# SMART LENDER -APPLICANT CREDIBILITY PREDICTION FOR LOAN APPROVAL

## TEAM ID :PNT2022TMID29739

### A PROJECT REPORT

### Submitted by

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*in partial fulfillment for the award of the degree*
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**BACHELOR OF ENGINEERING**

**I N**

**ELECTRONICS  AND  COMMUNICATION   ENGINEERING**

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# TABLE OF CONTENTS

# 1 .INTRODUCTION

## 1.1 PROJECT OVERVIEW

The Smart lender project is used to provide a way for the bank to trust the customer and provide the loan to a trustworthy person.This project decreases the approval time and decreases the risk associated with the loan.The aim of this project was to compare the various loan prediction models and show which is the best one with least amount of error and could be used by banks in real world to predict if the loan should be approved or not taking the risk factor in mind.After analyzing all models Random forest model is selected as the best model for predicting the loan eligibility of the customer

## 1 .2 PURPOSE

The smart lender project is used to predict whether a particular applicant is safe to provide loan

- The entire process of verifying the customer characteristics will be automated by machine learning technology.

- This credit forecasting is very useful for both bank employees and customer
- The customer can also provide their feedback in this system which helps the bank to improve their service

# 2 .LITERATURE SURVEY

## 2.1 EXISTING PROBLEM

Bank employees check the details of applicant and give the loan to eligible a pplicant.Checking the details of all applicant takes a lot of time.Assessing the risk,which is involved in a loan application,is one of the most important concerns o f the banks for survival in the highly competitive market and for profit ability.These banks receive number of loan applications for their customers and other people on daily basis.Not everyone gets approved .Most of the banks use their own credit scoring and risk assessment techniques in order to analyze the loan application and to make decisions on credit approval.In spite of this,there are many cases happening every year,where people do not repay the loan amount or they default,due to which these financial institution suffer huge amount of losses.

## 2.2 REFERENCE

**Paper 1:**<u>An Approach For Prediction Of Loan Approval</u>

**Publication year:**May-June 2021
**Author Name :**Ms. Kathe Rutika Pramod
**Summary:**In our banking system banks have many products to sell but main source of income of any banks is on its credit line they can earn from interest of those loans which they credits a bank's profit or a loss depends to a large extent on loans the customers are paying back the loan defaulting by predicting the loan defaulters.
**Methodology used:**The prediction model which is constructed using three different training algorithms to train a supervised two layer feedforward network. The results show that the training algorithm improves the design of loan default prediction model.and we use of machine learning

**Paper 2:Loan Prediction System using Machine Learning**

**Publication year:**March-April 2021
**Author name:**Ramrao ,yash patil
**Journal name**:International Conference on Advances in Computing and Communication (ICACC)

**Summary**:As the needs of people are increasing, the demand for loans in banks is also frequently getting higher every day. Banks typically process an applicant's loan after screening and verifying the applicant's eligibility, which is a difficult and time-consuming process. In some cases, some applicants default and banks lose capital.The Machine Learning Approach is ideal for reducing human effort and effective decision making in the loan approval process by implementing machines.

**Methodology used**:The algorithm which will be used for data modeling is Logistic Regression using stratified k-folds cross-validation and Random Forest.

**Paper 3:Loan Credibility Prediction System Based on Decision Tree Algorithm**

**Publication year**:09 September 2015
**Author name:**Sivasree M S,Rekha Sunny T
**Journal Name:**International Journal of Engineering Research & Technology (IJERT)
**Summary:**Data mining techniques are becoming very popular now-a-days because of the wide availability of huge quantities of data and the need for transforming such data into knowledge. Techniques of data mining are implemented in various domains such as retail industry, telecommunication industry, biological data analysis, intrusion detection and other scientific applications. Data mining techniques can also be used in the banking industry which help them compete in the market well equipped. In this paper we introduce an effective prediction model for the bankers that helps them predict the credible customers who have applied for loan.Data Mining Algorithm is applied to predict the attributes relevant for credibility.
**MethodologyUsed**:DecisionTree,CreditRiskAssessment,Classification,Prediction, Attribute Selection.

**Paper 4:Rethinking SME default prediction: a systematic literature review and future perspectives**

**Publication year**: 29 January 2021
**Author name**:Ciampi, F., Giannozzi, A., Marzi, G.
**Journal Name:**Scientometrics
**Summary:** Over the last dozen years, the topic of small and medium enterprise (SME) default prediction has developed into a relevant research domain that has grown for important reasons exponentially across multiple disciplines, including finance, management, accounting, and statistics.

**Paper 5:Analysis of Loan Availability using Machine Learning Techniques**

**Publication year:** September 2021
**Author name:**Sharayu Dosalwar, Ketki Kinkar, Rahul Sannat, Dr Nitin Pise
**JournalName:** International Journal of Advanced Research in Science, Communication and Technology (IJARCET)
**Summary: I**n the banking system, banks have a variety of products to provide, but credit lines are their primary source of revenue. As a result, they will profit from the interest earned on the loans they make.Loans, or whether customers repay or default on their loans, affect a bank's profit or loss. The bank's Non-Performing Assets will be reduced by forecasting loan defaulters. As a result, further investigation into this occurrence is essential. Because precise forecasts are essential for benefit maximization, it's crucial to analyze and compare the various methodologies

**Paper 6:Analysis and Comparison of Loan Sanction Prediction Model Using Python**
**Publication year**:Jun 2018
**Author name:** SRISHTI SRIVASTAVA, AYUSH GARG, ARPIT SEHGAL & ASHOK KUMAR
**JournalName:**International Journal of Computer Science Engineering and Information Technology Research (IJCSEITR)
**Summary:**Sanctioning of loan to borrowers form the most vital part of every bank's business, as most of its assets come from the profit gained in the loan distribution process. Therefore, it is essential for banks to estimate whether the customer is right.

## 2 .3 PROBLEM STATEMENT DEFINITION:

A bank is a financial institution licensed to receive deposits and make loans needs a way to verify the customer details and their documents for getting loan because they need a trustworthy customer with proper credentials who can repay the loan amount and interest on tim

# 3 .IDEATION & PROPOSED SOLUTION

## 3 .1 EMPATHY MAP CANVAS



## 3 .2 IDEATION & BRAINSTORMING :

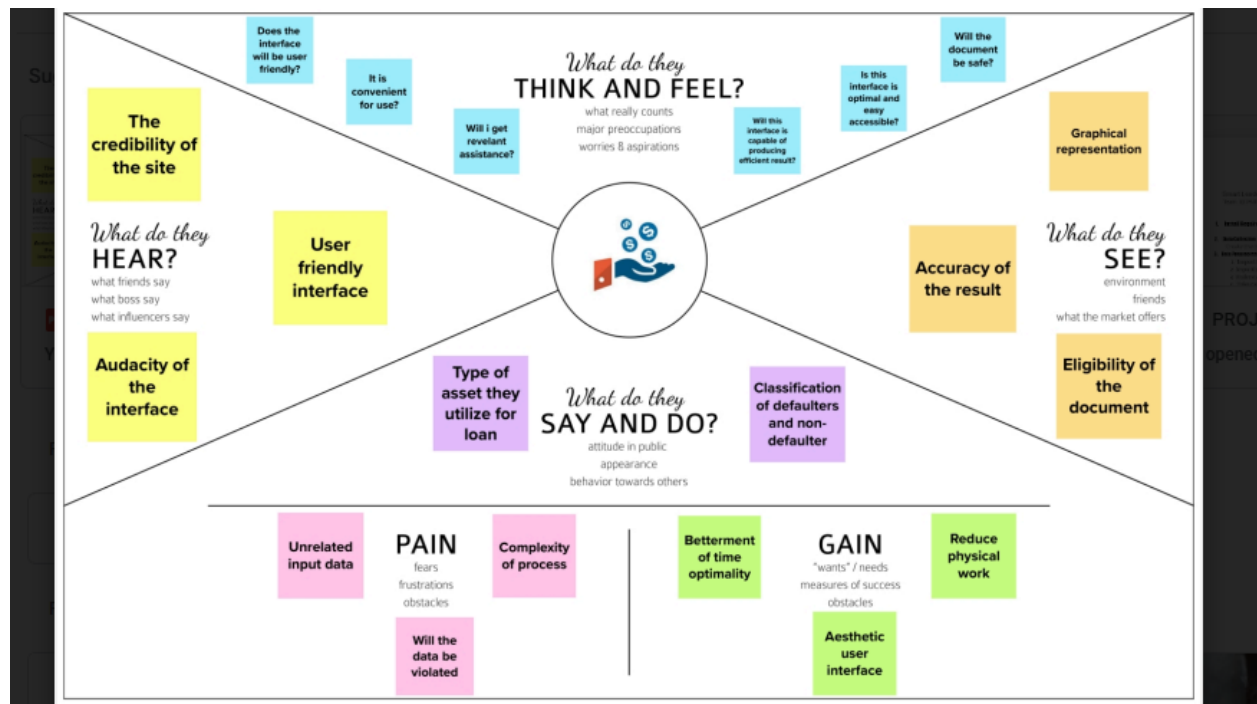Define your problem statement:

