Bachelor of Science in Computer Science & Engineering

Development of a Credit Lending Facility Recommendation System for Women Entrepreneurs in Bangladesh

by

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Thesis Proposal

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1 Introduction

Lending is a source of funding that can help financial institutions raise additional capital. Credit lending facilities means, one or more debt facilities. Many financial institutions may need additional capital to maintain their desired reserve needs in lending facilities. Bangladesh is a developing densely populated country where almost half of the population is women. Equal participation of this huge population is an important part to develop of the country. Women are entering the business not only to earn money but also to change their social conditions. In Bangladesh women entrepreneurs they face some problem like lack of information, limited business support, balancing family, acceptance from society. Capital is a big challenge for women where the main condition of business is capital. Most women entrepreneurs try to raise capital from their savings, but it is insufficient compared to what they need. So it is important for women to lend credit from any bank or organization.

Credit plays an important role in industrial development. Therefore, access to credit facilities is a decisive factor in economic level, activity and growth in the modern economic world. But women entrepreneurs face problems getting loans. However, there is a lack of information about where and which institution offers useful lend opportunities. They also do not have enough capital to hold a small loan from a bank as collateral or guarantor. In [1], the authors showed the women entrepreneurs face some problems to lend credit as like:

- Security requirements.
- Loan officers are not well informed about the loan.
- Officers are not helpful.
- Bank terms and conditions.

As a result, women entrepreneurs are not interested to take loan from any organization. So it is very important for women entrepreneurs to select a beneficial organization for getting credit lend facilities.

On the other hand banks also face some problems to provide loans. They have

confused about the women ability. In [2], the authors showed to provide credit to women entrepreneurs:

- Deficiency of confidence of women entrepreneurs.
- Deficiency of debt security.
- Deficiency of legal documents, etc.

For this reason they are unwilling to provide credit women entrepreneurs. For these, the banking industry's predictive modeling system for many issues, always need more accurate. Credit approval prediction is one of them. Credit approval is a very important process for banking organizations. The system has approved or denied credit applications. It is very difficult to predict the probability of payment of the loan by the customer. In [1] and [2], the authors showed some challenges which resist women entrepreneurs that to lend credit. To overcome these challenges, an automated recommendations system should be needed so that women entrepreneurs can know about credit lending facilities and necessary documents. This thesis paper will overcome some challenges which resist women entrepreneurs to lend credit.

2 Background and Present State

In [1], the authors describe about women entrepreneur's for Sylhet in Bangladesh perception to credit loan from any bank. The women entrepreneurs are not interested to take loan from any bank for many obstacle. The authors try to show a statistical result about women business characteristics and financing. The main limitations of this paper, the authors collected information only from Sylhet and can not provide any algorithm to overcome any problem. In [2], the authors describe about credit worthiness of women entrepreneurs of Bangladesh. They showed a statistical data of women employment status in Bangladesh. Collateral, infrastructure, trade license and lack of information about bank facilities resist women entrepreneurs to lend credit. The main limitations of this paper, the authors can not show any automated system to overcome the challenges for lending credit of women entrepreneurs in Bangladesh. Loan prediction is a very

important issue for banking systems. By the loan prediction system, we can we can predict the fraud customers by prediction model using machine learning algorithm. Many solutions have been proposed to predict loan status. In the paper [3], the authors showed model using Logistic Regression for validation of eligibility of customers to get the loan or not. In this work they collect dataset from Kaggle. In this paper they use various methods to evaluate the performance of model like accuracy, confusion metrics, precision, recall etc. High accuracy showed in balance class. The main limitation of this paper, their model showed low accuracy in unbalanced class. In paper [4], the authors showed model using two classifier algorithm (Decision Tree and Random Forest) prediction of application that can be used in android system. They train the two model for prediction. Finally they predict the applicants should be approved or not for loan. But they didn't show the accuracy of two models and also can not describe which model gives best results. They also didn't include most important feature like business experience. In paper [5], the authors showed prediction model using Logistic Regression classifier algorithm. In this, the outcome is dichotomous. After fitting data into model then the model predict weather the loan will approve or not. The main limitation of this paper they didn't show the accuracy of this model. So we can't understand how good the model was. In paper [6], the authors showed model for banking service recommendation system and movie recommendation system. The main limitation of this paper, the authors showed a model for banking service recommendation system using social media reviews. They didn't recommend bank on the demand of current users. In [7], the authors showed prediction model using K-Nearest Neighbour (KNN) algorithm. The main limitation of this paper, the author didn't include most important feature like business experience, business types. They also didn't show the accuracy more than 75.08 percent. To overcome the limitations of the existing works, we develop a system that can suggest beneficial bank on the basis of women entrepreneurs demand in Bangladesh in mobile application and also show the loan eligibility prediction for women entrepreneurs of Bangladesh. The application system is being proposed to overcome the credit lending problem for women entrepreneurs.

