How Banks are Leveraging Machine Learning: Perspective From African Banks

Abebe Sutukai Nwachukwu*[1], Kwame Efua Boatengu[2]

[1] *University of Lagos, Russian Conf, University Road Lagos Mainland Akoka, Yaba, Lagos, Nigeria*
abebesutukai@africamail.com
[2]*University of Cape Coast, New Administration Block, Cape Coast, Ghana*

Abstract

In the present day world, a lot of information is generated in each field, and every field, as well as the banking industry, is among them. This data contains valuable information. Hence, it's important to shop, procedure, manage and analyze this information to extract information from it. It helps boost company profit. Banking industry plays a vital role in the country's economy. Customers are the primary advantage of the bank. Thus, it's essential to focus on issues experienced by the banks. Below, we focus on customer retention and fraud detection. In this particular work, supervised synthetic neural community algorithm is implemented for category job

Keywords

Banking business, Machine Learning, Fraud Detection, Customer Retention, Artificial Neural Network

JEL Classification

M20, M25

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Introduction

The banking business generates an enormous volume of data each day. It has consumer account info, transaction info, all financial information, etc. Data analytics can be used to analyze huge volume data to extract significant info from it. It's great to uncover hidden info, hidden patterns, and knowledge from the massive volume of data. Banks face several challenges, such as customer retention, customer segmentation, risk management and fraud detection. It has to focus on these challenges to boost business profit. Customer retention is a method that is effective for the development of the banks. In the banking industry, churn and fraud get a serious problem now. So it's essential to recognize customer behavior and remember them. To keep customers first, it's essential to recognize which customers are inactive and active. Machine learning helps you handle huge data in probably the most intelligent way, by developing algorithms to produce insights from it. Here bank consumer information is used. In this particular job, we're using supervised synthetic neural networks to do classification

Literature Review

A literature review provides several results on evaluation of banking and economic details performed by various methods, strategies. Many researchers have developed and implemented various analysis and prediction models using several data mining techniques. Jahan et al. (2022) applied Support Vector Machine algorithm for category goal. To enhance the functionality of the SVM design, an arbitrary sampling strategy is utilized, and an F measure is selected for evaluating predictive energy in this particular paper [22]. Additionally, they developed a logistic regression style and then made comparisons between developed versions. The results clear that the SVM design random with sampling strategy works much better.

Isenberg et al. (2022) compared various methods employed for evaluation of credit scoring datasets [5]. They've compared outcomes of classification strategies including neural network, gradient boosting, logistic regression, arbitrary forests and least square assistance vector devices. They've checked the functionality of methods with increasing category imbalance of datasets using the below sampling methods. They realized that Random Forest and gradient boosting works better than various other strategies in case of BDA imbalance. Akter Jahan et al. (2022) predict churners by utilizing data mining strategies. They've used real life customer records provided by Asian institutions [15]. They've initially cleaned plus preprocessed raw data, then examined using the WEKA tool. For clustering, very simple K Means was utilized, and a rule based algorithm, JRip, was utilized for the principle generation goal. The acquired conclusion demonstrates that the implemented strategies can decide patterns in client actions and enable banks to identify churners.

Sazu et al. (2022) studied buying patterns of bank clients in Indian industries. They created design to convert raw customer information into valuable data. They've used data mining techniques to design models [2]. They've experimented with classification strategies that are Cart, and C 5.0. The Cart forecasts churn class profitably compared to C 5.0. The C 5.0 is forecasting proactive class properly compared to Cart. Sazu et al. (2022) implemented Multilayer Perceptron neural networks with back-propagation learning for churn prediction in a telecommunication business. To develop category products, they've used many topologies of MLP. For this, they used actual information of people in a significant Jordanian telecom business [7]. They evaluated and compared 2 approaches that are common altar on error and the ANN weights based approach. Many machine learning algorithms are useful for classification and clustering in literature by numerous writers. Table one describes some algorithms as Decision Tree, Neural Network, SVM, and K-means [18].