A bank is a financial institution licensed to receive deposits and make loans needs a way to verify the customer details and their documents for getting loan because they need a trustworthy customer with proper credentials who can repay the loan amount and interest on time

## Person 1

| | | |
|---|---|---|
| Automate loan process | loan status have two values | YES OR NO |
| approved or not approved | online application form filling | INCOME |
| LOAN AMOUNT | CREDIT HISTORY | EDUCATION |

## Person 2

| | | |
|---|---|---|
| NO of dependent | Today target amount | Business standing |
| DEPLOYMENT | Evaluation | MODELING |
| DATA UNDER STANDING | LOT OF MAN HOURS SAVE | CUSTOMER SEGMENTS |

## Person 3

| | | |
|---|---|---|
| ELIGIBLITY | BINARY CLASS | MULTI CLASS |
| DEAM HOUSE FINANCIAL | SEMI URBAN | RURAL |
| ALL URBAN | REAL TIME | CUSTOMER DETAILS |

**Importance**

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

INCOME

DREAM HOUSE

CREDIT HISTROY

EDUCATIONAL LOANS

LOAN AMOUNT

FINANCIAL LOANS

BACKGROUND

LOAN STATUS

EDUCATION
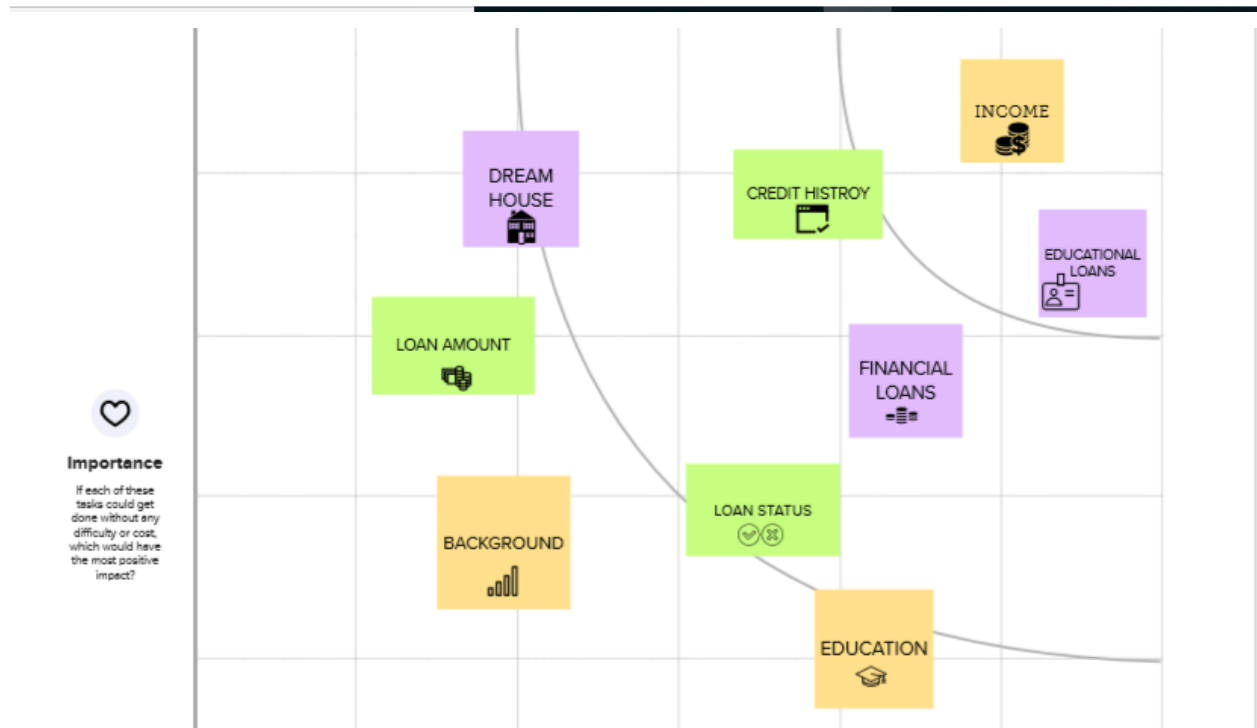
Prioritizing ideas

# 3 .3 PROPOSED SOLUTION

| SL.NO | PARAMETER | DESCRIPTION |
|---|---|---|
| 1 | **Problem Statement (Problem to be solved)** | * They have a presence across all urban ,semi urban, eligibility of loan, income,education..<br><br>*Applicants with high income should have more chances of getting approval.less the time period has higher chances of approval |
| 2 | **Idea / Solution description** | To gather loan data from multiple data sources and use various machine learning algorithms ..<br>* Who has paid their historical debts have more chances of getting approval.less the amount higher changes.. · |
| 3 | **Novelty / Uniqueness** | *Our contribute the work lies in deep learning.we want to use (BIG DATA ALGORITHM)<br>*They provide complete end-to-end machine learning workflow for building we includes methods like automated process in future |

## 3 .4 PROBLEM SOLUTION FIT

### 1. CUSTOMER SEGMENT(S) `CS`
Our target customers are mostly banking firm, small financial firm that lends out loan and credit card companies because of the increasing rate of loan defaulter and also to increase the slow process of the loan approval.

### 6. CUSTOMER CONSTRAINTS `CC`
Banks are not to correctly handle the loan request. People within a protected class being clearly treated differently than those of non-protected classes for loan. There is an increasing rate of loan defaults. Banks Identify the loan defaulters for much-reduced credit risk as large portions of a bank's assets directly come from the interest earned on loans given.

### 5. AVAILABLE SOLUTIONS `AS`
· Random forest, Logistic regression, Decision tree and Naive bayes algorithm are used
• Using data pre-processing data mining and data filtering
• Algorithms such as naïve bayes, k-nearest neighbors

### 2. JOBS-TO-BE-DONE / PROBLEMS `J&P`
Needs to Support genuine Entrepreneur That the process should be easier a timesaving. To find an applicant which can give best interest. Needs to find a loan applicant with good credit score

### 9. PROBLEM ROOT CAUSE `RC`
The root cause of this problem is the banks identify the loan defaulters formuch-reduced credit risk as large portions of a bank's assets directly come from the interest earned on loans given. . People within a protected class being clearly treated differently than those of non-protected classes for loan

### 7. BEHAVIOUR `BE`
Directly related:
The customers who lends the loan and the banks that checks the credibility seek to do the process faster.
Indirectly associated:
The small finance sector that deals with middle class and poor class people seek to find the credibility.