3 Aims and Objectives with Possible Outcomes

The main objectives of this work are as follows:

1. To suggest beneficial and suitable credit lending organization for women entrepreneurs in Bangladesh in Mobile application.
2. To know about necessary documents for loan application.
3. To show the bank at the nearest location.
4. To predict credit lending eligibility for women entrepreneurs, we will use and examine different ML classifier algorithms (K Nearest Neighbor, Logistic Regression, Random Forest).
5. To decide which algorithm gives us more better result to predict credit lending eligibility of women entrepreneurs.

4 Outline of Methodology

The objectives of this part divided into two parts:

- Credit lending eligibility prediction for women entrepreneurs in Bangladesh using machine learning
- A mobile application for searching suitable lending organization for women entrepreneurs according to their demand.

4.1 Credit lending eligibility prediction for women entrepreneurs in Bangladesh:

In this work, we will use three specific machine learning algorithm for bank loan eligibility prediction of women entrepreneurs in Bangladesh. The details of these algorithm are described below:

1. Random Forest Algorithm: Random Forest or Random Decision Forest is a

method that operates by constructing multiple decision trees. The decision will take on the majority of the trees is chosen by the random forest as the final decision. At a time it works on multiple tree and then take a decision.

2. K-Nearest Neighbor (KNN) Algorithm: In this classifier algorithm, we have to select the number of k of the neighbours and calculate the euclidean distance of a number of k neighbours. Then sort the euclidean distance descending to ascending order. Among these k neighbours count the number of data points in each category. Assign new data to the category for which the maximum number of neighbors.

3. Logistic Regression Algorithm: In this algorithm dependent attributes will be binary and independent attributes will be binary or continuous. In this algorithm a s shape curve is drawn using sigmoid function. Then take a decision.

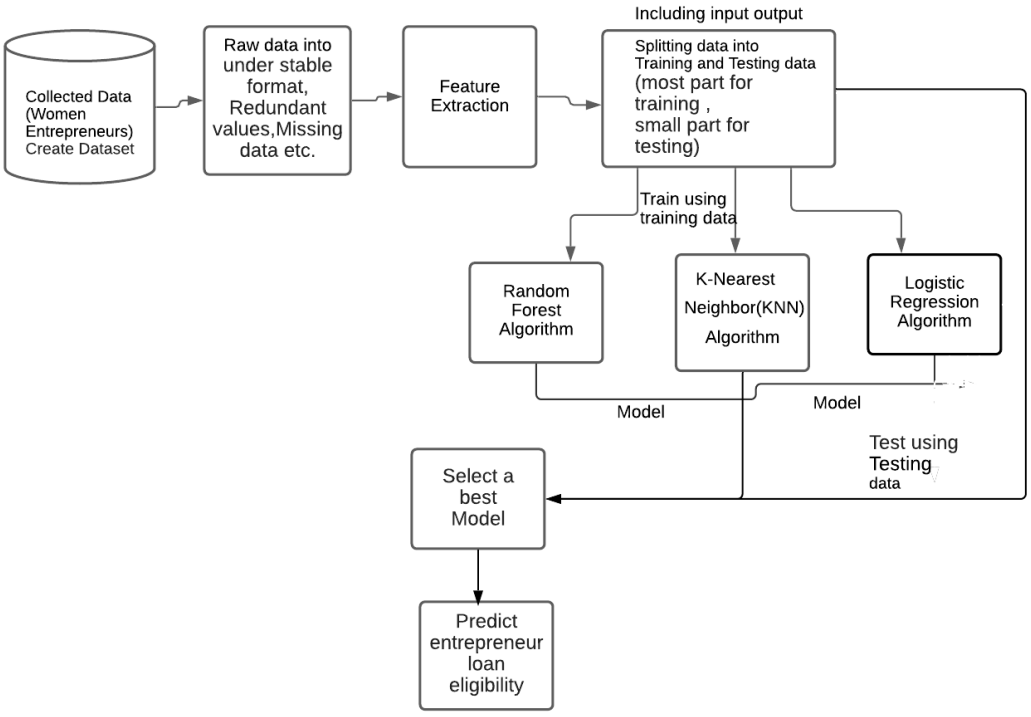

Figure 4.1: System Architecture of Women Entrepreneurs Credit Lending Eligibility Prediction

Figure 4.1: represents the system architecture of Women Entrepreneurs Credit Lending Eligibility Prediction. The main purpose of this system model is to predict whether assigning the loan individual person will be safe or not.

4.1.1 Data Collection, Transferring Raw Data to Under Stable Format, Feature Extraction

First of all we will collect data of women entrepreneurs from bank then create dataset. The features of this data set will be loanid, marital status, dependents, education, applicant income, credit amount, property area, business types, business experience, duration, credit history, loan status. In the stage of data preprocessing transferring raw data into a under stable format. We also remove all kinds of values that can cause error like incomplete values, redundant values, missing data, etc. Then we have to extract feature. Feature extraction is a method for creating a new and smaller set of features that captures of the useful information of raw data.

