Smart Lender - Applicant Credibility Prediction For Loan Approval

Project Report

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Chapter 1: INTRODUCTION

1.1 Project Overview

A loan is the core business part of banks. Bank Loan approval is a very important process for banking organizations. A The main portion the bank's profit is directly come from the profit earned from the loans. Recovery of loan is a major contributing parameter in the financial statements of a bank. It is very difficult to predict the possibility of repayment of loan by the customer. In recent years many researchers worked on loan approval prediction systems.

1.2 Purpose

Nowadays, the loan companies permit a loan after a very long process of verification and validation. However, they still don't have assurance that the applicant can return the loan amount without facing any difficulty. In banking industry, they have many products to sell but main source of income of any bank is on its credit line. so that they can earn from interest of these loans which they credits. A bank's profit or a loss depends to an outsized extent on loans i.e. whether the loan customers are paying back the loan or defaulting. By introducing the loan defaulters, the bank can reduce its Nonperforming Assets. This makes the study of this phenomenon vital. Previous research during this era has shown that there are numerous methods to check the matter of controlling loan default. But as the right predictions are vital for the maximization of profits, it's essential to study the character of the various methods and their comparison. Though bank approves loan after a regress process of verification and testimonial but still there's no surety whether the chosen hopeful is the right hopeful or not. This process takes fresh time while doing it manually. We can prophesy whether that particular hopeful is safe or not and the whole process of testimonial is automated by machine literacy style. Loan Prognostic is really helpful for retainer of banks as well as for the hopeful also.

In recent years many researchers worked on loan approval prediction systems. In the System Machine Learning (ML) techniques are very useful in predicting outcomes for large amount of data. In this paper two machine learning algorithms, Support Vector Machine (SVM) and Random Forest (RF) are applied to predict the loan approval of customers.

Chapter 2: LITERATURE SURVEY

2.1 Existing problem

[1] In 2019, Vimala and Sharmili proposed a loan prediction model using and Support Vector Machines(SVM)methods. Naïve Bayes, an independent speculation approach, encompasses probability theory regarding the data classification. On the other hand, SVM uses statistical learning model for classification of predictions. Dataset from UCI repository with 21 attributes was adopted to evaluate the proposed method.

[2] In 2019, Jency, Sumathi and Shiva Sri proposed an Exploratory Data Analysis(EDA) regarding the loan prediction procedure based on the client's nature and their requirements. The major factors concentrated during the data analysis were annual income versus loan purpose, customer 's trust, loan tenure versus delinquent months, loan tenure versus credit category, loan tenure versus number of years in the current job, and chances for loan repayment versus the house ownership. Finally, the outcome of the present work was to infer the constraints on the customer who are applying for the loan followed by the prediction regarding the repayment. Further, results showed that, the customers were interested more on availing short-tenure loans rather than long-tenure loans.

[3] In 2019, Supriya, Pavani, Saisushma, Vimala Kumari and Vikas presented a ML based loan prediction model. Themodulesin the present approach were data collection and pre-processing, applying the ML models, training followed by testing the data. During the pre-processing stage, the detection and removal of outliers and imputation removal processing were carried out. In the present method, SVM, DT, KNN and gradient boosting models were employed to predict the possibilities of current status regarding the loan approval process. The conventional 80:20 rule was adopted to split the dataset into training and testing processes.

[4] In 2017, Goyal and Kaur presented a loan prediction model using several Machine Learning (ML) algorithms. The dataset with features, namely, gender, marital status, education, number of dependents, employment status, income, co applicant's income, loan amount, loan tenure, credit history, existing loan status, and property area, are used for determining the loan eligibility regarding the loan sanctioning process. Various ML models adopted in the present method includes, Linear model, Decision Tree (DT), Neural Network (NN), Random Forest (RF), SVM, Extreme learning machines, Model tree, Multivariate Adaptive Regression Splines, Bagged Cart Model, NB and TGA.

[5] In 2016, Aboobyda Jafar Hamid and Tarig Mohammed Ahmed presented a loan risk prediction model based on the data mining techniques, such as Decision Tree (J48), Naïve Bayes (NB) and BayseNet approaches. The procedure followed was training set preparation, building the model, Applying the model and finally. Evaluating the accuracy.This approach was implemented using Weka Tool and considered a dataset with eight attributes, namely, gender, job, age, credit amount, credit history, purpose, housing, and class.

[6] In 2016, Kacheria, Shivakumar, Sawkar and Gupta suggested a loan sanctioning prediction procedure based on NB approach integrated with K-Nearest Neighbor (KNN) and binning algorithms. The seven parameters considered were income, age, profession, existing loan with its tenure, amount and approval status. The sub-processes include, Pre-processing (handling the missing values with KNN and data refinement using binning algorithm), Classification using NB approach and Updating the dataset frequently results in appropriate improvement in the loan prediction process.

[7] In 2016, Goyal and Kaur suggested an ensemble technique based loan prediction procedure for the customers. The sub processes in the present method includes, data collection, filtering the data, feature extraction, applying the model, and finally analysis the results. The various loan prediction procedures implemented in the present method were Random Forest (RF), SVM and Tree model with Genetic Algorithm (TGA). The parameters considered for evaluating the models were accuracy, Gini Coefficient, Area Under Curve (AUC), Receiver Operating Curve (ROC), Kolmogorov - Smirnov (KS) Chart, Minimum Cost - Weighted Error Rate, Minimum Error Rate, and K-Fold Cross Validation parameters.

2.2 References

[1] S. Vimala, K.C. Sharmili, —Prediction of Loan Risk using NB and Support Vector Machine‖, International Conference on Advancements in Computing Technologies (ICACT 2018), 2018

[2] X. Francis Jency, V.P.Sumathi, Janani Shiva Sri, —An Exploratory Data Analysis for Loan Prediction Based on Nature of the Clients‖, International Journal of Recent Technology and Engineering (IJRTE), 2018

[3] Pidikiti Supriya, Myneedi Pavani, Nagarapu Saisushma, Namburi Vimala Kumari, K. Vikas, —Loan Prediction by using Machine Learning

[4] Anchal Goyal, Ranpreet Kaur, —Accuracy Prediction for Loan Risk using Machine Learning Models‖,International Journal of Computer Science Trends and Technology (I JCST) , Jan-Feb 2017

[5] Aboobyda Jafar Hamid and Tarig Mohammed Ahmed, —Developing Prediction Model of Loan Risk in Banks using Data Mining‖, Machine Learning andApplications: An International Journal (MLAIJ), March 2016

[6] Aditi Kacheria, Nidhi Shivakumar, Shreya Sawkar, Archana Gupta, Loan Sanctioning Prediction System, International Journal of Soft Computing and Engineering (IJSCE), 2016

