Bachelor of Science in Computer Science & Engineering

Developing an Assistance System to Provide Immediate Help for Homeless People in Bangladesh

by

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Thesis Proposal

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1 Introduction

Homelessness is a state in which a person doesn't have access to an appropriate housing facility for living. Bangladesh is a growing developing country in the world but she has also seen her fair share of homeless people especially in the capital Dhaka. The number of homeless people is on the rise. We can see the majority of them in the streets of the city. The people who are found lying down in the streets can be of different types. Such as actually homeless poor people or drug addicts or injured or mentally unstable etc. They should not be ignored, they need our help. We aim to use technology to reach out to as many of them as possible and get them the proper needs which they deserve.

Several organizations in our country both government and non-government are working to provide shelter and basic needs for these floating people. Honorable Prime Minister of Bangladesh Sheikh Hasina has stated that "No one will be homeless in Bangladesh during Mujib Year and the 50th anniversary of our independence. Our government is devoted to achieving this goal."[1].The government has started a plan to provide houses to homeless people which is said to be the world's largest homeless houses plan[2]. Other than that several non Government organizations in our country especially "Biddyanondo"[3] have been phenomenal in helping the underprivileged people of our country.

The current world is full of technological advancements. Technology is controlling our life in almost every sector. Currently, we have mobile applications for all types of needs in our life. The system that we aim to build is for helping those needy unprivileged people lying in the streets deprived of basic human needs. What we aim to do is (a)When we see a homeless person, assessing their conditions we can use the app to contact the nearest service provider organization. Such as if a person needs shelter, we will alert all the nearest organizations who can arrange shelter for the concerned person. The same type of option will be available for Emergency Food, Medical Services, Domestic abuse, Rehab for Drug addicts, Emergency Police Service, Child Care Center. (b)When an organization responds to the call the proceedings will be shown as a running task in the app and will be completed when the organization notifies the system. (c)We will ask

feedback from both the user and the organization as a questionnaire regarding the homeless people who received help. (d)We will store these data and use them to form a data set that will be used to run several machine learning models to determine whether the person is homeless or not and show a comparative analysis of the outcome for different applications. (e)There will also be an option for lower-middle-class people who have access to a smartphone to request emergency needs without revealing their identity.

For the app interface, we will be using Flutter which is an open-source UI software developed by Google. For storing the data and performing various operations in the backend we will use Firebase which is s a backend system that offers a link between mobile applications and web to the backend cloud storage and backend APIs.For the Classification of homeless people, we will be implementing Several Classification algorithms such as Logistic Regression, Decision Tree, K-Nearest Neighbours. This will be done in Jupyter Notebook in python. Our goal is to arrange basic life needs for as many unprivileged people as possible.

2 Background and Present State

The statistics of the homeless people in Bangladesh do not show any good reports. The number of homeless individuals increased from 950,000 in 1991 to 11,30,000 in 2001 and 4.6 million in 2010. The number will be boosted to 8.5 million by 2021, according to the five-year plan materials[4].

In the work [5], the researcher states that Over the last three decades, Bangladesh has had one of the fastest urban population growth rates (about 7 percent per year). Every year, roughly 320,000 migrants from rural areas arrive in Dhaka, the capital city. Shelter, food, education, healthcare, and jobs are all in short supply in the city, which is rapidly growing. In Dhaka's overcrowded slums, an estimated 3.4 million people reside, and many more live in public spaces without even the most basic shelter.

The 1997 study by Islam et al.[6] found that 47 percent of the homeless in Dhaka lived on footpaths, 23 percent in the city's transport stations, and 12 percent in front of major market centers. The researcher found that nearly a quarter of the homeless came to Dhaka after losing their land and assets due to the erosion of

river-bank.

In this modern world, technology is controlling almost everything in our life. Using technology to help homeless people is becoming popular.

For research purposes, the identification of actual homeless people is needed. Machine learning is becoming a go-to solution for all types of problems. Machine learning aims to answer the question of how to create machines that learn on their own[7]. Finding out the actual homeless people is a big research challenge and we can use classification algorithms to get an answer. In general, a classification algorithm is a function that weights the input features so that the output divides one class into positive and negative values. The weights (and functions) that offer the most accurate and best separation of the two groups of data are identified during classifier training.[8]. The Most Commonly used Classification algorithms are Logistic Regression, Naive Bayes, K-Nearest Neighbors, Decision Tree, Support Vector Machines etc[9]. These algorithms can be used to provide a solution to find the actual homeless people.

