weight updates of the two methods for the same number of data presentations is very different. The online method weight updates are computed for each input data sample, and the weights are modified after each sample. An alternative solution is to compute the weight update for each input sample, but store these values during one a through the training set which is called an epoch. At the end of the epoch, all the contributions are added, and only then the weights will be updated with the composite value. This method adapts the weights with a cumulative weight update, so it will follow the gradient more closely.

It is called the batch-training mode. Training basically involves feeding training samples as input vectors through a neural network, calculating the error of the output layer, and then adjusting the weights of the network to minimize the error. The average of all the squared errors (E) for the outputs is computed to make the derivative easier. Once the error is computed, the weights can be updated one by one. In the batched mode variant, the descent is based on the gradient

$$\Delta wij\ (n) = -n^* \ \partial E/\partial Wij + \alpha^* \Delta wij\ (n-1)$$

Where η and α are the learning rate and momentum respectively. The momentum term determines the effect of past weight changes on the current direction of movement in the weight space. A good choice of both η and α are required for the training success and the speed of the neural network learning. It has been proven that back propagation learning with sufficient hidden layers can approximate any nonlinear function to arbitrary accuracy. This makes back propagation learning neural network a good candidate for signal prediction and system modeling.

4.3 Hebbian learning

The learning paradigms discussed above result in an adjustment of the weights of the connections between units, according to some alternation rule. Perhaps the most influential work in connectionism's history is the contribution of Hebb, where he presented a theory of behavior based, as much as possible, on the physiology of the nervous system. The important concept to emerge from Hebb's work was his formal statement of how learning could occur. Learning was based on the alternation of synaptic connections between neurons. particularly, when an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased. The principles underlying this statement have become known as Hebbian Learning. Virtually, most of the neural network learning techniques can be considered as a variant of the Hebbian learning rule. The basic idea is that if two neurons are active at same time, their interconnection sould be strengthened. If we consider a single layer net, one of the mutually connected neurons will be an input unit and one an output unit. If the data are represented in bipolar form, it is express the desired weight update as wi(new)=wi(old)+xi0, where o is the desired output for i = 1 to n(inputs). Unfortunately, plain Hebbian learning continually strengthens its weights without bound (unless the input data is properly normalized).

5. Artificial Neural Network Applications

Given this description of neural networks and how they work, what real world apply are they suited for? Neural networks have been broad applicability to real world business problems. In fact, they have already been successfully applied in serveral industries.

Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting needs including

- Sales forecasting
- Industrial process control
- Customer research
- Data validation
- Target marketing

But to give you some more important examples:

5.1 Artificial are also used in the following specific paradigms

Recognition of speakers in communications, Recovery of telecommunications from faulty software, Hand-written word recognition and Facial recognition.

5.2 Our neural network based data mining approach contain of three major phases:

1. Network construction and training.
This phase constructs and trains a three layer neural network based on the number of attributes and number of classes and chosen input coding method.

2. Network pruning
The pruning phase aims at removing redundant links and units without increasing the classification error rate of the network. A small number of units and links left in the network after pruning enable us to extract concise and comprehensible rules.

3. Rule extraction
This phase extracts the classification rules from the pruned network. The rules are in the form of "if (a, Bv,) and (x, Bv,) and ... and (x, Bv,) then Cy where a, s are the attributes of an input tuple, v, a~re constants, & are relational operators (=, <, 2, <>), and Ci is one of the class labels. Due to space limitation, in this paper we omit the discussion of the first two phases. Details of these phases can be found in our earlier work 191, [lo]. We shall elaborate in this paper the third phase. Section 2 describes our algorithms to extract classification rules from a neural network and uses an example to illustrate how the rules are generated using the proposed approach.

5.3 Extracting rule from a trained neural network:

Network pruning results in a relatively simple network. However, even with a simple network, it is still difficult to find the clear relationship between the input tuples and the output tuples. A number of reasons contribute to the difficulty of extracting rules from a pruned network. First, even with a pruned network, the links may be still too several to express the relationship between an input tuple and its class label in the form of if . . . then ... rules. If a network still has n input links with binary values, there could be as many as 2, similar type input patterns. The rules could be quite lengthy or complex even for a small n. Second, the activation values of a hidden unit could be anywhere in the range 1-1, 11 depending on the input tuple. It is difficult to derive an explicit relationship between the continuous activation values of the hidden units and the output values of a unit in the output layer.

A Rule Extraction Algorithm

The rule extraction algorithm, RX, consists of the four steps given below:

1) Apply a clustering algorithm to find out clusters of hidden node activation values.
2) Mention the discretized activation values and compute the network outputs Generate rules that describe the network outputs in terms of the discretized hidden unit activation values.
3) For each hidden unit, enumerate the input values that lead to them and generate a set of rules to describe the hidden units' discretized values in terms of the inputs.
4) Combine the two sets of rules obtained in the previous two steps to obtain rules that relate the inputs and outputs.

The first step of RX clusters the activation values of hidden units into a manageable number of discrete values without sacrificing the classification accuracy of the network. After Clustering, we obtain a set of activation values at each hidden node.

