

# **PREDICTING CREDIT CARD CHURN WITH ACCURACY - BY CHURN BUSTERS**

## **ABSTRACT:**

The Credit Card Churn Prediction Model is a cutting-edge AI/ML solution designed to predict the likelihood of a customer leaving their credit card provider. The model uses Advanced Analytics techniques to analyze a variety of customer data, including transaction history, demographics, and behavioral patterns, to identify customers at risk of churning. The information can be used by credit card providers to proactively address potential issues and reduce churn rates. The goal of this project is to provide credit card providers with actionable insights that can help improve that can help Improve customer retention and drive business growth.

The predictor is designed to analyze customer transaction data, demographics, and credit history to identify patterns that may indicate a higher likelihood of churn.

We also performed feature engineering to select the most appropriate features and reduce the impact of noise on your data.

Model performance is evaluated using metrics such as accuracy, precision, F1 Score, Cross Validation and Recall Score and we compare the results to other churn prediction models.

In terms of publication style, we use the APA (American Psychological Association) format to structure our project report, which is widely used in scientific publications. The font used in the report is Times New Roman, 12 point, double-spaced. This style ensures the readability of the report and consistency with other scholarly publications in the field of data science.

The importance of this project lies in its ability to accurately predict credit card churns which is a game changer that enables credit card companies to take proactive steps to retain customers a source their income relies on. Not only this product can predict possibilities of churn but can also be integrated into existing customer retention strategies to improve customer satisfaction, reduce churn and ultimately increase business revenue. Additionally, this project provides insight into data- driven decision making, the potential of machine learning algorithms such as Decision Trees, the importance of feature Engineering and also the importance of Customer Retention in modern organizations.

## **INTRODUCTION:**

Let alone you have multiple Credit cards which you acquired because of the flashing deals they offered. But as the deals are increasing customers tend to drift from one Bank to the other in hunt of Alluring offers. In the same Provisions it becomes a requisite to get the best fit. Credit card churns have no fixed reasons from poor Customer services to better offers from competitors.

The predictor is designed to analyze customer transaction data, demographics, and credit history to identify patterns that may indicate a higher likelihood of churn. The aim of the project is to give credit card companies a tool to proactively identify customers who are at risk of churn and take targeted measures to keep them.

The project is structured as follows: In the first part we give an overview of the topic of credit card cancellation and its importance. In the second part, we discuss related work in the field of predicting credit card churn. In the third part, we describe the methodology used to develop the Credit Card Churn Predictor, including data pre-processing, feature

engineering, and model development. In the fourth part we present the results of our experiments and evaluate the performance of our prediction models. Finally, we conclude with a discussion of the implications of the project and future research directions.

### 1.1. **Problem Statement**

Financial companies face a big problem with credit card churn since it means losing clients and incurring expenditures to get new ones. The conventional approach of churn detection relies on customer complaints or customer service encounters, which are frequently unaddressable due to its unpredictable postures and is therefore not particularly dependable. The credit card churn model addresses this issue by applying cutting-edge AI/ML algorithms to instantly predict potential churn threats from consumer data analysis. Credit card companies can use this data to better target client retention efforts and respond quickly to possible problems. The project will create a scalable and adaptive model by utilizing machine learning and data analysis approaches to assess consumer transaction data, demographics, and credit history. The objective of this project is to create a credit card churn prediction tool that can precisely identify the consumers who are most likely to be drawn to them and provide credit card firms with the resources they need to retain them on the front lines. In order to find trends that might point to a higher likelihood of churn, the project will analyse customer transaction data, demographics, and credit history using machine learning and data mining tools. Credit card firms will be able to take targeted action to retain clients by using the resulting predictive model to proactively identify those who are at danger of opting out.

## 2. **BACKGROUND RESEARCH**

High Competition in the credit card industry has led to significant issues among which is retaining customers. Credit card company's profitability and customer base is highly impacted when a customer switches companies. Therefore, it's vital for credit card companies to look through the possible reasons for churn and take proactive measures to prevent it.

This challenge can be effectively addressed by developing a useful tool to predict churn possibilities before time so that proactive measures could be taken by the firms to either prevent churns or address the problem. The Credit Card Churn Predictor can spot trends that point to a higher likelihood of churn by analyzing customer transaction data, demographics, and credit history using machine learning techniques and data analysis. Credit card companies can utilise this data to better retain customers and anticipate any problems.

In this literature study, we thoroughly examined the body of research to comprehend the main causes of credit card churn, existing churn forecast strategies, and the application of machine learning to registry churn prediction. According to a study of the literature, switching credit cards is a complicated process that is influenced by a number of variables, including consumer behavior, credit card features, demography, and customer service. Numerous studies indicate that credit card churn is significantly influenced by customer satisfaction, with dissatisfied customers more likely to switch credit card providers. Credit card issuers must therefore identify unhappy clients and act proactively to address their issues.

