A PROJECT REPORT ON

SMART LENDER - APPLICANT CREDIBILITY PREDICTION FOR LOAN APPROVAL

Domain: Applied Data Science

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1. INTRODUCTION

1.1 Project Overview

One of the most important factors which affect our country's economy and financial condition is the credit system governed by the banks. The process of bank credit risk evaluation is recognized at banks across the globe. As we know credit risk evaluation is very crucial, there is a variety of techniques are used for risk level calculation. In addition, credit risk is one of the main functions of the banking community. The prediction of credit defaulters is one of the difficult tasks for any bank. The banks may reduce their loss by reducing their non-profit assets, so that recovery of approved loans can take place without any loss and it can play as a contributing parameter of the bank statement. But by forecasting the loan defaulters, they may reduce the amount of money they have to put up for sale. Machine Learning techniques are very crucial and useful in the prediction of these types of data.

1.2 PURPOSE

Loans are the core business of banks. The main profit comes directly from the loan's interest. The loan companies grant a loan after an intensive process of verification and validation. However, they still don't have assurance if the applicant is able to repay the loan with no difficulties. Banks consider a number of factors in addition to the reason for the loan, such as the amount asked for and the applicant's credit and employment history, among others. The purpose of including such information on a loan application is so that a bank can assess the potential risk of lending money to an individual. If you're in the market for a personal loan, the purpose of your loan can impact which lenders you can work with and what your rates will be. Finding a lender that aligns with your loan purpose and financial goals can make a big difference in your overall satisfaction with your experience. They can be used for anything from taking a family vacation to consolidating your other debts.

2. LITERATURE SURVEY

SI No	Author & Year of publication	Journal	Title of the paper	Algorithm	Advantage	Limitation
1	Ambika and Santosh Biradar , 2021	IJARSCT	Survey on Prediction of Loan Approval Using Machine Learning Techniques.	The system can help to understand the factors which affect the specific outcomes most. Other model like neutral network can be used individually for enhancing reliability and accuracy prediction	This application is working properly and meeting to all Banker requirements.	This system cannot be utilized effectively by the soil testing laboratories.
2	Supriya, Pavani, Saisushma, Vimala Kumari and Vikas , 2019	IEEE	ML based loan prediction model	Data collection and preprocessing, applying the ML models and testing. The detection and removal of outliers and imputation removal were carried out.	Experimentation concluded that, DT has significantly higher loan prediction accuracy than the other models.	Testing dataset were difficult.
3	2016, Aboobyda Jafar Hamid and Tarig Mohamme d Ahmed	IEEE	Loan risk prediction model based on the data mining techniques	This model help to find the risk to predict the loan .	Accuracy were strong.	J48 based loan prediction approach resulted in better accuracy than the other methods.

4	Mohammed Ahamed Sheik, 2020	ICESC	An Approach for Prediction of Loan Approval using Machine Learning Algorithm	Through this method we are able to predict whether that particular candidate is safe or not and the whole method of validation of attribute is automated by machine learning technique.	This model performed better as it included applicants' various attributes such as the credit history, amount of credit, duration of credit, age, the intention of loan, etc.	Time manage - ment is an issue in this method
5	Mr. Ghorpade Dinesh B., 2021	IJCRT	Prediction of Loan Approval Using Machine Learning Algorithm	This system, banks have many products to sell but main source of income of any banks is credit line. Earn from interest of those loans which they credits.	Applicants with high income sanctioning low amount is to more likely get approved which make sense, more likely to pay back their loans.	Finance companies cannot get benefits.
6	Sivasree M S, Rekha Sunny T,2015	IJERT	Loan Credibility Prediction System Based on Decision Tree Algorithm	Problem Understanding, Data Understanding, Data filtering, System Modeling, System Evaluation (Input, Data Preprocessing, Test set Training data, Decision Tree, mode).	Loan repayment Capacity are presented in this section.	The data was just presented for credits
7	Bhanu Prakash Lohani, Mayank Trivedi, 2017	IEEE	RSB: A recommen dation System for Bank	A recommendation system for bank which considers a location detection module, data	The similar Bank can give Similar approval with different benefits.	The system does not get user feedback to improve the process.

				analysis and storage module, Loan database.		
8	Vignesh Gandge, Vidhya , 2018		A Study on Various Data Mining Techniques for loan approval	Decision tree using ID3 algorithm was considered for credential and the recommendations were generated	It was observed that Multiple Linear Regression gave an accuracy of 90-95% for Loan.	The algorithm needs to be increased efficiency to provide more accurate accuracy
9	Ridhik Jeet Singh, 2019	IEEE	Machine Learning Based Model For Prediction of Loan Approval	The methods used for checking manually for individual consumer. The prime goal is to invests their asset in safe hands.	Authors uses an ensemble technique called majority Voting Technique which combines the power of multiple models to achieve greater prediction accuracy	The accuracy obtained is 88% using the ensemble model.
10	Mir Ishark Maheer Dhruba Nawab Haider Ghani Sazzad Hossain, 2018	BRAC Univer sity	Application of Machine Learning in Credit risk Assessment	A precise credit risk assessment system is vital to financial institution for its proper and impeccable functioning. (RFECV, PCA)	This Model has brought about remarkable results which in turn can play major role in assessing credit risk of borrowers and enable all the worldwide financial institutions to keep operating in profitable way.	The platform cannot give basic details of consumer credits.