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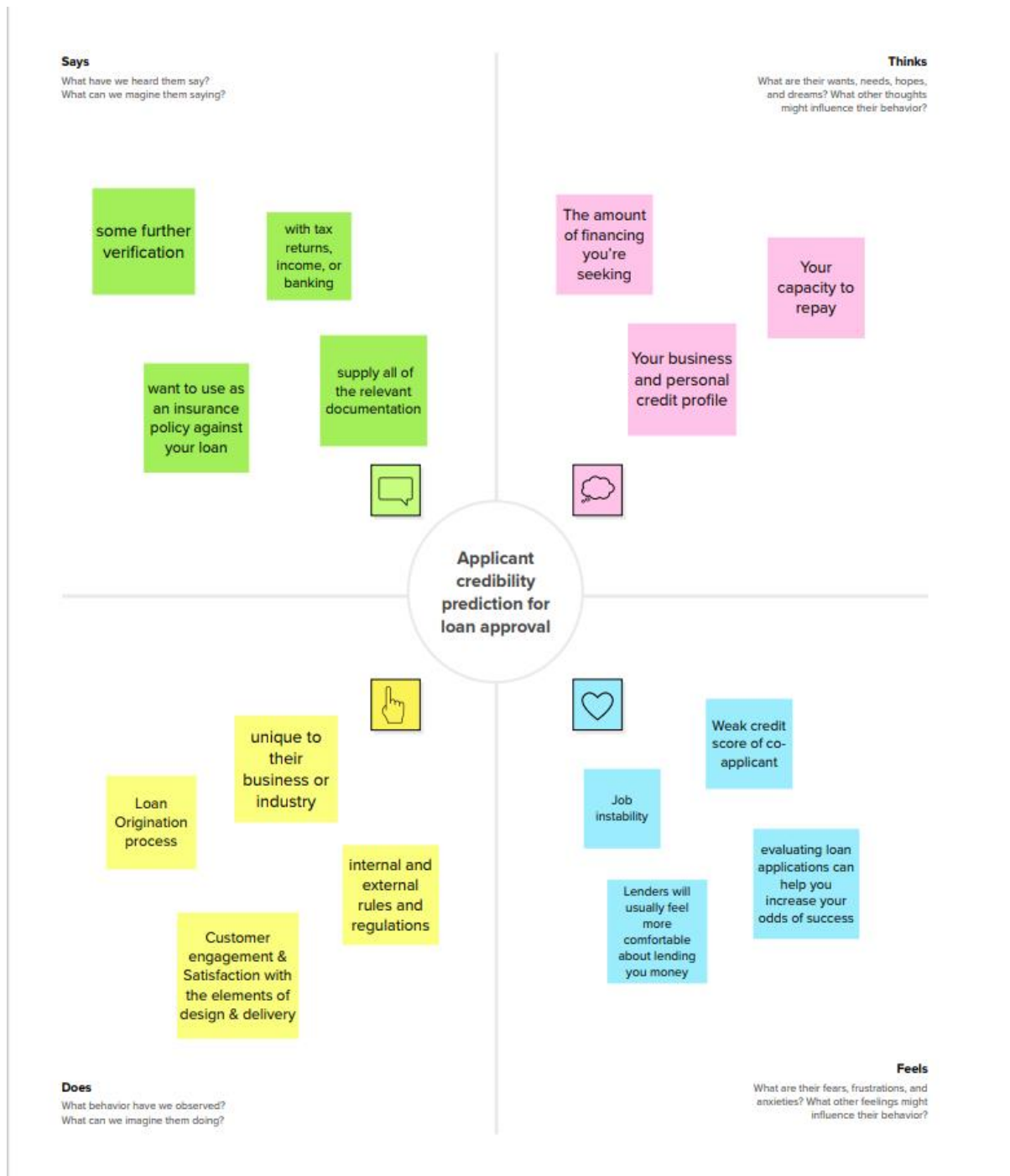
2.3 Problem Statement Definition

Approval of Loan is a very common real-life problem that every company faces in their lending operations. If the loan approval process is automated, it can save a lot of man hours and improve the speed of service to the customers. The increase in customer satisfaction and savings in operational costs are significant" "However, the rewards can only be realised if the bank has a sturdy model in place to accurately forecast which client's loans it should accept and which it should reject, in order to reduce potential risk.

The credit system governed by the banks is one of the most important factors which affect our country's economy and financial condition. Also, 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. This problem occurs when the banks need to provide loans to the customers who are in need of the money. But by forecasting the loan defaulters, the banks definitely may reduce their loss by reducing their non-profit assets.

Chapter 3: IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

Says
What have we heard them say?
What can we imagine them saying?

Thinks
What are their wants, needs, hopes, and dreams? What other thoughts might influence their behavior?

some further verification

with tax returns, income, or banking

want to use as an insurance policy against your loan

supply all of the relevant documentation

The amount of financing you're seeking

Your capacity to repay

Your business and personal credit profile

Applicant credibility prediction for loan approval

unique to their business or industry

Loan Origination process

internal and external rules and regulations

Customer engagement & Satisfaction with the elements of design & delivery

Weak credit score of co-applicant

Job instability

evaluating loan applications can help you increase your odds of success

Lenders will usually feel more comfortable about lending you money

Does
What behavior have we observed?
What can we imagine them doing?

Feels
What are their fears, frustrations, and anxieties? What other feelings might influence their behavior?

3.2 Ideation & Brainstorming

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

⏱ **5 minutes**

PROBLEM

How might we [your problem statement]?

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.

2

Brainstorm

Write down any ideas that come to mind
that address your problem statement.

⏱ **10 minutes**

Vikram

People with good credit scores are accepted for 79% of loans.	A high debt-to-income ratio gets your loan application rejected more often than not.	A low annual income can do a lot of damage to your chances of securing a loan.
you have a backup plan with a variety of options that lead to success.	Your credit score is a key consideration for the financial institutions giving out loans.	Financial institutions thoroughly analyze your income and lifestyle before giving out a loan.
you can get longer payment period with secured loans.	Variety of loan exists apply for the correct loan	you can get longer payment period with secured loans.

Naveen kumar

Establish tracking system for smarter and smooth loan process	Analyze performance of lending processes and protofio profitability	Workflow improvement for smarter and smooth loan process
Segregation of duties to aviod fredu in the bank	Improve the entrance test quality and control for new interns	Highly train all staff with real pratice before do the real work
Policy update/Third party real estate agent to do property evolution	identify missing files and documents	The lender should get proper income to repay the loan.

Susi karan

We will collect data from previous customers of several banks	The most effective way to raise your credit score is to reduce your debt. ?	Replace the call to action "Borrow money" with "see loan offers"
Include the option to use a different bank account to receive the loan	The loan approval system will predict when the application is accepted or rejected	Most lenders won't give out a large loan to someone with no experience, though.
Getting something like a credit card makes borrowing convenient	make small purchases and reduce your spending.	Eliminated manual loan approval and disbursement

Vignesh

The quality check stage of the loan origination process is done	Provide clarity around the loan amount, repayment amount, interest rate and loan duration	Get access to instant loans based on your "credit profile"
we have some ideation to resolve this solution	as long as you have a steady income and a bank account people wants to sign up	Lenders use loan origination system to know the credit worthiness of borrowers
make the process straightforward as possible	This will provide some personal information	The resulted in a lots of declined loan requests.

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

🕐 **20 minutes**

Know the lender's eligibility criteria

The system will automatically selects the eligible candidates to approve the loan

promote finance in your email signature

increased efciency of the internal team

reach outline and let your customers pre-qulaity

The model will predict whether the applicant is a fit for approval of the loan or not

allow user to request a different amount and repayment period

Maintain a good credit score

People with good credit scores are accepted for 79% of loans

it eliminate manual loan approval and disbursement

Compare portfolio segments to identify risk and opportunity,along with the underlying

