Bankruptcy Prediction System using ANN

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Abstract— Bankruptcy is a legal proceeding involving a person or business that is unable to repay outstanding debts. The bankruptcy process begins with a petition filed by the debtor, which is most common, or on behalf of creditors, which is less common. The application and benefits of data mining and machine learning techniques to construct prediction models in the field of corporate bankruptcy. It analyzes a dataset of 60 companies. Findings show that neural network is recommended as the best model to predict corporate bankruptcy. Findings also show that the proper use and selection of data mining techniques help to enhance the prediction accuracy of the models. Financial organizations can significantly benefit from using these prediction models as they allow them to anticipate the status of businesses in the future and make decisions accordingly.

Key words: Bankruptcy, Artificial Neural Network (ANN)

I. INTRODUCTION

A. Problem Definition

Bankruptcy is a legal proceeding involving a person or business that is unable to repay outstanding debts. Project predicts chances of bankruptcy using techniques of Artificial Neural Network to analyze a dataset of 60 companies. Dataset will contain balance sheet parameters such as current liabilities, current assets, total liabilities, total assets, EBIT (Earning before interest tax), no of years since company is established etc. Artificial Neural Network techniques are applied for prediction which in turns improves accuracy of the prediction. Result will give chances of bankruptcy in advance to decide further financial strategies and maneuver.

B. Overview

In today's competitive world everyone wants to be on top likewise every company owner wishes his company to be a leading one. For this many sites that provide them facility to register themselves. So, our system provides them that platform.

In proposed system, we are having a system that will enable companies to register themselves and accordingly will get the rating for that particular firm/ company. So, our system provides them that platform. So that users visit their site and they will get information about which company will be good to invest with and also will get reviews from other people.

In user module, user will search for a particular company if found any faults or negative results then system labels it as bankrupt. This system uses feed forward and back propagation algorithm.

Result will predict whether company will become bankrupt or not. Also bar graph will show comparison between different companies according to their financial status.

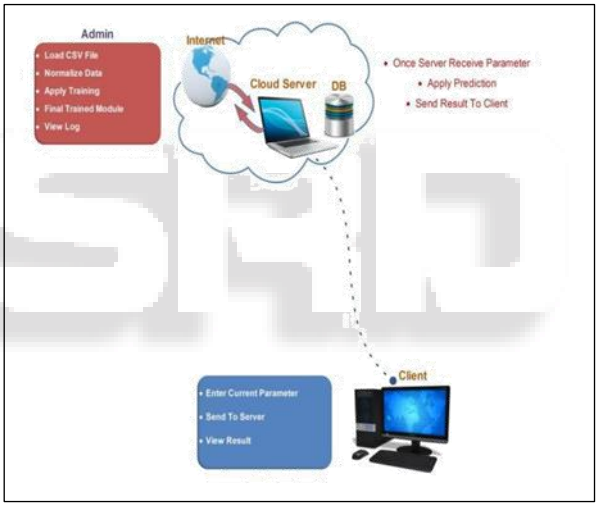
C. Purpose

Purpose of this system is that users should get better deals for the companies in which they want to invest. They can view the reviews and rate the companies as well. If any company is found faulty it is labeled as bankrupt.

If a company itself get to know their financial status in advance then planning for further strategies can be made for gaining profit. In user module, user will search for a particular company if found any faults or negative results then system labels it as bankrupt. This system uses feed forward and back propagation algorithm. This system will be useful for stock holders, bank which gives loan, for company itself.

II. SYSTEM DESIGN

A. System architecture



B. Admin side

1) Load CSV File:

Comma Separated Value File stores input dataset which is used for training of a classifier. This file contains data of 60 companies having balance sheet attributes.

2) Normalize Data:

Normalization is a preprocessing technique used to rescale attribute values to fit in a specific range. All attributes should have the same scale for a fair comparison between them. This operator performs normalization of selected attributes.

3) Apply Training:

Feed forward and back propogation algorithms are used for training of classifier.

Feed forward Neural Networks are artificial neural network where the connections between units do not form a cycle. Feed forward neural networks were the first type of artificial neural network invented and are simpler than their counterpart. Recurrent neural network they are called Feed forward because information only travels forward in the network (no loops), first through the input nodes, then

through the hidden nodes (if present), and finally through the output nodes.