Machine Learning Algorithms	Description
Decision Tree (DT)	It generates rules or patterns which are easy to interpret. These rules are in the form of if-then-else expressions.
K-means	It divides data into clusters on the basis of centroid. Elements in same cluster are close to centroid of that cluster.
Naive Bayes (NB)	It is used for making predictions. It uses Bayes' Theorem. It derives the probability of a prediction according to events present in the data [14].
Support Vector Machine (SVM)	It uses various kernel functions to process different data. Kernels functions are linear and nonlinear [14].

Table one: Different Machine Learning Algorithms employed for category and clustering

Proposed method

System Architecture

The device architecture includes different phases, such as data collection, data pre processing, making instruction, testing datasets, applying the ANN algorithm and result analysis [11]. Proposed system architecture is proven in figure one.

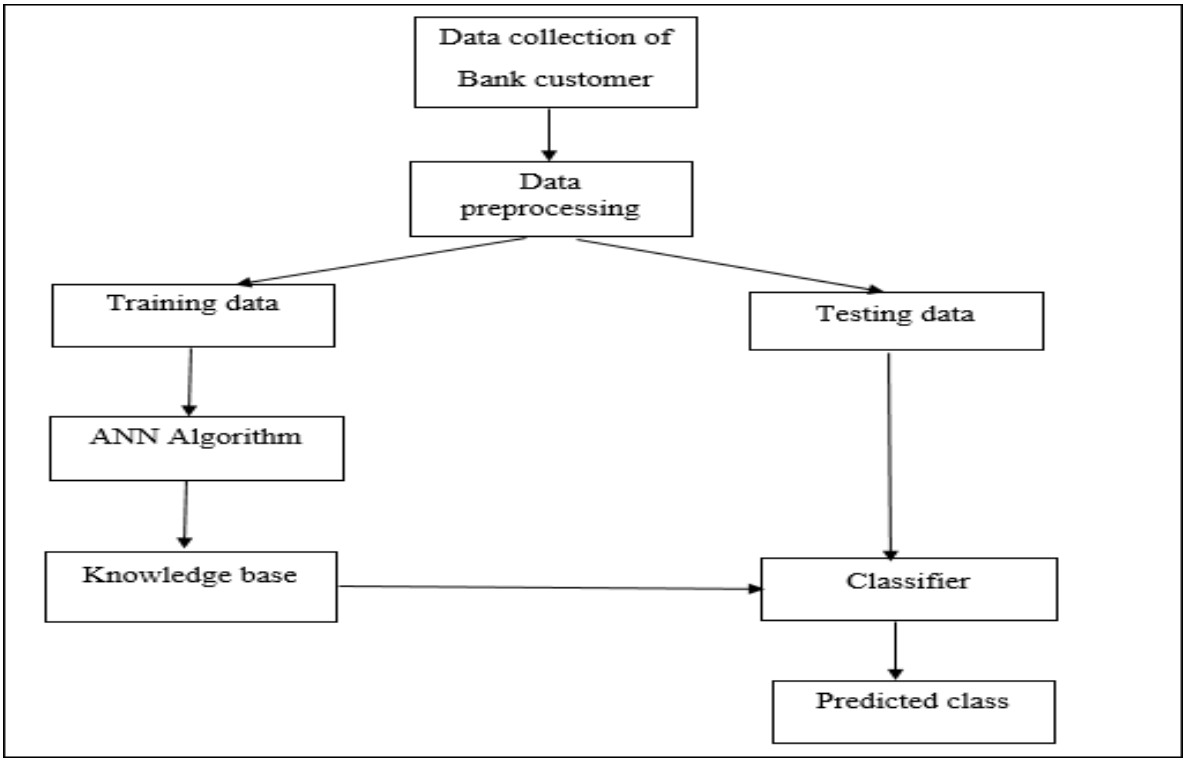

Figure one: System Architecture

First bank customer information is ready for processing. Input dataset contains both types of values categorical and numerical [9]. To carry out synthetic neural community algorithms, most information is initially changed into numerical values, then used as input to the algorithm for processing. Hence, the first information is preprocessed for processing. The information is divided into two parts: training data, as well as testing data to check the functionality of the model [13]. Right here, we've used Artificial Neural Network as a machine learning algorithm for prediction and classification [14]. ANN can also process several inputs efficiently, and handles big, complex data easily. Thus, this particular algorithm is used. For starters, an algorithm is used on training information and prepared models. Then item is used on testing data, which isn't used for training [10].

Working of Artificial Neural Network Algorithm

The experiment meets a specified threshold, Ɵ. If the activation fulfills the threshold, then paper is placed to one. The framework of ANN includes 3 primary layers, for example feedback, hidden and paper layer.

Components of neural network

1. Weighting Factors: In ANN, the neuron gets numerous inputs simultaneously. To process elements, summation functionality weight is given to every input. Weights are adaptive coefficients that help determine the intensity of the enter offered to the neural system.

