

# C-Score: An Alternative Banking Methodology

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**Abstract**—In this day and age, we talk the dialect of assets, stock market investigation and transaction arranged business, or to put a more extensive perspective, money. The current framework focuses on credit score as a default standard for advance application and profiting other banking facilities. The real aspect which is by all accounts missing is adaptability and a connect with the customer. This indirectly prompts a disarray of customer satisfaction and acquisition. The objective of this paper is to build up a superior association with the customers and to create a framework with more pliant aspects, thinking about a more extensive scope of factors for deciding the advance status of a potential applicant. Keeping in mind the end goal to help our speculation, we have contrived a mathematical equation that enables us to perform calculations in light of bigger scope of factors which help decide the applicant's status. This status will appear as a value, which we call the C-Score. This value is utilized to set the level of advantages which can be profited by a customer, accordingly featuring the efficiency of a customer. A calculation is constructed utilizing random forest regression to monitor defaulters and understanding the stream of transactions with respect to advance installments, which is additionally a part of the C-Score. Machine Learning is utilized to play out the calculations at a dynamic stream, the variance being for each customer individually.

**Index Terms**—assets, stock market, transaction, C-Score, machine learning, random forest, regression.

## I. INTRODUCTION

We face a daily reality such that money assumes a noteworthy part or at the end of the day the main part. When we approach the subject of finance, the following aspect that comes to the mind is the banks that enable us to have an expert, sorted out association with this aspect. To understand how money plays the roles with respect to banks, we begin by understanding the basic nature of the banking facilities. Just like how every different process has a tendency to have a positive and a negative aspect to it, we will need to comprehend the negative aspects of the current framework keeping in mind the end goal to watch how the accompanying proposed hypothesis allows us to overcome these negativities. The banks in general have a tendency to categorize the customers in view of a couple of selected criteria. Banks for the most part have a tendency to penalize defaulters, make strides for acquisition more than considering customer satisfaction, while we are here to ensure we give equivalent or more importance to customer satisfaction and national interest by compensating the feasible customers. We decide whether a particular customer

is credible or not founded on this score, to be specific the C score. All incoming and cordial installments from a person's account, his credit and debit settlements, his offenses or negligible crimes and unpaid tickets are considered to calculate this C Score. The higher this score, the more credible the customer is considered to be and more waivers with respect to customer servicing, loans and interest rates will be provided. The basic comprehension of how the C score calculated is utilized to execute the above told positives would be finished with the assistance of the concepts of machine learning. The primary motivation is to draw out an ideal answer for both the consumer and the banks. This particular criteria persuades the customer by giving better openings and a sense to maintain a strategic distance from unimportant crimes, likewise for the banks, reduces the need to manage problematic customers and have a limited number to customer acquisition and retention. This likewise brings about credit commendable and socially dependable customers.

## II. OBJECTIVES

### A. Customer Acquisition and Retention

The significance of customer acquisition for each bank is that it gives an incentive to the business and an upper hand in the market. Each major money related establishment centers around customer retention also for precise and budgetary development. In the proposed framework, acquisition is overseen by unique demographic choice. By enhancing the advantages of the customer, it tends to pull the customers and simultaneously, make a practical pool of potential customers. Retention is performed by giving certain advantages to sound customers in view of loan portion installments and interest rate returns. These advantages differ from bank to bank contingent upon inward functioning.

### B. Customer Management

Customer relationship management (CRM) isn't only the utilization of innovation, but also a technique to take in more about customers' needs and practices keeping in mind the end goal to create more grounded relationships with them. All things considered, it is to a greater degree a business logic than a specialized answer for help with managing customers adequately and effectively. Successful CRM depends on the utilization of technology.

The banks and budgetary establishments require a more mechanized process for taking care of defaulters and customers with a low credit score. Subsequently, a Machine learning algorithm performing random Forest, composed

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with the assistance of the mathematical formula containing the vital components, is kept running on a powerful GPU based cloud. This algorithm performs calculation separately for each customer. By considering a bigger scope of components, we can give a chance to better loan endorse and bring down interest rates. As per the present framework, stopping ticket infringement and references can bring about a low credit score, which is basically a non-issue factor for sanctions. The algorithm is fabricated, thinking about insignificant wrongdoings and history.