The second step is to relate these discretized activation values with the output layer activahon values, i e, the class labels. And the third step is to relate them with the attribute values at the nodes connected to the hidden node a general purpose algorithm X2R was developed and implemented to automate the rule generation process. It takes as input a set of discrete patterns with the class labels and produces the rules describing the relationship between the patterns and their class labels the details of this rule generation algorithm can be found in our earlier work to cluster the activation values, we used a simple clustering algorithm.

5.4 Artificial Neural Networks in Marketing

There is a marketing application which has been integrated with neural networks system. The airline marketing tactician is a computer system made various intelligent technologies including expert systems. A feed forward neural network is desegregated with the AMT and was trained using back – propagation to assist the marketing control of airline seat allocations. The adaptive neural approach was governable to rule expression. Furthermore, the application's environment changed rapidly and constantly, which required an uninterrupted adaptive solution. The system is a monitor and recommend booking advice for each departure. Such information has a direct effect on the profitability of an airline and can provide a technological advantage for users of the system.

While it is significant that neural networks have been applied to this problem, it is also important to see that this intelligent technique can be integrated with expert systems and other approaches to make a functional system. Neural networks were apply to discover the influence of undefined interactions by the different variables. While these interactions were not defined, they were used by the neural system to develop useful conclusions. It is also noteworthy to see that neural networks can influence the bottom line.

5.5 Neural Networks in Medicine

Artificial Neural Networks (ANN) are currently a 'hot' research area in medicine and it is believed that they will receive extensive application to biomedical systems in the next few years. At the moment, the research is several on modeling parts of the human body and recognizing diseases from various scans.Neural networks are ideal in recognizing diseases using scans since there is no need to mention a specific algorithm on how to identify the disease. Neural networks learn by example to explain of how to recognize the disease are not needed. What is needed is a set of examples that are representative of all the variations of the disease. The quantity of examples is not as important as the 'quantity'. The examples need to be selected very carefully if the system is to perform reliably and efficiently.

5.5 Modeling and Diagnosing the Cardiovascular System

Neural Networks are used experimentally to model the human cardiovascular system. Diagnosis can be achieved by building a model of the cardiovascular system of an individual and comparing it with the real time physiological measurements taken from the patient. If this routine is carried out regularly, potential harmful medical conditions can be detected at an early stage and thus make the process of combating the disease much easier.

A model of an individual's cardiovascular system must mimic the relationship among physiological variables (i.e., heart rate, systolic and diastolic blood pressures, and breathing rate) at different physical activity levels. If a model is adapted to a separately, then it will becomes a model of the physical condition of that individual. The simulator will have to be able to adapt to the features of any individual without the supervision of an expert. This calls for a neural network.

Another reason that justifies the use of artificial neural network technology, is the ability of artificial neural networks to provide sensor fusion which is the combining of values from several different sensors. Sensor fusion activated the Artificial neural networks to learn complex relationships among the individual sensor values, which would otherwise be lost if the values were separately analyzed. In medical modeling and diagnosis, this implies that even though every sensor in a set may be sensitive only to a specific physiological variable, artificial neural networks are capable of detecting complex medical conditions by fusing the data from the individual biomedical sensors.

5.6 Instant Physician

An application developed in the mid-1980s called the "instant physician" trained an auto associative memory neural network to store a large number of medical records, each of which includes information on symptoms, diagnosis, and treatment for a particular case. After training, the net can be presented with input consisting of a set of symptoms; it will then find the full stored pattern that represents the "best" diagnosis and treatment.

6. Conclusion

By studying artificial Neural Network we had concluded that as per as technology is developing day by day the need of Artificial Intelligence is increasing because of only parallel processing. Parallel Processing is several needed in this present time because with the help of parallel processing only we can save more and more time and money in any work related to computers and robots. If we talk about the Future enhancement work we can only say that we have to develop much more algorithms and other problem solving techniques so that we can remove the limitations of the Artificial Neural Network. And if the Artificial Neural Network concept combined with the Computational Automata and Fuzzy Logic we will definitely solve some limitations of this excellent technology.

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Author Profile

Mr. Thangaraj E. received the M. Tech in Computer Science and Engineering at Dr. M.G.R Educational and Research Institute University in Chennai and B. E degree in Computer Science and Engineering at Madurai Kamaraj University in Madurai. Presently he is working as a lecturer in ST. Joseph College of Engineering and Technology in Tanzania for the past 6 years. His area of interest is networking and cloud computing.

Mr. Subinson G. received the M. E in Computer Science and Engineering at V.M.K.V Engineering College in Salem and M.SC in Information Technology at Sami Arul Arts and Science College at Tanjore. Presently he is working as a lecturer in ST. Joseph College of Engineering and Technology in Tanzania for the past 6 years. His area of interest is networking and cloud computing.

Mr. S.Rimlon Shibi. Received the M.E in Computer and Communication at National Engineering College in Kovilpatti and B.Tech in Information Technology at Francis Xavier Engineering College in Tirunveli. Presently he is working as a lecturer in ST. Joseph College of Engineering and Technology in Tanzania for the past 3 years. His area of interest is Wireless networking and cloud computing.