promote a featured financed offer

improved the visual design of the app

Analyze performance of lending processes and proforlo profitability

Bank decide to given loan based on credit score,income

The quality check stage of the loan origination process is done

People with good credit scores are accepted for 79% of loans

Should have a good bank balance

Transfer of documents must take minutes instead of hours or days

Replace paper with digital documents

we can predict using automated processing system module

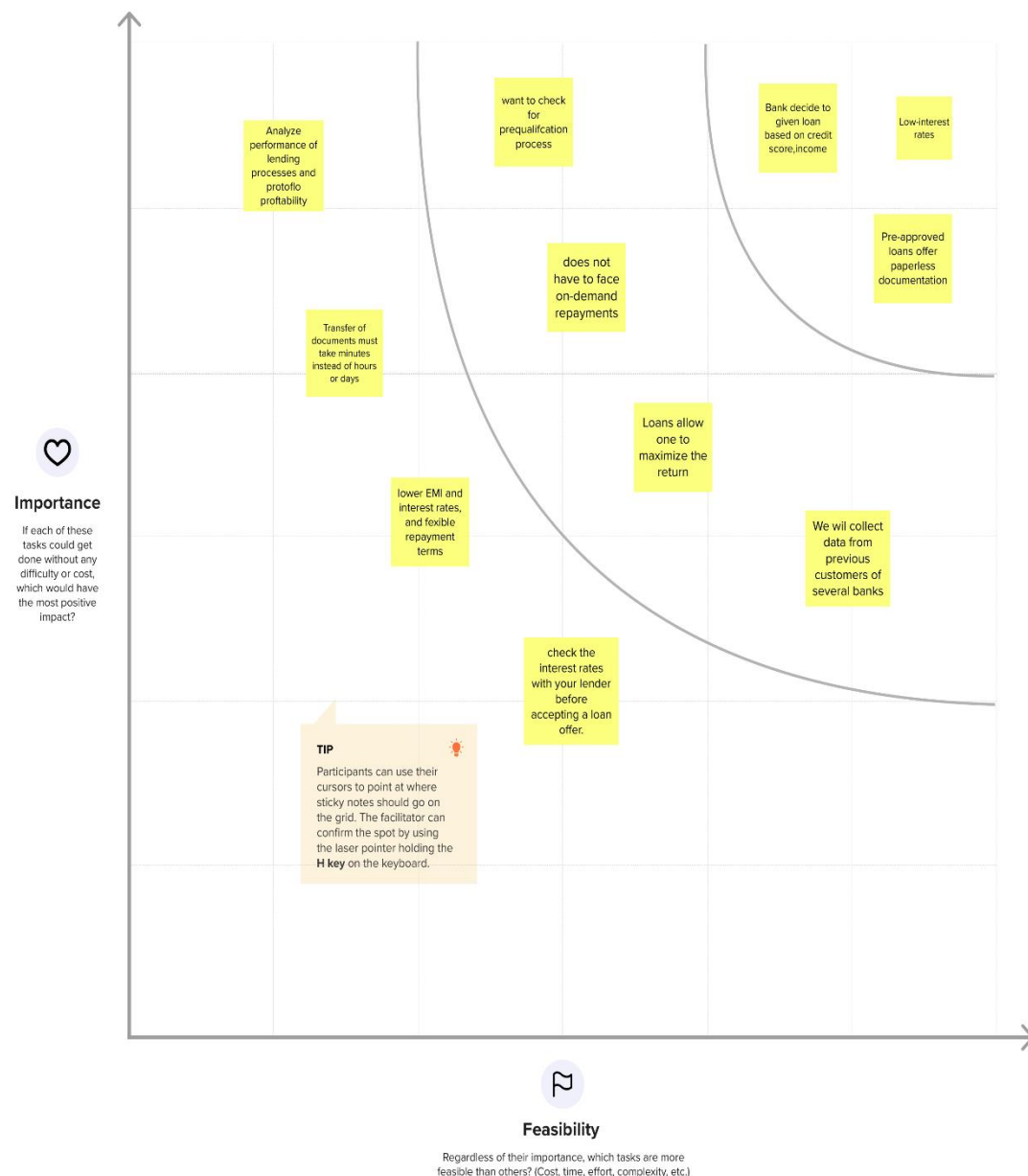The loan approval system will predict whether the application's accepted or rejected

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⏱ **20 minutes**

♡

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Analyze performance of lending processes and protoflo proftability

want to check for prequalifcation process

Bank decide to given loan based on credit score,income

Low-interest rates

does not have to face on-demand repayments

Pre-approved loans offer paperless documentation

Transfer of documents must take minutes instead of hours or days

Loans allow one to maximize the return

lower EMI and interest rates, and fexible repayment terms

We wil collect data from previous customers of several banks

check the interest rates with your lender before accepting a loan offer.

TIP 💡

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.

⚑

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.3 Proposed Solution

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	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 are a variety of techniques 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.
2.	Idea / Solution description	The property documents of the customer need to be submitted and the customer should agree to the terms and conditions of the bank. Varies efficient machine learning algorithms can be used to predict the loan eligibility of the customer.
3.	Novelty / Uniqueness	Provide customer ratings and reviews for understanding the customer. Adding digital signature of the customer on agreement of the terms and conditions. Predicts the eligibility of the user in an efficient, orderly, and timely manner.
4.	Social Impact / Customer Satisfaction	Improve the banking ecosystem and reduce the loan defaulting rates that banks currently see. Easy and fast loan approval process for the customer.
5.	Business Model (Revenue Model)	Credit risk modelling is a method used by lenders to determine the risk involved in providing loan to a particular applicant by analyzing various attributes such as applicant income, coapplicant income, education status, credit history and employment status.

6.	Scalability of the Solution	Any type of customer can predict their loan approval without any discrimination. More data when made available can be processed and produce efficient results. This system is easily and efficiently scalable

3.4 Problem Solution fit

Problem-Solution fit canvas 2.0

To find a solution that can help the banking sector identify whether a given person is eligible for a loan.

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

Our Custormers are officials from the banking sector who handle the loaning process for their customers.

6. CUSTOMER CONSTRAINTS — CC

Choices of solutions are limited by the budget, knowledge required to use the solution, database access, internet connectivity, etc.

5. AVAILABLE SOLUTIONS — AS

Solutions include:
1. Creating an database functions that gives results based on information of a person. Pros: simple, Cons: low accuracy.

2. Using past records of other people with conditions similar to the current person. Pros: Good Accuracy, Cons: Past records cannot exist for all types of conditions of the current person.

3. Creating an applicaion that uses machine learning techniques to predict the loan eligibility of person.

Explore AS, differentiate

Focus on J&P, tap into

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Problems include deciding whether or not a customer is eligible for availing a loan scheme from bank, increasing customer interaction, etc.

9. PROBLEM ROOT CAUSE — RC

Customer are required to increase their ability to recognise a person's loan eligibility in order increase the productivity of the company and cater to needs of the customers.

7. BEHAVIOUR — BE

Customers spend time slowly analysing the various details of people inorder to derive the result.
They also conduct various interviews with the person to see if they are who they claim to be.

Focus on J&P, tap int c

Identify strong TR & EM

3. TRIGGERS — TR

Customers are triggered from the need to standardise the loan process and make their work more customer-friendly.

4. EMOTIONS: BEFORE / AFTER — EM

Customers, from being indecisive, become more confident about the whether or not the person-in-question is able to avail their loan schemes.

10. YOUR SOLUTION — SL

Our Solution involve using ensemble ML models which can predict the loan eligibility of a person in the form of score that can be used as standard in the banking sector. It will also include an application framework that uses this ML model and some UI/UX to provide the results directly to the customer.

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE
They also conduct various interviews with the person to see if they are who they claim to be.

8.2 OFFLINE
Customers spend time slowly analysing the various details of people inorder to derive the result.

Extract online & offline CH of BE

⭐ AMALTAMA

Chapter 4: REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Login	Login using username and password
FR-3	User View Procedure	User will find the complete details and steps for applying loan
FR-4	User Application	User upload their details and document proof
FR-5	Data verification	The data entered by the user should be in correct format as required by the trained model
FR-6	Loan prediction	Predicts the eligibility of loan
FR-7	Credit Verification	Bank verifies the user details and documents and approves loan
FR-8	Result	The prediction result is displayed in the User Interface.

4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The system must be easy to use. The user must be able to enter their data easily.
NFR-2	Security	A tight security should be there in the system particularly for the customer's documentation and the personal details
NFR-3	Reliability	It is the measure of credibility based on the customer's documents.
NFR-4	Performance	It defines how the software system performs certain functions based on specific conditions.
NFR-5	Availability	It defines how long the System can be unavailable without impacting the operations.
NFR-6	Scalability	It is the measure of the system to increase or decrease the performance and cost in response

Chapter 5: PROJECT DESIGN

5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.
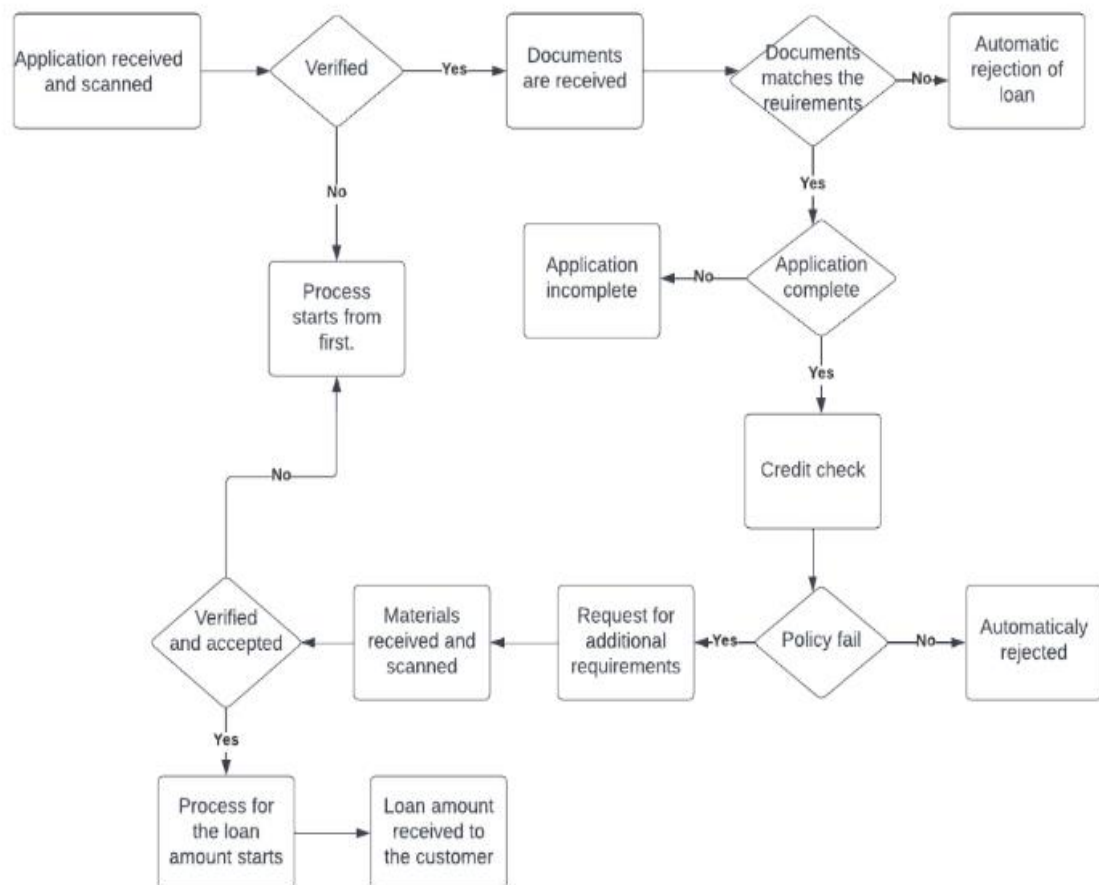
5.2 Solution & Technical Architecture

