

Proposed Method for Classification of Learning Disable Students using Artificial Neural Network and Decision Tree

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Abstract— Learning Disability is a term that describes a heterogeneous group of disorders that impact listening, speaking, reading, writing, reasoning, Math and social skill .So, early recognition of warning signs, well-targeted screening and assessment, effective intervention, and ongoing monitoring of progress are critical to helping individuals with LD to succeed in School in the workplace and in life. Here we attempt to build a Neural Network and Decision tree based classifier that can identify the Learning disability in student from its physical measurements. Seven physical characteristics of a learning disable students are considered which are again characterize in different measurement which are Gross and Fine Motor skill ,Language ,Reading ,Written Language ,Attention ,Math and Social &Emotional .The problem on hand is to identify the learning disability in student for given the observed values for each of these seven physical characteristics.

Index Terms —Learning Disability, Artificial Neural Network, Decision Tree, Matlab

I. INTRODUCTION

Classification is one of the most frequently encountered decision making tasks of human activity. A classification problem occurs when an object needs to be assigned into a predefined group or class based on a number of observed attributes related to that object. Many problems in business, science, industry, and medicine can be treated as classification problems. Examples include bankruptcy prediction, credit scoring, medical diagnosis, quality control, handwritten character recognition, and speech recognition.

Traditional statistical classification procedures such as discriminate analysis are built on the Bayesian decision theory. In these procedures, an underlying probability model must be assumed in order to calculate the posterior probability upon which the classification decision is made. One major limitation of the statistical models is that they work well only when the underlying assumptions are satisfied. The effectiveness of these Methods depends to a large extent on the various assumptions or conditions under which the models are developed. Users must have a good knowledge of both data properties and model capabilities before the models can be successfully applied. Neural networks have emerged as an important tool for Classification. The recent vast research activities in neural

classification have established that neural networks are a promising alternative to various conventional classification methods. The advantage of neural networks lies in the following theoretical aspects to the data without any explicit specification of functional or distributional form for the underlying model. Second, they are universal functional approximates in that neural networks can approximate any function with arbitrary accuracy Since any classification procedure seeks a functional relationship between the group membership and the attributes of the object, accurate identification of this underlying function is doubtlessly important. Third, neural networks are nonlinear models, which makes them flexible in modeling real world complex relationships. Finally, neural networks are able to estimate the posterior probabilities, which provide the basis for establishing classification rule and performing statistical analysis.

Although significant progress has been made in classification related areas of neural networks, a number of issues in applying neural networks still remain and have not been solved successfully or completely. In this paper, some theoretical as well as empirical issues of neural networks are reviewed and discussed. Although many types of neural networks can be used for classification purposes our focus nonetheless is on the feed forward multilayer networks or multilayer perceptions' (MLPs) which are the most widely studied and used neural network classifiers. Most of the issues discussed in the paper can also apply to other neural network models.

The decision tree is one of the data mining techniques which are widely used by number of the researchers in their application and classification problem. The decision tree based classification is based on divide and conquer mechanism. The requirements for constructing a decision tree based classification are its attribute-value description which means its objects should be expressible in terms of a fixed collection of points called attributes, predefined classes also called as the target classes which have discrete output values and finally sufficient data which helps in understanding the model completely.

II. LEARNING DISABILITY

The term "Learning Disabilities" was first used in 1963. However, experts in this field have not yet completely reach an agreement on the definition of LD and its exact meaning. The National Center for Learning Disabilities has given LD the following definition:

"A learning disability (LD) is a neurological disorder that affects the brain's ability to receive process, store and respond to information. The term learning disability is used to describe the seeming unexplained difficulty a person of at least average intelligence has in acquiring basic academic skills. These skills are essential for success at school and work, and for coping with life in general. LD is not a single disorder. It is a term that refers to a group of disorders. As a result, a person can be of average or above-average intelligence, not have any major sensory problems (like blindness or hearing impairment), and yet struggle to keep up with people of the same age in learning and regular functioning."

Most of the people have problems with learning and behavior disability from time to time. During the school years, parents and educators should be on the alert for consistent and persistent patterns of difficulty that children and adolescents may experience over time as they may signal an underlying learning disability (LD). There are many people and specially the children as young are ignored due to the lack of the knowledge of the Learning disability problem. Learning disability problem can co-occur with other disorders so it is important to keep careful and complete records of observations and impressions so they can be shared among Parents, educators and related service providers when making important decisions about needed services and supports.

The Learning Disable Student always has some specific symptom related to the Learning. Learning is the continuous process where the People try to Learn in their entire Life. Therefore when people cannot try to Learn then have certain symptom related to that which shows that the person or the students have Learning disability.