2.3 Problem Statement Definition

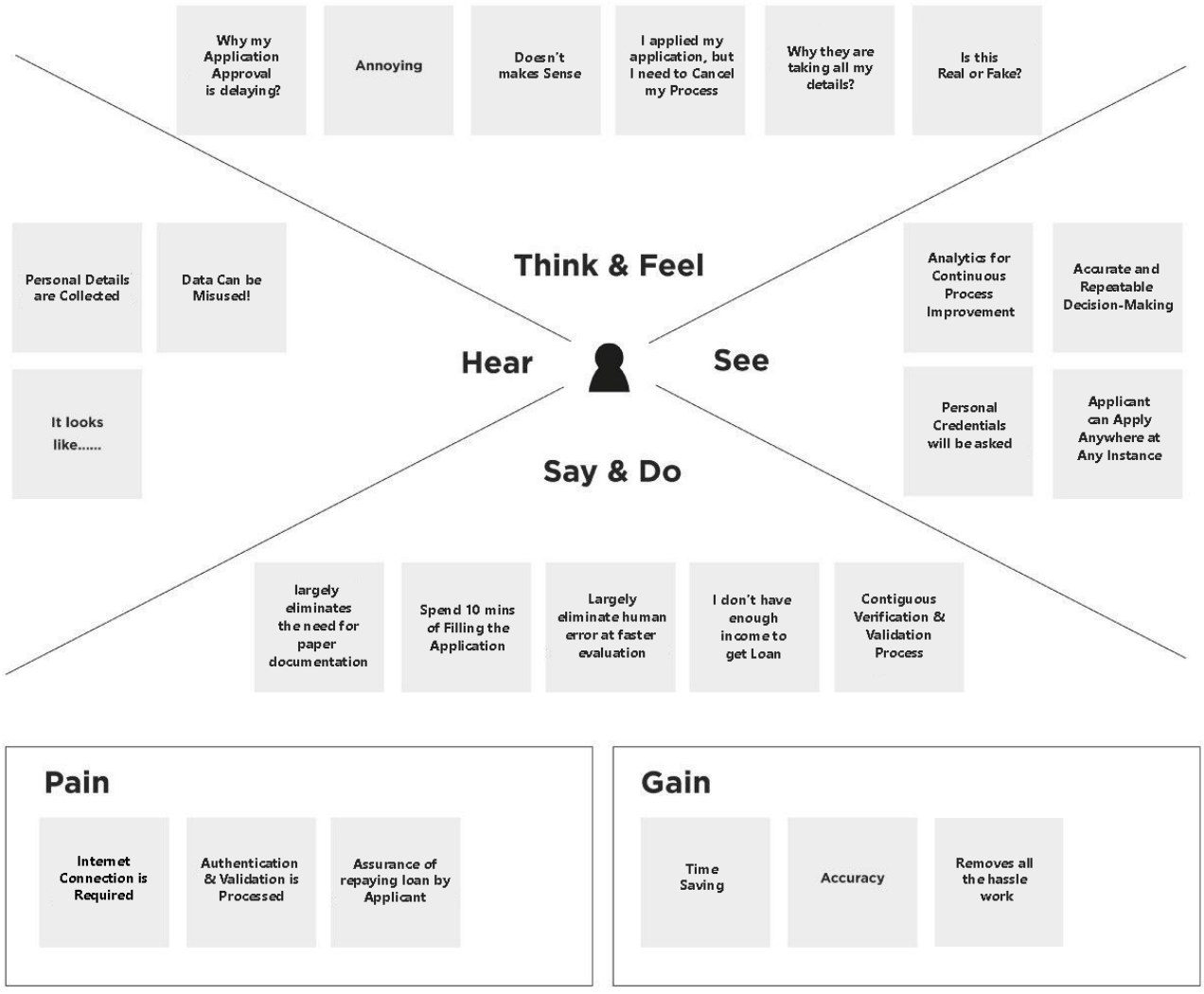
Money Lender

Debtor

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Money Lender	Approve Loan Application	It consumes lot of time and effort	There is a problem in approving huge number of applications and has a lot of risk in loss	Pressurized and Frustrated
PS-2	Debtor	Borrow money from bank	It consumes lot of time and effort	There is a huge delay in approving loan	Pressurized

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Brainstorm

Brainstorm & idea prioritization

TOPIC:
Smart Lender Applicant Credibility Prediction for Loan Approval

Prioritize Decision making system

1

Define your problem statement

PROBLEM

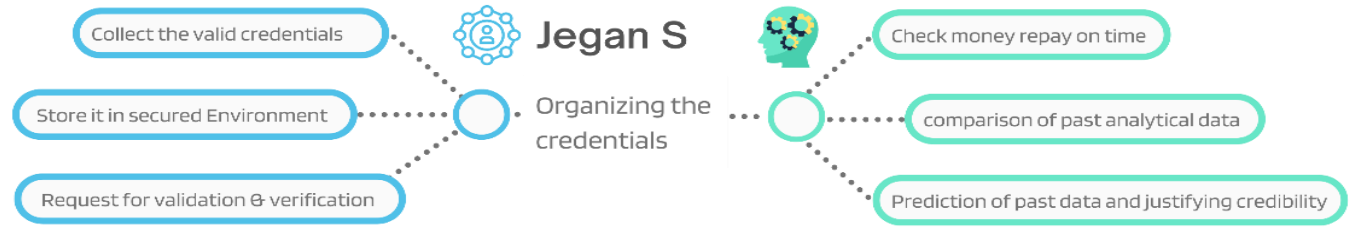
Running an online lending organization in the digital age can be wildly complex. Sanctioning loans, Transaction, and Other lending prospects over internet need to encourage qualified and credibility. while sanctioning, one should have surety of getting their money back along with interest in it. so they need to know credibility and justification of client completely. However, going through several factors consumption of time in approval of Loan Application is a big pain. Moreover our Solution provides the efficient progress.

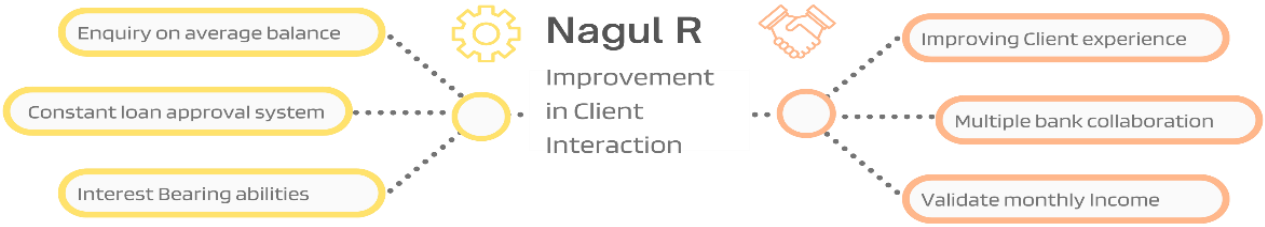
Key rules of brainstorming

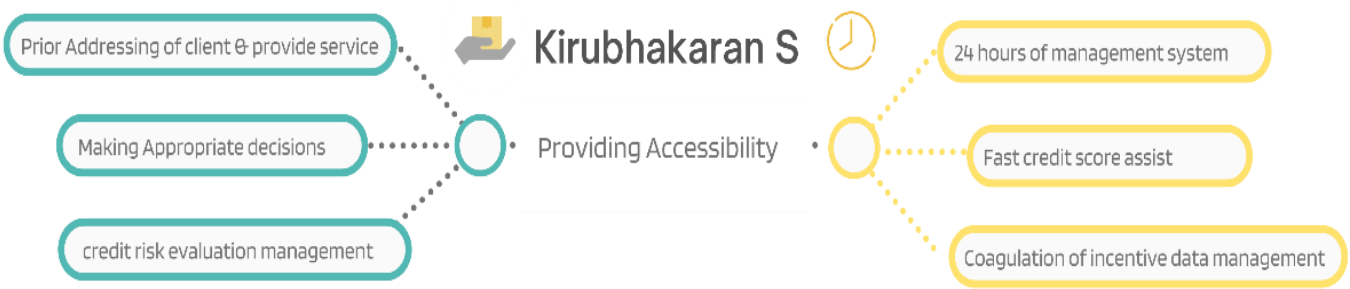
To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping