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

● Find the best tech solution to solve existing business problems .

● Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders .

● Define features, development phases, and solution requirements .

● Provide specifications according to which the solution is defined, managed, and delivered.
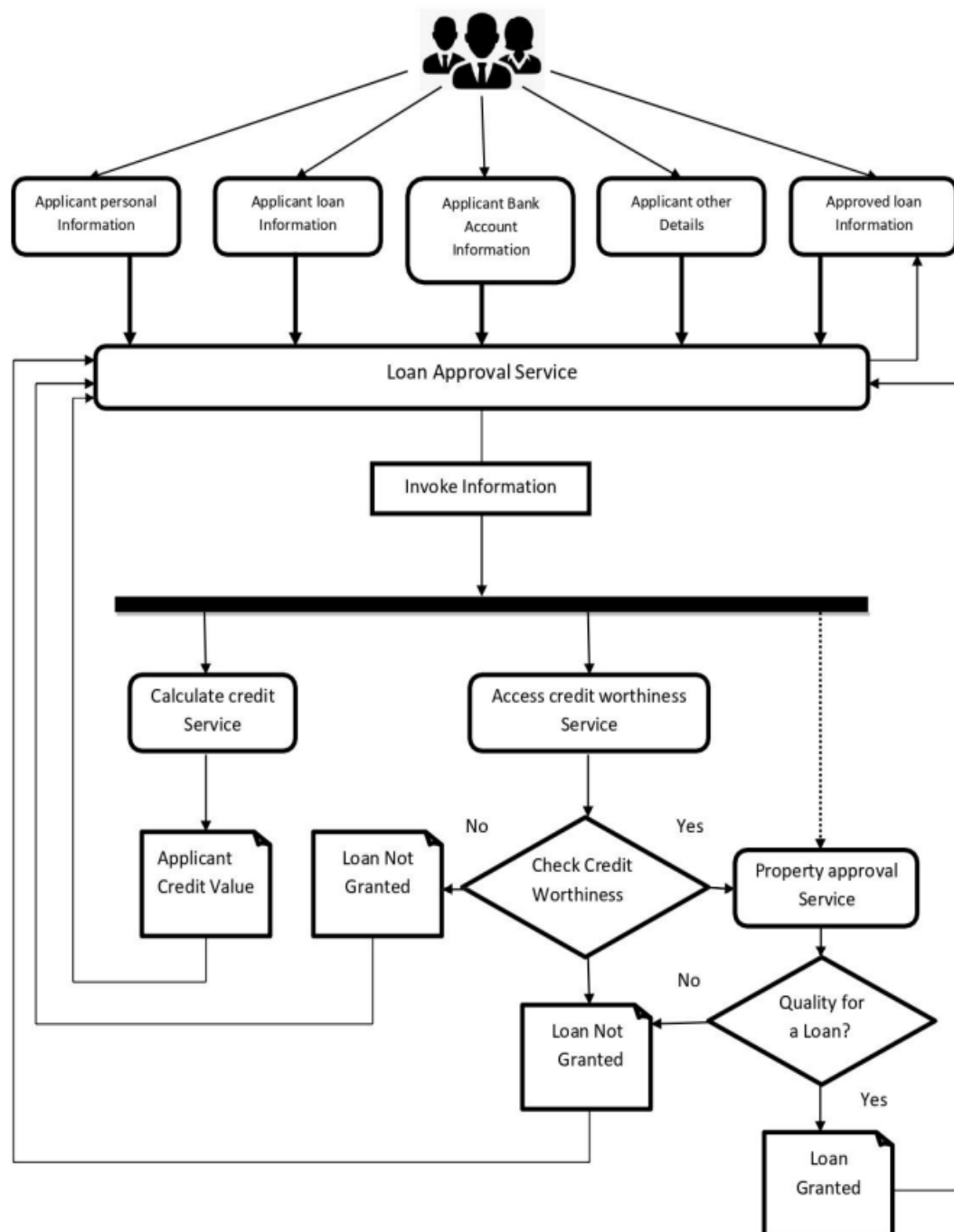
Technical Architecture:

Front End	Back End	IBM Could

Customer Login and Register → Customer Dashboard → Application Filling Screen / View Application Status

Admin Login and Register → Admin Dashboard → Manage Application / Error Management Window

Loan Approval Officer Login and Register → Approval Dashboard → Manual Override / Smart Application Approval / Approval Verification