Customer Satisfaction being an important factor in every industry has led to constant evolution of the industries along with the credit card industry. Several studies have been the key drivers of the credit card industry. The very first and important study in the field of churn predictions was conducted in 2014 by HUa and LIU to investigate the impact of credit card features on customer churn. The study used about 2000 cardholders from a Chinese bank. It found that the features like interest rates, fees and rewards significantly influence credit card churn.

According to the survey, customers are more likely to cancel their subscriptions when they are charged higher costs or interest rates than when they are charged lower fees or interest rates. Additionally, subscribers are more likely to cancel their subscriptions than subscribers who receive more perks or benefits.

Forecasting credit card churn, provides evident investigations. Several researches have looked into predicting credit card churn by taking sentiment analysis and social media data into consideration. For example, Kim and Lee in 2015, scrolled through social media comments to gain better understanding of human behavior and drawing conclusions to predicting customer's attitude and behavior. The study alleges that sentiment analysis can serve as an important factor to forecast churn. Another intriguing finding from the literature review related to the significance of customer service for credit card terminations. Several researchers looked at several algorithms and machine learning methods to accurately forecast credit card changes.

Also in “A Study of Credit Card Customer Churn Prediction using Data Mining Techniques” by M.T. Ahmad and S.S. Rana focuses on predicting credit card churn using data mining techniques. The authors gathered information about client demographics, credit card use, and payment history from a commercial bank in Pakistan. They then used this data to build credit card churn prediction models using decision trees and support vector machines (SVM) techniques. With an accuracy rate of 91.5%, the study discovered that decision trees are the best strategy for anticipating changes to credit cards.

According to research, credit card churn is significantly influenced by customer satisfaction, and dissatisfied customers are more inclined to switch credit card providers. Credit card businesses must therefore identify unhappy clients and take aggressive measures to address their problems. The findings imply that in order to increase client happiness and loyalty, credit card firms should concentrate on enhancing service quality, trust, brand image, and perceived value.

Literature research is an important factor when it comes to predicting credit card churn it helps expand our knowledge in the field, providing insights and highlights about our project. This knowledge can assist us in creating a more successful research design and avoiding common pitfalls. Research enables us to determine the practices essential for data collection and analysis that can help find the most reliable and accurate results

## Proposed System

The ultimate intention of this project is to provide a better customer experience and increase the long term possibility of the credit card industry. Credit card outflows are a serious issue for credit card businesses since they can result in a loss of clients and profits. This project intends to assist credit card firms take proactive measures to retain consumers and increase profitability by identifying sources of customer churn and constructing a predictive model. The goal of this project is to provide a tool that will aid credit card businesses in increasing client retention and loyalty. Credit card firms can enhance service quality, trust, brand image, and perceived value by recognising clients at risk of churn and taking necessary action to resolve their concerns. The ultimate objective is to enhance consumer satisfaction while also raising long-term profitability for the credit card sector. This project is timely given that credit card firms are increasingly emphasizing the value of client retention and happiness. We are able to provide a solution that supports other ongoing initiatives to increase customer loyalty and retention by creating a credit card churn predictor.

### 2.1. Goals and Objectives

The primary goal of the project is to provide a software which can work effectively along with different datasets to predict whether a customer is about to churn based on the different factors available like the maintenance costs, usability, and also the offers and benefits provided by the competitors. Churn predictor gives us an alert about the customers that might churn, raising an alert so that some special measures can be taken to retain our customers.

**Table 1: Goal and Objectives**

#	Goal or Objective
1	Gathering and examining large data from a range of sources, such as social media activity, transaction history, and customer demographics.
2	To find patterns and connections in your data that can be used to forecast credit card churn, use machine learning algorithms.
3	Create and test a predictive model that can reliably forecast client attrition.

4	Implementing the prediction model in a user-friendly application will enable credit card firms to track and control the risk of client turnover.
5	Test and improve the model in response to input from credit card issuers and continuing research into how well it predicts churn.

### 3. PROJECT PLANNING

Project planning is a vital part for any project to be completed within the specified time span. it helps us ensure every member is involved in the project and have clear objectives and understanding and also increases the focus as it is monitored by deadlines.