# 4 .REQUIREMENT ANALYSIS

## 4 .1 FUNCTIONAL REQUIREMENT

| USER. No | Functional Requirement | subRequirement (Story/Sub T ask) |
|---|---|---|
| usr–1 | User Registration | Registration through Form e-mail |
| usr–2 | User Login | Login using username and password |
| usr–3 | Bank Login | LOGIN using bank credentials |
| usr–4 | User View Profile | User will find the complete details a nd steps for applying loan |
| usr–5 | User Application | User upload their details and document proof |
| usr–6 | Contact | User can contact the bank in case of any queries |

## 4.2 NON-FUNCTIONAL REQUIREMENT

following are the non-functional requirements of the proposed solution

| USER NO | NON-FUNCTIONAL REQUIREMENT | DESCRIPTION |
|---------|---------------------------|-------------|
| User-1 | Usability | User friendly U1 Easy to use |
| user-2 | Security | Login Verification User details not shared to third party Verification by bank Captcha security |
| User -3 | Reliability | Handle changes |
| user-4 | Performance | Responsive Website Quick loading |
| user-5 | Availability | Good Services Availability Satisfies user needs Meets user requirements |
| user-6 | Scalability | The System Can Grow Without negative influence Adaptable Handle multiple users64 |

# 5 .PROJECT DESIGN

## 5.1 DATA FLOW DIAGRAM
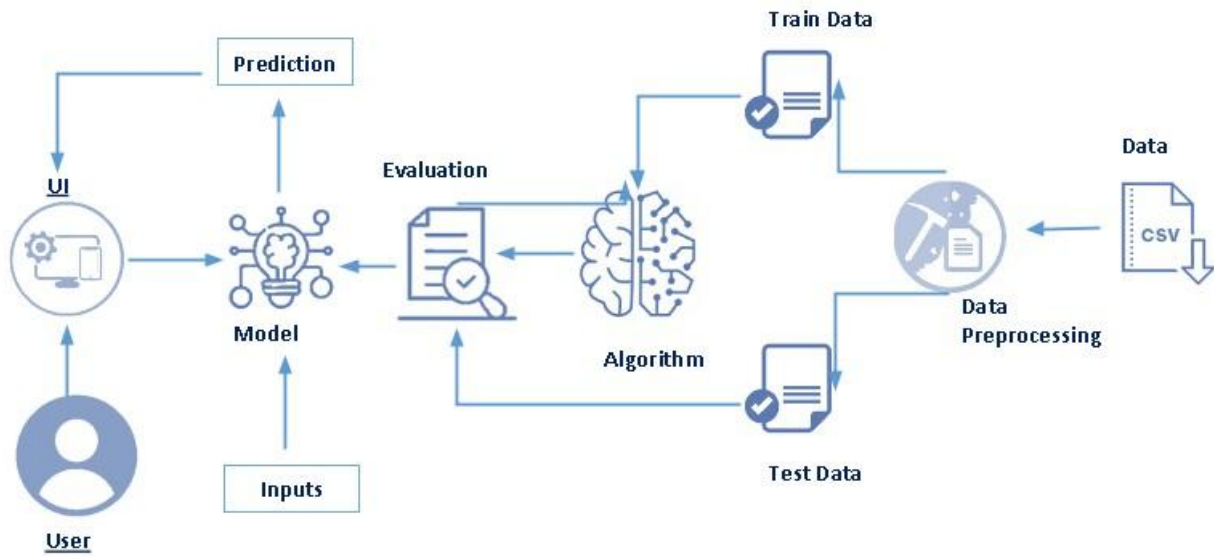
## 5 .2 SOLUTION AND TECHNICAL ARCHITECTURE
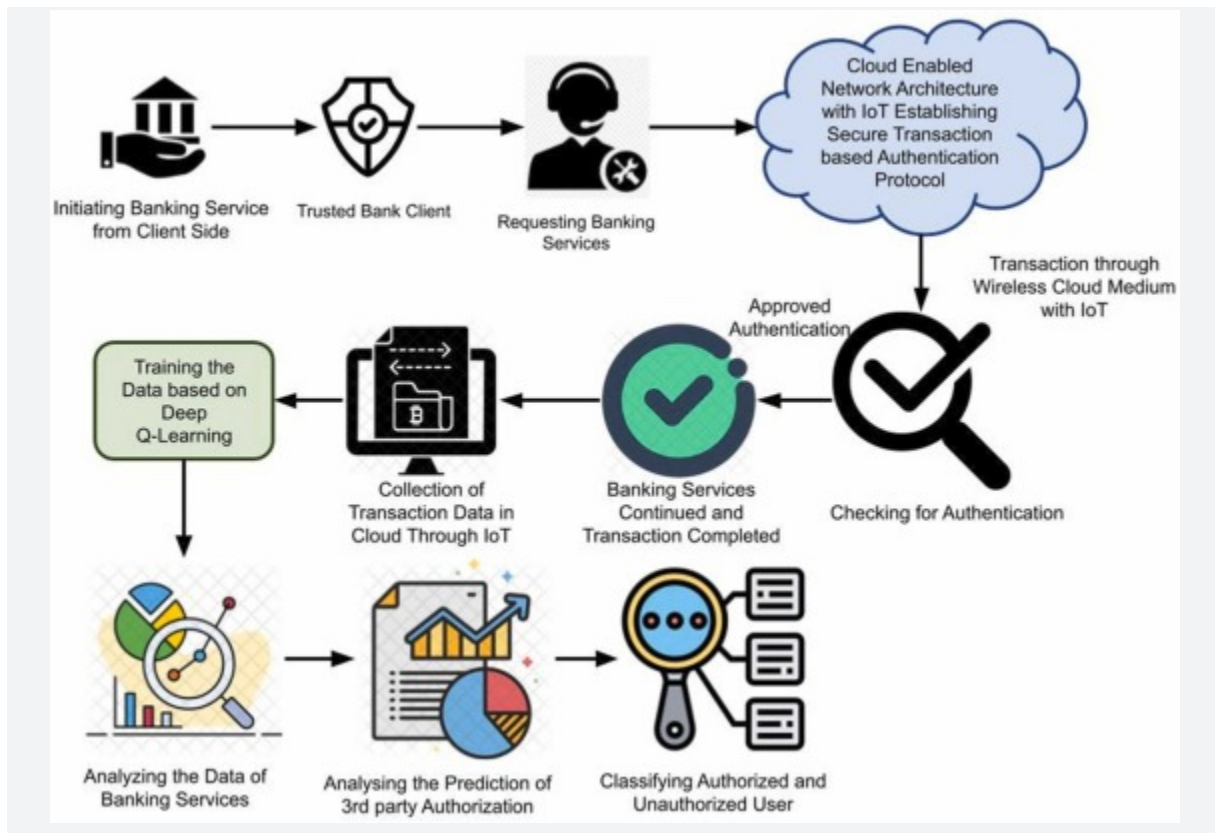
## Application characteristics

| S.no | Characteristics | Description | Technology |
|---|---|---|---|
| 1 | Open-Source FrameworksList | Listhe open-source frameworks used | IBM Cloud |
| 2 | Security Implementations | ItsSecures information and data | IBM Cloud provides layered security controls across network and infrastructure |
| 3 | Scalable Architecture | Its support various data sizes | IBM Cloud |
| 4 | Availability | Creating multiple pages for comfortable user interface experience | HTML,CSS, JavaScrip |

## 5.3 USER STORIES

| User Type | Functional Requirement | User Story no | User story/ Task | Priority | Priority Release |
|---|---|---|---|---|---|
| customer | Registration | USN-1 | As a user,I can register for the application by entering my name,email Passwords etc. | HIGH | Sprint-1 |
| | Login | USN-2 | As a user,I can log into the application by entering the user's name and password | HIGH | Sprint-1 |
| | Navigation | USN-3 | As a user,I can Navigate to different tabs like home,descript-ion,contact | LOW | SPrint-2 |
| | View procedure | USN-4 | As a user,I can View the procedure to apply for loan | MEDIUM | Sprint-3 |
| | Contact | USN-5 | As a user,I can Contact bank | HIGH | Sprint-3 |

# 6 .PROJECT PLANNING AND SCHEDULING

## 6 .1 SPRINT PLANNING AND ESTIMATION

| Sprint | Functional Requirement (Epic) | User Story Number | User Story / Task Sprint | Story Points | Priority | Team Members |
|---|---|---|---|---|---|---|
| **Sprint-1** | **Login** | **USN-1** | As a user, I can log into the application by entering the username and password | 2 | HIGH | JANANI K GOKULNATH |
| **Sprint-1** | | **USN-2** | As a user login the gmail id | 3 | HIGH | NALIN KUMAR JANANI |
| **Sprint-2** | | **USN-3** | As a user, I can view the procedure to apply for loan | 2 | LOW | GOKULNATH NALINKUMAR |
| **Sprint-2** | | **USN-4** | AS a user upload the document files for loan verification | 2 | MEDIUM | ANADHASAYAN GOKULNATH |
| **Sprint-3** | | **USN-5** | As a Bank administrator, I can Approve/Reject the loan for the customer based on their details. | 1 | HIGH | ANADHASAYAN NALINKUMAR |
| **Sprint-4** | | **USN-6** | As a user, I can get confirmation of loan approval through email | **2** | **HIGH** | GOKULNATH JANANI |

## 6 .2 SPRINT DELIVERY SCHEDULE

| Sprint | Total Story Points | Duration | Sprint End Date | Sprint End Date (Planned) | Story Points Complete | Sprint Release Date |
|--------|--------------------|----------|-----------------|---------------------------|-----------------------|---------------------|
| **Sprint-1** | 5 | 6 days | 24 oct 2022 | 29 oct 2022 | 5 | 29 oct 2022 |
| **Sprint-2** | 6 | 6 days | 31 oct 2022 | 05 nov 2022 | 7 | 05 nov 2022 |
| **Sprint-3** | 7 | 6 days | 07 nov 2022 | 12 nov 2022 | 7 | 09 nov 2022 |
| **Sprint-3** | 8 | 6 days | 14 nov 2022 | 19 nov 2022 | 6 | 17 nov 2022 |

$$\text{AV} = \frac{\text{Sprint duration}}{\text{Velocity}} = \frac{20}{10} = 2$$

**AVERAGE VELOCITY =6/6=1**

## Burndown Chart

A burndown chart shows the amount of work that has been completed in an epic or sprint, and the total work remaining.