4.1.2 Splitting the Data, Training the Model, Testing the model

We have to split data into training data and testing data for training the model using train data and testing the model using testing data. Most of the data is used for training, and a small part of the data is used for testing. We will create model using machine learning algorithm like Random Forest Algorithm, K-Nearest Neighbor (KNN) Algorithm, Logistic Regression Algorithm. Then we will train the model using train data. After training these model using training data then we select a best model on the basis of accuracy. Finally, we can predict Women Entrepreneurs credit lending eligibility.

4.2 Mobile Application

To design the mobile application Flutter UI (User Interface) and programming language dart will be used for coding. Flutter is an open source UI software development unit kit. Firebase is also used and it is a backend system. Firebase offers a link between mobile application and web to the backend cloud storage and API. Figure 4.2: represents the Process Flow Diagram for Suggesting Suitable

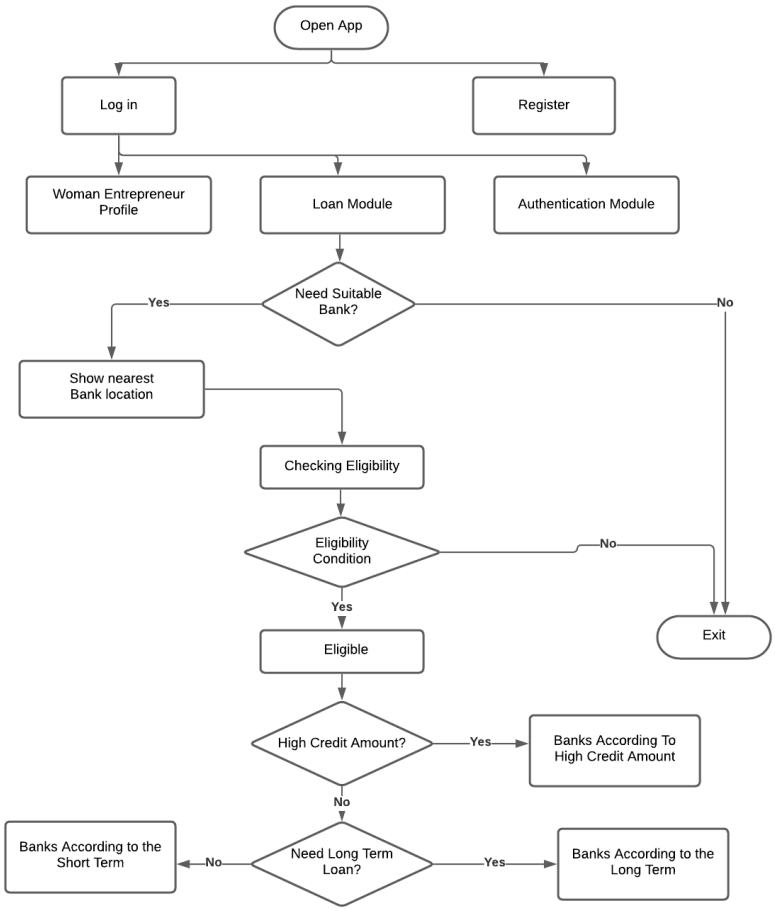

Figure 4.2: Process Flow Diagram for Suggesting Suitable Lending organization for women Entrepreneurs

Lending Sector for women Entrepreneurs. When women entrepreneurs open the mobile app, they can see the user interface with Login/Register. After Login they can see

4.2.1 Women Entrepreneurs Profile

In this section, women entrepreneurs can see their profile. They can change their name, email or others personal information.

4.2.2 Loan Module

In this section, if women entrepreneurs are interested to suitable bank (recommendation based on their profile) then they enter show nearest bank location. In this section, the women entrepreneurs can see the nearest bank location. Then in

the checking eligibility section, women entrepreneurs can see a form. They have to fill up this form. The form will fill up through answering some questions:

1. How old are you?
2. Marital status
3. What is your educational qualification?
4. What is your location?
5. What is your property located?
6. How much money do you need?
7. What types of business?

and so on. If the eligibility testing will become true then they can see the bank according to their preference.

4.2.3 Authentication

In this section, women entrepreneurs can see what documents (NID card, photo, business document) they should need if they will lend loan.

5 Required Resources

The necessary tools to implement this project can be divided into two Categories as illustrated below:

1. Hardware Requirements:
    - Personal Computer
    - Android Smartphone
2. Software Tools:
    - OS: Windows 10
    - Tools: Anaconda,Visual Studio, Flutter, Firebase, Google Map API
    - Programming Language : Python, Drat

6 Cost Estimation

Estimated total cost is given below:

Cost of Materials :

• Personal Computer	Tk 50,000
• Android Smartphone	Tk 2o,000
• Internet Connection	Tk 2500
Total	Tk. 72,500

c. Drafting & Binding :

• Paper	Tk 200
• Drafting	Tk 300
• Printing	Tk 500
• Binding	Tk 200
Total	Tk. 2400
Miscellaneous	Tk. 500
Grand Total	Tk. 74,200

CSE Undergraduate Studies (CUGS) Committee

Reference :

Meeting No : **Resolution No :** **Date :**

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Signature of the Student

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Signature of the Supervisor

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Signature of the Head of the Department

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