### IILC-SCORE

The credibility score is essentially a value used to determine the eligibility of a customer. The eligibility can either be:

1. Loan sanction (home, car etc.)
2. Startup A or B series funding
3. Benefits offered to certain customers

The C-score is backed up by random Forest, which uses the formulation as support vectors to generate a value based on certain criteria.

#### A. Factors

##### 1. Customer transaction

Roughly 3.4 Billion transactions occur on a daily basis (may vary among banks) and x transitions occur on a monthly basis. Monitoring them is a cumbersome task and it significantly differs from customer to customer. This factor has to be handled twofold:

##### ● Monitoring by means of dynamic fragmentation

Dynamic fragmentation is a technique by which the records are segmented so that data which are similar in salary range and existing credit score are taken as a single group, thereby performing a cache based fragmentation for quicker processing.

● Segregation based on individual or large parties such as companies.

Various parameters significantly differ with respect to companies and individual applicants. Group segregation based on applicant's size is important as it improves the accuracy of the algorithm and simplifies processing.

##### 2. Loan Defaults

Application of loans can range from car to home loans, being the most common. Defaulting loans can arise due to high interest rates, pre-existing loans and so on. As a result, loan defaults can become a significant disadvantage for the client in question as it can result in reduced benefits. Future work involved is determining the rate of reduction based on financial circumstances.

##### 3. Petty Crimes and Violations

In many countries, petty crimes such as parking ticket violations severely affect the credit score. Avoiding payment can result in a severe increase of existing credit, resulting in a crushing debt for lower income groups. Certain bank branches can debar loan sanctioning for a number of petty crimes, which reduces opportunity for growth.

#### B. Mathematical Formulation

The formulation revolves around the fact that both banking credibility and social involvement are considered. At the same time, the bank must ensure that financial credibility is given more importance as the organizational profitability is given due credit. So, all financial parameters are placed the denominator with the bank balance been given a separate composition. All social entities are placed together in the numerator.

Also two important exclusions are made, i.e., A person with low or no bank balance and a person with heavy crime record. Both these customers cannot be encouraged by the bank and the state respectively.

$$\frac{(L \times F \times C \times P)^2 + 1}{(D - W) \times \sqrt{B}}$$

D → Deposit per week  
 W → Withdrawals per week  
 F → Defaults  
 B → Account Balance  
 C → Petty crime details  
 P → Pending Tickets  
 L → Total Loans taken currently

An important note to consider is that in this formulation, the closer the value is to zero, the better is the 'credibility' the customer.

#### C. Waiver Suggestions

##### 1. Loan Value Increase

Accommodation for sanctioning loans at a lower interest rate, although will be difficult to calculate, can be the most effective way to acquire and retain customers.

##### 2. Interest Reduction On Loans and Credit Cards

Credit card debt is the most crippling debt for middle income groups. Although debt waiver is impossible, providing reward points based on a more meticulous system as opposed to the current system may provide a more reliable way for customer retention.

##### 3. Loan Processing Fee

Processing fee, usually ranging up to 2-6% can be waived or reduced for customers with a good C-Score.

##### 4. Concession in Locker Fee

Locker fee concessions are common in banks, especially for long time customers. Lockers are required for storing valuables, as a result, the requirement for lockers are significantly high. Providing concessions for classic and non-classic members can improve customer relations.

#### IV. CASE STUDIES

##### A. Case Study 1: Developed Country

We take a developed country which gives citizens unique ID and issues tickets for petty crimes.

Examp

le 1 D

= 50

USD

W =

30

USD F

$$C\text{-score} = ((1)^2 + 1) / ((50-30) * \sqrt{1000})$$

$$= 0.0031$$

B = 1000

Example

1 D = 50

USD W =

30 USD F

= 1

B = 1000

USD C = 10

$$C\text{-score} = ((1)^2 + 1) / ((50-30) * \sqrt{1000})$$

$$= 0.0031$$

Example 2

D = 2000 USD

W = 50 USD

F = 0

B = 10000 USD

C = 5

P = 0

$$C\text{-Score} = (5)^2 + 1 / 500 \times \sqrt{10000}$$

$$= 0.0052 \text{ (approx.)}$$

Example

2 D = 30

USD W =

20 USD F

= 5

B = 1200

USD C = 10

$$C\text{ score} = (((3*5)^2 + 1) / ((30-20) * \sqrt{1200}))$$

$$= 0.6524$$

Thus we can see that:

The first person who has a very good banking credibility and a decent social credibility gets the best C-score

The person with an average banking score manages to have a decent C-score. He could get a better one if the pending loans and defaults can be corrected.