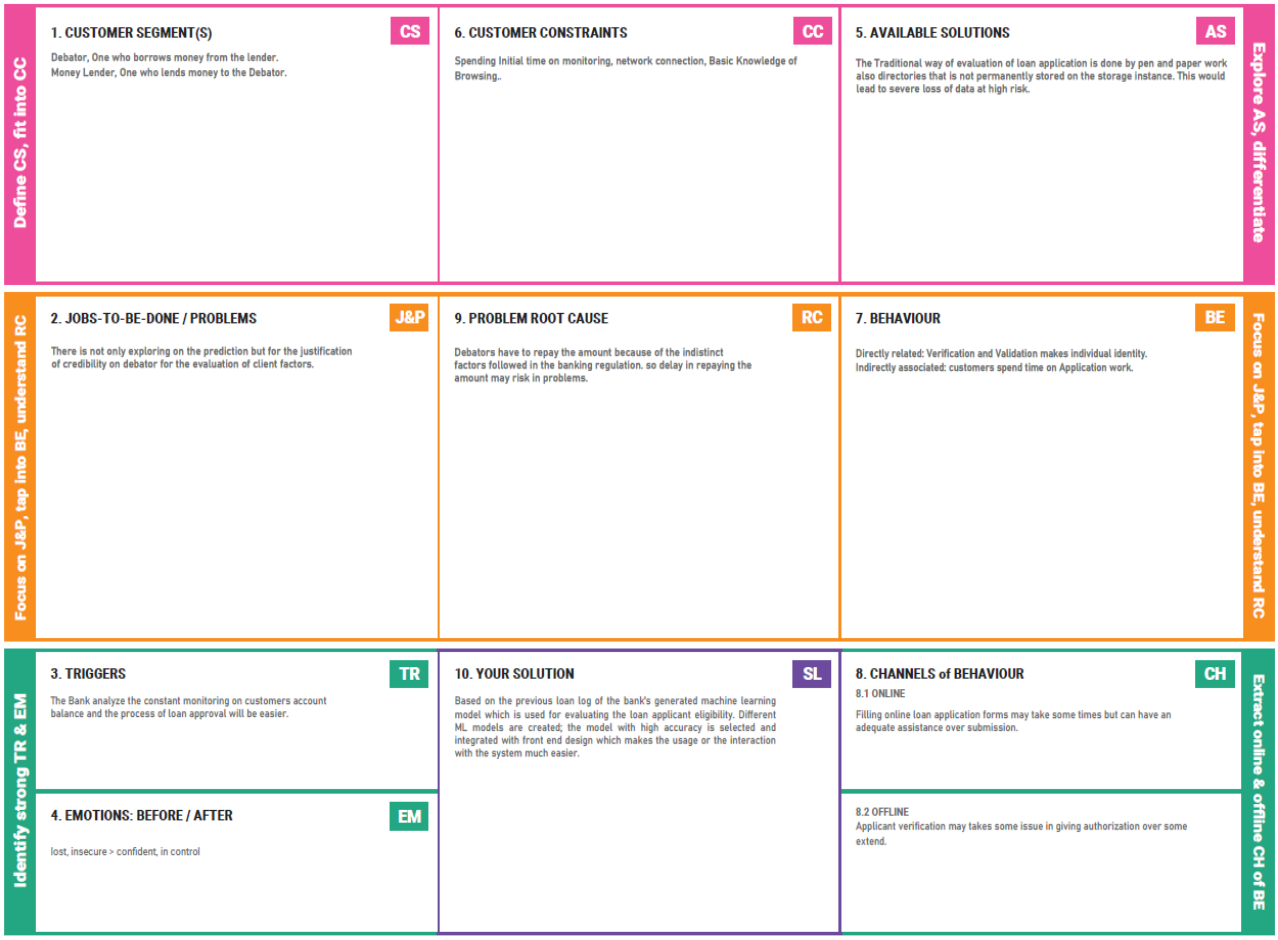


Step-3: Idea Priortization

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Running an online lending organization in the digital age can be widely complex. Sanctioning loans, Transaction and Other lending prospects over internet need to encourage qualified and credibility. But By engaging several factors and making predictive decisioning model on deciding justification of credibility of loan approval by reducing their consumption of time. Henceforth, provides the efficient way of evaluation progress.
2.	Idea / Solution description	Our Solution presents Machine Learning techniques (Naïve Bayes Algorithm) which can be used to perform such classifications of the entity as they are very crucial and useful in the prediction of these types of structured data. Classification algorithms such as Naïve Bayes Algorithm, Decision tree, Random-forest, KNN, Xgboost and SVM is used. The train-test split data is trained and tested with these algorithms and finally, the predictive model is selected and saved in pkl format. Then, flask integration and IBM cloud DB2 storage deployment is done.
3.	Novelty / Uniqueness	The Solution model is used to get intact with the satisfactory classification of predicting individual loan application.
4.	Social Impact / Customer Satisfaction	This application helps for the ease of time efficient constraint both from the Debator and Money Lender in huge number of application.
5.	Business Model (Revenue Model)	This application is used on the basis of subscription constraint on the bank prospects and leverage most of the debator at one cost of instance.
6.	Scalability of the Solution	The User Interface of the application is the integration of flask interface templates. The pickle model is the integration of deployment templates. The bank end uses the flask integration.

3.4 Problem Solution Fit



4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Online Form Application Registration through Virtual Mode
FR-2	User Confirmation	Confirmation via Email and Bank respective Confirmation via OTP to the corresponding Bank Connected Phone number
FR-3	User Login	Username and Password is given for the respective person and making them available to use their Lending System.
FR-4	Encryption Process	Cryptography Fernet Encryption process is used for further implementation of Data Hiding

4.2 Non-functional Requirements:

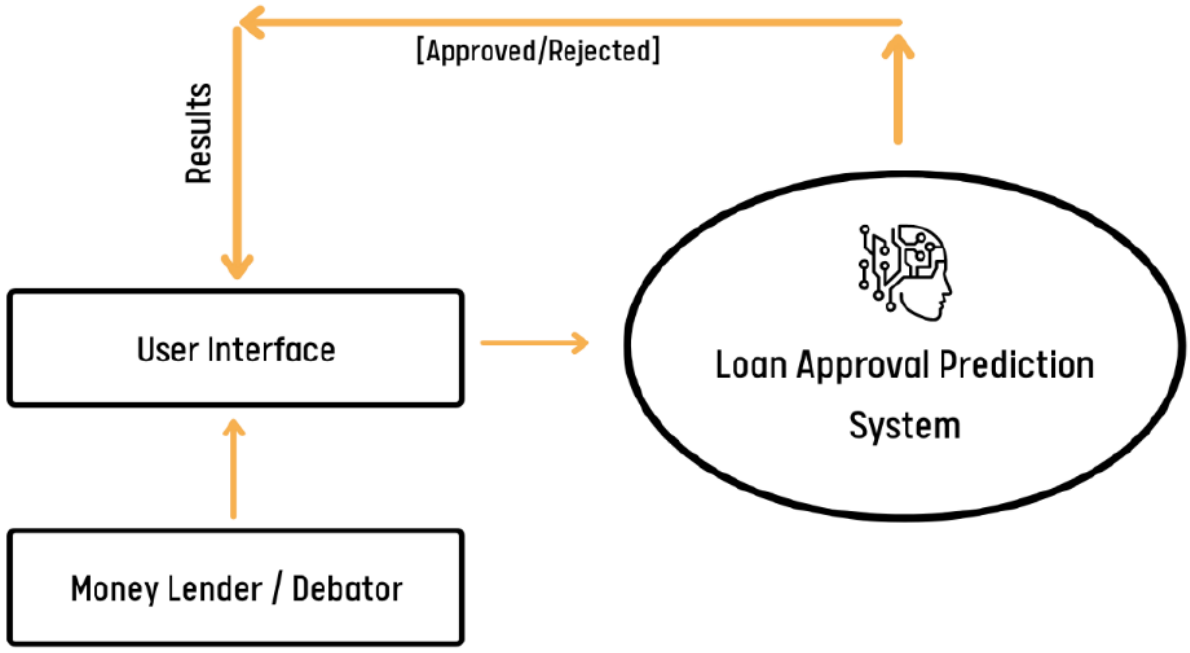
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	There is no need of One-to-One conversation.
NFR-2	**Security**	Cryptography-Fernet process is used for security purpose
NFR-3	**Reliability**	It makes Users saves time effectively
NFR-4	**Performance**	Overall performance withstands Traditional Method of loan approval
NFR-5	**Availability**	24hr service is available for the Loan Approval System.
NFR-6	**Scalability**	It achieve more accuracy and more number of application within a fixed time in deciding them whether application gets approved or not.