Database

Smart lending window
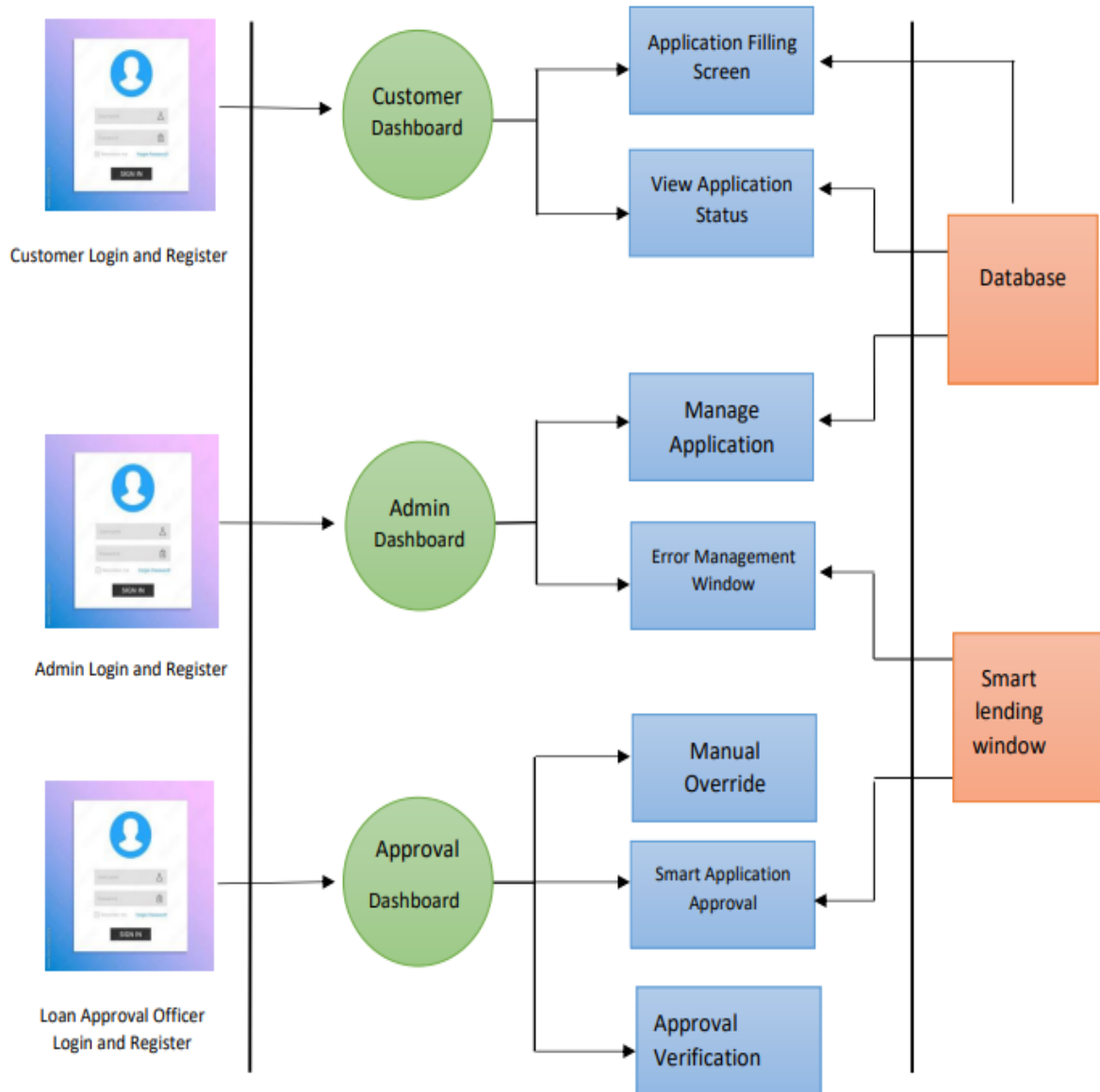
5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can receive confirmation email & click confirm	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	Able to login	High	Sprint-1
	Dashboard	USN-6	As a user, I should be able to access the dashboard with everything I am allowed to use.	Access the dashboard	Medium	Sprint-1
Customer (Web user)	Registration	USN-7	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-8	As a user, I will receive confirmation email	I can receive confirmation	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			once I have registered for the application	email & click confirm		
		USN-9	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-1
		USN-10	As a user, I can register for the application through Gmail	I can receive confirmation email & click confirm	Medium	Sprint-1
	Login	USN-11	As a user, I can log into the application by entering email & password	Able to login	High	Sprint-1
	Dashboard	USN-12	As a user, I should be able to access the dashboard with everything I am allowed to use.	Access the dashboard	Medium	Sprint-1
Loan Approval Officer	Register	USN-13	As a loan approval officer, I should be able to register myself as one using unique email and password.	I can access my account	Medium	Sprint-2
	Login	USN-14	As a loan approval officer I should be able to login myself as one using unique email and password.	Access loan approval dashboard	Medium	Sprint-2
	Automated analysis of credit history	USN-15	As a loan approval officer, I can access the dashboard where I feed application for loan prediction.	I can access the dashboard for loan application prediction	High	Sprint-3
		USN-16	As a loan approval officer, I can get a decision followed by some details for the decision when I	Get a decision for loan prediction with details regarding the decision	High	Sprint-3

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			feed an application for loan prediction.			
Dashboard	Register	USN-17	As a loan approval officer, I can get a decision followed by some details for the decision when I feed an application for loan prediction.	I can access my account	Medium	Sprint-4
	Login	USN-18	As an admin I should be able to login myself as one using unique email and password.	Able to login	Medium	Sprint-4
	Dashboard	USN-19	As a admin, I should be able to access the dashboard with everything I am allowed to use.	Access the dashboard	Medium	Sprint-4

Chapter 6: PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirements (Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint -1	Registration	USN-1	As a user, I can register for the application by entering my detail	2	High	Naveen Kumar S Susikaran B
Sprint -1	Login	USN-2	As a user, I can log into the application by entering the user name and password.	2	High	Naveen Kumar S Susikaran B
Sprint -1		USN-3	As a user,I can log in using Gmail.	1	Low	Naveen Kumar S Susikaran B
Sprint 2	Upload details	USN-4	As a user,I can upload my details and documents.	3	High	Naveen Kumar S Susikaran B
Sprint -2	Navigation	USN-5	As a user, I can navigate to different tabs like home, description, contact,login,procedure.	2	Low	Naveen Kumar S Susikaran B
Sprint -2	View procedure	USN-6	As a user, I can view the procedure to apply for loan.	1	Medium	Naveen Kumar S Susikaran B
Sprint -2	Contact	USN-7	As a user, I can contact bank	1	Low	Naveen Kumar S Susikaran B
Sprint -3	Ratings	USN-8	As a user, I can provide ratings for the service Provided.	2	Medium	Vignesh S Vikram C
Sprint -3	View user details	USN-9	As a Bank administrator , I can view the user details.	2	Medium	Vignesh S Vikram C

Sprint -3	Credit verification	USN-10	As a Bank administrator, I can verify the credibility of the customer	3	High	Vignesh S Vikram C
Sprint -4	Document Verification	USN-11	As a Bank administrator,I can Verify all the documents proof and ID proof of the customer.	3	High	Vignesh S Vikram C
Sprint -4	Loan approval status	USN-12	As a Bank administrator, I can Approve/Reject the loan for the customer based on their detail	3	High	Vignesh S Vikram C
Sprint -4		USN-13	As a user, I can get confirmation of loan approval through email. .	3	High	Vignesh S Vikram C

6.2 Sprint Delivery Schedule

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	5	6 Days	24 Oct 2022	29 Oct 2022	5	29 Oct 2022
Sprint-2	7	6 Days	31 Oct 2022	05 Nov 2022	7	05 Nov 2022
Sprint-3	7	6 Days	07 Nov 2022	12 Nov 2022	7	12 Nov 2022
Sprint-4	6	6 Days	14 Nov 2022	19 Nov 2022	6	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time it is often used in agile software development methodologies such as scrum.However,burn down charts can be applied to any project containing measurable progress over time

Chapter 7: CODING & SOLUTIONING

7.1 Feature 1

Screenshot 1 (top) — VS Code, prediction.html:

```html
41      <option value="Male">Male</option>
42      <option value="Female">Female</option>
43    </select>
44  </div>
45  <div class="mb-3">
46    <label for="exampleFormControlInput1" class="form-label">Married status</label>
47    <select class="form-select" id="married" name="married" aria-label="Default select example">
48    <option selected>-- select married status --</option>
49    <option value="Yes">Yes</option>
50    <option value="No">No</option>
51    </select>
52  </div>
53  <div class="mb-3">
54    <label for="exampleFormControlInput1" class="form-label">Dependents</label>
55    <select class="form-select" id="dependents" name="dependents" aria-label="Default select example">
56    <option selected>-- select dependents --</option>
57    <option value="0">0</option>
58    <option value="1">1</option>
59    <option value="2">2</option>
60    <option value="3+">3+</option>
61    </select>
62  </div>
63  <div class="mb-3">
64    <label for="exampleFormControlInput1" class="form-label">Education</label>
65    <select class="form-select" id="education" name="education" aria-label="Default select example">
66    <option selected>-- select education --</option>
67    <option value="Graduate">Graduate</option>
68    <option value="Not Graduate">Not Graduate</option>
69    </select>
70  </div>
71  <div class="mb-3">
72    <label for="exampleFormControlInput1" class="form-label">Self_Employed</label>
73    <select class="form-select" id="employed" name="employed" aria-label="Default select example">
74    <option selected>-- select Self_Employed --</option>
75    <option value="Yes">Yes</option>
76    <option value="No">No</option>
77    </select>
78  </div>
79  <div class="mb-3">
80    <label for="exampleFormControlInput1" class="form-label">Credit_History</label>
```

Screenshot 2 (bottom) — VS Code, prediction.html:

```html
81    <select class="form-select" id="credit" name="credit" aria-label="Default select example">
82    <option selected>-- select Credit_History --</option>
83    <option value="1.000000">1.000000</option>
84    <option value="0.000000">0.000000</option>
85    <option value="0.842199">0.842199</option>
86    </select>
87  </div>
88  <div class="mb-3">
89    <label for="exampleFormControlInput1" class="form-label">Property_Area</label>
90    <select class="form-select" id="area" name="area" aria-label="Default select example">
91    <option selected>-- select Property_Area --</option>
92    <option value="Semiurban">Semiurban</option>
93    <option value="Urban">Urban</option>
94    <option value="Rural">Rural</option>
95    </select>
96  </div>
97  <div class="mb-3">
98    <label for="exampleFormControlInput1" class="form-label">Enter ApplicantIncome</label>
99    <input type="text" class="form-control" id="ApplicantIncome" name="ApplicantIncome" placeholder="ApplicantIncome">
100 </div>
101 <div class="mb-3">
102   <label for="exampleFormControlInput1" class="form-label">Enter CoapplicantIncome</label>
103   <input type="text" class="form-control" id="CoapplicantIncome" name="CoapplicantIncome" placeholder="CoapplicantIncome">
104 </div>
105 <div class="mb-3">
106   <label for="exampleFormControlInput1" class="form-label">Enter LoanAmount</label>
107   <input type="text" class="form-control" id="LoanAmount" name="LoanAmount" placeholder="LoanAmount">
108 </div>
109 <div class="mb-3">
110   <label for="exampleFormControlInput1" class="form-label">Enter Loan_Amount_Term</label>
111   <input type="text" class="form-control" id="Loan_Amount_Term" name="Loan_Amount_Term" placeholder="Loan_Amount_Term">
112 </div>
113 <div class="mb-3">
114     <button type="submit" class="btn btn-primary">Predict</button>
115   </div>
116   </form>
117 </div>
118 </section>
119
```

