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# CREDIT CARD DEFAULT PREDICTION

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Low Level Design (LLD)

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# 1. INTRODUCTION

There are times when even a seemingly manageable debt, such as credit cards, goes out of control. Loss of job, medical crisis or business failure are some of the reasons that can impact your finances. In fact, credit card debts are usually the first to get out of hand in such situations due to hefty finance charges (compounded on daily balances) and other penalties. A lot of us would be able to relate to this scenario. We may have missed credit card payments once or twice because of forgotten due dates or cash flow issues. But what happens when this continues for months? How to predict if a customer will be defaulter in next months? To reduce the risk of Banks, this model has been developed to predict customer defaulter based on demographic data like gender, age, marital status and behavioral data like last payments, past transactions etc.

## 2. PROBLEM STATEMENT

Financial threats are displaying a trend about the credit risk of commercial banks as the incredible improvement in the financial industry has arisen. In this way, one of the biggest threats faced by commercial banks is the risk prediction of credit clients. The goal is to predict the probability of credit default based on credit card owner's characteristics and payment history.

## 3. DATASET INFORMATION

**ID:** ID of each client

**LIMIT\_BAL:** Amount of given credit in NT dollars (includes individual and family/supplementary = credit)

**SEX:** Gender (1=male, 2=female)

**EDUCATION:** (1=graduate school, 2=university, 3=high school, 4=others, 5=unknown, 6=unknown)

**MARRIAGE:** Marital status (1=married, 2=single, 3=others)

**AGE:** Age in years

**PAY\_0:** Repayment status in September, 2005 (-1=pay duly, 1=payment delay for one month, 2=payment delay for two months, ... 8=payment delay for eight months, 9=payment delay for nine months and above)

**PAY\_2:** Repayment status in August, 2005 (scale same as above)

**PAY\_3:** Repayment status in July, 2005 (scale same as above)

**PAY\_4:** Repayment status in June, 2005 (scale same as above)

**PAY\_5:** Repayment status in May, 2005 (scale same as above)

**PAY\_6:** Repayment status in April, 2005 (scale same as above)

**BILL\_AMT1:** Amount of bill statement in September, 2005 (NT dollar)

**BILL\_AMT2:** Amount of bill statement in August, 2005 (NT dollar)

**BILL\_AMT3:** Amount of bill statement in July, 2005 (NT dollar)

**BILL\_AMT4:** Amount of bill statement in June, 2005 (NT dollar)

**BILL\_AMT5:** Amount of bill statement in May, 2005 (NT dollar)

**BILL\_AMT6:** Amount of bill statement in April, 2005 (NT dollar)

**PAY\_AMT1:** Amount of previous payment in September, 2005 (NT dollar)

**PAY\_AMT2:** Amount of previous payment in August, 2005 (NT dollar)

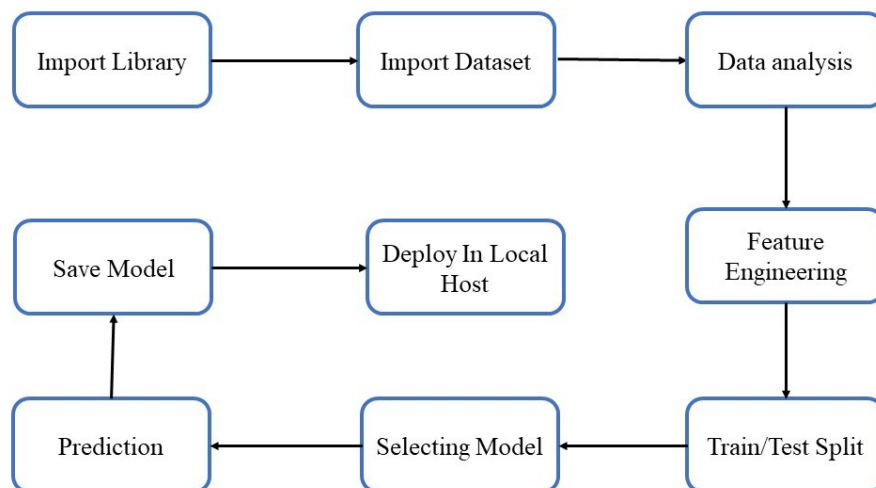
**PAY\_AMT3:** Amount of previous payment in July, 2005 (NT dollar)

**PAY\_AMT4:** Amount of previous payment in June, 2005 (NT dollar)

**PAY\_AMT5:** Amount of previous payment in May, 2005 (NT dollar)

**PAY\_AMT6:** Amount of previous payment in April, 2005 (NT dollar)

**default.payment.next.month:** Default payment (1=yes, 0=no)



## 4. Architecture Description.

### 4.1.Data Description:

The dataset was taken from Kaggle (URL: <https://www.kaggle.com/uciml/default-of-credit-card-clients-dataset>), This dataset contains information on default payments, demographic factors, credit data, history of payment, and bill statements of credit card clients in Taiwan from April 2005 to September 2005.

## **4.2 Data Pre-processing.**

This included importing of important libraries such as seaborn, matplotlib, pandas etc. We imported the same dataset mentioned above from Kaggle.

## **4.3.Data Analysis**

Here we handled the null values, changed the column names, plotted multiple graphs in seaborn, matplotlib and other visualization library for proper understanding of the data and the distribution of information in the same. As there were no null values in the data, we proceeded with the visualization and analysis.

For each specific feature we analysed the data using visualization, and jotted down the important key points which can impact the final predictions.

## **4.4. Feature Engineering**

Merging 2 or more columns to get in-depth knowledge and information regarding the data.

## **4.5.Train/Test Split**

This library was imported from Sklearn to divide the final dataset into the ratio of 80-20%, where 80% of the data was used to train the model and the latter 20% was used to predict the same.

## **4.6 Selecting Model**

We tried and tested multiple models such as XGBoost, RandomForest, Decision Tree, ADABOOST for the model and came up with the model with the best performance, i.e the Random Forest Classifier.

## **4.7. Prediction**

The Accuracy of Random Forest was **81.7%** and the F1 score was **47.3%**.

## **4.8 Save Model**

Model was saved using the pickle library which saves the file in a binary mode.

## **4.9 Deploy in Local Host**

We created a HTML template and deployed the model through Flask.

Here is the image of the same:

Credit Card Defaulter Prediction

Talking:

Demographic data:

Gender:

☐ Male ☐ Female

Education:

☐ Graduate School ☐ University ☐ High School ☐ Others ☐ Unknown

Marrital Status:

☐ Married ☐ Single ☐ Others

Age:

Limit Balance:

Amount of given credit in dollar (includes individual and family/supplementary credit)

Behavioral data:

Repayment Status:

(-1=pay duly, 1=one month delay, 2=two months delay, ... 9=delay for nine months and above)

April

May

June

July

August

September

0

0

0

0

0

0

Bill Amounts: Amount of bill statements (in dollar)

April

May

June

July

August

September

0

0

0

0

0

0

Previous Payments: Amount of previous payments (in dollar)

April

May

June

July

August

September

0

0

0

0

0

0

Predict

The Credit card holder will not be Defaulter in the next month