5. PROJECT DESIGN

5.1. Data Flow Diagram

Smart Lender Applicant Credibility Prediction for Loan Approval:

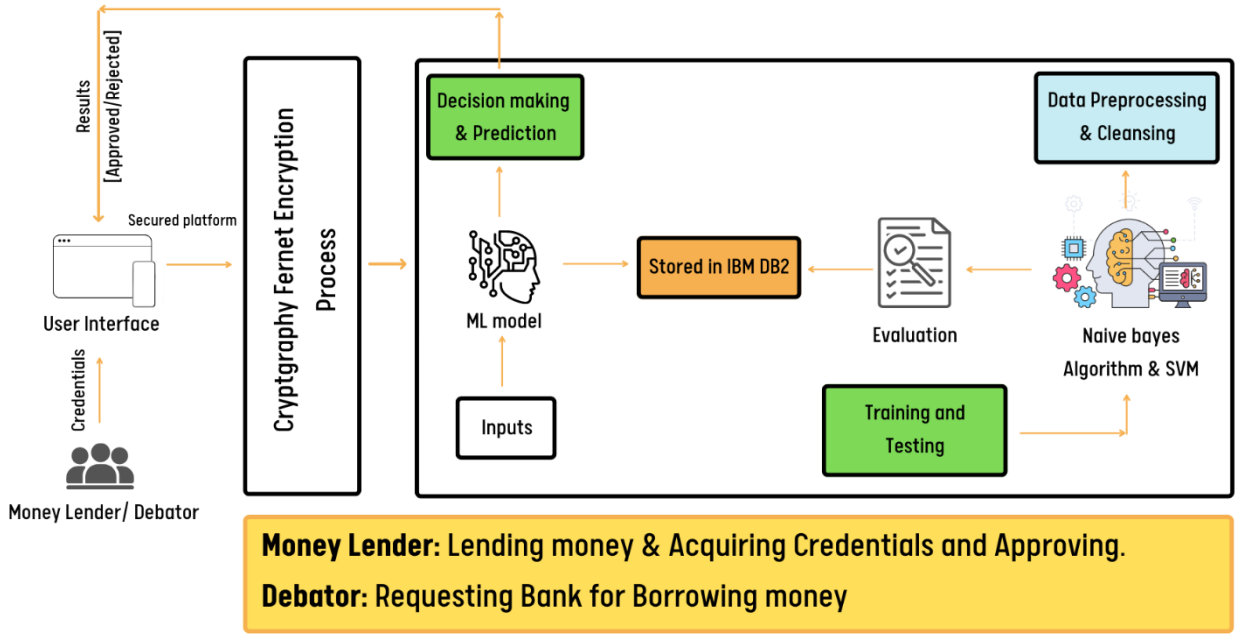


5.2. Solution & Technical Architecture

Solution Architecture

1st Level DFD Data flow:

1. User open the application then the homepage is appear.
2. User open the login/Register page from Homepage.
3. User can register through email id and password.
4. User is redirected to the Homepage once they login.
5. User open the loan page.
6. User enters the required details for loan approval prediction.
7. Result will be displayed in the result page.



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Home Page	USN - 1	Loan approval prediction description	I can view /access my homepage.	Low	Sprint - 3
		USN - 2	Information about the credibility details required for the prediction		Low	Sprint - 3
	User Register	USN - 3	Enter Email ID and other personal details required for Register.	I can successfully register by receiving mail.	Medium	Sprint - 2
	User Login	USN - 4	Uses Email ID and Password for login	I have successfully logged in.	Medium	Sprint - 2
	Loan approval Form	USN - 5	Credibility details required for loan should be entered for prediction.	I can access the customer details form	High	Sprint - 1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Result	USN - 6	Results will be displayed.	I got my result successfully.	High	Sprint - 1
		USN - 7	• If Approved, The information about what is done to be next is displayed. • If Not approved, The information about which rejection criteria you are not eligible for the loan is displayed.	I got useful information	Low	Sprint - 4

6. Project Planning & Scheduling

6.1 Sprint Planning & Estimation

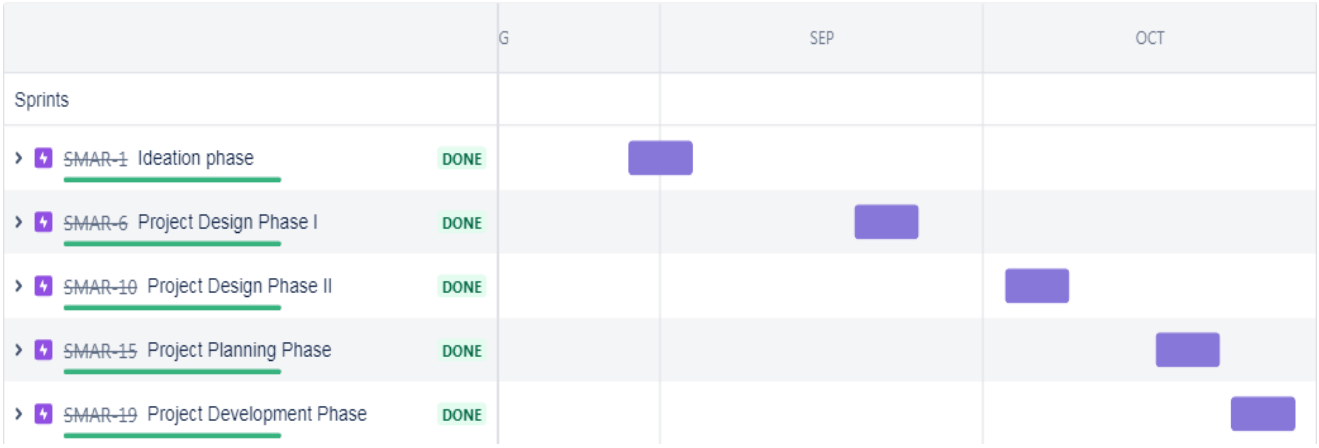
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	ML model	USN-10	Get the Dataset for training.	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-1		USN-11	Pre-Process the Dataset	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-1		USN-12	Train the Model	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-1		USN-13	Optimize the Model	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-2		USN-14	Connect Model to User Interface	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-2	Customer User Interface	USN-1	As a user, I can view the web application and I am able to interact with it	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-2		USN-2	As a user,I will able to enter the details of customer who I'm looking to appraise	3	High	Jegan, Kirubhakaran, Nagul, Maheshwaran