7.2 Feature 2

LOAN APPROVAL STATUS

Congratulations! vikram You are eligible for loan

```python
41     # gender
42     if (gender == "Male"):
43         male=1
44     else:
45         male=0
46
47     # married
48     if(married=="Yes"):
49         married_yes = 1
50     else:
51         married_yes=0
52
53     # dependents
54     if(dependents=='1'):
55         dependents_1 = 1
56         dependents_2 = 0
57         dependents_3 = 0
58     elif(dependents == '2'):
59         dependents_1 = 0
60         dependents_2 = 1
61         dependents_3 = 0
62     elif(dependents=="3+"):
63         dependents_1 = 0
64         dependents_2 = 0
65         dependents_3 = 1
66     else:
67         dependents_1 = 0
68         dependents_2 = 0
69         dependents_3 = 0
70
71     # education
72     if (education=="Not Graduate"):
73         not_graduate=1
74     else:
75         not_graduate=0
76
77     # employed
78     if (employed == "Yes"):
79         employed_yes=1
```

```python
81         employed_yes=0
82
83     # property area
84
85     if(area=="Semiurban"):
86         semiurban=1
87         urban=0
88     elif(area=="Urban"):
89         semiurban=0
90         urban=1
91     else:
92         semiurban=0
93         urban=0
94
95
96     ApplicantIncomelog = np.log(ApplicantIncome)
97     totalincomelog = np.log(ApplicantIncome+CoapplicantIncome)
98     LoanAmountlog = np.log(LoanAmount)
99     Loan_Amount_Termlog = np.log(Loan_Amount_Term)
100
101     prediction = model.predict([[credit, ApplicantIncomelog,LoanAmountlog, Loan_Amount_Termlog, totalincomelog, male, married_yes, dependent
102
103     #print(prediction)
104
105     if(prediction=="N"):
106         return render_template("approve.html", prediction_text ='Congratulations! '+name+' You are eligible for loan')
107     else:
108         return render_template("reject.html",prediction_text ='Sorry '+name+' You are not eligible for loan')
109
110
111
112
113     else:
114         return render_template("prediction.html")
115
116
117
118 if __name__ == "__main__":
119     app.run(debug=True)
```

Chapter 8: TESTING

8.1 Test Cases

Loan_ID	Gender	Married	Dependents	Education	Self-employed	Applicant Income	Co-applicant Income	Loan Amount	Loan Amount Term	Credit History	Property Area	Loan Status
LP001002	Male	No	0	Graduate	No	5849	0		360	1	Urban	Y
LP001003	Male	Yes	1	Graduate	No	4583	1508	128	360	1	Rural	N
LP001005	Male	Yes	0	Graduate	Yes	3000	0	66	360	1	Urban	Y
LP001006	Male	Yes	0	Not Graduate	No	2583	2358	120	360	1	Urban	Y
LP001008	Male	No	0	Graduate	No	6000	0	141	360	1	Urban	Y
LP001011	Male	Yes	2	Graduate	Yes	5417	4196	267	360	1	Urban	Y
LP001013	Male	Yes	0	Not Graduate	No	2333	1516	95	360	1	Urban	Y
LP001014	Male	Yes	3	Graduate	No	3036	2504	158	360	0	Semiurban	N
LP001018	Male	Yes	2	Graduate	No	4006	1526	168	360	1	Urban	Y
LP001020	Male	Yes	1	Graduate	No	12841	10968	349	360	1	Semiurban	N

8.1 User Acceptance Testing

Purpose of Document:

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

Defect Analysis:

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	9	3	1	2	15
Duplicate	0	0	4	0	4
External	1	2	0	0	3
Fixed	10	5	4	21	40
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	20	9	9	23	64

Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	46	0	0	46
Security	4	0	0	4
Outsource Shipping	3	0	0	3
Exception Reporting	7	0	0	7
Final Report Output	4	0	0	4
Version Control	2	0	0	2

Chapter 9: RESULTS

9.1 Performance Metrics

Model Performance Testing:

Project team shall fill the following information in the model performance testing template.

S.No.	Parameter	Screenshot / Values
1	Data Responsiveness	The ML model takes about 0.3 seconds to process the dataset. The credibility result is predicted in approximately 0.9 seconds.
2	Utilization of Data Filters	Sufficient data filters have been used for ideal model building
3	Effective User Story	No of Scene Added - 15
4	Descriptive Reports	No of Visualizations / Graphs - 13

Chapter 10: ADVANTAGES & DISADVANTAGES

Advantages:

Keep Control of the Company

A bank loans money to a business based on the value of the business and its perceived ability to service the loan by making payments on time and in full. Unlike with equity finance where the business issues shares, banks do not take any ownership position in businesses. Bank personnel also do not get involved in any aspect of running a business to which a bank grants a loan. This means you get to retain full management and control of your business with no external interference.

Bank Loan is Temporary

Once a business borrower has paid off a loan, there is no more obligation to or involvement with the bank lender unless the borrower wishes to take out a subsequent loan. Compare this with equity finance, where the company may be paying out dividends to shareholders for as along as the business exists.

Interest is Tax Deductible

The interest on business bank loans is tax-deductible. In addition, especially with fixed-rate loans, in which the interest rate does not change during the course of a loan, loan servicing payments remain the same throughout the life of the loan. This makes it easy for businesses to budget and plan for monthly loan payments. Even if the loan is an adjustable-rate loan, business owners can use a simple spreadsheet to compute future payments in the event of a change in rates.

Increased revenue

This stems from all of the above: an automated loan processing system enables lenders toprocess more applications, assign and manage more loans, and see them all the way through closing all while detecting scams and preventing delays. The staff is free to oversee the process and focus on client relationships and look for new business opportunities. This enables financial companies to gain a distinct competitive edge and increase revenue.

Disadvantages:

Tough to Qualify

      One of the greatest disadvantages to bank loans is that they are very difficult to obtain unless a small business has a substantial track record or valuable collateral such as real estate. Banks are careful to lend only to businesses that can clearly repay their loans, and they also make sure that they are able to cover losses in the event of default. Business borrowers can be required to provide personal guarantees, which means the borrower's personal assets can be seized in the event the business fails and is unable to repay all or part of a loan.

High Interest Rates

      Interest rates for small-business loans from banks can be quite high, and the amount of bank funding for which a business qualifies is often not sufficient to completely meet its needs. The high interest rate for the funding a business does receive often stunts its expansion, because the business needs to not only service the loan but also deal with additional funding to cover funds not provided by the bank. Loans guaranteed by the U.S. Small Business Administration offer better terms than other loans, but the requirements to qualify for these subsidized bank loans are very strict.

Automation of routine processes

      Using robotic process automation to streamline simple rule-based processes is another must-have feature of a loan management platform. Automation accelerates loan origination and processing and accounts for increasing client satisfaction. On top of that, it helps to avoid human error.

Third-party integration

      Another feature that most organizations find especially attractive in a loan processing system, is its capability to integrate with other enterprise software. ERP and CRM solutions are capable of enriching the lending system with data and insights. Systems integrating lending modules with software for remote sales personnel are also enjoyinghigh popularity among lenders.

Security

      Finance company software works with classified and highly sensitive data, and for bothlenders and customers, security is a matter of paramount importance. An excellent lending system should possess advanced security capabilities, and ensure the highest level of customer, data, and network protection.

