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Neural Network Model to Analyze Retained Customers for Future Prediction

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***Abstract*—In this proposed work, we presented an Artificial Neural Network approach to predict the Bank customer Retaining Rate. We have created the design of the Neural Network model with its salient features and customizable parameters. A number of the activation functions are implemented along with the options for the cross-validation sets. We have tested our algorithm with different databases across different banking network in where we predict the values on the basis of values from the past days. We are targeting to achieve a best-case accuracy of 96% on the dataset.**

***Index Terms*— Business models, enterprising, Customer Retention**

I. Introduction

In a big MNC(s) &Business models, customers are considered as building blocks for its success and profitable income and that is why Banking Industries focuses on importance of gaining customers' satisfaction. Customer relationship management (CRM) supports the market by picking up a handful of targeted customers and proposing cost-effective relationships Customer relationship management approaches to manage a company's interaction with current and potential customers. It uses data analytics about customers' past background with a company to enhance business relationships with customers, predominantly concentrating on customer retention and ultimately enterprising Customer Retention. Thus, CRM systems helps to an industry to utilize the analytical models & identify the most successive groups and target them to achieve superior customer retention rates. These models are feasible in predicting customers retention with high probability to retain based on analyzed customers' personal, demographic and behavioral database to provide the desired outputs on customer-oriented marketing campaigns so as to gain customer satisfaction. The CRM includes four different stages: 1) identification; 2) attraction; 3) retention; and 4) development. 1) Stage 1 Identification: The main aim is to focus on the profitable customers and the ones that will be bringing high profitable and GDP to the Industry. Segmentation and clustering are some of the techniques that can help us to explore customers' personal and historical data to create segments/sub-groups of similar customers 2) Customer attraction: The recognized customer segments & sub-groups are then analyzed to identify the mutual features that helps to differentiate customers within a division. 3) Customer retention: The main aim of CRM as retaining existing customers is to help retain customers with a more cost effective process than acquiring new ones depending on business domains Customer retention comprehends all the actions taken by an organization so as assure customer loyalty and which leads to reduce customer churn. Customer retaining prediction includes the use of data mining and predictive analytical models in prediction of the customers with high mutual favor to defect. 4) Customer development: This stage focuses to increase the Number of customer transactions for increasing revenue. This Analyses of customer (CLTV) can help recognizing the lifetime value of their total net income thus helping in retaining customer prediction rates.

II. Proposed System

This project aims to retain customers for bank and provide them with better offers. This project analyses the previous customers and the existing customers data while considering various number of fields to predict if a current customer is going to leave the bank or not. We are going to achieve this by applying machine learning on previous data to predict on subsequent data. So the predicted data can be helpful to provide them with better offers so that they don't have to leave the bank anymore.

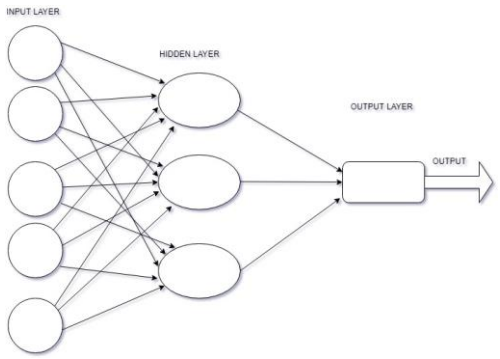


Fig. 1. Layers of neural network

III. Advantages of Proposed System

Neural network can generalize, After learning from the initial inputs and their relationships, it can conclude unseen

relationships on unseen data as well, thus making the model generalize and predict on unseen data .Unlike many other prediction techniques, neural network does not impose any restrictions on the input variables given its ability to learn hidden relationships in the data without imposing any fixed relationships in the data. This is something very useful in analysing for the retained customers for future prediction where data volatility is very high.