# 6.3 REPORTS FROM JIRA

# 7 .CODING AND SOLUTIONING

## 7 .1 Feature 1:Contact

The user can contact the bank in case of any queries through this contact feature . They should fill in their name,email ID ,mobile number and the message they want t o send to them.

**CODE:**
**home.html**

```html
C: > Users > ELCOT > Desktop > ibmmmm > templates > <> home.html > <> html
1    <!DOCTYPE html>
2    <html lang="en">
3    <head>
4        <meta charset="UTF-8">
5        <meta http-equiv="X-UA-Compatible" content="IE=edge">
6        <meta name="viewport" content="width=device-width", initial-scale=1.0">
7        <title>Loan prediction</title>
8    </head>
9    <body>
10       <nav>
11        <div class="teams">
12            <div class="logo">
13                <a href="#">Loan Prediction🏅 </a>
14
15        </div>
16        <ul>
17            <li><a href="#">INFO</a></li>
18            <li><a href="#">ABOUT</a></li>
19            <li><a href="#">SERVICES</a></li>
20            <li><a href="#">DETAILS</a></li>
21        </ul>
22        </div>
23   </nav>
24   <div class="img"></div>
25   <div class="center">
26       <div class="title">WELCOME TO LOAN PREDICTION</div>
27       <div class="sub_title">Loan approval is made simple through this application by predicting the credit score of user <br>To check Loan Elig
28       <div class="btns">
29           <a href="predict.html">
30               <button>PREDICT</button>
31           </a>
32       </div>
33   </div>
```

```
33    </div>
34    </body>
35    </html>
36    <style>
37    nav{
38        background-position: fixed;
39        background-color: ▉rgb(107, 144, 192);
40        width:100%;
41        padding: 12px 0;
42
43    }
44    nav .teams{
45        max-width: 1250px;
46        margin: auto;
47        display: flex;
48        align-items: center;
49        justify-content: space-between;
50        padding: 0 20px;
51    }
52    .teams .logo a{
53        text-decoration: none;
54        color: ▢rgb(10, 5, 5);
55        font-size: 30px;
56        background: ◻white;
57        padding: 6px 12px;
58        border-radius: 30px;
59        font-family:Verdana, Geneva, Tahoma, sans-serif;
60        font-weight: 530;
61    }
62    .teams ul{
63        display: inline-flex;
64    }
65    .teams ul li{
```

```
    Get Started        <> home.html  X
C: > Users > ELCOT > Desktop > ibmmmm > templates > <> home.html > </> style > ts nav .teams
 65   .teams ul li{
 66       list-style: none;
 67       margin-left: 8px;
 68   }
 69   .teams ul li a{
 70       text-decoration: none;
 71       color: ☐rgb(0, 0, 0);
 72       font-size: 15px;
 73       font-family:system-ui, -apple-system, BlinkMacSystemFont, 'Segoe UI', Roboto, Oxygen, Ubuntu, Cantarell, 'Open Sans', 'Helvetica Neue', sans-
 74       font-weight: 500;
 75       background: ☐white;
 76       padding: 8px 15px;
 77       border-radius: 30px;
 78       transition: all 0.3s ease;
 79   }
 80   .teams ul li a:hover{
 81       background: ☐rgb(0, 16, 49);
 82       color: ☐white;
 83   }
 84   .img{
 85       background: url('https://static.vecteezy.com/system/resources/previews/005/085/280/original/a-new-startup-has-successfully-applied-for-a-loan
 86       height: 95vh;
 87       width: 100%;
 88       background-size: cover;
 89       background-position: center;
 90       position: relative;
 91   }
 92   .img::before{
 93       content: '';
 94       position: absolute;
 95       height: 100%;
 96       width: 100%;
```

## Home css.

```
 98   .center{
 99       position: absolute;
100       top: 58%;
101       left: 50%;
102       width: 100%;
103       transform: translate(-50% , -50%);
104       padding: 0 20px;
105       text-align: center;
106   }
107   .center .title{
108       color: ☐rgb(0, 20, 31);
109       font-size: 55px;
110       font-weight: 900;
111       font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
112   }
113   .center .sub_title{
114       color: ☐rgb(5, 21, 65);
115       font-size: 18px;
116       font-weight: 900;
117       font-family:'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
118   }
119   .center .btns{
120       margin-top: 20px;
121   }
122   .center .btns button{
123       height: 45px;
124       width: 150px;
125       border-radius: 25px;
126       border: none;
127       margin: 0 10px;
128       border: 1px solid ☐white;
129       font-size: 22px;
130       font-weight: 500;
```

```css
112    }
113    .center .sub_title{
114        color: ☐rgb(5, 21, 65);
115        font-size: 18px;
116        font-weight: 900;
117        font-family:'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
118    }
119    .center .btns{
120        margin-top: 20px;
121    }
122    .center .btns button{
123        height: 45px;
124        width: 150px;
125        border-radius: 25px;
126        border: none;
127        margin: 0 10px;
128        border: 1px solid ☐white;
129        font-size: 22px;
130        font-weight: 500;
131        font-family: fantasy;
132        padding: 0 10px;
133        cursor: pointer;
134        outline: none;
135        transition: all 0.3s ease;
136    }
137    .center .btns button:first-child{
138        color: ☐rgb(8, 8, 8);
139        background: ☐rgb(249, 250, 249);
140    }
141    .center .btns button:first-child:hover{
142        background: ☐rgb(37, 71, 221);
143        color:☐rgb(236, 247, 247);
```

## 7 .2 FEATURE 2:Prediction

**The user will upload all their details in this prediction page to predict the eligibility  o f them to to get the loan**