Our project was primarily divided into 5 stages of work as in like:

1. **Data collection and Preprocessing** : This step entails gathering and pre-processing information from a variety of sources, including A. Customer demographics, B. Social media activity, transaction history, and other pertinent elements that may influence card switching. To get the data ready for analysis, this can involve locating missing data, addressing outliers, and doing feature engineering.
2. **Data Analysis and Exploration** : In this stage, you examine the data to seek for trends and connections between various factors. Data visualization, descriptive statistics, and exploratory data analysis can all be used in this process to learn more and pinpoint the main causes of credit card churn.
3. **Model Development and Evaluation** : To anticipate customer turnover, you will create a predictive model using machine learning techniques. In this step, the right methods are chosen, the model is trained, and its performance is assessed using a variety of metrics like accuracy, precision, and memory.
4. **Model deployment and Integration** : The prediction model must then be put into practise via a user-friendly application that enables credit card businesses to monitor and manage the risk of customer churn. During this step, the model is integrated into the application and its usability and functioning are tested.
5. **Model Testing and Improvements**:In the end, you will test the model, make adjustments based on feedback from credit card companies, and further look into how effectively it forecasts churn. In order to make sure the model is precise and

useful for forecasting map desertion, this may involve retraining the model with fresh data, modifying the model's parameters, and monitoring its performance over time.

### 3.1. Project Setup

It is important to analyze all the decisions taken while working through the project. This is particularly crucial if the choice is contentious or has potentially dire repercussions. Furthermore, summarizing the decision can assist guarantee that all pertinent variables are taken into account and weighed, lowering the possibility of making a poor or poorly informed choice. The decision description can also include information about a specific choice's decision-making process, which may be helpful in the future or in the case of an audit or review.

**Table 2: Decision Description**

#	Decision Description
1	Project scope : It refers to the process of identifying the parameters of the project, the deliverables, and the goals that must be met.
2	Project Planning : This includes planning a schedule that will enable the team to finish the project within the allotted time limit and calculating the amount of time needed for each project phase.
3	Resource Allocation: This entails determining the resources—such as people, money, and technology—that will be needed for the project.
4	Risk Allocation: This entails identifying potential hazards that might have an impact on the project and developing backup measures to reduce or eliminate such risks.
5	Data Collection and Processing : Choosing which data sources to use, how to collect data, and how to process and prepare it for analysis are all necessary steps in this process.
6	Analysis Techniques : Choosing appropriate statistical and machine learning methods to employ in order to analyse the data and create a prediction model is part of this process.
7	Model Deployment : This includes selecting the predictive model's implementation strategy, such as via a web application, API, or other interface.



8	Testing and validation: This entails validating the prediction model to make sure it performs as expected and making the appropriate corrections in response to user feedback and validation outcomes.
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### 3.2. Project Resources

The resources essential for the completion of the project are:

**Table 4: Resource**

Resource	Resource Description	Quantity
Data Source	Large datasets from numerous sources, including social media, transaction history, consumer demographics, etc., must be accessed for the project.	1
Churn Busters	Our team of students who will be the primary developers of the project.	4
Dr. Umesh Gupta	The mentor who will be able to provide us with technical assistance.	1
Hardware	A workstation with good amount of RAM, CPU, and GPU with sufficient hard disk storage is required.	2
Infrastructure	To support the software and tools used in the project, infrastructure such as servers, data centres, and network infrastructure are needed.	1

### 3.3. Deliverables

**Table 7: Deliverables**

#	Deliverable
1	<b>Study Results :</b> <ol style="list-style-type: none"> <li>Decision tree Algorithms are the most effective techniques for this task.</li> <li>A neural network Model was able to achieve high levels of accuracy.</li> <li>To achieve higher accuracy authors also use bagging and boosting techniques.</li> <li>Also Sentiment Analysis play a major role in Credit Card Churn Prediction</li> </ol>