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2		USN-3	As a user, I can add or change the parameters list to accommodate for the unavailability of a specific data.	2	Medium	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-3		USN-4	As a user, I can ask for the data's prediction store at any time.	2	Medium	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-3		USN-5	As a user, I can request for mail transcript of the Prediction along with the details given at the time to the specified email id.	2	Medium	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-3		USN-6	As a user, I should be able to submit some feedback on the website.	1	Low	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-4	Admin User Interface	USN-7	As ana admin, I can look at the past prediction stored in the cloud.	1	Low	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-4		USN-8	As an Admin, I can look at the user feedbacks.	1	Low	Jegan, Kirubhakaran, Nagul, Maheshwaran
Sprint-4		USN-9	As an admin, I can tweak the ML model.	1	Low	Jegan, Kirubhakaran, Nagul, Maheshwaran

6.2 Sprint Delivery Schedule & Project Tracker:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	12	9 Days	24 Oct 2022	01 Oct 2022	12	29 Oct 2022
Sprint-2	11	8 Days	01 Oct 2022	08 Nov 2022	11	29 Oct 2022
Sprint-3	5	5 Days	08 Nov 2022	12 Nov 2022	5	29 Oct 2022
Sprint-4	3	5 Days	12 Nov 2022	16 Nov 2022	3	29 Oct 2022

6.3 Reports from JIRA



7. Coding & Solutioning

7.1 Feature 1

- Analyzed university admission Statistics
- Developed tools for Classifying Loan Approval Using Analytical Processing.
- Language : Python, Node js
- Tools/IDE : Jupyter Notebook, Spyder
- Libraries : Tensorflow, Keras, Sklearn, Seaborn

```
sever1.js   Machine Learning Model Dev.ipynb   mainserver.py
mainproject > mainserver.py > ...
from flask import Flask,redirect,url_for,request,jsonify, render_template
# Data manipulation
import pandas as pd
# Matrices manipulation
import numpy as np
# Script logging
import logging
# ML model
import joblib
# JSON manipulation
import json
# Utilities
import sys
import os

import json
import requests
from cryptography.fernet import Fernet
import mysql.connector
def sample(e,r1):
    a=["http://localhost:8084/","http://localhost:8081/","http://localhost:8082/","http://localhost:8083/"]
    def datainsert(a):
        mydb = mysql.connector.connect(
          host="localhost",
          user="root",
          password="",
          database="data_protection"
        )
        mycursor = mydb.cursor()

        sql = "INSERT INTO data (emailid,password1,password2,password3,password4,key1,key2,key3,key4) VALUES (%s,%s,%s,%s,%s,%s,%s,%s,%s)"
        val = (a,"","","","","","","","")
        mycursor.execute(sql, val)

        mydb.commit()
    def sep(s):

        c=int(len(s)/4)
        k=c
        data=[]
        i=0
        for j in range(4):
            if (j==3):
                data.append(s[i:])
            else:
                data.append(s[i:c])
                i=i+k
                c=c+k
```

```
mainproject > mainserver.py > ...
            return data

    def encrypt(message):
        data=[]
        key = Fernet.generate_key()
        print(key)
        data.append(key)
        fernet = Fernet(key)
        encMessage = fernet.encrypt(message.encode())
        print(encMessage)
        data.append(encMessage)
        return data
    data=encrypt(r1)
    password=sep(data[1])
    key=sep(data[0])

    def postdata(a,b,c):
        response=requests.post(a,{
            "email":e,
            "password":b,
            "key":c
        })
    datainsert(e)
    for i in range(4):
        postdata(a[i],password[i],key[i])
def checkpass(a1,b):
    password=[]
    key=[]
    a=["http://localhost:8084/","http://localhost:8081/","http://localhost:8082/","http://localhost:8083/"]
    for i in a:
        x = requests.get(i,data=a1)
        r=x.text.split(" ")
        print(x.text)
        password.append(r[0])
        key.append(r[1])
    password="".join(password).encode()
    key="".join(key).encode()
    f=Fernet(key)
    rp=f.decrypt(password).decode()
    if (rp==b):
        return 1
    else:
        return 0
def checkemail(a):
    mydb = mysql.connector.connect(
      host="localhost",
      user="root",
      password="",
```

```python
    )

    mycursor = mydb.cursor()

    mycursor.execute("SELECT * FROM data WHERE emailid='"+a+"'")

    myresult = mycursor.fetchall()
    if(len(myresult)!=0):
        return 1
    else:
        return 0
app = Flask(__name__)
a=[]
@app.route('/',methods=["POST","GET"])
def hello_world():
    if request.method=="POST":
        user=request.form['emails']
        user1=request.form['passwords']
        if(checkemail(user)==0):
            sample(user,user1)
            return render_template("index.html")
        elif(checkemail(user)==1):
            return redirect("http://localhost/IBM/index.php?signid=alr")
    else:
        return "success"
@app.route('/login',methods=["POST","GET"])
def hello_world1():
    if request.method=="POST":
        user=request.form['email']
        user1=request.form['password']
        if(checkemail(user)==0):
            return redirect("http://localhost/IBM/index.php?id=not")
        elif(checkpass(user,user1)==0):
            return redirect("http://localhost/IBM/index.php?pass=not")
        else:

            return render_template("index.html")
    else:
        return "success"

# Current directory
current_dir = os.path.dirname(__file__)

# Function
def ValuePredictor(data = pd.DataFrame):
    # Model name
    model_name = 'bin/xgboostModel.pkl'
    # Directory where the model is stored
```

mainproject > mainserver.py > ...

```
144     model_name = 'bin/xgboostModel.pkl'
145     # Directory where the model is stored
146     model_dir = os.path.join(current_dir, model_name)
147     # Load the model
148     loaded_model = joblib.load(open(model_dir, 'rb'))
149     # Predict the data
150     result = loaded_model.predict(data)
151     return result[0]
152 
153 # Application page
154 @app.route('/application')
155 def home():
156     return render_template('application.html')
157 
158 # Prediction page
159 @app.route('/prediction', methods = ['POST'])
160 def predict():
161     if request.method == 'POST':
162         # Get the data from form
163         name = request.form['name']
164         gender = request.form['gender']
165         education = request.form['education']
166         self_employed = request.form['self_employed']
167         marital_status = request.form['marital_status']
168         dependents = request.form['dependents']
169         applicant_income = request.form['applicant_income']
170         coapplicant_income = request.form['coapplicant_income']
171         loan_amount = request.form['loan_amount']
172         loan_term = request.form['loan_term']
173         credit_history = request.form['credit_history']
174         property_area = request.form['property_area']
175 
176         # Load template of JSON file containing columns name
177         # Schema name
178         schema_name = 'data/columns_set.json'
179         # Directory where the schema is stored
180         schema_dir = os.path.join(current_dir, schema_name)
181         with open(schema_dir, 'r') as f:
182             cols =  json.loads(f.read())
183         schema_cols = cols['data_columns']
184 
185         # Parse the categorical columns
186         # Column of dependents
187         try:
188             col = ('Dependents_' + str(dependents))
189             if col in schema_cols.keys():
190                 schema_cols[col] = 1
191             else:
```

```
            else:
                pass
        except:
            pass
        # Column of property area
        try:
            col = ('Property_Area_' + str(property_area))
            if col in schema_cols.keys():
                schema_cols[col] = 1
            else:
                pass
        except:
            pass

        # Parse the numerical columns
        schema_cols['ApplicantIncome'] = applicant_income
        schema_cols['CoapplicantIncome'] = coapplicant_income
        schema_cols['LoanAmount'] = loan_amount
        schema_cols['Loan_Amount_Term'] = loan_term
        schema_cols['Gender_Male'] = gender
        schema_cols['Married_Yes'] = marital_status
        schema_cols['Education_Not Graduate'] = education
        schema_cols['Self_Employed_Yes'] = self_employed
        schema_cols['Credit_History_1.0'] = credit_history

        # Convert the JSON into data frame
        df = pd.DataFrame(
                data = {k: [v] for k, v in schema_cols.items()},
                dtype = float
            )

        # Create a prediction
        print(df.dtypes)
        result = ValuePredictor(data = df)

        # Determine the output
        if int(result) == 1:
            prediction = 'Dear Mr/Mrs/Ms {name}, your loan is approved!'.format(name = name)
        else:
            prediction = 'Sorry Mr/Mrs/Ms {name}, your loan is rejected!'.format(name = name)

        # Return the prediction
        return render_template('prediction.html', prediction = prediction)

    # Something error
    else:
        # Return error
        return render_template('error.html', prediction = prediction)
```

```
            # Determine the output
            if int(result) == 1:
                prediction = 'Dear Mr/Mrs/Ms {name}, your loan is approved!'.format(name = name)
            else:
                prediction = 'Sorry Mr/Mrs/Ms {name}, your loan is                    e)
                                                                    (variable) prediction: str
                                                                    (variable) prediction: str
            # Return the prediction
            return render_template('prediction.html', prediction = prediction)

        # Something error
        else:
            # Return error
            return render_template('error.html', prediction = prediction)


if __name__ == '__main__':
    app.run(debug = True)
```