## CODE:

## Prediction.html

```
C: > Users > ELCOT > Desktop > Ibm project > templates > <> predict.html > ⦿ html > ⦿ style > Ꮺ .wrapper
  1   <!DOCTYPE html>
  2   <html lang="en">
  3   <style type="text/css">
  4
  5     *{
  6     margin: 0;
  7     padding: 0;
  8     box-sizing: border-box;
  9     font-family: 'Montserrat', sans-serif;
 10   }
 11   body{
 12     background: ▢grey;
 13     padding: 0 10px;
 14   }
 15   .wrapper{
 16     max-width: 500px;
 17     width: 100%;
 18     background: ▢#fff;
 19     margin: 20px auto;
 20     box-shadow: 4px 4px 25px ▢#000;
 21     padding: 30px;
 22   }
 23
 24   .wrapper .title{
 25     font-size: 20px;
 26     font-weight: 700;
 27     margin-bottom: 25px;
 28     color: ▢#264653;
 29     text-transform: uppercase;
 30     text-align: center;
 31   }
 32
 33   .wrapper .form{
```

```css
.wrapper .form{
  width: 100%;
}

.wrapper .form .inputfield{
  margin-bottom: 15px;
  display: flex;
  align-items: center;
}

.wrapper .form .inputfield label{
  width: 200px;
  color: #757575;
  margin-right: 10px;
  font-size: 14px;
}

.wrapper .form .inputfield .input,
.wrapper .form .inputfield .textarea{
  width: 100%;
  outline: none;
  border: 1px solid #d5dbd9;
  font-size: 15px;
  padding: 8px 10px;
  border-radius: 3px;
  transition: all 0.3s ease;
}

.wrapper .form .inputfield .textarea{
  width: 100%;
  height: 125px;
  resize: none;
```

```css
.wrapper .form .inputfield .textarea{
  width: 100%;
  height: 125px;
  resize: none;
}

.wrapper .form .inputfield .custom_select{
  position: relative;
  width: 100%;
  height: 37px;
}

.wrapper .form .inputfield .custom_select:before{
  content: "";
  position: absolute;
  top: 12px;
  right: 10px;
  border: 8px solid;
  border-color: #d5dbd9 transparent transparent transparent;
  pointer-events: none;
}

.wrapper .form .inputfield .custom_select select{
  -webkit-appearance: none;
  -moz-appearance:    none;
  appearance:         none;
  outline: none;
  width: 100%;
  height: 100%;
  border: 0px;
  padding: 8px 10px;
```

```css
 92      font-size: 15px;
 93      border: 1px solid #d5dbd9;
 94      border-radius: 3px;
 95  }
 96
 97  .wrapper .form .inputfield .input:focus,
 98  .wrapper .form .inputfield .textarea:focus,
 99  .wrapper .form .inputfield .custom_select select:focus{
100      border: 1px solid #264653;
101  }
102
103  .wrapper .form .inputfield .btn{
104      width: 100%;
105       padding: 8px 10px;
106      font-size: 15px;
107      border: 0px;
108      background: #264653;
109      color: #fff;
110      cursor: pointer;
111      border-radius: 3px;
112      outline: none;
113      text-align: center;
114  }
115
116  .wrapper .form .inputfield .btn:hover{
117      background: #ffb5a7;
118  }
119
120  .wrapper .form .inputfield:last-child{
121      margin-bottom: 0;
122  }
123  .wrapper .form .inputfield .btn{
124      width: 100%;
```

```css
124      width: 100%;
125       padding: 8px 10px;
126      font-size: 15px;
127      border: 0px;
128      background: #264653;
129      color: #fff;
130      cursor: pointer;
131      border-radius: 3px;
132      outline: none;
133  }
134  </style>
135
136  <head>
137      <meta charset="UTF-8">
138      <meta name="viewport" content="width=device-width, initial-scale=1.0">
139      <title>Loan Predictor App</title>
140  </head>
141
142  <body>
143
144  <br>
145
146  <center>
147      <H1 style="color:#264653;"> Bank Loan</H1>
148  </center>
149
150  <div class="wrapper">
151      <div class="title">
152          Loan Approval Prediction Form
153          <br><br><h2><b>{{ prediction_text }}</b></h2>
154      </div>
155
```

**Prediction css:**

```html
<form action='/predict' method='POST'>

  <div class="form">

    <div class="inputfield">
      <label>Gender</label>
      <div class="custom_select">
        <select name="gender">
          <option value="">Select</option>
          <option value="Male">Male</option>
          <option value="Female">Female</option>
        </select>
      </div>
    </div>

    <div class="inputfield">
      <label>Married</label>
      <div class="custom_select">
        <select name="married">
          <option value="">Select</option>
          <option value="Yes">Yes</option>
          <option value="No">No</option>
        </select>
      </div>
    </div>

    <div class="inputfield">
      <label>Dependents</label>
      <div class="custom_select">
        <select name="dependents">
          <option selected disabled hidden>Select</option>
          <option value="0">0</option>
```

```html
191                </select>
192              </div>
193            </div>
194
195            <div class="inputfield">
196              <label>Education</label>
197              <div class="custom_select">
198                <select name="education">
199                  <option value="">Select</option>
200                  <option value="Graduate">Graduate</option>
201                  <option value="NonGraduate">Non Graduate</option>
202                </select>
203              </div>
204            </div>
205
206          <div class="inputfield">
207            <label>Self Employed</label>
208            <div class="custom_select">
209              <select name = "employed">
210                <option value="">Select</option>
211                <option value="Yes">Yes</option>
212                <option value="No">No</option>
213              </select>
214            </div>
215          </div>
216
217          <div class="inputfield">
218            <label>Applicant Income (Monthly)</label>
219            <input type="number" class="input" name="ApplicantIncome" min="0">
220          </div>
221
222          <div class="inputfield">
223            <label>Co Applicant Income</label>
```

```html
223            <label>Co Applicant Income</label>
224            <input type="number" class="input" name="CoapplicantIncome" min="0">
225          </div>
226
227          <div class="inputfield">
228            <label>Loan  Amount</label>
229            <input type="number" class="input" name="LoanAmount" min="0">
230          </div>
231
232          <div class="inputfield">
233              <label>Loan Amount Term</label>
234            <input type="number" class="input" name="Loan_Amount_Term" min="0">
235          </div>
236
237          <div class="inputfield">
238              <label>Credit History</label>
239            <div class="custom_select">
240              <select name = "credit">
241                <option value="">Select</option>
242                <option value="Yes">Yes</option>
243                <option value="No">No</option>
244              </select>
245            </div>
246          </div>
247
248          <div class="inputfield">
249              <label>Property Area</label>
250            <div class="custom_select">
251              <select name = "proparea">
252                <option value="">Select</option>
253                <option value="Rural">Rural</option>
254                <option value="SemiUrban">Semi Urban</option>
```

## 7 .3 FEATURE

## 3 :Rating and Reviews

The user can provide their feedback at last about the service so that the bank can improve  their service

## CODE:

```html
1   <!DOCTYPE html>
2   <html lang="en" dir="ltr">
3     <head>
4       <meta charset="utf-8">
5       <title>Loan approval status</title>
6       <link rel="stylesheet" href="static/reject.css">
7       <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.3/css/all.min.css"/>
8     </head>
9     <body>
10      <h1>LOAN APPROVAL STATUS</h1>
11      <h2>{{prediction_text}}</h2>
12      <img src="static/reject.jpg" width="200px" height="200px">
13      <h3>Please provide your feedback</h3>
14      <div class="container">
15
16        <div class="post">
17          <div class="text">Thanks for rating us!</div>
18          <div class="edit">EDIT</div>
19        </div>
20        <div class="star-widget">
21          <input type="radio" name="rate" id="rate-5">
22          <label for="rate-5" class="fas fa-star"></label>
23          <input type="radio" name="rate" id="rate-4">
24          <label for="rate-4" class="fas fa-star"></label>
25          <input type="radio" name="rate" id="rate-3">
26          <label for="rate-3" class="fas fa-star"></label>
27          <input type="radio" name="rate" id="rate-2">
28          <label for="rate-2" class="fas fa-star"></label>
29          <input type="radio" name="rate" id="rate-1">
30          <label for="rate-1" class="fas fa-star"></label>
31          <form action="#">
32            <header></header>
33            <div class="textarea">
```

```
33  │          <div class="textarea">
34  │            <textarea cols="30" placeholder="Describe your experience.."></textarea>
35  │          </div>
36  │          <div class="btn">
37  │            <button type="submit">Post</button>
38  │          </div>
39  │        </form>
40  │      </div>
41  │    </div>
42  │    <script>
43  │      const btn = document.querySelector("button");
44  │      const post = document.querySelector(".post");
45  │      const widget = document.querySelector(".star-widget");
46  │      const editBtn = document.querySelector(".edit");
47  │      btn.onclick = ()=>{
48  │        widget.style.display = "none";
49  │        post.style.display = "block";
50  │        editBtn.onclick = ()=>{
51  │          widget.style.display = "block";
52  │          post.style.display = "none";
53  │        }
54  │        return false;
55  │      }
56  │    </script>
57  │  </body>
58  │</html>
```

```
1   │<!DOCTYPE html>
2   │<html lang="en" dir="ltr">
3   │  <head>
4   │    <meta charset="utf-8">
5   │    <title>Loan approva status</title>
6   │    <link rel="stylesheet" href="static/approve.css">
7   │    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.3/css/all.min.css"/>
8   │  </head>
9   │  <body>
10  │    <h1>LOAN APPROVAL STATUS</h1>
11  │    <h2>{{prediction_text}}</h2>
12  │    <img src="static/approve.jpg" width="150px" height="150px">
13  │    <h3>Please provide your feedback</h3>
14  │    <div class="container">
15  │
16  │      <div class="post">
17  │        <div class="text">Thanks for rating us!</div>
18  │        <div class="edit">EDIT</div>
19  │      </div>
20  │      <div class="star-widget">
21  │        <input type="radio" name="rate" id="rate-5">
22  │        <label for="rate-5" class="fas fa-star"></label>
23  │        <input type="radio" name="rate" id="rate-4">
24  │        <label for="rate-4" class="fas fa-star"></label>
25  │        <input type="radio" name="rate" id="rate-3">
26  │        <label for="rate-3" class="fas fa-star"></label>
27  │        <input type="radio" name="rate" id="rate-2">
28  │        <label for="rate-2" class="fas fa-star"></label>
29  │        <input type="radio" name="rate" id="rate-1">
30  │        <label for="rate-1" class="fas fa-star"></label>
31  │        <form action="#">
```