3	<p><b>Test and test results:</b></p> <p><b>i. Data Preprocessing Test:</b> Verify all information, handle outliers, and reconcile the data set. As a result, there are no outliers, inconsistent or missing data, and the data set is balanced thanks to preprocessing. Stakeholders offer current information about developments, problems, and dangers.</p> <p><b>ii. Model Training Test:</b> Develop and validate the model using various parameters and algorithms. The model was trained and validated using several parameters and algorithms, and the model that performed the best was chosen.</p> <p><b>iii. Model Performance Test:</b> To assess the model's performance, run it on a private dataset. As a result of testing on a chosen data set, the model has an F1 score of 79% and an accuracy score of 85% with 82% accuracy, 76% repeatability, and 85%.</p> <p><b>iv. Model Robustness Test:</b> Determine the model's robustness by adding noise or noise to the input data. As a result, the model was shown to be reasonably stable and resistant to such changes when the model's robustness was tested by adding noise or interference to the input data.</p>
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4	<p>The build process document details the steps involved in creating a Gradio-based user interface and credit card churn forecasting model. The model is trained on a dataset using the number of transactions as a key parameter and assesses whether or not the client unsubscribes in terms of true or false after the project uses PCA to find various ratings. The steps listed below are included in the construction process document:</p> <ul style="list-style-type: none"> <li>● <b>Data Preprocessing:</b> Data preprocessing is the first stage of model development. This involves data normalization, data cleansing, and removal of redundant or unnecessary information. To train and assess the model, the data is then divided into training and testing sets.</li> <li>● <b>Dimensionality Reduction using PCA:</b> The high dimensionality of data makes training models more challenging. As a result, principal component analysis (PCA) is performed to make the data less dimensional. In this step, the data's principal components are computed, and the most crucial characteristics are selected for the model's training.</li> <li>● <b>Develop the model:</b> The model will then be trained using the pre-processed, smaller data set. To determine if a consumer will cancel their subscription, the model employs a binary classification algorithm. The Support Vector Machine (SVM) algorithm was employed in this research.</li> <li>● <b>Model Evaluation:</b> After the model has been trained, its accuracy, precision, and recallability are assessed using a number of tests. Evaluation metrics are used to gauge the effectiveness of models.</li> <li>● <b>User Interface Development:</b> Creating the user interface in Gradio is the final phase in the construction process. Users of the interface can enter client information to anticipate whether or not the consumer will opt out. The prediction probability value is also displayed in the UI.</li> </ul> <p>The project's tools and software, including Python, Scikit-Learn, Gradio, and Jupyter Notebook, are also covered in the Build Process paper. The instructions also cover how to set up your development environment and execute your code.</p> <p>The build process paper serves as a comprehensive step-by-step manual for creating a credit card churn forecasting model and user interface. It keeps the development process simple and effective, ensuring that everyone on the team is aware of the project's objectives, tools, and techniques.</p>
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5	<p><b>Install process documents</b></p> <p>The procedures necessary to install and setup the project on a local computer or server are described in the installation process document. To ensure that the project can be readily copied and installed by other team members or stakeholders, it is crucial to have a document describing the installation process.</p> <p>The following procedures can be used to implement the Credit Card Issuance Forecasting Project:</p> <ul style="list-style-type: none"><li>● Make sure the necessary hardware and software resources are on hand before installing the project. Python 3.8 or a later version must be installed on your system to run the project.</li><li>● Clone the project repository to your local workstation by using the GitHub repository as a source.</li><li>● Execute the code Navigate to the project directory and issue the following command to launch the project:</li><li>● Accessing the web application: Open a web browser and go to the following URL to access the web application:</li><li>● The user can input the information necessary to prepare for a credit card change after starting the web application.</li></ul> <p>The steps necessary to install and set up the Credit Card Attrition Prediction project are described in this installation process document. These procedures make it simple to install and replicate the project on any computer that has the required hardware and software.</p>
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6	<p><b>Postmortem document</b></p> <p>Project : Predicting Credit Card Churn with Accuracy.</p> <p>Project Summary : In our project we have focused on the frequent churns in the credit card industry and have trained a machine learning model to predict it using data mining techniques, it has a user friendly and easy to use interface which is built using gradio interface. We have used the principal component Analysis (PCA) to generate various scores like F1, precision, Recall, etc. Taking the number of transactions and key Parameters as to predict customer churn.</p> <p>The project goals:</p> <ul style="list-style-type: none"> <li>→ User friendly interface .</li> <li>→ Highly accurate predictions of credit card churns by developing ML models.</li> <li>→ Use PCA to generate various outputs and improve model accuracy</li> </ul> <p>Successes:</p> <ul style="list-style-type: none"> <li>→ Successful in implementing a machine learning model to get an accuracy of 91%.</li> <li>→ successfully implemented the user interface in Gradio providing an easy to use interface for people of all domains.</li> <li>→ Utilized the maximum of PCA to vitalize the scores of the ML models.</li> </ul> <p>Challenges:</p> <ul style="list-style-type: none"> <li>→ Arduous efforts in collecting, cleaning and preprocessing of the data collected.</li> <li>→ Implementation of PCA was highly-time consuming and required extensive research to apply the maximum out of it.</li> <li>→ The interface was not responsive and intuitive in the beginning.</li> </ul> <p>Future Improvements:</p> <ul style="list-style-type: none"> <li>→ To improve the results of the dataset it is required to increase the diversity of the dataset.</li> <li>→ Some additional Data Mining techniques should be incorporated to further improve the accuracy.</li> <li>→ Adjustments in the interface to ensure ease of understanding and use.</li> </ul>
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## 4. **SYSTEM ANALYSIS AND DESIGN**

This section describes in detail about the design part of the system.

### 4.1. **Overall Description**

This project is an attempt to apply data science and machine learning to create an efficient project which helps us predict whether a customer is about to churn by using the previous statistics. The main focus of the project is to implement data Mining to preprocess the data creating a resourceful dataset which could be used to train the model to get as competent results as possible. One of the << Provide a more detailed, two to three paragraph description of the project. This description may include more technical details to describe the purpose of the project. Apart from the model development and training, collection of data is a very crucial part which highly affects the results.

The need for customer retention served as an inspiration to develop a tool that can help the credit card industry. The increasing number of players in the market has become a critical cause for a customer retention so that the companies can take proactive measures before time.