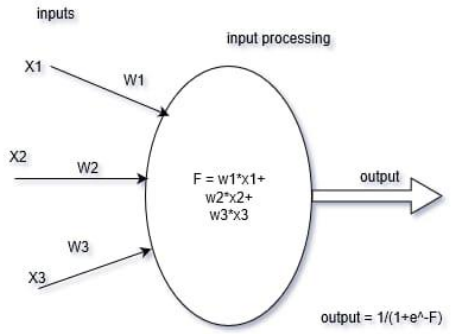


Fig. 2. Input processing

IV. Mathematical Introduction

For prediction of datasets using neural networks we will be using sigmoid function which helps us to create hidden layer which we be parameterizing inputs and helps us in giving predicted outputs as required for to retain customers.

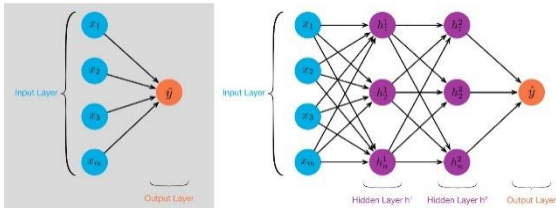


Fig. 3. Weights and neurons

- Y variables are the output layer elements
- h variables as hidden layers with n no of hidden layers depending upon no of inputs
  $W \cdot X = w_1x_1 + w_2x_2 + \ldots + w_mx_m = \sum_{i=1}^{m} w_ix_i$
- The above equation is used to create hidden layers h^1,h^2,h^3,hn followed by output y
- W is the weight of n set of neuron (X variables as considered as input layer elements in the above figure no of variables as no of inputs are increased W_1,W_2,W_m)
- N is the set of products for following inputs
  Formula of sigmoid

$$\sigma(z) \equiv \frac{1}{1+e^{-z}}$$

The above function is a sigmoid function

- Sigmoid function is a neuron which is an upgrade over a normal neuron carrying weights
- Sigmoid function is smooth and is very nice and simple of its derivatives which is easily differentiable.

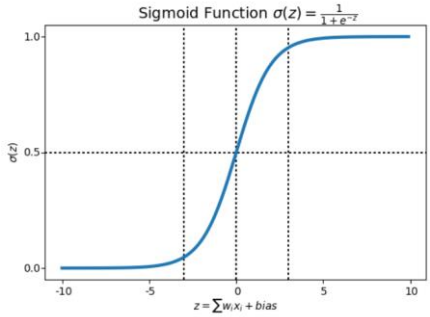


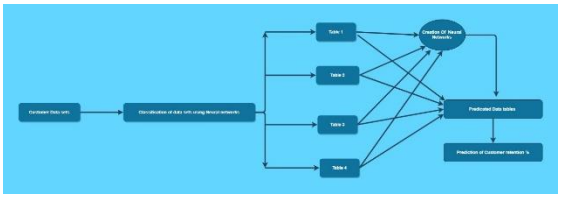
Fig. 4. Graphs of sigmoid function

The above given graph is an example of sigmoid functions and its smooth curve nature

- Sigmoid function graph values varies from .0 to 1
- A small change in weight of input layer can change the prediction as our aim is to be precise and accurate so as to gain 96% accurate results
- As predictions are always should be positive and so we are using this function as its value lies between 0 and 1.

V. System Architecture

The neural network consists three layers which are input layer, output layer and hidden layer (it is not exposed to outer world). So the basic method is when data is passed through system repeatedly, the activity of each hidden unit is determined by the activities of the input units and the weights on the connections between the input and the hidden units which helps the network to learn the pattern. In this system the hidden layer are free to construct their representation of the inputs. So when the network is trained, the weight will be higher between them higher the influence between all the layers.