7.2 Feature 2

index.html

```
<!DOCTYPE html>
<html>
<head>
<title>Home page | Teckton</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<!-- <link rel="stylesheet" href= "{{ url_for('static',filename='styles/style.css') }}"> -->

<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css">
<script src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.16.0/umd/popper.min.js"></script>
<script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js"></script>

<link rel="stylesheet" href="../static/styles/style.css">
<style>
    body{
        margin-top: 0;
    }
</style>
</head>

<body >
    <div class="dropdown">
    <nav>
        <h4>IBM Loan Lender</h4>
        <ul>
            <li><a href="/">Home</a></li>
            <li><a href="#">Blog</a></li>
            <li><a href="#">Account</a>
                <ul class="dropdwn">
                    <li><a href="#">My Profile</a></li>
                    <li><a href="#">Log Out</a></li>
                </ul>
            </li>
            <li><a href="#">About</a>
                <ul class="dropdwn">
                    <li><a href="#">Developer</a></li>
                    <li><a href="#">Preference</a></li>
                    <li><a href="#">reference</a></li>
                </ul>

            </li>
        </ul>
    </nav>
    </div>
    <div class="container mt-4"></div>
    <div class="container-expl">
        <small style="font-size: 30px;">Welcome to Our</small>
```

```
            </li>
        </ul>
    </nav>
    </div>
    <div class="container mt-4"></div>
    <div class="container-expl">
        <small style="font-size: 30px;">Welcome to Our</small>
            <br>
        <h1 style="color:#2f3c6e; letter-spacing: 1.5px;">IBM Smart Loan Lender Interface</h1>

        <div style="width: 530px; font-size: medium;">
            <p style="text-align: justify;">Digitalized Loan Approval Application Using XGBoost Algorithm. Apply Loan Comfortly from home without paper documents
            Cryptography-Fernet Encryption Helps us to improve the performance of the application.
            </p>
        </div>
        <br>
        <form action="http://127.0.0.1:5000/application">
            <button class="butn" >Apply Loan Application</button>
        </form>

    </div>
    <div class="choose-file">
        <img src="../static/images/banner.png"  alt="">
    </div>
    <script type="text/javascript">
        const actualBtn = document.getElementById('actual-btn');

        const fileChosen = document.getElementById('file-chosen');

        actualBtn.addEventListener('change', function(){
          fileChosen.textContent = this.files[0].name
        })
    </script>
</body>
</html>
```

mainproject > templates > prediction.html > ...

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Result of Application</title>

    <!-- Font Icon -->
    <link rel="stylesheet" href="../static/fonts/material-icon/css/material-design-iconic-font.min.css">
    <!-- Main css -->
    <link rel="stylesheet" href="../static/styles/prediction.css">
</head>
<body>

    <div class="main">

        <!-- Prediction status -->
        <section class="sign-in">
            <div class="container">
                <div class="signin-content" >
                    <div class="signin-image">
                        <figure><img src="../static/images/loan-manager.jpg" alt="Loan-Status image"></figure>
                    </div>

                    <div class="signin-form">
                        <h2 class="form-title" style="font-size:2rem ;">Application Status</h2>
                        <a style="text-align:justify;">Our Loan approval system will give you the most effective classification of loan approval status according to the Debat
                        </br></br> <b style="color: red;">{{ prediction }}</b>

                        </br></br>
                        <div class="form-group">
                            <label for="agree-term" class="label-agree-term"><span><span></span></span>
                                <a href="{{url_for('home')}}" class="term-service">Back to Home</a>
                            </label>
                        </div>
                    </div>
                </div>
            </div>
        </section>

    </div>

</body>
</html>
```

Prediction.html

mainproject > templates > prediction.html > ...

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Result of Application</title>

    <!-- Font Icon -->
    <link rel="stylesheet" href="../static/fonts/material-icon/css/material-design-iconic-font.min.css">
    <!-- Main css -->
    <link rel="stylesheet" href="../static/styles/prediction.css">
</head>
<body>

    <div class="main">

        <!-- Prediction status -->
        <section class="sign-in">
            <div class="container">
                <div class="signin-content" >
                    <div class="signin-image">
                        <figure><img src="../static/images/loan-manager.jpg" alt="Loan-Status image"></figure>
                    </div>

                    <div class="signin-form">
                        <h2 class="form-title" style="font-size:2rem ;">Application Status</h2>
                        <a style="text-align:justify;">Our loan approval system will give you the most effective classification of loan approval status according to the Debat
                        </br></br> <b style="color: red;">{{ prediction }}</b>

                        </br></br>
                        <div class="form-group">
                            <label for="agree-term" class="label-agree-term"><span><span></span></span>
                                <a href="{{url_for('home')}}" class="term-service">Back to Home</a>
                            </label>
                        </div>
                    </div>
                </div>
            </div>
        </section>

    </div>

</body>
</html>
```

Application.html

```
mainproject > templates > <> application.html > ...
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Loan Approval Prediction</title>

    <!-- Font Icon -->
    <link rel="stylesheet" href="../static/fonts/material-icon/css/material-design-iconic-font.min.css">

    <!-- Main css -->
    <link rel="stylesheet" href="../static/styles/styleloan.css">
</head>
<body>
    <div class="main">

        <!-- Applicant form -->
        <section class="signup">
            <div class="container">
                <div class="signup-content">
                    <div class="signup-form">
                        <h2 class="form-title">Fill the Loan Application</h2>
                        <form action="http://127.0.0.1:5000/prediction" method="POST" class="register-form" id="register-form">
                            <h3>Enter Valid Details</h3>
                            <!-- Name -->
                            <div class="form-group">
                                <label for="name"><i class="zmdi zmdi-account material-icons-name"></i></label>
                                <input type="text" name="name" id="name" placeholder="Your Name" required/>
                            </div>
                            <!-- Birthdate -->
                            <div class="form-group">
                                <label for="birthdate"><i class="zmdi zmdi-calendar"></i></label>
                                <input type="date" name="birthdate" id="birthdate" placeholder="Your Birthdate" required/>
                            </div>
                            <!-- Gender -->
                            <div class="form-group">
                                <label for="gender"><i class="zmdi zmdi-accounts"></i></label>
                                <select name="gender" id="gender" placeholder="Your Gender" required>
                                    <option value="" disabled selected>Your Gender</option>
                                    <option value="1">Male</option>
                                    <option value="0">Female</option>
                                </select>
                            </div>
                            <!-- Education -->
                            <div class="form-group">
                                <label for="education"><i class="zmdi zmdi-book"></i></label>
                                <select name="education" id="education" placeholder="Your Education" required>
```