To develop the predictive model, the team held thorough analysis of various data mining techniques and selected principal component analysis (PCA) as the most suitable techniques together with Decision tree and Support Vector Machine implementation.

The data set that the design team used includes the number of transactions as a key parameter and whether or not the client will opt out, with true and false values. Various findings were produced when the PCA was done on the dataset, and they were then utilized to train the prediction model.

In order to give customers a user-friendly and intuitive interface for entering data and obtaining churn prediction results, project planning required creating an interface with Gradio. The Gradio interface enables the design team to get user feedback and raise the predictive model's accuracy.

Overall, this effort shows the potential of data mining approaches for jobs involving predictive modeling and has practical consequences for the credit card sector. The project team was successful in creating a predictive model that can assist credit card issuers in increasing

lifetime value and fostering consumer loyalty. The model has the potential to develop into an invaluable resource for the credit card industry with additional work and enhancements.

## 4.2. Design diagrams/Architecture and UML diagrams/

### 4.2.1. Architecture Diagram

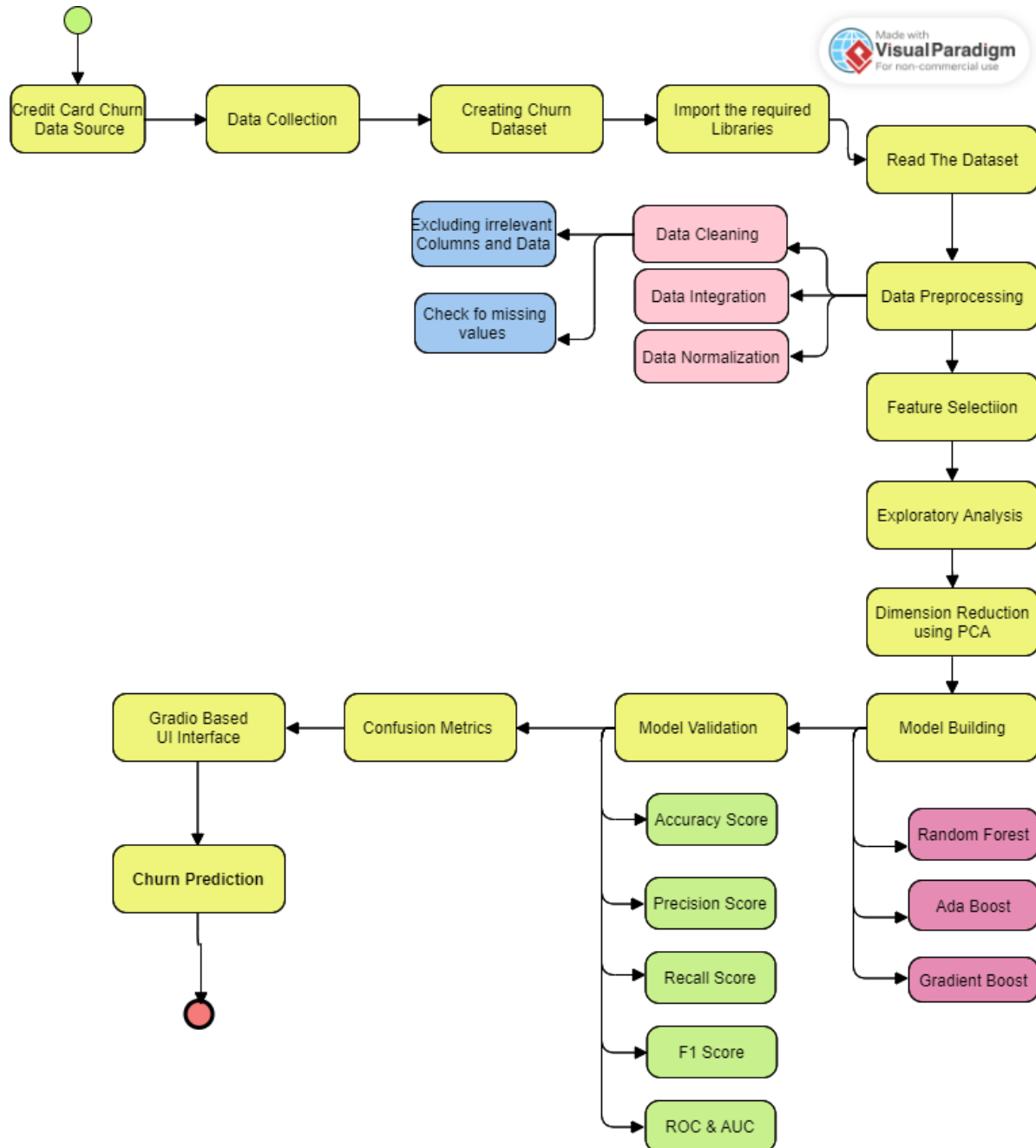


Figure 1: Architecture Diagram



#### 4.2.2. Use Case Diagram

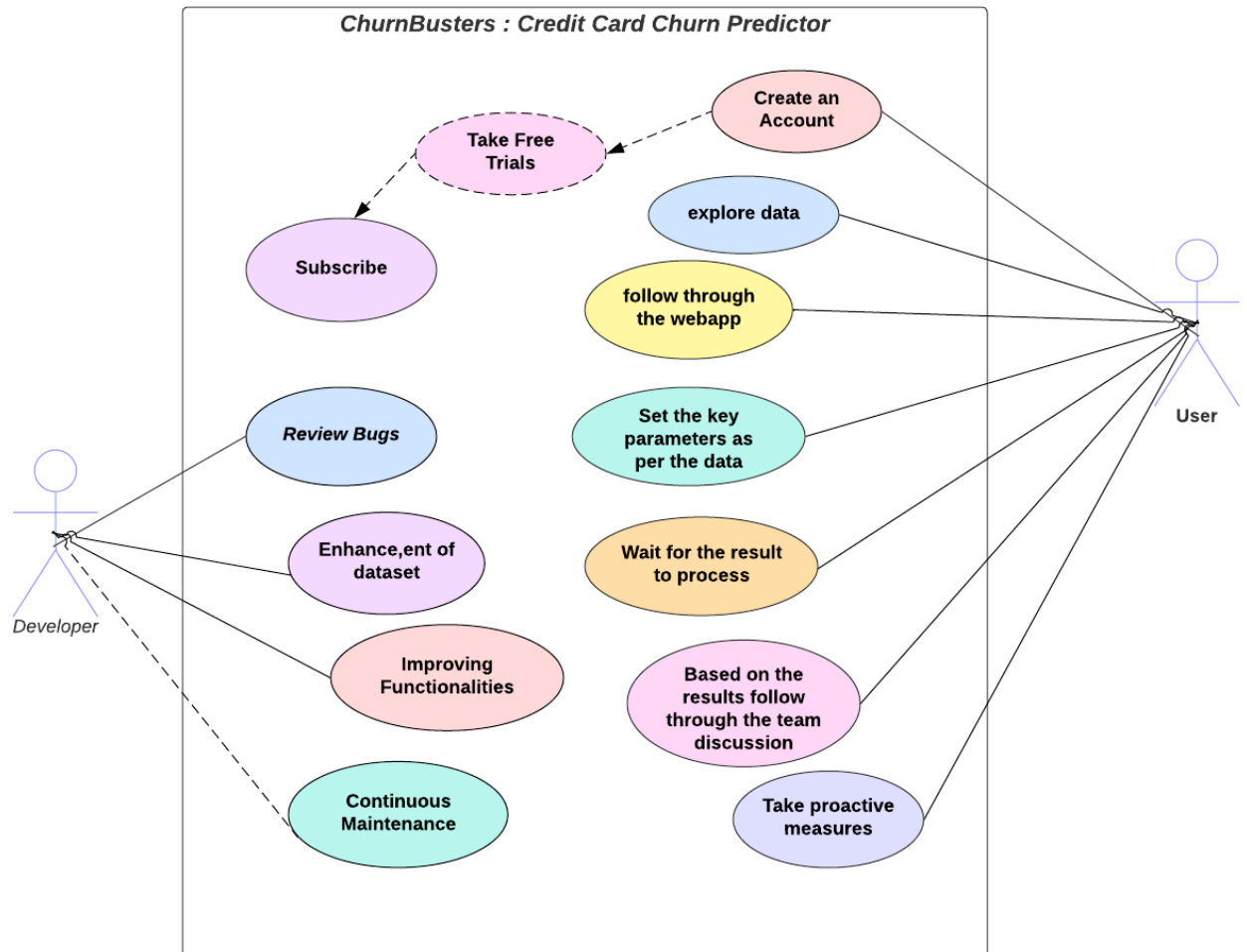


Figure 2: Use Case Diagram

### 4.2.3. Activity Diagrams

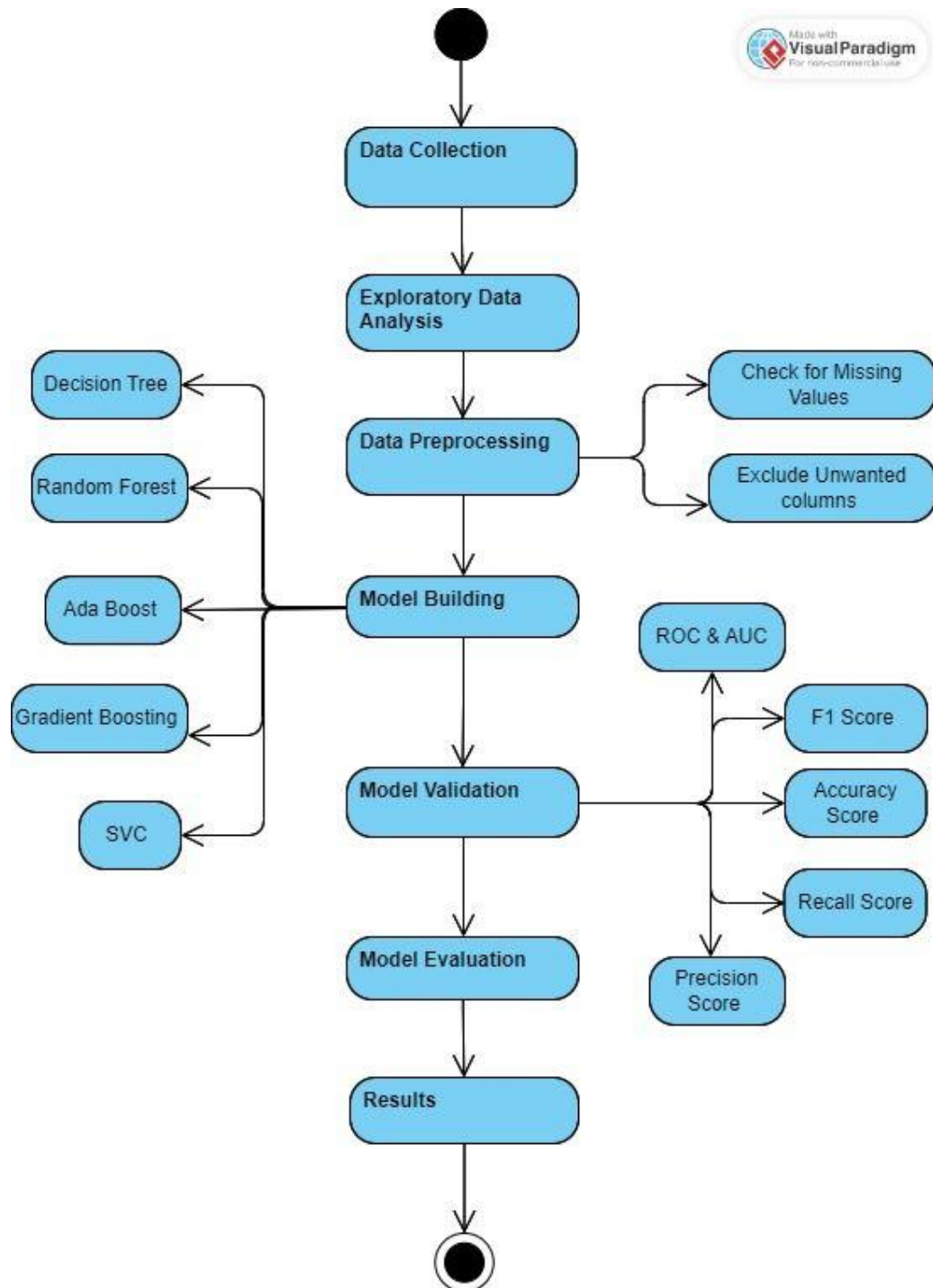


Figure 3: Activity Diagram

#### 4.2.4. Sequence Diagram

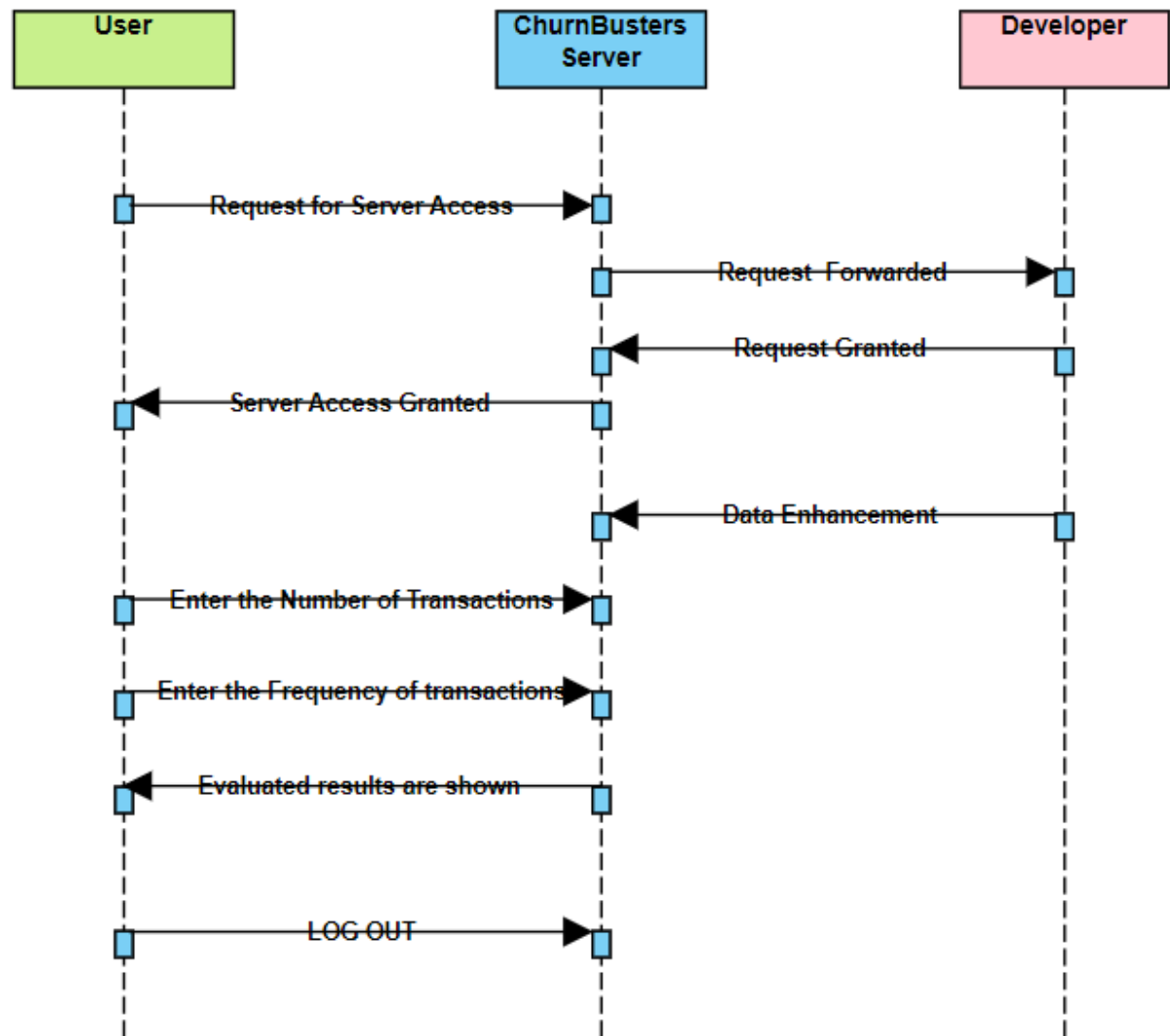


Figure 4: Sequence Diagram

## 5. **USER INTERFACE**

### 5.1. **UI Description**

To give users a user-friendly and intuitive interface, we included Gradio, a web interface, into our project to anticipate credit