

SURVEY ON ARTIFICIAL NEURAL NETWORK

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ABSTRACT

An artificial neural network (ANN) is the piece of a computing system intended to recreate the manner human brain analyzes and processes information. The introduction of artificial intelligence (AI) solved the problems that would prove to be impossible or difficult by human or statistical standards. Artificial neural networks are normally referred to as signal process mathematical models that support the biological nerve cell. A neural network could be an advanced structure that consist a bunch of interconnected neurons that provides an awfully application in resolving the issues of pattern recognition, prediction, optimization, associative memory and management and much more. In this paper we have presented an overview of the artificial neural network, it's working advantages along with its various applications.

Keywords: Artificial Neural Network (ANN), Feedback Network, Feed-Forward Network, Artificial Neuron, Biological Paradigm, Pattern Recognition.

I. INTRODUCTION

The year 2015 was a great year in the field of artificial Intelligence. The study of the Human brain has been a remarkable space for a long time. Inspired by the enlightened functionality of human brains where hundreds of billions of interconnected neurons process information in parallel, researchers have successfully tried demonstrating certain levels of intelligence in order to design some artificial intelligence system. Due to this intelligence of artificial neural network it is used to detect or recognize the hidden traits from a complex data which is far beyond the human capability. Basically neural network work differently when compared with conventional computers. In case of conventional computer, they require specific steps for performing the task unless or until the steps are not provided the conventional computer won't start its work which is the biggest disadvantage of conventional computer that was overcome by neural network. Neural Network work in a similar way like our human brain cells work. Neural network consists of complex interconnected nodes which work parallel in order to generate the desired output. The disadvantage of a neural network is that the output is unpredictable since it produces output from its own intelligence. Quite possibly the most powerful advancements of the previous decade are artificial neural networks, the basic piece of deep learning algorithms, the front line of artificial insight. You can thank neural networks for large numbers of uses you utilize each day, for example, Google's translation service, Apple's Face ID iPhone lock, and Amazon's Alexa AI-powered assistant. Neural networks are likewise behind a portion of the significant artificial insight leap forwards in different fields, for example, diagnosing skin and breast cancer, pattern recognition, and offering eyes to self-driving vehicles, and much more.

II. ARTIFICIAL NEURAL NETWORK

Artificial neural networks are not another idea. Truth be told, they unquestionably don't look similar now as they did at their beginning. Back during the 1960s, we had what was known as a perceptron, at that point individuals began making multilayer perceptron's, which is synonymous with the general artificial neural network we hear about now.

In earlier days in the beginning of deep learning era "Perceptions" were used for processing the data more precisely they were capable of classifying the data into two or more groups also called as "Linear Binary Classifier" but due to the advancement in the amount of data and increased dimensionality it becomes less useful here comes the Multilinear-Perceptron also called as "Artificial Neural Network". Artificial neural networks (ANNs) are mathematical models that are inspired by the human's central nervous system (in explicit the brain) capable of extracting the hidden features by itself without being explicitly programmed. Artificial

neural networks are simply a sort of network of extremely interconnected elements called "neurons", which may be millions in range. With the assistance of those interconnected neurons, all the data processing is being performed and final output is generated.

Neural Network consists of 3 Layers called input layer , hidden layer and output layer. Here input layer is responsible for getting the input, hidden layer is responsible for extracting the hidden features in the data set, output layer is responsible for providing the output.

Each layer contains a number of nodes according to the need. at every node some calculations are being performed with the following formula