7.3 Database Schema

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Loan_ID	Gender	Married	Dependen	Education	Self_Empl	ApplicantI	Coapplicar	LoanAmou	Loan_Amo	Credit_His	Property_A	Loan_Status	
2	LP001002	Male	No	0	Graduate	No	5849	0		360	1	Urban	Y	
3	LP001003	Male	Yes	1	Graduate	No	4583	1508	128	360	1	Rural	N	
4	LP001005	Male	Yes	0	Graduate	Yes	3000	0	66	360	1	Urban	Y	
5	LP001006	Male	Yes	0	Not Gradu	No	2583	2358	120	360	1	Urban	Y	
6	LP001008	Male	No	0	Graduate	No	6000	0	141	360	1	Urban	Y	
7	LP001011	Male	Yes	2	Graduate	Yes	5417	4196	267	360	1	Urban	Y	
8	LP001013	Male	Yes	0	Not Gradu	No	2333	1516	95	360	1	Urban	Y	
9	LP001014	Male	Yes	3+	Graduate	No	3036	2504	158	360	0	Semiurban	N	
10	LP001018	Male	Yes	2	Graduate	No	4006	1526	168	360	1	Urban	Y	
11	LP001020	Male	Yes	1	Graduate	No	12841	10968	349	360	1	Semiurban	N	
12	LP001024	Male	Yes	2	Graduate	No	3200	700	70	360	1	Urban	Y	
13	LP001027	Male	Yes	2	Graduate		2500	1840	109	360	1	Urban	Y	
14	LP001028	Male	Yes	2	Graduate	No	3073	8106	200	360	1	Urban	Y	
15	LP001029	Male	No	0	Graduate	No	1853	2840	114	360	1	Rural	N	
16	LP001030	Male	Yes	2	Graduate	No	1299	1086	17	120	1	Urban	Y	
17	LP001032	Male	No	0	Graduate	No	4950	0	125	360	1	Urban	Y	
18	LP001034	Male	No	1	Not Gradu	No	3596	0	100	240		Urban	Y	
19	LP001036	Female	No	0	Graduate	No	3510	0	76	360	0	Urban	N	
20	LP001038	Male	Yes	0	Not Gradu	No	4887	0	133	360	1	Rural	N	

8. Testing

8.1 Test Cases

For checking the loan application, We have two test

- Eligible
- Not eligible

This is based on the training and testing the model we used in our application.

- This is based on the training and testing the model we used in our application.
- This eligibility can be checked by using the details entered by the users. This includes the details like
- Gender
- Status
- Dependants
- Education
- Employ
- Income
- Co-income(additional income)
- Loan amount
- Loan amount term(in days)
- Credit history
- Property area(type of location)

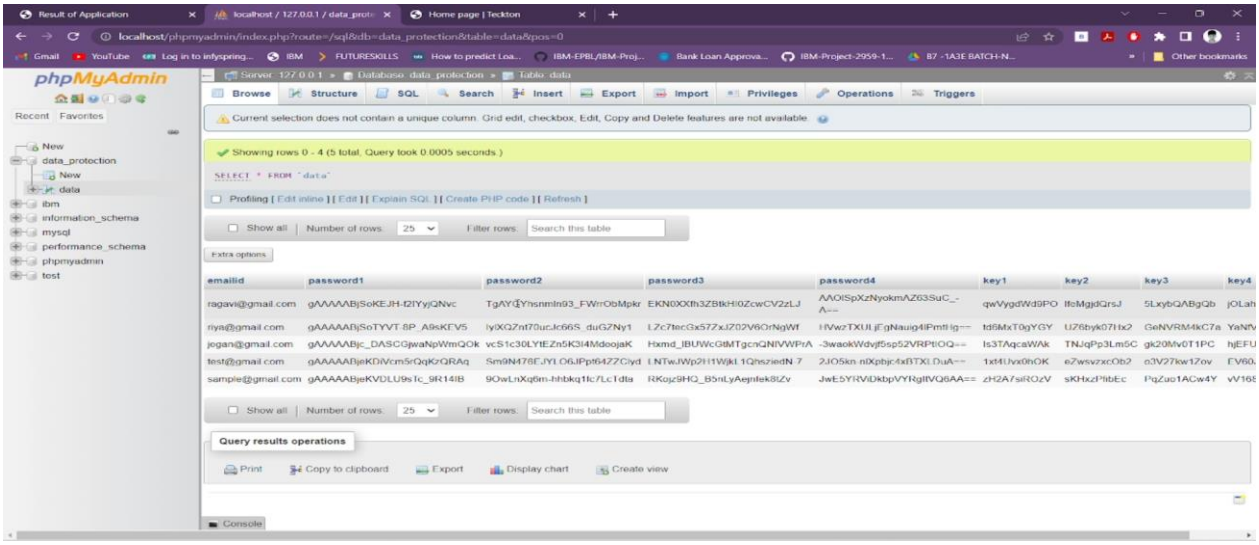
User Acceptance Testing

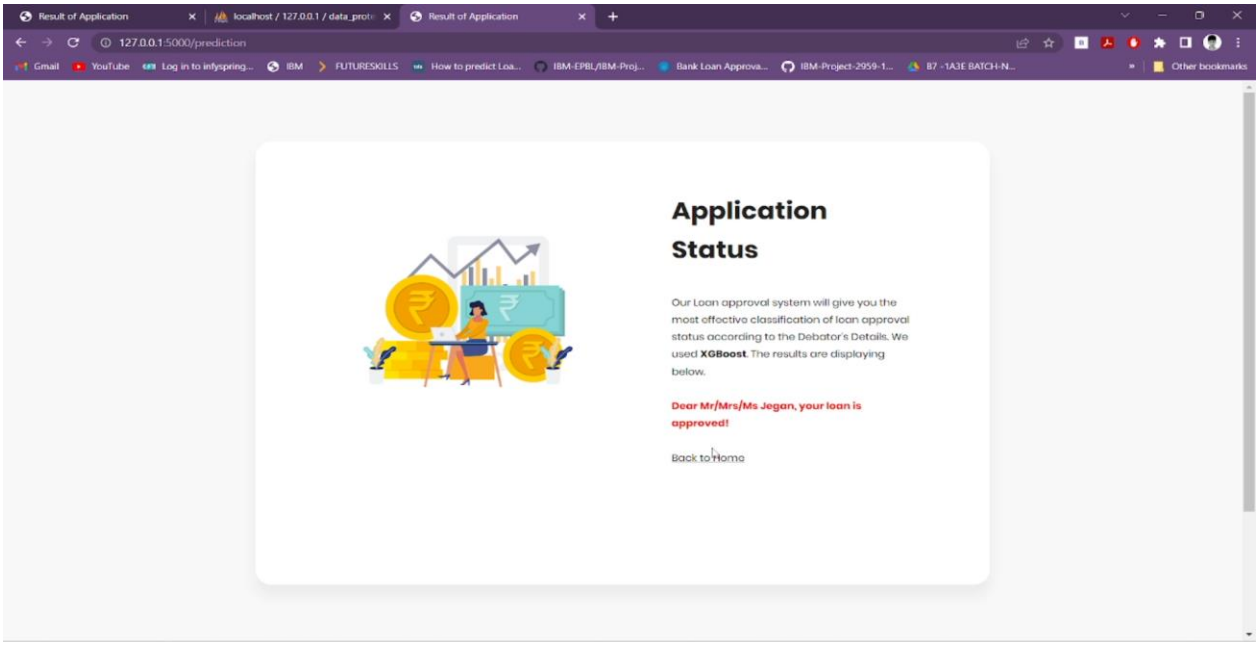
- **Purpose Of Document:** The purpose of this document is to briefly explain the test coverage and open issues of the [Smart Lender - Applicant Credibility Prediction for Loan Approval] project at the time of the release to User AcceptanceTesting(UAT).
-
- **Defect AnalysiS:** This report shows the number of resolved or closed bugs ateach severity level, and how they were resolved.

