ARTIFICIAL INTELLIGENCE: PROSPECTS IN ARTIFICIAL NEURAL NETWORK (ANN)

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ABSTRACT: Artificial Intelligence (AI) means the intelligence exhibited by a machine. It is the area of computer science which emphasizes on the creation of machines which work and act like human brains. Artificial Intelligence is a prevailing field as it has contributed to a great extent in manufacturing and service sectors. Expert Systems are those machines which emulates the decision making ability of the human brain. Artificial Intelligence has proved to be functional in fields like gaming, speech recognition, computer vision, medicine, business, aviation, etc. The areas working on Artificial Intelligence have now been working with better performance and efficiency. Another research field in Artificial Intelligence is the Artificial Neural Networks (ANN), which is idealized from the human nervous system. Artificial Intelligence is becoming a popular field in computer science as it has upgraded the human life in many areas. Researches have been done emphasizing upon the basics of Artificial Intelligence, its major contribution in Artificial Neural Network and Medicine.

General Terms: Speech recognition, computer vision, aviation

Keywords: *Artificial Intelligence, Expert systems, Artificial Neural Networks, Weak AI, Strong AI.*

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1. INTRODUCTION

Artificial Intelligence is one of the most important areas in computer science. It has proved its importance in various fields like medicine, business, robotics, etc. The term Artificial Intelligence was coined by John McCarthy in 1955. McCarthy taught mathematics at Dartmouth when he organized the first conference on Artificial Intelligence in 1956. The intelligence is exhibited by thinking, making decisions, solving problems and learning.

The machines created by artificial intelligence exhibit smartness, but they do not manifest the emotions like anger, happiness, and are not racist. This makes them neutral towards decision making.

The Artificial Intelligence is demarcated into two categories: Weak AI and Strong AI. Weak AI is a form of AI specifically designed to be focused on a narrow task and seem very intelligent at it. Apple's Siri is a very good and practical example of weak AI. Strong AI Strong AI's goal is to develop artificial intelligence to the point where the machine's intellectual capability is functionally equal to a human's.

One of the most important and advanced developments is the Artificial Neural Network (ANN) is an artificial neuralnetwork (ANN) is a network inspired by biological neural networks(the central nervous systems of animals, in particular the brain) which are used to estimate or approximate functions that can depend on a large number of inputs that are generally unknown.

2. UNDERSTANDING THE ARTIFICIAL NEURAL NETWORK

Artificial Neural Networks are relatively crude electronic models based on the neural structure of the brain. ANN are those computers whose architecture is designed keeping in mind the working of the brain. They typically consist of hundreds of simple processing units which are wired together in a complex communication network. Each unit or node is a simplified model of real neuron which sends off a new signal or if it receives a sufficiently strong input signal from the other nodes to which it is connected. The structure of almost all the artificial neural networks is similar. In the structure, the neurons are incorporated to the real world to receive inputs. Neural networks take a different approach to problem solving

than that of conventional computers. Conventional computers use an algorithmic approach i.e. the computer follows a set of instructions in order to solve a problem. Unless the specific steps that the computer needs to follow are known thecomputer cannot solve the problem. That restricts the problem solving capability of conventional computers to problems that we already understand and know how to solve. The usefulness of the computers is defined by those things which are typical to beperformed by the human brain. Neural networks process information in a similar way the human brain works.

The network is composed of large number of highly interconnected processing elements (neurons) working in parallel to solve a specific problem.

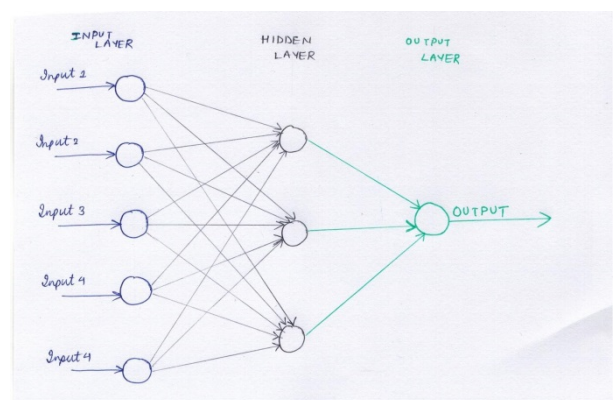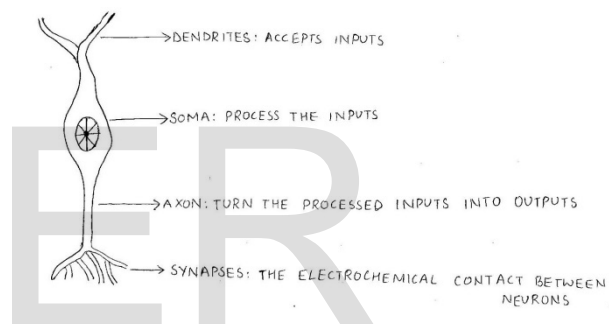## 3. WORKING OF THE ARTIFICIAL NETWORK