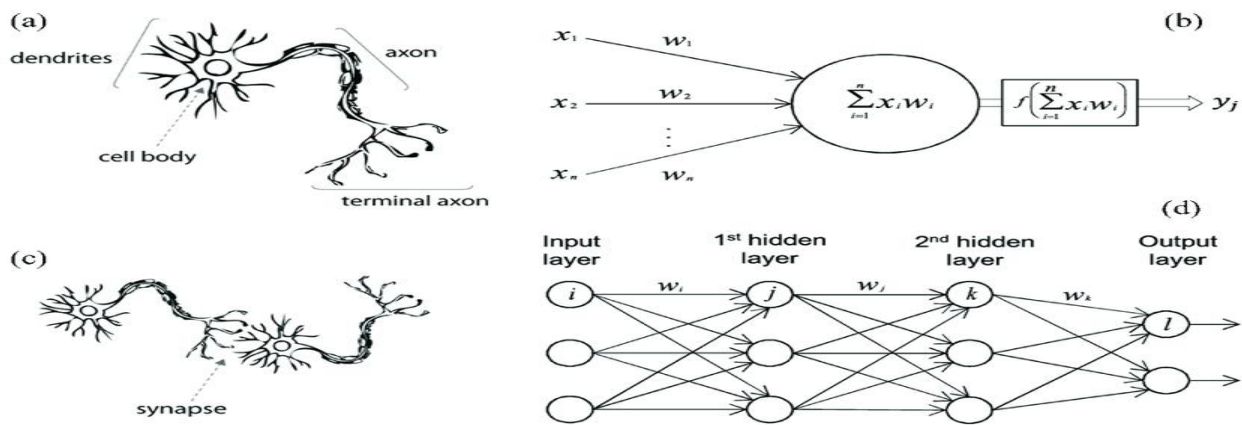


Fig 1. Artificial Neural Network

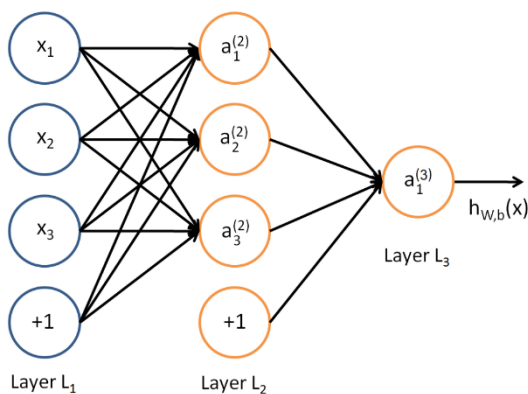


Fig 2. Three Layer of ANN

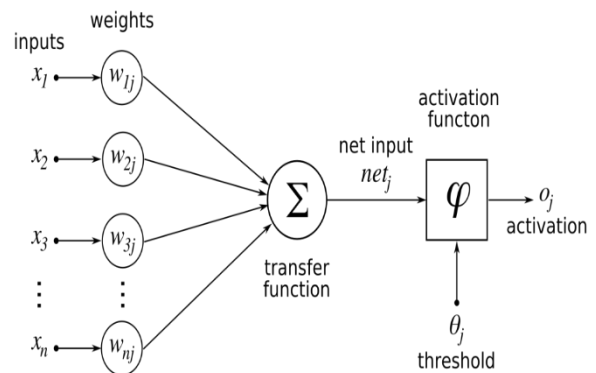


Fig 3. How node value is calculated

The center part of ANNs is artificial neurons. Every neuron gets contributions from several other neurons, multiplies them by assigned weights, adds them, and passes the total to at least one neuron. Some artificial neurons may apply an activation function to the output before passing it to the next variable. At its center, this may seem like an extremely trifling mathematical activity. Yet, when you place hundreds, thousands, and millions of neurons in numerous layers and stack them up on top of one another, you'll acquire an artificial neural network that can perform extremely complicated undertakings, such as classifying images or recognizing speech. For instance, a neural network that detects persons, cars and animals will have an output layer with three nodes. A network that classifies bank transactions between fraudulent and safe will have a one output