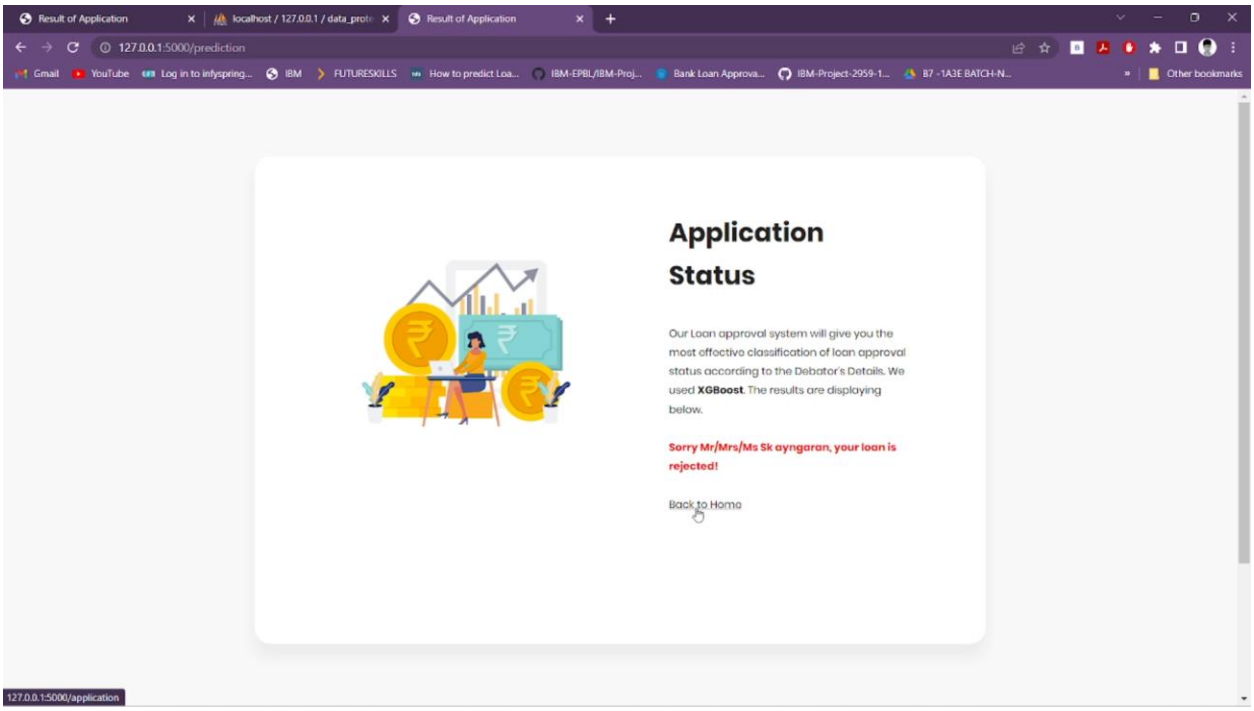
	Total StoryPoints	**Duration**	**Sprint Start Date**	**Sprint End Date(Planned)**	**Story Point Completed(as an planned end date)**	**Sprint Release Date(Actual)**
Sprint-1	10	9 Days	21 Oct2022	30 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	11	6 Days	06 Nov2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	19	6 Days	12 Nov 2022	19 Nov 2022	19	19 Nov 2022

9. RESULTS
9.1 Performance Metrics

FIS Financial View, for example, compiles useful indicators and KPIs and then helps organize and explain them so you can react to trends, uncover performance possibilities, and monitor financial health. In bank laon prediction, the upside of the framework is that we present the prerequisites as a calculation, and while confirming the subtleties, we decide the necessities that have beenendorsed and that meet the rerequisites of the unlawful client.







Evaluating Performance Of The Models:

When compared with all other algorithms Random Forest Algorithm has the highest accuracy of 0.8285714285714286. By using this algorithm ,we obtain the prediction for the loan approval or rejection.
F1-Score:
0.831333
Mean:
0.91

10.ADVANTAGE AND DISADVANTAGES

10.1 ADVANTAGES

- Provide a better user experience by improving the speed and accuracy of loan applications.
- Process a larger number of loan applications with existing resources.
- Largely eliminate human error while making faster, better-quality evaluation decisions.
- Establish predictable, repeatable, and auditable processes that support compliance.
- Reduce delays and costs associated with paper processes.

- Analyze process and loan performance to continually improve efficiency and profitability.

10.2 DISADVANTAGES

- Strict eligibility criteria. One of the major disadvantages of a bank loan is that banks can be cautious about lending to small businesses. …
- Lengthy application process. …
- Not suitable for ongoing expenses. ...
- Secured loans carry risk.

11.CONCLUSION

This application is working properly and meeting to all Banker requirements. This component can be easily plugged in many other systems. It works correctly and fulfills all requirements of bankers and can be connected to many other systems. There were multiple malfunctions in the computers, content errors and fixing of weight in computerized prediction systems.In the near term, the banking software could be more reliable, accurate, and dynamic in nature and can be fit in with an automated processing unit. There have been numbers cases of computer glitches, errors in content and most important weight of features is fixed in automated prediction system more secure, reliable and dynamic weight adjustment. The system is trained on old training dataset in future software can be made such that new testing date should also take part in training data after some fix time. Machine learning helpsto understand the factors which affect the specific outcomes most. Other models like neutral network and discriminate analysis can be used individually or combined for enhancing reliability and accuracy prediction.

12.FUTURE SCOPE

The Future scope of this project is very broad.Few of them are

- This can be implemented in less time for proper loan approval.
- This application can be accessed anytime anywhere, The internet connection is need to connect with the application.
- The user need not to travel long distance for apply any kind of loans in bank.
- The scope of this project is smart lendor application that allow the user to enter certain details about what kind of loan that the corresponding user want .
- By using this application the future banking system will be automotive process so the process will not require any manpower.
- It reduce time process for applying the loan.