33

```html
32          <header></header>
33          <div class="textarea">
34            <textarea cols="30" placeholder="Describe your experience.."></textarea>
35          </div>
36          <div class="btn">
37            <button type="submit">Post</button>
38          </div>
39        </form>
40      </div>
41    </div>
42    <script>
43      const btn = document.querySelector("button");
44      const post = document.querySelector(".post");
45      const widget = document.querySelector(".star-widget");
46      const editBtn = document.querySelector(".edit");
47      btn.onclick = ()=>{
48        widget.style.display = "none";
49        post.style.display = "block";
50        editBtn.onclick = ()=>{
51          widget.style.display = "block";
52          post.style.display = "none";
53        }
54        return false;
55      }
56    </script>
57  </body>
58 </html>
```

# 8. TESTING

## 8 .1 TEST CASES

| Test case ID | Functional | Test Scenario | Test data | Result | Status |
|---|---|---|---|---|---|
| Home page_TC_oo1 | Functional | Verify user is able to see the Home page when the user enters the url | url of the web application | Home page should be displayed | |
| Home page_TC_oo2 | UI | Verify the UI elements in the home page | home.html | Application should display UI elements: a.home tab b.about tab c.procedure tab d.user login tab e.predict button | pass |
| Home page_TC_oo3 | functional | Verify user is able to see the Login page when user clicked on User l ogin butt | home.html | Login page should be display | pass |
| Home page_TC_oo4 | functional | Verify user is able to log into application with valid credentials | Username: mm@gmail.com password: mohit | User should navigate to prediction page | pass |

| Home page_TC_oo5 | functional | Verify user is able to log into application with invalid credentials | Username:mm /EmailId: a ss@gmail.com password: mohit | Application should show ' Login failed Invalid username o r email ID or password' validation message | pass |
|---|---|---|---|---|---|
| prediction page_TC_oo6 | functional | Verify user is able to see the prediction page when user clicked on predict button | prediction.html | Prediction page should be display | pass |
| prediction page_TC_oo7 | U I | Verify the UI elements in prediction page | prediction.html | Application should show below U I elements: a . Name text box b . Email ID text box c .Gender drop down menu d .Education drop down menu e.Self_Employ ed drop down menu f.married drop down menu g.Dependents h.property area drop down menu i.credit History jApplicant income | Pass |

| | | | k..Co Applicant income l..Loan amount text . Predict button | | |
|---|---|---|---|---|---|
| prediction page_TC_oo9 | functional | Verify user is able to predict the results with Valid credentials | Name:aishu E mail ID:aishu@gmail.com Gender:Female Education: Graduate Self-Employed :No Married:No Dependents:3+ Property Area: Urban CreditHistory: No Applicant Income:10000 Co-applicant Incom-e:5000 Loan amount:7000 Loan amount term:3600 Property document:proof | Application should be directed t o the approve page or reject p age based on their given data | Pass |
| Approve page_TC_010 | functional | Verify user is able to see the Approve page when user clicked on predict button and when predictive value | approve.html | Approve page should be display | pass |

## 8 .2 USER ACCEPTANCE TESTING

**Defect Analysis**

| Resolution | Severity 1 | severity2 | severity3 | severity4 | subtotal |
|---|---|---|---|---|---|
| By Design | 7 | 2 | 1 | 1 | 11 |
| Duplicate | 1 | 0 | 0 | 0 | 1 |
| External | 2 | 3 | 0 | 1 | 6 |
| Fixed | 1 | 2 | 4 | 12 | 19 |
| Not Reproduced | 0 | 0 | 1 | 0 | 1 |
| Skipped | 0 | 0 | 1 | 1 | 2 |
| Won"t Fix | 0 | 0 | 2 | 1 | 3 |
| Totals | 11 | 7 | 9 | 16 | 43 |

**Test Case Analysis**

| section | Total Cases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| Login | 5 | 0 | 0 | 5 |
| Prediction | 3 | 0 | 0 | 3 |
| Rating | 1 | 0 | 0 | 1 |

# 9 .RESULTS

## 9 .1 PERFORMANCE METRICS

| S.no | Para meter | Values | Screenshot |
|---|---|---|---|
| 1 | meteric es | **Classification model**<br><br>**Confusion matrix**<br><br>   **0-[[51  9]]**<br>   **1-[[7 72]]**<br>**Accuracy score**<br> **Random Forest:**<br>**Testing accuracy =**<br>**0.777292576419214**<br>**Training Accuracy=**<br>**0.9891774891774892**<br><br><br>**Precision    recall     fi-score    support**<br><br>**0    0.77       0.75       0.76          106**<br><br>**1    0.79       0.80       0.80          123**<br><br><br>**Accuracy                    0.78     229**<br>**Macro avg  0.78    0.78   0.78     229**<br><br>**Weighted    0.78   0.78     0.78    229** | ```
**** Random Forest Classifier ****
Confusion Matrix
[[51  9]
 [ 7 72]]
Classification Report
             precision   recall  f1-score   support

         0      0.88      0.85      0.86        60
         1      0.89      0.91      0.90        79

  accuracy                          0.88       139
 macro avg      0.88      0.88      0.88       139
weighted avg    0.88      0.88      0.88       139
```<br><br>```
x_train, x_test, y_train, y_test = train_test_split(x_bal, y_bal, test_size = 0.33, random_state = 30)

Random Forest Model

model = RandomForestClassifier(n_estimators=10,criterion='entropy')
model.fit(x_train,y_train)
y_predict= model.predict(x_test)
y_predict_train = model.predict(x_train)


print('Testing accuracy = ', accuracy_score(y_test,y_predict))
print('Training accuracy= ',accuracy_score(y_train,y_predict_train))

Testing accuracy =  0.777292576419214
Training accuracy=  0.9891774891774892
``` |

# 10.ADVANTAGES AND DISADVANTAGES

## ADVANTAGES

The customer can predict their eligibility from any part of the world    and at   any time so it provides user convenience

- Eligible applicant will be sanctioned loan without any delay
- Minimal documentation is required and there is no physical submission of   documents
- Whole process will be automated,so human error will be avoided

- Time period for loan sanctioning will be reduced and more Accurate  prediction for loan eligibility will be given
. ● The customer can contact bank at any time in case of any queries and we had  also provided the detailed procedure for applying loan and customer can also  provide the rating

## DISADVANTAGES

- The customer can contact the lender only through online using email or call   them in case of any queries
- The bank should externally connect to database and use this software in real   time we had provided only the feature
- There may be some risk associated with security of the customers as they are  providing all their details in online
- The Accuracy of prediction can also be improved

# 1 1.CONCLUSION

The analysis has started from data preprocessing ,handling missing value, exploratory analysis and different models were built like Decision tree model,KNN model,Xgboost model and Random Forest model and there performance were evaluated , as a result the Random Forest model is selected as the best model for predicting the loan approval status of the customer after evaluating its performance ,as it got 91% accuracy in prediction.This application is then tested and it functions properly and it also meets all the requirements of the bank in selecting the trustworthy person to provide loan.

# 1 2.FUTURE SCOPE

I n future,payment option can be included in this application for exchanging money between the lender and borrower and bank can verify the customer document online using AI which makes the process of verification simpler and could be made more secure,trustworthy and dynamic weight conformation and in near future this module can be integrated with the module of automated processing system.