Many technological solutions have been offered to help homeless people.

A process is described in [10] focuses on building an app named YTH Streetconnect to assist youths and their providers in gaining access to health and essential resources, and to undertake usability and feasibility testing of the app with youth and technical consultants with local knowledge of treating youth. The limitation of this system is it focuses on youth only. No real-time updates can be seen in the app. The service is limited to the United States only.

Another app described in [11] shows a web-based system to broadcast announcement, specifying whether it is related to food, shelter, etc. Once the announcement has been added to the database, a text message is sent out to all individuals who have expressed interest in that kind of announcement (food, shelter, etc). Following the addition of the announcement to the database, a text message is sent to all individuals who have expressed interest in receiving that type of notification (food, shelter, etc). This provides only a temporary solution where the success rate is not very good.

The author in [12] designed an app Ask Izzy which provides a solution for homeless people's various needs such as Housing, Food, Domestic Violence, Health,

Legal in a list view. The users can access the required service's contact information and take action. The author failed to show any real-time map data in the application and the service provided by them is restricted to Australia only.
Another Youth based app [13] named Youth Matters: Philly (YMP) provides a web-based solution for homeless and unstably housed youth. The app is intended to assist them in searching for, identifying, locating, and using Philadelphia-based social and health services, as well as to investigate youth opinions of YMP's usability, usefulness, and accessibility. They have also arranged campaigns to promote their service. But a question remains are the actual homeless people getting help? Because not a lot of homeless people own smartphones.
There are several apps available in app stores such as Ourcalling[14], Homeless People - Shelter App[15], Concrn[16], Helpfinder NYC[17], and Streetlight Chicago[18] where concrn is not functional right now. Helpfinder NYC and Concrn are only ios app. Streetlight Chicago is not available in our country. Homeless Resources - Shelter app only shows information in the map only but it doesn't show the help as an ongoing process. It doesn't work in our country too. Ourcalling app is only properly functional but for the United States only and no real-time update is shown there.
In comparison to these, the application system which is proposed here can overcome all the problems and ensure a proper solution for homeless people in Bangladesh in a convenient way.

3 Specific Objectives and Possible Outcomes

The Main Objective of this project is to develop an assistance system to provide immediate help for homeless people in Bangladesh. This system includes a mobile application to arrange immediate help and a classification system to identify if a person is homeless or not using machine learning. The main objective and possible results of this work may be set out in the following:

- To design an app that shows the nearest service provider organization for

different needs such as Homeless Shelter, Food for everyone, Hospital, Domestic abuse, Rehab for drug addicts, Police and Child Care.

- To notify the nearest organization with the actual location on the map for urgent response.
- Show the ongoing help process as a task in the app and save it in history.
- After the task is done show a feedback form to the user which is a questionnaire for gathering data about the homeless person.
- Analyze the data and classify if he is actually homeless or not using Machine Learning Algorithms.
- Compare Which algorithm provides better results to classify homeless people.

4 Outline of Methodology

The objectives of the proposed system discussed earlier can be divided into two sections:

1. A mobile application to provide immediate help for homeless people.
2. A training model to classify homeless people.

4.1 Mobile Application

4.1.1 The Application User Interface

To design the application user interface Flutter will be used with dart as a programming language. Flutter is an open-source UI software developed by Google. It is used as a cross-platform application development framework. When the user opens the app there will be an opening screen with a login/Sign up page. Firebase will be used as a cloud database for backend operations and to save data. Firebase is a backend system that offers a link between mobile applications and the web to the backend cloud storage and backend APIs.

4.1.2 User Profile/Service Provider Profile

When a user logs in there will be a profile section at the bottom to access the user's profile data.If the service provider logs in they will see a dashboard.The users/service providers will be able to see their previous help history done through this app.