Chapter 11: CONCLUSION

From the overall discussion, it can be concluded that, the system helps us to reduce human intervention and increase efficiency of work. From the analysis of data, it is clear that it reduces the frauds done at the time of loan approval. And thus it can be said that our proposed system is efficient enough to achieved the aim of predicting the risk of future loan defaulters and can be brought into real time. Data mining strategies are helpful to the financial part for better focusing on and procuring new clients, most significant client maintenance, programmed credit endorsement which is utilized for extorsion avoidance, misrepresentation identification progressively, giving section based item, investigation of the client, exchange designs after some time for better maintenance and relationships, hazard the executives and showcasing.

The analysis starts from data cleaning and processing missing value, exploratory analysis and finally model building and evaluation of the model. The best accuracy on public test set is when we get higher accuracy score and other performance metrics which will be found out. This project can help to predict the approval of bank loan or not for a candidate.

Chapter 12: FUTURE SCOPE

• We can make the Bank Loan Approval prediction to connect with Cloud for future use to optimize the work to implement in Artificial Intelligence environment.

• Assists the lender in analyzing the situation.

• Gives better services for use.

• Reduce the risk factor by choosing the right person.

• Save time and money for the lender.

Chapter 13: APPENDIX

13.1 Source Code

Index.html

```html
<!doctype html>
<html lang="en">
  <head>
    <!-- Required meta tags -->
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1">

    <!-- Bootstrap CSS -->
    <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-beta3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48ckxlpbzKgwra6" crossorigin="anonymous">
    <link href="https://unpkg.com/tailwindcss@^2/dist/tailwind.min.css" rel="stylesheet">

    <title>loan Prediction</title>
  </head>
  <body>

<!-- This example requires Tailwind CSS v2.0+ -->
<div class="relative bg-white overflow-hidden">
  <div class="max-w-7xl mx-auto">
    <div class="relative z-10 pb-8 bg-white sm:pb-16 md:pb-20 lg:max-w-2xl lg:w-full lg:pb-28 xl:pb-32">
      <svg class="hidden lg:block absolute right-0 inset-y-0 h-full w-48 text-white transform translate-x-1/2" fill="currentColor" viewBox="0 0 100 100" preserveAspectRatio="none" aria-hidden="true">
        <polygon points="50,0 100,0 50,100 0,100" />
      </svg>

      <div class="relative pt-6 px-4 sm:px-6 lg:px-8">
        <nav class="relative flex items-center justify-between sm:h-10 lg:justify-start" aria-label="Global">
          <div class="flex items-center flex-grow flex-shrink-0 lg:flex-grow-0">
            <div class="flex items-center justify-between w-full md:w-auto">
              <a href="#">
                <span class="sr-only">Workflow</span>
                <img class="h-8 w-auto sm:h-10" src="https://tailwindui.com/img/logos/workflow-mark-indigo-600.svg">
              </a>
```

```html
        <div class="-mr-2 flex items-center md:hidden">
            <button type="button" class="bg-white rounded-md p-2 inline-
flex items-center justify-center text-gray-400 hover:text-gray-500 hover:bg-
gray-100 focus:outline-none focus:ring-2 focus:ring-inset focus:ring-indigo-
500" aria-expanded="false">
                <span class="sr-only">Open main menu</span>
                <!-- Heroicon name: outline/menu -->
                <svg class="h-6 w-6" xmlns="http://www.w3.org/2000/svg"
fill="none" viewBox="0 0 24 24" stroke="currentColor" aria-hidden="true">
                    <path stroke-linecap="round" stroke-linejoin="round"
stroke-width="2" d="M4 6h16M4 12h16M4 18h16" />
                </svg>
            </button>
        </div>
    </div>
</div>
<div class="hidden md:block md:ml-10 md:pr-4 md:space-x-8">
    <a href="#" class="font-medium text-gray-500 hover:text-gray-
900">Home</a>

    <a href="prediction.html" class="font-medium text-gray-500
hover:text-gray-900">Prediction</a>

    <a href="about.html" class="font-medium text-gray-500 hover:text-
gray-900">About us</a>

    <a href="contact.html" class="font-medium text-gray-500
hover:text-gray-900">contact</a>

</div>
</nav>
</div>

<!--
    Mobile menu, show/hide based on menu open state.

    Entering: "duration-150 ease-out"
        From: "opacity-0 scale-95"
        To: "opacity-100 scale-100"
    Leaving: "duration-100 ease-in"
        From: "opacity-100 scale-100"
        To: "opacity-0 scale-95"
-->
<div class="absolute top-0 inset-x-0 p-2 transition transform origin-
top-right md:hidden">
    <div class="rounded-lg shadow-md bg-white ring-1 ring-black ring-
opacity-5 overflow-hidden">
        <div class="px-5 pt-4 flex items-center justify-between">
```

```html
                <div>
                    <img class="h-8 w-auto"
src="https://tailwindui.com/img/logos/workflow-mark-indigo-600.svg" alt="">
                </div>
                <div class="-mr-2">
                    <button type="button" class="bg-white rounded-md p-2 inline-
flex items-center justify-center text-gray-400 hover:text-gray-500 hover:bg-
gray-100 focus:outline-none focus:ring-2 focus:ring-inset focus:ring-indigo-
500">
                        <span class="sr-only">Close main menu</span>
                        <!-- Heroicon name: outline/x -->
                        <svg class="h-6 w-6" xmlns="http://www.w3.org/2000/svg"
fill="none" viewBox="0 0 24 24" stroke="currentColor" aria-hidden="true">
                            <path stroke-linecap="round" stroke-linejoin="round"
stroke-width="2" d="M6 18L18 6M6 6l12 12" />
                        </svg>
                    </button>
                </div>
            </div>
            <div class="px-2 pt-2 pb-3 space-y-1">
                <a href="#" class="block px-3 py-2 rounded-md text-base font-
medium text-gray-700 hover:text-gray-900 hover:bg-gray-50">Home</a>

                <a href="prediction.html" class="block px-3 py-2 rounded-md text-
base font-medium text-gray-700 hover:text-gray-900 hover:bg-gray-
50">prediction</a>

                <a href="about.html" class="block px-3 py-2 rounded-md text-base
font-medium text-gray-700 hover:text-gray-900 hover:bg-gray-50">about us</a>

                <a href="contact.html" class="block px-3 py-2 rounded-md text-base
font-medium text-gray-700 hover:text-gray-900 hover:bg-gray-50">contact</a>
            </div>

        </div>
    </div>

    <main class="mt-10 mx-auto max-w-7xl px-4 sm:mt-12 sm:px-6 md:mt-16
lg:mt-20 lg:px-8 xl:mt-28">
        <div class="sm:text-center lg:text-left">
        <h1 class="text-4xl tracking-tight font-extrabold text-gray-900
sm:text-5xl md:text-6xl">
            <span class="block xl:inline">Applicant Credibility Prediction
for</span>
            <span class="block text-indigo-600 xl:inline"> Loan Approval
</span>
        </h1>
```

```html
        <p class="mt-3 text-base text-gray-500 sm:mt-5 sm:text-lg sm:max-w-
xl sm:mx-auto md:mt-5 md:text-xl lg:mx-0">
            To know your loan approval status,click the below prediction
button    </p>
        <div class="mt-5 sm:mt-8 sm:flex sm:justify-center lg:justify-
start">
          <div class="rounded-md shadow">
            <a href="./predict" class="w-full flex items-center justify-
center px-8 py-3 border border-transparent text-base font-medium rounded-md
text-white bg-indigo-600 hover:bg-indigo-700 md:py-4 md:text-lg md:px-10">
              Prediction
            </a>
          </div>

        </div>
      </div>
    </main>
  </div>
</div>
<div class="lg:absolute lg:inset-y-0 lg:right-0 lg:w-1/2">
  <img class="h-56 w-full object-cover sm:h-72 md:h-96 lg:w-full lg:h-full"
src="https://images.unsplash.com/photo-1551434678-e076c223a692?ixlib=rb-
1.2.1&ixid=eyJhcHBfaWQiOjEyMDd9&auto=format&fit=crop&w=2850&q=80" alt="">
  </div>
</div>



    <!-- Option 1: Bootstrap Bundle with Popper -->
    <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/js/bootstrap.bundle.min.js" integrity="sha384-
JEW9xMcG8R+pH31jmWH6WWP0WintQrMb4s7ZOdauHnUtxwoG2vI5DkLtS3qm9Ekf"
crossorigin="anonymous"></script>

  </body>
</html>
```