#### V. ARCHITECTURE AND IMPLEMENTATION & RESULTS

The data in question is dependent on the banks themselves. Security is also a super eminent concern.

The banks have an individual database or a series of databases usually maintained by a third party. The required data is transferred to a data warehouse by means of migrating softwares. The data warehouse is strictly non-operational and cannot be accessed by anyone.

After analyzing the two examples, we can see the credibility of the formula that we use. The second example proves to have the most optimal C score (value closest to zero). The person has a very good banking value and a low crime and default record.

The first example follows up because of his average banking and default rate.

##### B. Case Study 2: Developing Country

Now we consider developing or under developed countries which either do not focus much on petty crime ticketing or do not hold record of them. Since most countries have unique IDs or use passport number as the citizen identification, we do not face issue with respect to calculating C-score for every person separately. In such nations, the unknown entities are taken as void.

(For convenience purpose, we consider all components in dollars)

The warehouse is connected to a cloud platform for performing machine learning. This is done for the purpose of GPU computation. The cloud is a private cloud and has no point of access except via the warehouse. In case of loss of data integrity as in the case of Equifax, all information is immediately wiped out, but the operational database is kept intact. Security standards used are AES encryption. The warehouse used is Mongo DB, a NOSQL database which stores data in document format. Mongo DB uses the concept of shards to store data. These shards are distinguishable and therefore make it easy to identify data. Machine Learning algorithms are dynamic in nature. Performing predictive analysis is an efficient way to monitor customer actions. The algorithm needs to be built keeping in mind bias variance trade-off, feature scaling (data preprocessing), and accuracy. The accuracy should be more than 90.376% approximately. This value is obtained from calculations made based on training and testing data sets. The algorithm used is Random Forest because we need an algorithm which can perform operations at the level of every node.

The data can strictly be accessed only by admins with security clearance. Cloud is offline and no access points are made available. This is done to ensure security and maintaining data integrity. Data migration is an essential step here. Migration depends on the format of data storage. RDBMS to Mongo DB migration is done by using the Mongo DB import tool. The scripting is done using JSON in a hierarchical manner. The conversion of SQL to JSON is done using the import tool of Mongo DB.

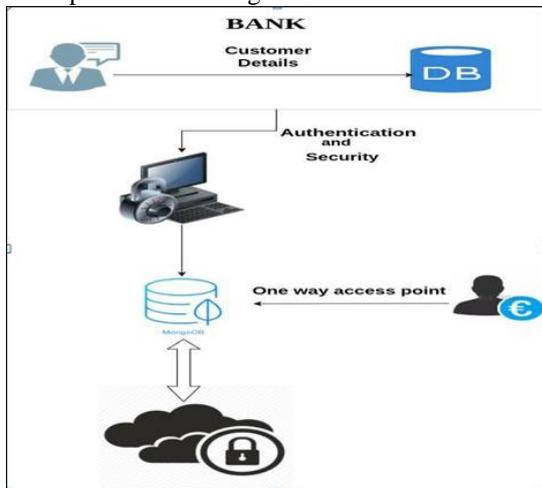


Fig: 1 Architecture Flowchart

## VI. CONCLUSION

Based on the facts and case study provided, it is imperative that a change in the system needs to arise from an automated perspective because the existing system taken in too few parameters which are insufficient and certain critical factors are neglected. It is also relatively easy to embezzle money due to a lack of constant monitoring, which can only be provided by a dynamic algorithm. The implementation schema also involves a social impact as loan allocation is facilitated easier and increases potential applicant's probability of loan sanctioning and processing. The future work involves improving the accuracy and load distribution management. Also, more robust waiver suggestions are imperative and should serve as a base for equity

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