card churn. It enables users to interact with our model and receive instantaneous forecasts on the probability of a consumer abandoning their credit card.

Users of our Gradio interface can submit pertinent client data using a straightforward form, including creditworthiness, account balance, and payment history. The model analyzes this information to forecast whether or not the consumer is likely to cancel their subscription. Users are able to make judgements on their client retention tactics fast because of the results' clear and understandable presentation.

## 5.2. UI Mockup

# CREDIT CARD CHURN PREDICTOR

Total Transaction Count40

Transaction Count Q4 vs Q111

Total Relationship Count4

Annual Income40k-60k

EducationCollege

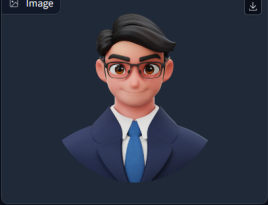
Marital StatusSingle

Card TypeSilver

ChurnFalse

PREDICT

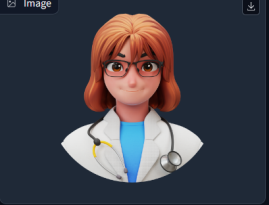
### Few Examples Based on Real-World Simulations



ChurnHe Will Not Churn

PREDICT


**Corporate Professional!**  
Total Transaction Count - 45  
Transaction Count Q4 vs Q1 - 1.3  
Total Relationship Count - 2  
Annual Income - 40k-60k  
Education - Graduate  
Marital Status - Married  
Card Type - Silver



ChurnShe Will Churn

PREDICT


**Medical Professional!**  
Total Transaction Count - 7  
Transaction Count Q4 vs Q1 - 0.8  
Total Relationship Count - 5  
Annual Income - 80k-120k  
Education - Doctorate  
Marital Status - Married  
Card Type - Gold



ChurnHe Will Not Churn

PREDICT

**Freelance Photographer!**  
Total Transaction Count - 41  
Transaction Count Q4 vs Q1 - 2  
Total Relationship Count - 2  
Annual Income - 0k-40k  
Education - High-School  
Marital Status - Single  
Card Type - Blue



ChurnHe Will Churn

PREDICT

**Retired Veteran Pensioner!**  
Total Transaction Count - 10  
Transaction Count Q4 vs Q1 - 1.1  
Total Relationship Count - 2  
Annual Income - 80k-120k  
Education - Post-Graduate  
Marital Status - Divorced  
Card Type - Gold