Prediction.html

```html
<!doctype html>

<html lang="en">
  <head>
    <!-- Required meta tags -->
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1">

    <!-- Bootstrap CSS -->
    <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-
eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48ckxlpbzKgwra6"
crossorigin="anonymous">
    <link href="https://unpkg.com/tailwindcss@^2/dist/tailwind.min.css"
rel="stylesheet">

    <title>prediction</title>
  </head>
  <body>
  <section class="text-gray-600 body-font">
  <div class="container px-5 py-24 mx-auto">
    <div class="flex flex-col text-center w-full mb-20">

      <h1 class="sm:text-3xl text-2xl font-medium title-font mb-4 text-gray-
900">Loan Approval Prediction</h1>
      <p class="lg:w-2/3 mx-auto leading-relaxed text-base">Fill the form for
prediction</p>
    </div>

    <a class="btn btn-primary" href="./" role="button">Back</a>
<form action='/predict' method='POST'>
  <div class="mb-3">
    <label for="exampleFormControlInput1" class="form-label">Name</label>
    <input type="text" class="form-control" id="Name" name="Name"
placeholder="Enter your Name" required >
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label"> Email ID</label>
  <input type="email" class="form-control" id="email" name="email"
placeholder="Enter your Email ID" required >
</div>
<div class="mb-3">
<label for="exampleFormControlInput1" class="form-label">Mobile Number</label>
<input type="text" class="form-control" id="mon" name="mon" placeholder="Enter
your Mobile number" required>
</div>
```

```html
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label"> gender</label>
  <select class="form-select" id="gender" name="gender" aria-label="Default
select example">
  <option selected>-- select gender --</option>
  <option value="Male">Male</option>
  <option value="Female">Female</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label"> married
status</label>
  <select class="form-select" id="married" name="married" aria-label="Default
select example">
  <option selected>-- select married status --</option>
  <option value="Yes">Yes</option>
  <option value="No">No</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Dependents</label>
  <select class="form-select" id="dependents" name="dependents" aria-
label="Default select example">
  <option selected>-- select dependents --</option>
  <option value="0">0</option>
  <option value="1">1</option>
  <option value="2">2</option>
  <option value="3+">3+</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Education</label>
  <select class="form-select" id="education" name="education" aria-
label="Default select example">
  <option selected>-- select education --</option>
  <option value="Graduate">Graduate</option>
  <option value="Not Graduate">Not Graduate</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-
label">Self_Employed</label>
  <select class="form-select" id="employed" name="employed" aria-
label="Default select example">
  <option selected>-- select Self_Employed --</option>
  <option value="Yes">Yes</option>
  <option value="No">No</option>
</select>
```

```html
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-
label">Credit_History</label>
  <select class="form-select" id="credit" name="credit" aria-label="Default
select example">
  <option selected>-- select Credit_History --</option>
  <option value="1.000000">1.000000</option>
  <option value="0.000000">0.000000</option>
  <option value="0.842199">0.842199</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-
label">Property_Area</label>
  <select class="form-select" id="area" name="area" aria-label="Default select
example">
  <option selected>-- select Property_Area --</option>
  <option value="Semiurban">Semiurban</option>
  <option value="Urban">Urban</option>
  <option value="Rural">Rural</option>
</select>
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Enter
ApplicantIncome</label>
  <input type="text" class="form-control" id="ApplicantIncome"
name="ApplicantIncome" placeholder="ApplicantIncome">
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Enter
CoapplicantIncome</label>
  <input type="text" class="form-control" id="CoapplicantIncome"
name="CoapplicantIncome" placeholder="CoapplicantIncome">
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Enter
LoanAmount</label>
  <input type="text" class="form-control" id="LoanAmount" name="LoanAmount"
placeholder="LoanAmount">
</div>
<div class="mb-3">
  <label for="exampleFormControlInput1" class="form-label">Enter
Loan_Amount_Term</label>
  <input type="text" class="form-control" id="Loan_Amount_Term"
name="Loan_Amount_Term" placeholder="Loan_Amount_Term">
</div>
<div class="mb-3">
```

```html
                <button type="submit" class="btn btn-primary">Predict</button>
            </div>
          </form>
        </div>
    </section>


        <!-- Optional JavaScript; choose one of the two! -->

        <!-- Option 1: Bootstrap Bundle with Popper -->
        <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/js/bootstrap.bundle.min.js" integrity="sha384-
JEW9xMcG8R+pH31jmWH6WWP0WintQrMb4s7ZOdauHnUtxwoG2vI5DkLtS3qm9Ekf"
crossorigin="anonymous"></script>

        <!-- Option 2: Separate Popper and Bootstrap JS -->
        <!--
        <script
src="https://cdn.jsdelivr.net/npm/@popperjs/core@2.9.1/dist/umd/popper.min.js"
integrity="sha384-
SR1sx49pcuLnqZUnnPwx6FCym0wLsk5JZuNx2bPPENzswTNFaQU1RDvt3wT4gWFG"
crossorigin="anonymous"></script>
        <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/js/bootstrap.min.js" integrity="sha384-
j0CNLUeiqtyaRmlzUHCPZ+Gy5fQu0dQ6eZ/xAww941Ai1SxSY+0EQqNXNE6DZiVc"
crossorigin="anonymous"></script>
        -->
    </body>
</html>
```

App.py

```python
# save this as app.py
from flask import Flask, escape, request, render_template
import pickle
import numpy as np

app = Flask(__name__)
model = pickle.load(open('model.pkl', 'rb'))

@app.route('/')
def home():
    return render_template("index.html")


@app.route('/about.html')
def about():
    return render_template('about.html')


@app.route('/contact.html')
```

```python
def contact():
    return render_template('contact.html')

@app.route('/prediction.html')
def formpg():
    return render_template('prediction.html')

@app.route('/predict', methods=['GET', 'POST'])
def predict():
    if request.method ==  'POST':
        name=request.form['Name']
        gender = request.form['gender']
        married = request.form['married']
        dependents = request.form['dependents']
        education = request.form['education']
        employed = request.form['employed']
        credit = float(request.form['credit'])
        area = request.form['area']
        ApplicantIncome = float(request.form['ApplicantIncome'])
        CoapplicantIncome = float(request.form['CoapplicantIncome'])
        LoanAmount = float(request.form['LoanAmount'])
        Loan_Amount_Term = float(request.form['Loan_Amount_Term'])

        # gender
        if (gender == "Male"):
            male=1
        else:
            male=0

        # married
        if(married=="Yes"):
            married_yes = 1
        else:
            married_yes=0

        # dependents
        if(dependents=='1'):
            dependents_1 = 1
            dependents_2 = 0
            dependents_3 = 0
        elif(dependents == '2'):
            dependents_1 = 0
            dependents_2 = 1
            dependents_3 = 0
        elif(dependents=="3+"):
            dependents_1 = 0
            dependents_2 = 0
            dependents_3 = 1
```

```python
        else:
            dependents_1 = 0
            dependents_2 = 0
            dependents_3 = 0

        # education
        if (education=="Not Graduate"):
            not_graduate=1
        else:
            not_graduate=0

        # employed
        if (employed == "Yes"):
            employed_yes=1
        else:
            employed_yes=0

        # property area

        if(area=="Semiurban"):
            semiurban=1
            urban=0
        elif(area=="Urban"):
            semiurban=0
            urban=1
        else:
            semiurban=0
            urban=0


        ApplicantIncomelog = np.log(ApplicantIncome)
        totalincomelog = np.log(ApplicantIncome+CoapplicantIncome)
        LoanAmountlog = np.log(LoanAmount)
        Loan_Amount_Termlog = np.log(Loan_Amount_Term)

        prediction = model.predict([[credit, ApplicantIncomelog,LoanAmountlog,
Loan_Amount_Termlog, totalincomelog, male, married_yes, dependents_1,
dependents_2, dependents_3, not_graduate, employed_yes,semiurban, urban ]])

        #print(prediction)

    if(prediction=="N"):
            prediction=="No"
    else:
            prediction=="Yes"

    if(prediction=="Yes"):
        return render_template("approve.html", prediction_text
='Congratulations! '+name+' You are eligible for loan')
```

```python
        else:
            return render_template("reject.html",prediction_text ='Sorry '+name+' You are not eligible for loan')

    else:
        return render_template("prediction.html")


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

13.2 GitHub & Project Demo Link

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-42914-1660711145

Project Demo Link

https://www.youtube.com/watch?v=wSkKeAgkUUA