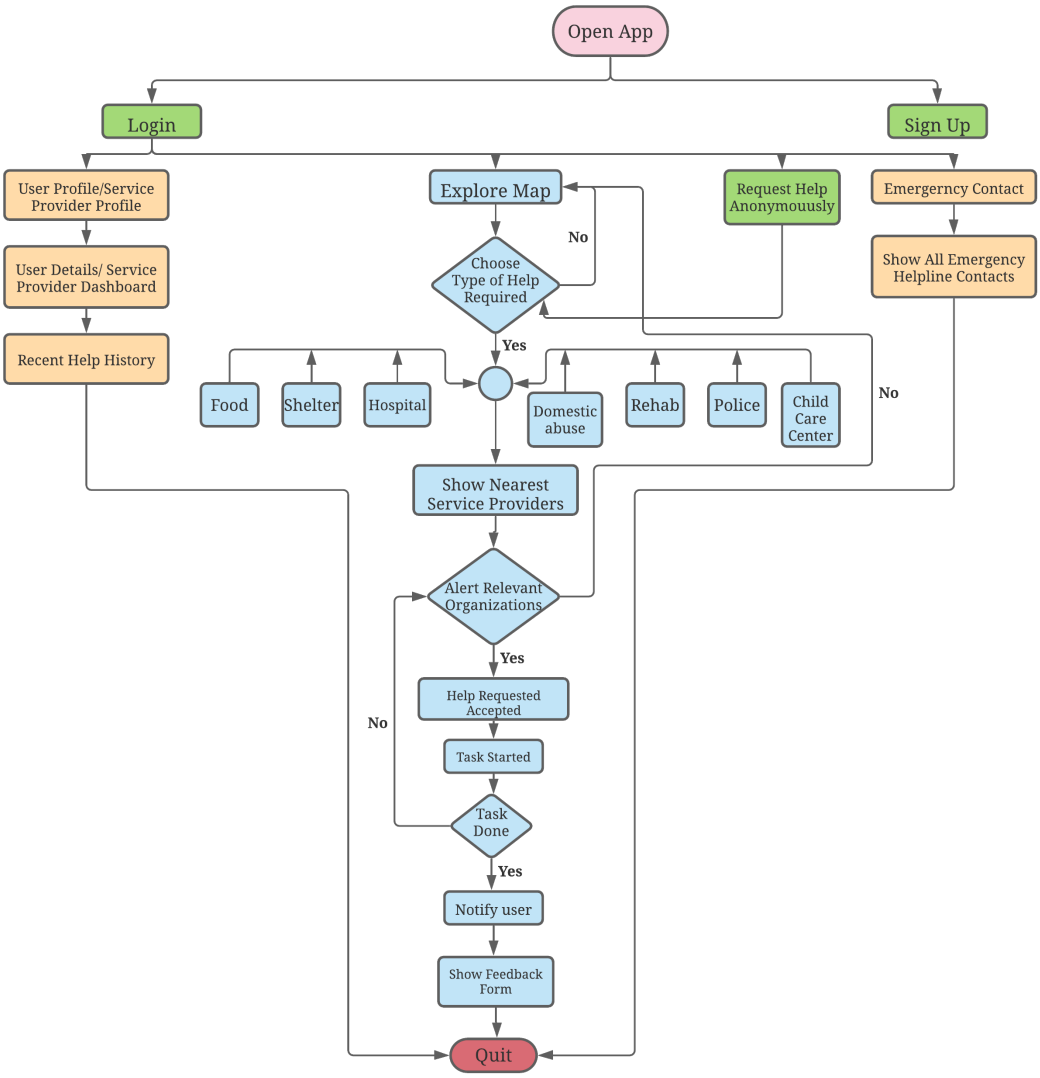

Figure 4.1: A Block diagram representation of the Mobile Application

4.1.3 Explore Map

There will also be an explore map option which will be the default screen to show when the users log in to the app. This will be done with Google Maps Flutter plugin with Google Map APIs.Google APIs are application programming

interfaces (APIs) created by Google that allow users to communicate with Google Services and integrate them with other services. Along with the map at the bottom, there will be buttons for Locating immediate help services which are Food, Shelter, Hospital, Domestic Abuse, Rehab Centres, Police Stations, Child Care Centres.

So the process which will be followed here is :

- When the users select an option the nearest service providers for that need will be displayed in the map using Google Maps API in Flutter.
- Then the concerned organizations will receive notifications with the location. This will be done with the cloud notification feature in Firebase.
- When they accept the request it will list as a job in the app.
- When the job is done the user will be notified. Then a feedback form will be shown in the app and a questionnaire will be there. The data will be stored in the firebase.

4.1.4 Request Help Anonymously

This option will be for the lower-middle-class people who are shy to ask for help openly. Their identity will be kept secret and requests will be forwarded to the relevant organization.

4.1.5 Emergency Contacts

Emergency phone numbers of Police, Hospital, Fire Service, and other emergency services will be listed here.