III. ARTIFICIAL NEURAL NETWORK

A. Introduction:

An artificial neural network (ANN) often just called a "neural network" (NN), is a mathematical model or computational model based on biological neural networks, in other words, is an emulation of biological neural system. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. [1]

B. Feed forward neural network with backpropagation of error:

The feed forward neural network was the first and arguably simplest type of artificial neural network devised. In this network, the information moves in only one direction, forward, from the input nodes, through the hidden nodes (if any) and to the output nodes. There are no cycles or loops in the network. The data processing can extend over multiple (layers of) units, but no feedback connections are present, that is, connections extending from outputs of units to inputs of units in the same layer or previous layers.

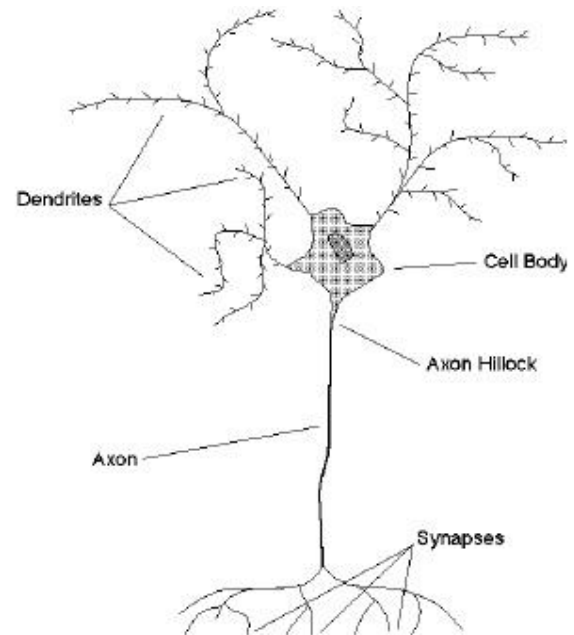


Fig. 1. Neural Connection in Animal



Fig. 2. Artificial Neural Network Model

C. Feed forward neural network using backpropagation of error algorithm:

- Decide input, target and testing data.
- Initialize the weight and bias.
- Calculate the feed forward Neural Network output.
- Match the output with target.
- Calculate the error= difference between actual & desired output.
- Update all the weight and bias of the Neural Network.
- Repeat the steps until the error will not reduced.

D. Training of artificial neural networks:

A neural network has to be configured such that the application of a set of inputs produces (either 'direct' or via a relaxation process) the desired set of outputs. Various methods to set the strengths of the connections exist. One way is to set the weights explicitly, using a priori knowledge. Another way is to 'train' the neural network by feeding it teaching patterns and letting it change its weights according to some learning rule. Supervised learning or Associative learning in which the network is trained by providing it with input and matching output patterns. These input-output pairs can be provided by an external teacher, or by the system which contains the neural network (self-supervised).

IV. DECISION TREE

Decision Tree is more simple and easy to understand compared to that of neural networks and support vector machines since they combines more data in an easily understandable format. Even small changes in the input data may lead no change in the neural network and the SVM but to great variations in constructing the Decision Tree. In some

cases it has to deal with uncertainties. This can be solved using sequential decision making of Decision Tree. The process of determining the expected values from the end node back to the root node is known as decision tree roll-back. The advantages of Decision Tree are they are computationally cheap, easy to use and implement and simple. It also provides objective analysis to decision making, allows flexibility and effective for decision making. Major drawback of DT is that the whole process relies on the accuracy of the input data used and also requires qualitative data to determine the accuracy of the output.

A. The Process of Constructing a Decision Tree:

- Select an attribute to place at the root of the decision tree and make one branch for every possible value.
- Repeat the process recursively for each branch.

V. PROPOSED METHOD

The algorithm is developed in MATLAB R2009. It uses a Feed forward algorithm. Algorithm for classification using ANN:

The code builds a classifier that can identify that the particular people or students have learning disability or not. To classify the student having learning disability for that we have taken the checklist and the symptom is observed then that value is 1 and if the symptom is not there then that value or input is 0 and all the people who have learning disability they all assigned value as 1 and normal student as 0. By presenting previously recorded inputs to a neural network and then tuning it to produce the desired target outputs. This process is called neural network training.

B. Input data:

Data for classification problems are properly inserted into the Excel file.csv file according to the symptom of the person. The excel file consist of the eight column with 130 record where the many records are collected and randomly generated based on the observation of the learning disable person. The person those who are suffering with the learning disability problem we collected the symptom and for all their symptoms which are present we assigned the value as 1 and for absent symptom we assigned the vale as 0. there respective classes are defined in the eight column of the file.csv file

C. The neural network classifier

The next step is to create a neural network (feed forward back propagation network) that will learn to identify the classes. It will differ slightly every time it is run. The random seed or twister is set to avoid this randomness.

Now the network is ready to be trained. The samples divided into training, validation and test sets. The training set is used to teach the network. Training continues as long as the network continues improving on the validation set. The test set provides a completely independent measure of network accuracy.