# 1 3.APPENDIX

SOURCE CODE

Home.html

```html
C: > Users > ELCOT > Desktop > ibmmmm > templates > <> home.html > @ html
1    <!DOCTYPE html>
2    <html lang="en">
3    <head>
4        <meta charset="UTF-8">
5        <meta http-equiv="X-UA-Compatible" content="IE=edge">
6        <meta name="viewport" content="width=device-width", initial-scale=1.0">
7        <title>Loan prediction</title>
8    </head>
9    <body>
10       <nav>
11        <div class="teams">
12            <div class="logo">
13                <a href="#">Loan Prediction🏅 </a>
14
15        </div>
16        <ul>
17            <li><a href="#">INFO</a></li>
18            <li><a href="#">ABOUT</a></li>
19            <li><a href="#">SERVICES</a></li>
20            <li><a href="#">DETAILS</a></li>
21        </ul>
22        </div>
23    </nav>
24    <div class="img"></div>
25    <div class="center">
26        <div class="title">WELCOME TO LOAN PREDICTION</div>
27        <div class="sub_title">Loan approval is made simple through this application by predicting the credit score of user <br>To check Loan Elig
28        <div class="btns">
29            <a href="predict.html">
30                <button>PREDICT</button>
31            </a>
32        </div>
33    </div>
```

```
33    </div>
34    </body>
35    </html>
36    <style>
37    nav{
38        background-position: fixed;
39        background-color: ▉rgb(107, 144, 192);
40        width:100%;
41        padding: 12px 0;
42
43    }
44    nav .teams{
45        max-width: 1250px;
46        margin: auto;
47        display: flex;
48        align-items: center;
49        justify-content: space-between;
50        padding: 0 20px;
51    }
52    .teams .logo a{
53        text-decoration: none;
54        color: ▢rgb(10, 5, 5);
55        font-size: 30px;
56        background: ◻white;
57        padding: 6px 12px;
58        border-radius: 30px;
59        font-family:Verdana, Geneva, Tahoma, sans-serif;
60        font-weight: 530;
61    }
62    .teams ul{
63        display: inline-flex;
64    }
65    .teams ul li{
```

Get Started          <> home.html ✕

```
65    .teams ul li{
66        list-style: none;
67        margin-left: 8px;
68    }
69    .teams ul li a{
70        text-decoration: none;
71        color: ▢rgb(0, 0, 0);
72        font-size: 15px;
73        font-family:system-ui, -apple-system, BlinkMacSystemFont, 'Segoe UI', Roboto, Oxygen, Ubuntu, Cantarell, 'Open Sans', 'Helvetica Neue', sans-
74        font-weight: 500;
75        background: ◻white;
76        padding: 8px 15px;
77        border-radius: 30px;
78        transition: all 0.3s ease;
79    }
80    .teams ul li a:hover{
81        background: ▢rgb(0, 16, 49);
82        color: ◻white;
83    }
84    .img{
85        background: url('https://static.vecteezy.com/system/resources/previews/005/085/280/original/a-new-startup-has-successfully-applied-for-a-loan
86        height: 95vh;
87        width: 100%;
88        background-size: cover;
89        background-position: center;
90        position: relative;
91    }
92    .img::before{
93        content: '';
94        position: absolute;
95        height: 100%;
96        width: 100%;
```

**43**

```css
 98    .center{
 99        position: absolute;
100        top: 58%;
101        left: 50%;
102        width: 100%;
103        transform: translate(-50% , -50%);
104        padding: 0 20px;
105        text-align: center;
106    }
107    .center .title{
108        color: □rgb(0, 20, 31);
109        font-size: 55px;
110        font-weight: 900;
111        font-family: 'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
112    }
113    .center .sub_title{
114        color: □rgb(5, 21, 65);
115        font-size: 18px;
116        font-weight: 900;
117        font-family:'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
118    }
119    .center .btns{
120        margin-top: 20px;
121    }
122    .center .btns button{
123        height: 45px;
124        width: 150px;
125        border-radius: 25px;
126        border: none;
127        margin: 0 10px;
128        border: 1px solid ■white;
129        font-size: 22px;
130        font-weight: 500;
```

```css
112    }
113    .center .sub_title{
114        color: □rgb(5, 21, 65);
115        font-size: 18px;
116        font-weight: 900;
117        font-family:'Gill Sans', 'Gill Sans MT', Calibri, 'Trebuchet MS', sans-serif;
118    }
119    .center .btns{
120        margin-top: 20px;
121    }
122    .center .btns button{
123        height: 45px;
124        width: 150px;
125        border-radius: 25px;
126        border: none;
127        margin: 0 10px;
128        border: 1px solid ■white;
129        font-size: 22px;
130        font-weight: 500;
131        font-family: fantasy;
132        padding: 0 10px;
133        cursor: pointer;
134        outline: none;
135        transition: all 0.3s ease;
136    }
137    .center .btns button:first-child{
138        color: □rgb(8, 8, 8);
139        background: ■rgb(249, 250, 249);
140    }
141    .center .btns button:first-child:hover{
142        background: □rgb(37, 71, 221);
143        color:■rgb(236, 247, 247);
```

## Predict .html

```html
1    <!DOCTYPE html>
2    <html lang="en">
3    <style type="text/css">
4
5      *{
6      margin: 0;
7      padding: 0;
8      box-sizing: border-box;
9      font-family: 'Montserrat', sans-serif;
10    }
11    body{
12      background: ■grey;
13      padding: 0 10px;
14    }
15    .wrapper{
16      max-width: 500px;
17      width: 100%;
18      background: ■#fff;
19      margin: 20px auto;
20      box-shadow: 4px 4px 25px □#000;
21      padding: 30px;
22    }
23
24    .wrapper .title{
25      font-size: 20px;
26      font-weight: 700;
27      margin-bottom: 25px;
28      color: □#264653;
29      text-transform: uppercase;
30      text-align: center;
31    }
32
33    .wrapper .form{
```

```css
32
33   .wrapper .form{
34     width: 100%;
35   }
36
37   .wrapper .form .inputfield{
38     margin-bottom: 15px;
39     display: flex;
40     align-items: center;
41   }
42
43   .wrapper .form .inputfield label{
44       width: 200px;
45       color: #757575;
46       margin-right: 10px;
47     font-size: 14px;
48   }
49
50   .wrapper .form .inputfield .input,
51   .wrapper .form .inputfield .textarea{
52     width: 100%;
53     outline: none;
54     border: 1px solid #d5dbd9;
55     font-size: 15px;
56     padding: 8px 10px;
57     border-radius: 3px;
58     transition: all 0.3s ease;
59   }
60
61   .wrapper .form .inputfield .textarea{
62     width: 100%;
63     height: 125px;
64     resize: none;
```

```css
60
61   .wrapper .form .inputfield .textarea{
62     width: 100%;
63     height: 125px;
64     resize: none;
65   }
66
67   .wrapper .form .inputfield .custom_select{
68     position: relative;
69     width: 100%;
70     height: 37px;
71   }
72
73   .wrapper .form .inputfield .custom_select:before{
74     content: "";
75     position: absolute;
76     top: 12px;
77     right: 10px;
78     border: 8px solid;
79     border-color: #d5dbd9 transparent transparent transparent;
80     pointer-events: none;
81   }
82
83   .wrapper .form .inputfield .custom_select select{
84     -webkit-appearance: none;
85     -moz-appearance:    none;
86     appearance:         none;
87     outline: none;
88     width: 100%;
89     height: 100%;
90     border: 0px;
91     padding: 8px 10px;
```

```css
92      font-size: 15px;
93      border: 1px solid #d5dbd9;
94      border-radius: 3px;
95  }
96
97  .wrapper .form .inputfield .input:focus,
98  .wrapper .form .inputfield .textarea:focus,
99  .wrapper .form .inputfield .custom_select select:focus{
100     border: 1px solid #264653;
101 }
102
103 .wrapper .form .inputfield .btn{
104     width: 100%;
105      padding: 8px 10px;
106     font-size: 15px;
107     border: 0px;
108     background: #264653;
109     color: #fff;
110     cursor: pointer;
111     border-radius: 3px;
112     outline: none;
113     text-align: center;
114 }
115
116 .wrapper .form .inputfield .btn:hover{
117     background: #ffb5a7;
118 }
119
120 .wrapper .form .inputfield:last-child{
121     margin-bottom: 0;
122 }
123 .wrapper .form .inputfield .btn{
124     width: 100%;
```

```html
156     <form action='/predict' method='POST'>
157
158       <div class="form">
159
160         <div class="inputfield">
161           <label>Gender</label>
162           <div class="custom_select">
163             <select name="gender">
164               <option value="">Select</option>
165               <option value="Male">Male</option>
166               <option value="Female">Female</option>
167             </select>
168           </div>
169         </div>
170
171         <div class="inputfield">
172           <label>Married</label>
173           <div class="custom_select">
174             <select name="married">
175               <option value="">Select</option>
176               <option value="Yes">Yes</option>
177               <option value="No">No</option>
178             </select>
179           </div>
180         </div>
181
182         <div class="inputfield">
183           <label>Dependents</label>
184           <div class="custom_select">
185             <select name="dependents">
186               <option selected disabled hidden>Select</option>
187               <option value="0">0</option>
```