2. Summation Function: The inputs and weights of its will be represented as and. The entire input will be the dot product of these 2 vectors. The end result is + +

,….. +. The summation function could be complicated. The weights and input may be combining in different ways just before passing on the transfer function [16]

3. Activation/Transfer feature: algorithmic practice implies transfer functionality is used on the summation performance, which changed to a performing paper [23].

4. There are lots of potential activation functions

i. Step feature: The output of this particular purpose is binary. It depends upon if the input.

ii. Scaling and Limiting: If transfer functionality is complete, the end result can pass through extra tasks as limit and scale [17].

5. Output Function: Each type in component has 1 output related to it. Usually, the output is the same as the outcome of transfer functions.

6. Error Function: In the procedure of mastering neural networks, distinction between the present result and the real paper is examined as a mistake, after which error functionality converts it. This particular mistake is propagated backwards to a prior level to upgrade weights [19].

7. Learning Function: It's utilized to alter the weights on the inputs of every processing component. The learning fee determines how adjustment is necessary to make the community much better [21].

ANN Back Propagation Algorithm

For feed ahead networks, the most typical learning algorithm will be the back-propagation algorithm. For unsupervised training versions, the training set has just input vectors. There's no output vector related with it [3]. The paper decides the paper. During supervised neural networks, each enter and its corresponding output is supplied with it, and networks are compensated for the proper category [1]. This algorithm comprises 2 phases, that are weight and propagation phase update phase. For the very first stage, activations are forwarded from input to paper level, with incorporating weights to

neurons in addition to compute activation functionality [12]. Then the model calculates error, that is distinction between legitimate and the predicted value. This particular mistake is propagated backward to change weights. For 2nd stage, ANN weights are modified to achieve minimization criteria [4].