Fig, 3. System architecture

VI. Module Identification

- ANN Stands for Artificial Neural Network
- ANN gathers all the Knowledge by detecting the patterns and relationships in data and learn about them
- So, we have Created an algorithm for making our program run helping it learning all the Inputs and Predicting the Outputs First Data will be defined according to the desired targets and then Inputs will be given

- Secondly Data will be classified into a training set or to a validation set in case going for training set our AI will be learning from the Inputs.
- ANN structure will be created consisting on each hidden layer so as to parameterize inputs given by user and getting a good predictive output
- After Our AI has parameterize all its layers and constructed its ANN structure we will be giving similar inputs checking outputs gathering the information about the prediction of Customers

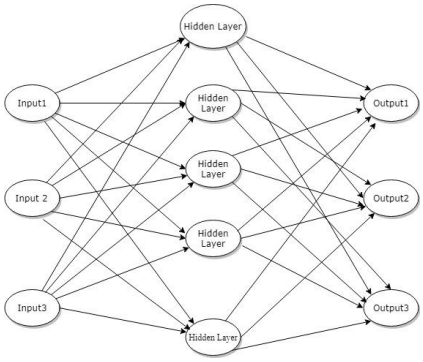


Fig. 4. Weighted bias network

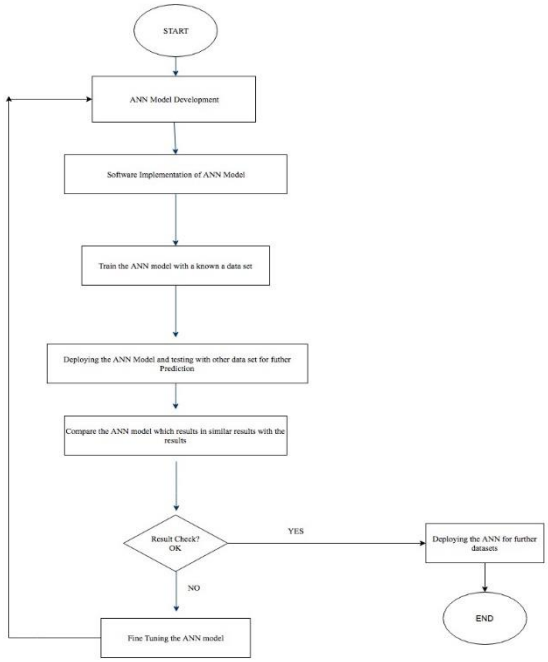


Fig. 5. ANN Algorithm module

VII. Identifying Customer Behavior

For classification of customers behavior so as to retain them we need to create rules that can parameterize and analyzed according to give outputs as stated

- First data is taken from the database for data extraction
- After data extraction the data as classified by the neural networks based on rules
- In the third stage a network profile is created with that parameterized database
- New database is stored in the Database server of neural networks

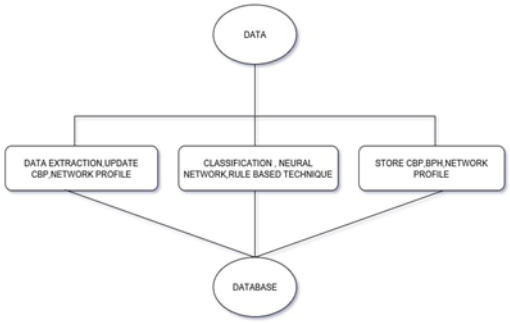


Fig. 6. Dataflow of neurons

The set of rules for the account search followed by neural networks are classified as follows

- First is the profiling stage which is based on transactions done by the customer parameterizing the money value
- Second is the Usage stage which focus on services used by the customers notices the abnormal activity and feedbacks of the user
- This feature of Profiling a customer accounts helps in learning the needs and services required by the customer so as to get the précised outputs

VIII. Conclusion

In this research paper we have described an application of Artificial Intelligence so as to help banking Industries to retain their customers. In this paper we have concluded in predicting the data and requirements so as to retain customers in the banking industry with the help of neural networks and by analyzing previous datasets providing 96% of prediction matches as compared with similar data sets

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