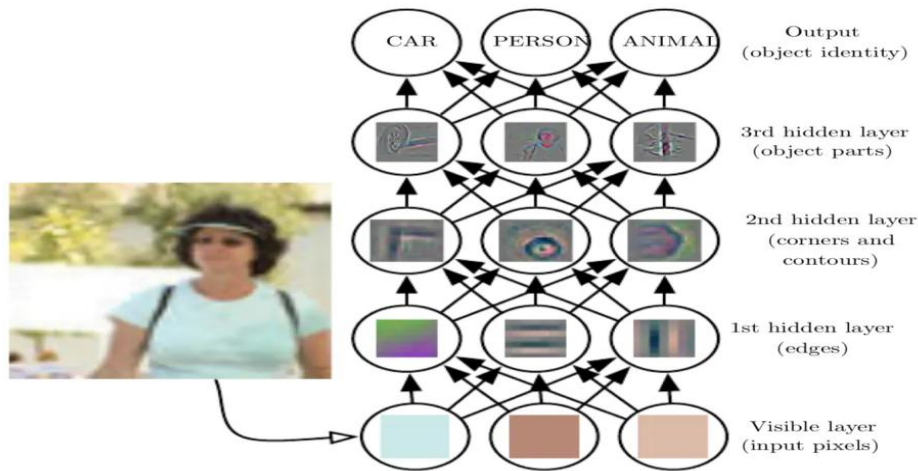


Fig 4. Feature extracted at different layer

Training an Artificial Neural Network Since Artificial Neural Network start with assigning random values to the weights of the connection between the neurons but in order to get the correct and accurate result we need to adjust the weights to a correct value but it's not that much simpler task since a neural network consists of many layers with many interconnected neurons which make the complete process quite complex. So in order to adjust the weights the neural network is trained with more and more training examples, the neural network gradually adjusts its weights to map each input to the correct outputs.

Fundamentally, what occurs during preparing is simply the network acclimate to gather explicit examples from the information. Once more, on account of a picture classifier network, when you train the AI model with quality models, each layer identifies a particular class of highlights. For example, the primary layer may recognize level and vertical edges, the following layers may distinguish corners and round shapes. Further down the network, deeper layers will begin to select further developed highlights like faces and items.

So when you have a new image through a well-trained neural network the adjusted weights of the neurons will be able to extract the right features and determine with accuracy to which output class the image belongs.

III. CHARACTERISTICS OF NEURAL NETWORK

Following are the characteristics of an ANN:

1. Since an ANN has a very expressive hypothesis space, it is important to choose the approximate network topology (simplistic, layered, and multi-layered) for a given problem to avoid model overfitting
2. ANN can handle redundant features because the weights are autonomous and automatically learned during the learning process. The weights for redundant features tend to be insignificant
3. Training an ANN is time-consuming particularly when the numbers of hidden layers are quite significantly large
4. ANN is quite sensitive to the perspective of noise in the training data. One approach to address this issue is to use a validation set to determine and eliminate generalization errors. Another approach is to adjust the weights by some percentages at each iteration
5. ANN is a very complex system so it must be fault-tolerant. Because if any part fails it will not affect the system as much but if all parts fail at the same time the system will fail.
6. ANN is an interconnected system the output of a system is a collective output of various inputs so the result is the summation of all the outputs which come after processing various inputs.

IV. ADVANTAGES

- 1 Neural Networks have the ability to learn on their own and produce the result that is not limited to the inputs they are given.
2. It is used where rapid assessment of the profession is taught.
3. ANNs can carry longer training sessions depending on factors such as the number of weights on the network, the number of training models considered, and the parameters of the various learning algorithm parameters.

4. ANN learning methods are very strict on noise in training data. Training examples may contain errors, which do not affect the final result.
5. Neural networks adapt to conditions in a changing environment. While neural networks may take a while to learn big changes suddenly, they are very good at adapting to the ongoing changes of information.
6. Neural networks can create informative models whenever conventional methods fail. Because neural networks can handle very complex interactions they can easily display data that is very difficult to replicate in traditional ways such as unlimited statistics or system concepts.

V. DISADVANTAGE

1. Many ANN systems does not describe how they solve the problems
2. The output quality of ANN is unpredictable
3. Artificial neural networks requires parallel processing, by their structure.
4. Advisable and suitable for complex problems.
5. Training time is large
6. Nature of ANN is like a Black box

VI. CONCLUSION

In this paper we have discussed the neural implant network, the function of neural networks, the features of ANN, its benefits, limitations and the use of ANN. There are various benefits of ANN in standard ways. Depending on the type of application and the strength of the internal data patterns you can expect the network to be well trained. Neural Input Networks allow offline processes, becoming the most popular and useful tool in solving many problems such as partition, integration, retrieval, pattern recognition, size reduction, systematic prediction, machine translation, vision, vision, computer vision, computer vision, and others. This diversity of skills makes it possible to use artificial neural networks in many areas. By studying the Artificial Neural Network, we concluded that as technology increases the need for Artificial Intelligence it also grows as a result of the same processing, because by using the same processing we can perform more than one task at a time. Therefore, the same processing is needed at this time because with the help of the same processing we can save a lot of time and money on any work related to electronics, computers and robots

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