Single-unit perceptrons are only capable of learning linearly separable patterns; in 1969 in a famous monograph entitle perception, Marvin Minsky and Seymour Papert showed that it was impossible for a single-layer perceptron network to learn an XOR function (nonetheless, it was known that multi-layer perceptrons are capable of producing any possible boolean function)

Back propagation is a method used in artificial neural networks to calculate the error contribution of each neuron after a batch of data (in image recognition, multiple images) is processed. It is a special case of an older and more general technique called automatic differentiation. In the context of learning, back propagation is commonly used by the gradient descent optimization algorithm to adjust the weight of neurons by calculating the gradient of the loss function. This technique is also sometimes called backward propagation, because the error is calculated at the output and distributed back through the network layers.

A multi-layer neural network can compute a continuous output instead of a step function. A common choice is the so-called logistic function.

$$f(x) = \frac{1}{1+e^{-x}}$$

4) Back propagation algorithm:

Assign all network inputs and output
Initialize all weights with small random numbers, typically between -
1 and 1
repeat
for every pattern in the training set Present the pattern to the network
// Propagated the input forward through the network:
for each layer in the network
for every node in the layer
Calculate the weight sum of the inputs to the node
Add the threshold to the sum
Calculate the activation for the node
end
end
// Propagate the errors backward through the network
for every node in the output layer
calculate the error signal
end
for all hidden layers
for every node in the layer
Calculate the node's signal error
Update each node's weight in the network
end
end
// Calculate Global Error Calculate the Error Function
end
while ((maximum number of iterations < than specified) AND (Error Function is > than specified))

5) Error Function diagram:

Finally, Back propagation is derived by assuming that it is desirable to minimize the error on the output nodes over all the patterns presented to the neural network. The following equation is used to calculate the error function E, for all patterns

$$E = \tfrac{1}{2} \sum (\sum (t_k - O_k)^2)$$

6) Hidden Layer:

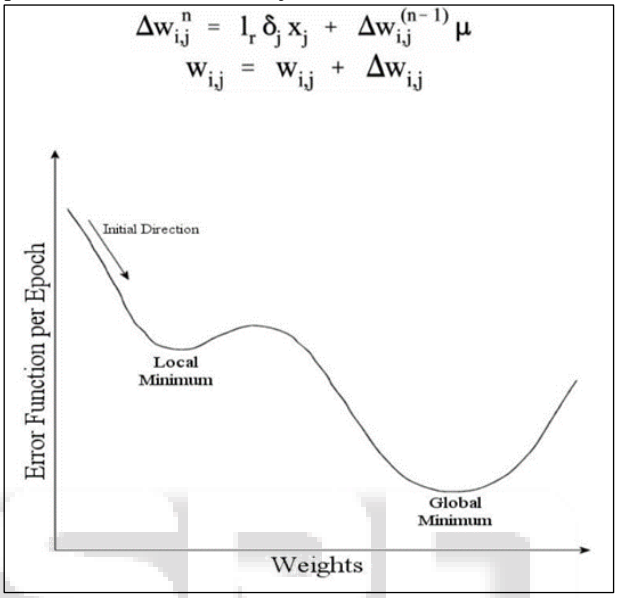
The error signal for node j in the hidden layer can be calculated as

$$\delta_k = (t_k - O_k) O_k \sum (w_{j,k} \delta_k)$$

Where the Sum term adds the weighted error signal for all nodes, k, in the output layer.

As before, the formula to adjust the weight, wi,j, between the input node, i, and the node, j is:

$$\Delta w_{i,j}^{n} = l_r \delta_j x_j + \Delta w_{i,j}^{(n-1)} \mu$$
$$w_{i,j} = w_{i,j} + \Delta w_{i,j}$$



Where-

tk - Expected output from node k

Ok- actual activation value of the output node, k Wi,j- Weight connecting node i to node j

7) Final Trained module:

Testing dataset is applied to the final trained module to check the accuracy of the final trained module.

C. Client side

1) Enter current parameters:

Client will enter balance sheet attributes of their company to check the prediction result.

2) Send to server:

Entered parameters will be sent to server (Admin Side) for further calculations.

3) View Result:

Result of prediction will be displayed to client

III. CONCLUSION

Financial organizations can significantly benefit from using these prediction models as they allow them to anticipate the status of businesses in the future and make decisions accordingly. Users will get better decision making power using this website so as to invest or not. Frauds will be less as people are getting aware of it. It Provides security. Frauds are detected at early stage Notification in form of label are used and labeled as bank-trupt or not. Quick identification is possible. Can give reviews and search for desired bank

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