## Approve .html

```html
1   <!DOCTYPE html>
2   <html lang="en" dir="ltr">
3     <head>
4       <meta charset="utf-8">
5       <title>Loan approva status</title>
6       <link rel="stylesheet" href="static/approve.css">
7       <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.3/css/all.min.css"/>
8     </head>
9     <body>
10      <h1>LOAN APPROVAL STATUS</h1>
11      <h2>{{prediction_text}}</h2>
12      <img src="static/approve.jpg" width="150px" height="150px">
13      <h3>Please provide your feedback</h3>
14      <div class="container">
15
16        <div class="post">
17          <div class="text">Thanks for rating us!</div>
18          <div class="edit">EDIT</div>
19        </div>
20        <div class="star-widget">
21          <input type="radio" name="rate" id="rate-5">
22          <label for="rate-5" class="fas fa-star"></label>
23          <input type="radio" name="rate" id="rate-4">
24          <label for="rate-4" class="fas fa-star"></label>
25          <input type="radio" name="rate" id="rate-3">
26          <label for="rate-3" class="fas fa-star"></label>
27          <input type="radio" name="rate" id="rate-2">
28          <label for="rate-2" class="fas fa-star"></label>
29          <input type="radio" name="rate" id="rate-1">
30          <label for="rate-1" class="fas fa-star"></label>
31          <form action="#">
```

C: > Users > ELCOT > Desktop > lbm project > templates > <> approve.html > ⬡ html > ⬡ body > ⬡ h3

```html
32            <header></header>
33            <div class="textarea">
34              <textarea cols="30" placeholder="Describe your experience.."></textarea>
35            </div>
36            <div class="btn">
37              <button type="submit">Post</button>
38            </div>
39          </form>
40        </div>
41      </div>
42      <script>
43        const btn = document.querySelector("button");
44        const post = document.querySelector(".post");
45        const widget = document.querySelector(".star-widget");
46        const editBtn = document.querySelector(".edit");
47        btn.onclick = ()=>{
48          widget.style.display = "none";
49          post.style.display = "block";
50          editBtn.onclick = ()=>{
51            widget.style.display = "block";
52            post.style.display = "none";
53          }
54          return false;
55        }
56      </script>
57    </body>
58  </html>
```

# reject .html

```html
<!DOCTYPE html>
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Loan approval status</title>
    <link rel="stylesheet" href="static/reject.css">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.3/css/all.min.css"/>
  </head>
  <body>
    <h1>LOAN APPROVAL STATUS</h1>
    <h2>{{prediction_text}}</h2>
    <img src="static/reject.jpg" width="200px" height="200px">
    <h3>Please provide your feedback</h3>
    <div class="container">

      <div class="post">
        <div class="text">Thanks for rating us!</div>
        <div class="edit">EDIT</div>
      </div>
      <div class="star-widget">
        <input type="radio" name="rate" id="rate-5">
        <label for="rate-5" class="fas fa-star"></label>
        <input type="radio" name="rate" id="rate-4">
        <label for="rate-4" class="fas fa-star"></label>
        <input type="radio" name="rate" id="rate-3">
        <label for="rate-3" class="fas fa-star"></label>
        <input type="radio" name="rate" id="rate-2">
        <label for="rate-2" class="fas fa-star"></label>
        <input type="radio" name="rate" id="rate-1">
        <label for="rate-1" class="fas fa-star"></label>
        <form action="#">
          <header></header>
          <div class="textarea">
```

```html
          <div class="textarea">
            <textarea cols="30" placeholder="Describe your experience.."></textarea>
          </div>
          <div class="btn">
            <button type="submit">Post</button>
          </div>
        </form>
      </div>
    </div>
    <script>
      const btn = document.querySelector("button");
      const post = document.querySelector(".post");
      const widget = document.querySelector(".star-widget");
      const editBtn = document.querySelector(".edit");
      btn.onclick = ()=>{
        widget.style.display = "none";
        post.style.display = "block";
        editBtn.onclick = ()=>{
          widget.style.display = "block";
          post.style.display = "none";
        }
        return false;
      }
    </script>
  </body>
</html>
```

# Model.ipynb

```python
import pandas as pd
import numpy as np
import pickle
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import sklearn
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import GradientBoostingClassifier, RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import RandomizedSearchCV
import warnings
warnings.filterwarnings('ignore')
import imblearn
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix, f1_score
from sklearn.model_selection import cross_val_score
```

```python
data=pd.read_csv(r"D:\gokulnath\ibm\Loan_Predict.csv")
```

```python
data.head()
```

```python
def decisionTree(x_train,x_test,y_train,y_test):
    dt = DecisionTreeClassifier()
    dt.fit(x_train,y_train)
    pred_test = dt.predict(x_test)
    pred_test
    print('***DecisionTreeClassifier***')
    print('Confusion Matrix')
    print(confusion_matrix(y_test,pred_test))
    print('Classification Report')
    print(classification_report(y_test,pred_test))
    print('Score')
    print(dt.score(x_test,y_test))
```

```python
decisionTree(x_train,x_test,y_train,y_test)
```

```
***DecisionTreeClassifier***
Confusion Matrix
[[48 12]
 [14 65]]
Classification Report
              precision    recall  f1-score   support

           0       0.77      0.80      0.79        60
           1       0.84      0.82      0.83        79
```

```python
data.shape
print("\n")
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 614 entries, 0 to 613
Data columns (total 13 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Loan_ID            614 non-null    object
 1   Gender             601 non-null    object
 2   Married            611 non-null    object
 3   Dependents         599 non-null    object
 4   Education          614 non-null    object
 5   Self_Employed      582 non-null    object
 6   ApplicantIncome    614 non-null    int64
 7   CoapplicantIncome  614 non-null    float64
 8   LoanAmount         592 non-null    float64
 9   Loan_Amount_Term   600 non-null    float64
 10  Credit_History     564 non-null    float64
 11  Property_Area      614 non-null    object
```

```
        rf = RandomForestClassifier()
        rf.fit(x_train,y_train)
        pred_test = rf.predict(x_test)
        print("**** Random Forest Classifier ****")
        print('Confusion Matrix')
        print(confusion_matrix(y_test,pred_test))
        print('Classification Report')
        print(classification_report(y_test,pred_test))
        print('Score')
        print(rf.score(x_test,y_test))
```

```
    randomForest(x_train,x_test,y_train,y_test)
```

```
**** Random Forest Classifier ****
Confusion Matrix
[[51  9]
 [ 7 72]]
Classification Report
              precision    recall  f1-score   support

           0       0.88      0.85      0.86        60
           1       0.89      0.91      0.90        79

    accuracy                           0.88       139
   macro avg       0.88      0.88      0.88       139
```

```
        Knn = KNeighborsClassifier()
        Knn.fit(x_train,y_train)
        pred_test = Knn.predict(x_test)
        print("**** KNeigborsClassifier ****")
        print('Confusion Matrix')
        print(confusion_matrix(y_test,pred_test))
        print('Classification Report')
        print(classification_report(y_test,pred_test))
        print('Score')
        print(Knn.score(x_test,y_test))
```
[98]

```
        KNN(x_train,x_test,y_train,y_test)
```
[99]

```
...   **** KNeigborsClassifier ****
      Confusion Matrix
      [[38 22]
       [27 52]]
      Classification Report
                    precision    recall  f1-score   support

                 0       0.58      0.63      0.61        60
                 1       0.70      0.66      0.68        79
```

**GITHUB :**[https://github.com/IBM-EPBL/IBM-Project-11641-1664170589](https://github.com/IBM-EPBL/IBM-Project-11641-1664170589)

**DEMO LINK:**