4.2 Training Model to Classify Homeless People

In this section, the data collected from the feedback form will be used to classify homeless people.

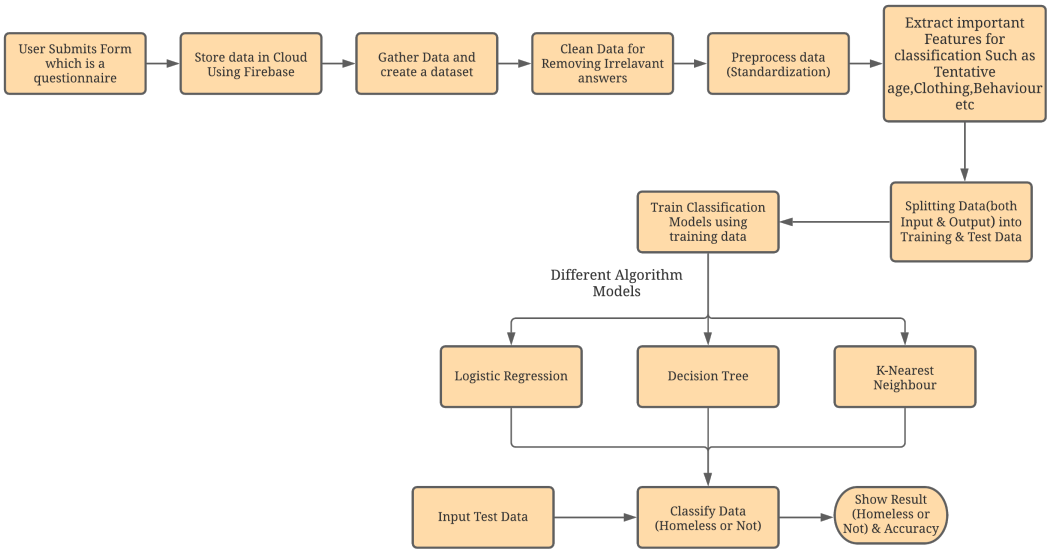

Figure 4.2: A Block diagram representation of the Training Module

4.2.1 Gathering Data

The questionnaire in the feedback form is the source of our data. The questions asked there will be :

1. How old was the person you helped? (Tentative age)
2. Where did you find the person? (Roadside/Slum/Rail stations/Others)
3. How was the clothing of the person? (Torn/Muddy/Blood Soaked/Others)
4. Was the person injured?
5. Did the person look like suffering from Malnutrition?
6. Was the person begging?
7. Was the person violent?
8. Was the person showing any sick mentality?
9. Was there any makeshift home?
10. Was there any indication of drug abuse?

These data stored in the database will be gathered all together in a CSV file which will be the dataset.

4.2.2 Data cleaning, Data preprocessing and Feature Extraction

The dataset will be scanned for irrelevant data and unfinished data and they will be removed. The method of transforming data into a standardized format so that users can process and evaluate it is known as data standardization. This process will be applied here so that the feature extraction and data analysis process can be done easily. Then the relevant features will be extracted with feature extraction processes which are exhaustive search, max–min feature selection. Feature extraction is a dimensionality reduction procedure that reduces a large set of raw data into smaller groupings for processing.

4.2.3 Training Data with Machine learning Models and Classify Homeless People

Then the data will be split into train and test data. Machine learning classification models of algorithms Logistic regression, Decision Tree, K-nearest Neighbour will be used in the training data. Then the test data will be applied to classify if the person is homeless or not. There will also be a comparative analysis of the performance metrics of the algorithms.

5 Required Resources

Resources required to complete this project are listed below:

5.1 Hardware Requirements

1. A Personal Computer
2. Internet Connectivity
3. Android Smartphone

5.2 Software Tools

1. Visual Studio Code
2. Flutter
3. Firebase
4. Google Map API
5. Jupyter Notebook with Python 3.x installed

6 Cost Estimation

The cost of Implementing the scheme is given below:

a.Cost of Materials :

• Personal Computer	Tk 90000
• Android Smartphone	Tk 30000
• Softwares	Tk 5000
Total	Tk. 125000

b.Printing & Drafting & Binding :

- Paper Tk 500
- Drafting Tk 1000
- Printing Tk 500
- Binding Tk 400

Total	Tk. 2400
Miscellaneous	Tk. 500

Grand Total	Tk. 127900

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Signature of the Student

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