unseen relationships on unseen data as well, thus making the model generalizes and predict on unseen data.
3. Unlike many other prediction techniques, ANN does not impose any restrictions on the input variables (like how they should be distributed). Data with high volatility and non-constant variance, given its ability to learn hidden relationships in the data without imposing any fixed relationships in the data

Now understand the advantages of a neural network in short.

1. Can work with incomplete information once trained
2. Have the ability of fault tolerance.
3. Have a distributed memory
4. Can make machine learning
5. Parallel processing
6. Stores information on an entire network
7. Can learn non-linear and complex relationships
8. Ability to generalize, i.e. can infer unseen relationships after learning from some prior relationships.

ANNs, due to some of its wonderful properties have many applications:

1. Image Processing and Character recognition: Given ANNs ability to take in a lot of inputs, process them to infer hidden as well as complex, non-linear relationships, ANNs are playing a big role in image and character recognition.
2. Forecasting: Forecasting is required extensively in everyday business decisions (e.g. sales, financial allocation between products, capacity utilization), in economic and monetary policy, in finance and stock market.
3. Recognition of handwriting: Neural networks are used to convert written text into characters that machines can recognize.
4. Stock Exchange prediction: The stock exchange is influenced by numerous factors, making it difficult to monitor and comprehend. A neural network, on the other hand, can look at many of these factors and make daily price predictions, which would be helpful to stockbrokers.
5. Traveling issues of sales: It's about figuring out the best way to get from one city to another in a given area. The issue of generating more revenue at lower costs can be addressed with the aid of neural networks.
6. Image compression: It helps us to compress the data to store the encrypted form of the actual image.

II. CONCLUSION

As a Conclusion of the article, we are able to understand the Neural Network. It provides the basic idea about the mid-level and higher-level concepts of Neural Networks. The neural network allows us to analyze large amounts of data while making it more human-readable. It can carry out any task with the least amount of human involvement and is an excellent addition to your growing AI workflows.

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There is huge career growth in the field of neural networks. The average salary of a neural network engineer ranges from 25 lac rupees to 75 lac rupees per year approximately.
A required skill for neural network is Knowledge of applied maths and algorithms.
Knowledge of Probability and statistics and Distributed computing

BIBLIOGRAPHY

1. https://developer.nvidia.com/discover/artificial-neural-network
2. https://mindmajix.com/neural-network-in-artificial-intelligence
3. https://www.softwaretestinghelp.com/artificial-neural-network/
4. Article by Priya Pedamkaron Neural Networks
5. Article on Machine Learning vs Neural Network