The neurons are the fundamental units of a neural network. When the neuron receives an input, it processes the input and produces an apparent output. Artificial Neural Network is based on the concept of grouping of the neurons. An individual neuron takes around 10^{-3} seconds. The output is calculated by multiplying each input by its weight. The grouping of the neurons works in such a way that the data present in the human brain can be organized in a dynamic and interactive manner. A neural network is a collection of "neurons" with "synapses" connecting them. This grouping occurs by creating layers which are then collection is organized into three main parts: the input layer, the hidden layer, and the output layer. Each layer consists of one or more nodes and the line between the nodes represent the flow of information from one node to another. They accept a single input and process the input to produce multiple outputs. Each value of the input is duplicated and sent to the hidden nodes. This is a fully interconnected structure of the neurons. The values entering a hidden node are multiplied by weights, a set of predetermined values. The nodes in the network are usually connected in the feed-forward layers, where the connection transfers from the input layer nodes to the hidden layer nodes and then passes to the output layer nodes. The feed-forward network means that the nodes in

the network are connected to the nodes of the previous layers. The overall input of the nodes can be depicted by:

$$node_i = \sum + w_{ab\,dynamic} + input_{ext}$$

Where, $node_i$ represents the overall input of the node, $\sum$ represents the sum of all the nodes connected to the input , w_{ab} represents theweight of thenodes, the range of the weights is between 0-1 and $input_{ext}$ is the external input applied to the nodes.

The Non Recurrent Structure is also known as Associative or feed-forward network. In Feed forward Network, the signal travel in one way only but in Feedback Network, the signal travel in both the directions by introducing loops in the network.
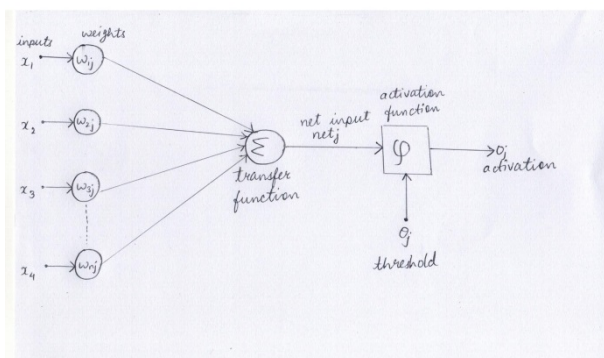
Where w_{ij} are the weights of the nodes, $\sum$ is the transfer function,

φ is the activation function; θ is the threshold function,

o shows the activation after the threshold has been applied.

4. ATTRIBUTES OF ARTIFICIAL NEURAL NETWORK

4.1. Network Structure

The structure for the network of ANN should be simple and easy to understand. There are basically two types of structures recurrent and non-recurrent structure .The Recurrent Structure is also known as Auto associative or Feedback Network and the Non Recurrent Structure is also known as Associative or feed-forward network. In Feed forward Network, the signal travel in one way only but in Feedback Network, the signal travel in both the directions by introducing loops in the network.

4.2. Fault Tolerance

One of the most important properties of neural networks is their forbearance against damage to individual neurons. This means that there is any harm to any part it does not affect the system as much and does not harm the entire system but if all parts fail at the same time it will cause harm to the system resulting in the complete failure of the system.

4.3. Parallel Processing

Parallel processing is the processing of program instructions by dividing them among multiple processors with the objective of running a program in less time. Parallel processing can also be applied on artificial neural networks.

4.4. Distributed Memory

The distributed memory is analogous to the independent processors and we can say that a processor is addressable only to its own memory. This concept is useful in forming the artificial neural networks.

4.5. Collective Solution

ANN is an interconnected system the output of a system is a collective output of various input so the result is summation of all the outputs which comes after processing various inputs.

5. SCOPE OF ARTIFICIAL NEURAL NETWORK

5.1.Adaptive learning: A neural networks have the ability to learn how to do things.

5.2. Self-Organization: A neural network or ANN can create its own representation of the information it receives during learning.

5.3. Real Time Operation: In neural network or ANN computations can be carried out in parallel.

5.4. Pattern recognition: It is a powerful technique for the data security. Neural networks learn to recognize the patterns which exist in the data set.

5.5. The system is developed by learning rather than programming. Neural networks teach themselves the patterns in the data freeing the analyst for more interesting work.

5.6. Flexibility: Neural networks are flexible in a changing environment. Although neural networks may take some time to learn a sudden drastic change but they are excellent in adapting the constantly change in information.

5.7. Neural networks can build informative models whenever conventional approaches fail. Because neural networks can handle very complex interactions they can easily model data which is too difficult to model with traditional approaches such as inferential statistics or programming logic.

6. APPLICATIONS OF ARTIFICIAL NEURAL NETWORK

6.1. Character Recognition - The idea of character recognition has become very important as handheld devices like the Palm Pilot are becoming increasingly popular. Neural networks can be used to recognize handwritten characters.

6.2. Image Compression –The artificial neural network can accept various inputs and can also prove efficient for image compression.

6.3. **Stock Market Prediction** - The day-to-day business of the stock market is extremely complicated. Many factors weigh in whether a given stock will go up or down on any given day. Since neural networks can examine a lot of information quickly and sort it all out, they can be used to predict stock price.

7. LIMITATIONS OF ARTIFICIAL NEURAL NETWORK

7.1. There is an unpredictability in the output of the network.

7.2. It cannot be used to solve the daily life problems.

7.3. The artificial neural network has black box nature.

7.4. The model development of the Artificial Neural Network is empirical in nature.

7.5. There is no single standardized paradigm for ANN development.

7.6. There is no structured methodology available in ANN.

8.CONCLUSION

The computing world has bright prospects with broad scope in the field of neural networks. They are efficient for the real time systems because of their fast response as they do not depend much over the time constraints. The neural network have proved their worth in the field of research .Also they have been of great use in the study of psychology and provide a new alternative for various other studies such as logistic regression , statistical training.

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