RESEARCH PAPER ON NEURAL NETWORKS

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Abstract- **The various types of neural networks are explained and demonstrated, applications of neural networks like ANNs in medicine are described, and a detailed historical background is provided.This report is an introduction to Artificial Neural Networks. Many practitioners are wary of Neural Networks due to their black box nature, even though they have proven themselves in many situations. Neural network have been of greater interest while doing DATA MINING algorithim. This paper gives overview of Artificial Neural Network, working & training of ANN. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information.**

I. INTRODUCTION

The study of the human brain is thousands of years old. With the advent of modern electronics, it was only natural to try to harness this thinking process. The first step toward artificial neural networks came in 1943 when Warren McCulloch, a neurophysiologist, and a young mathematician, Walter Pitts, wrote a paper on how neurons might work. They modeled a simple neural network with electrical circuits. Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. Other advantages include:

Learning: An ability to learn how to do tasks based on the data given for training or initial experience.

Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.

Operation Real Time : ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.

Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

II. NEURAL NETWORKS OVER COMPUTERS WHICH ARE CONVENTIONAL

Neural networks process information in a similar way the human brain does. The network is composed of a large number of highly interconnected processing elements(neurones) working in parallel to solve a specific problem. Neural networks learn by example. They cannot be programmed to perform a specific task. The examples must be selected carefully otherwise useful time is wasted or even worse the network might be functioning incorrectly. The disadvantage is that because the network finds out how to solve the problem by itself, its operation can be unpredictable.

On the other hand, conventional computers use a cognitive approach to problem solving; the way the problem is to solved must be known and stated in small unambiguous instructions. These instructions are then converted to a high level language program and then into machine code that the computer can understand. These machines are totally predictable; if anything goes wrong is due to a software or hardware fault.

There are tasks are more suited to an algorithmic approach like arithmetic operations and tasks that are more suited to neural networks. Even more, a large number of tasks, require systems that use a combination of the two approaches (normally a conventional computer is used to supervise the neural network) in order to perform at maximum efficiency.

Unless the specific steps that the computer needs to follow are known the computer cannot solve the problem. That restricts the problem solving capability of conventional computers to problems that we already understand and know how to solve. But computers would be so much more useful if they could do things that we don't exactly know how to do.The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly

interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information.

III. APPLICATION

The various real time application of Artificial Neural Network are as follows:

1. Function approximation, or regression analysis, including time series prediction and modelling.
2. Call control- answer an incoming call (speaker-ON) with a wave of the hand while driving.
3. Classification, including pattern and sequence recognition, novelty detection and sequential decision making.
4. Scroll Web Pages, or within an eBook with simple left and right hand gestures, this is ideal when touching the device is a barrier such as wet hands are wet, with gloves, dirty etc.
5. Skip tracks or control volume on your media player using simple hand motions- lean back, and with no need to shift to the device- control what you watch/ listen to.
6. Data processing, including filtering, clustering, blind signal separation and compression.

IV. WHY USE NEURAL NETWORKS?

In that structure some of the neurons interfaces to the real world to receive its inputs. Other neurons provide the real world with the network's outputs. This output might be the particular character that the network thinks that it has scanned or the particular image it thinks is being viewed. All the rest of the neurons are hidden from view. But a neural network is more than a bunch of neurons. Some early researchers tried to simply connect neurons in a random manner, without much success. Now, it is known that even the brains of snails are structured devices. One of the easiest ways to design a structure is to create layers of elements. It is the grouping of these neurons into layers, the connections between these layers, and the summation and transfer functions that comprises a functioning neural network. The general terms used to describe these characteristics are common to all networks.Although there are useful networks which contain only one layer, or even one element, most applications require networks that contain at least the three normal types of layers - input, hidden, and output. The layer of input neurons receive the data either from input files or directly from electronic sensors in real-time applications. The output layer sends information directly to the outside world, to a secondary computer process, or to other devices such as a mechanical control system. Between these two layers can be many hidden layers. These internal layers contain many of the neurons in various interconnected structures. The inputs and outputs of each of these hidden neurons simply go to other neurons.

They are the glue to the system. They are the connections which provide a variable strength to an input. There are two types of these connections. One causes the summing mechanism of the next neuron to add while the other causes it to subtract. In more human terms one excites while the other inhibits. Some networks want a neuron to inhibit the other neurons in the same layer. This is called lateral inhibition. The most common use of this is in the output layer

V. ADVANTAGES OF NEURAL NETWORKS

1. When an element of the neural network fails, it can continue without any problem by their parallel nature.
2. Tolerance: Neural networks are very flexible with respect to incomplete, missing and noisy data.
3.Ease of maintenance: Neural networks can be updated with fresh data, making them useful for dynamic environments.
4.Accuracy: Neural networks are able to approximate complex non-linear mappings
5. Neural networks can be implemented in parallel hardware

VI. WHAT IS ARTIFICIAL NEURAL NETWORK?

The brain basically learns from experience. It is natural proof that some problems that are beyond the scope of current computers are indeed solvable by small energy efficient packages. This brain modeling also promises a less technical way to develop machine solutions. This new approach to computing also provides a more graceful degradation during system overload than its more traditional counterparts. These biologically inspired methods of computing are thought to be the next

major advancement in the computing industry. Even simple animal brains are capable of functions that are currently impossible for computers. Computers do rote things well, like keeping ledgers or performing complex math. But computers have trouble recognizing even simple patterns much less generalizing those patterns of the past into actions of the future. Now, advances in biological research promise an initial understanding of the natural thinking mechanism. This research shows that brains store information as patterns. Some of these patterns are very complicated and allow us the ability to recognize individual faces from many different angles. This process of storinginformation as patterns, utilizing those patterns, and then solving problems encompasses a new field in computing.

VII. WORKING OF ANN

The other parts of the ―art of using neural networks revolve around the myriad of ways these individual neurons can be clustered together. This clustering occurs in the human mind in such a way that information can be processed in a dynamic, interactive, and self-organizing way. Biologically, neural networks are constructed in a three-dimensional world from microscopic components. These neurons seem capable of nearly unrestricted interconnections. That is not true of any proposed, or existing, man-made network. Artificial Neural Networks are relatively crude electronic models based on the neural structure of the brain

Currently, neural networks are the simple clustering of the primitive artificial neurons. This clustering occurs by creating layers which are then connected to one another. How these layers connect is the other part of the "art" of engineering networks to resolve real world problems.

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