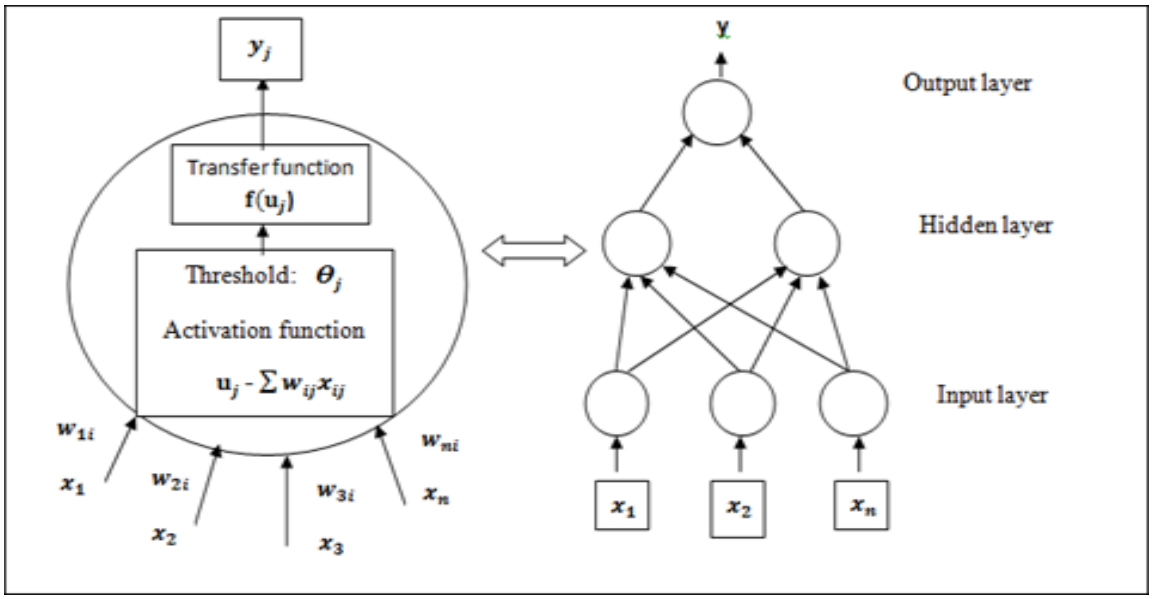

Figure two: The Back Propagation Algorithm

Experimental results

Dataset1: The germen credit dataset is used for fraud detection issues. This particular information is publicly offered at the UCI machine mastering repository. It has credit holders' info. This data has 2 varieties of credits, like bad and good. You will find complete twenty four inputs along with one output.

Dataset2: This dataset is used for client retention issues. This information is prepared under the assistance of the bank. It has bank customer's info, for example client id, age, gender, balance, income, charge card status, marital status, mortgage sort, account type, quantity of transaction he can make, job and education of client. It has records of thousands of customers. It has twelve inputs. This data has 2 varieties of customers, like inactive and active.

Dataset	Input	Data set size	Training set size	Testing set size
Dataset1 (D1)	24	1000	700	300
Dataset2 (D2)	12	1000	700	300

Table two: Dataset characteristics

This particular dataset is divided into training and tests set in the ratio of 7:3, which implies that 700 files are used for instruction. 300 data is used for screening objective and outcome. On training data returned propagation, an artificial neural network is used and prepared for the model. Right here, logistic sigmoid activation function can be used at hidden layer. Following completion of training, this particular model is used for testing data [20].

A very simple thresholding technique is used to divide information into classes. Here 0.5 threshold grate is utilized to differentiate customer as well as credit group for 2 datasets. If output is in excess of 0.5 afterward, enter belongs to one class or else to the next class [8]. This process works effectively. The outcomes are pointed out in table three. It identifies Root Mean Square Error, accuracy on instruction, and testing datasets [6]. By the end result, it's apparent that error for instruction phase is much less for both datasets. There's just 0.28 as well as 0.014 misclassification error for dataset one and dataset two respectively. The seventy two %, along with ninety eight % accuracy, are obtained for dataset2 and dataset1 respectively. It means out of 300 information, it predicts the right category for approximately 295 documents of dataset2. Hence, using this model, we can effectively identify clients or credits status.

Dataset	Hidden nodes	RMSE		Accuracy %	
		Train	Test	Train	Test
D1	10	0.000003	0.0444	99	72
D2	7	0.000188	0.1093	99	98

Table three: Results on training as well as testing data

Conclusion

In the banking field, substantial information is continuously generated. This data could be used to extract significant information from it. In this particular job, we've used 2 datasets, bank customer's information, along with germen credit information, to generate - Positive Many Meanings - category. For classification, objective supervised artificial neural community is used. This algorithm gives seventy two % and ninety eight % accuracy for dataset2 and dataset1 respectively. From outcomes, it shows that the created unit works effectively for 2 datasets

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