TABLE I. PARAMETER SETTING FOR FEED FORWARD NEURAL NETWORK

Class types determined from classified Data	Class Type determined from Reference			Total
	#Plot	Normal	Disable	
Normal		27	01	28
Disable		0	22	22
Total		27	23	50

Parameter	Values
Number of input node	7
Number of output node	1
Number of hidden layer	1
Number of neurons in hidden layer	20
Learning rate	0.02
Number of epoch	239

D. Testing the classifier

The trained neural network can now be tested with the testing samples. This will give us a sense of how well the network will do when applied to data from the real world. If require the testing can be done with a separate testing set which is created while creating training set. The network response can now be compared against the desired target response to build the classification matrix.

VI.DATA ACQUIRED

Here in this classification problem we have used the checklist for the learning disable student which is developed by the “The National Center for Learning Disabilities”. So, the data collected from the different learning disable student and the counselors those who all are doing the treatment of the learning disable students.

VI.RESULT

The particular Neural Network trained with the help of 128 known input data of Learning Disable patients where we have result for all those data. Now we have tested the Neural Network with the help of 50 data of Learning Disable patients where we do not having the result for that and we got the following observation and the result:

TABLE II.ACCURACY ASSESMENT OF ANN

$$\text{Accuracy} = ((27+22)/50)*100=98\%$$

Diagonal Represent sites classified correctly according to reference data. Off-diagonal were misclassified.

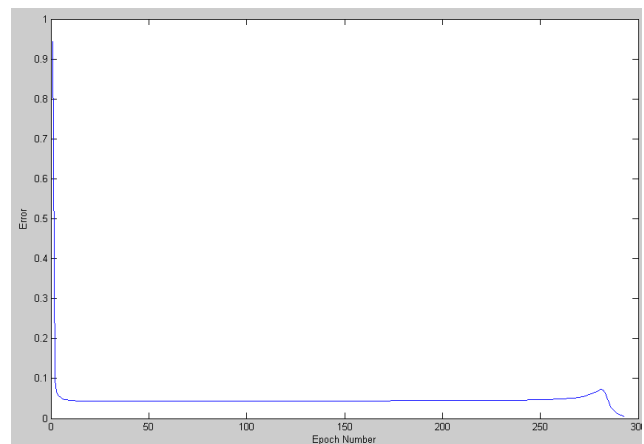


Fig. 3.Error Graph

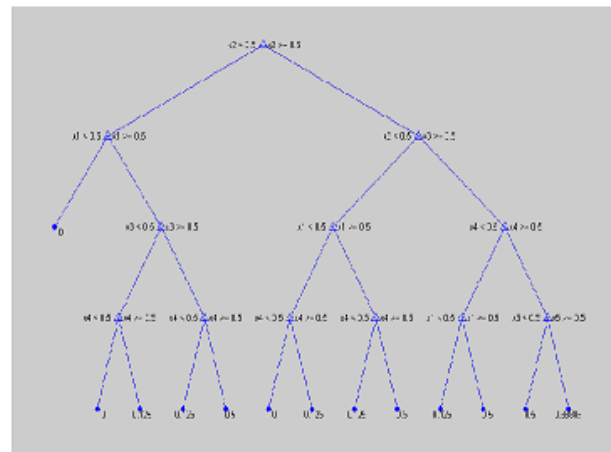


Fig. 4.Decision Tree

VII.CONCLUSION

The checklist for the Learning disability is very big and very difficult to take the decision on that So, This Neural network helps the parents, Teacher and the Institution where the learning disable students are there. This very important for the

student those who suffer with the learning disability and this very important that we should find out them give them very special education and the treatment so that they should not be neglected by the society.

VIII.FUTURE WORK

The Neural network developed to classify the student in the Learning disable and enable student which is not sufficient. There are the student or the people those have the disability in only certain part of the learning where certain people can read properly but there behavior's are good but still they have learning disability .So, here in the future work of this project we can create different classes where the student have the learning disability in the specific area i.e. Mathematics, Writing, Learning and behavioral etc

ACKNOWLEDGMENT

Apart from the efforts of me, the success of project depends largely on the encouragement and guidelines of many others. I Take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. I would like to show my greatest appreciation to my internal guide Prof. (Mrs.) Varsha Turkar and Head of Department Prof (Mr.) Santosh Singh. I can't say thank you enough for the tremendous support and help. I feel motivated and encouraged every time when I met for my work. Without her encouragement and guidance this project would not have materialized. I am indebted to the principal Dr (Mrs.) C.T.Chakraborty and also staff and management of the Thakur College of Science and Commerce for providing their cooperation without which it would not have possible to complete the work in time and successfully. Special thanks goes The school and there Teacher's which have given me chance to meet the learning disable student to know about their behavior clearly to prepare my input data.

Collectively and individual acknowledgements go to my partner, colleagues from IT Department division for their technical help. I would like to thank my family members and everybody who was important to the successful realization of project, as well as expressing my apology that I could not mention personally one by one.

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