</Hunger>

An Engineering Project in Community Service

Phase – II Report

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in partial fulfillment of the requirements for the degree of

Bachelor of Engineering and Technology

VIT Bhopal University
Bhopal
Madhya Pradesh

April, 2022

Bonafide Certificate

Certified that this project report titled **"</Hunger>"** is the bonafide work of "19BAI10008 PRANJAL ROY, 19BAI10017 SHANZEH BATOOL, 19BAI10081 VAIBHAV ROY, 19BAI10095 KARAN JAIN, 19BAI10139 SHALINI DAS, 19BCE10108 ASHI SACHAN, 19BCY10044 KRISHNA KUMAR AGRAWAL, 19BEE10020 RITUPARNA GUPTA**"** who carried out the project work under my supervision.

This project report (Phase II) is submitted for the Project Viva-Voce examination held on 20/04/2022

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1. INTRODUCTION

"There are people in the world so hungry that God cannot appear to them except in the form of bread." - Mahatma Gandhi.

This isn't a simple quote but has been an everyday situation for many people over the years. Crores of people sleeping on an empty stomach and tonnes of food being wasted every day have become all too common in India since British colonization. Observing a large amount of food mismanagement and the inability to serve a large quantity of food without compromising the quality of food for people who cannot afford a single meal for his/her family in a day.This project aims to maximize food utilization while reducing the graph of people suffering from starvation.

1.1 Motivation

Aristophanes famously said*, "Hunger knows no friend but its feeder."*
When people are hungry, they will seize any opportunity to fill their stomachs. Other people in society frequently take advantage of their crisis. According to research, some of the physical effects of hunger include malnutrition, stunted growth, wasting, premature births, low birth weights, and, in extreme cases, infant and child mortality. Poor health, physical symptoms such as stomachaches and headaches, signs of worry, anxiety, and behavioral issues are also side effects.Babies born with smaller brain size, poor performance on measures of infant cognitive development, lower scores on both IQ and achievement tests, increased likelihood of impaired mental and intellectual delays, and inability to fully engage in school are all cognitive effects of hunger. If we want people in our society to be self-sufficient and responsible, i.e. capable of caring for themselves and others, the first step is to address the problem of hunger, which many people in our society are currently experiencing. A living being can only dream and have ambitions after their hunger has been satisfied.As a result, the goal of this project is to provide the most basic yet important thing to people in poverty: food.

1.2   Objective

According to one source, over 20 crore people sleep on an empty stomach every day, and approximately 25 lakh people die each year as a result of hunger. On the other hand, approximately 40% of food is wasted, which is a significant amount. The goal is to ensure that no one dies solely as a result of hunger, because the issue here is not the quantity of food, but rather the fact that they cannot afford it.This project aims to maximize food utilization while reducing the graph of people suffering from starvation. We have a lot of restaurants that waste a lot of food every day. When a person is hungry, they are only a phone call away from being fed, thanks to our application.

"You pray for the hungry. Then you feed them. This is how prayer works." –Pope Francis.

2.   Existing Work / Literature Review

Although, given our novel idea, there are not many such projects found to be implemented in real life, we do find a few similar applications whose main purpose is the same as ours i.e. to end hunger and feed the hungry but their approach for carrying out the same is different and involves a number of different communities.

Following are a few prominent examples in the Indian market.

'No Food Waste' is a social start-up which has a smartphone app with the same name that allows it to crowdsource data about India's famine hotspots and accept requests for surplus food donations. In Delhi and the national capital region, the app has discovered 80 such locations. Individuals can give food directly or request to collect and distribute it for them via the app, which is accomplished with the help of volunteers.

Another such organization is 'Feeding India', which feeds 15,000 people in 25 Indian cities, including 2,500 in Delhi. It claims to receive roughly 100 requests for excess food pick-up in the Capital every day. The Feeding India App allows users to enter the amount of food to be donated, the number of people it can feed, and the estimated pick-up time.

These organizations also work with restaurants, hostels, caterers, and corporate houses to collect extra food on a daily basis, which is then distributed to orphanages, old age homes, shelters, and other charitable organizations.

We also take a look at two foreign US based startups with a similar goal as ours.

'Food Rescue US' is an app that connects 'food donors,' such as grocery shops and restaurants, with food rescue organizations and local community kitchens to combat food waste and help the hungry.

New York City based 'Transfernation' will take any unused surplus food off your hands and ensure that it reaches the correct individuals in need. The organization focuses on redistributing excess food from events to those in need through a number of approaches, such as connecting social institutions with events, volunteer food recovery, and collaborations with distribution networks and enterprises. The software is simple to use and uses the GPS capability on your phone to establish a geo-referenced pickup. Because so much of Transfernation's transportation is done on environmentally friendly cargo bikes, it reduces car emissions as well.

Most of these start-ups rely heavily on a large number of volunteers to carry out the task of delivering food packets to the assigned areas. What we aim to achieve with this project is to establish a direct link between those in need of food and those having surplus food via the methodology as is further explained in the document.

Fighting hunger with charity is not an option. There's also the matter of decency when it comes to donating leftover food. Creating skills and livelihood opportunities is the actual solution. But, for the time being, the starving masses who rely on these start-ups for one square meal a day have nowhere else to turn to.

3.   Topic of the work:

a)   System Design / Architecture

System Design for NLP Model:

The NLP Model is being used to process the user information that we get from phone calls.
This NLP model consists of techniques like converting speech to text, text to speech, extracting location keywords from the text, using which we try to find the nearest restaurant location in the MongoDB database. Python language is used for this.

The following flowchart describes the necessary steps involved in detail to get the desired output:
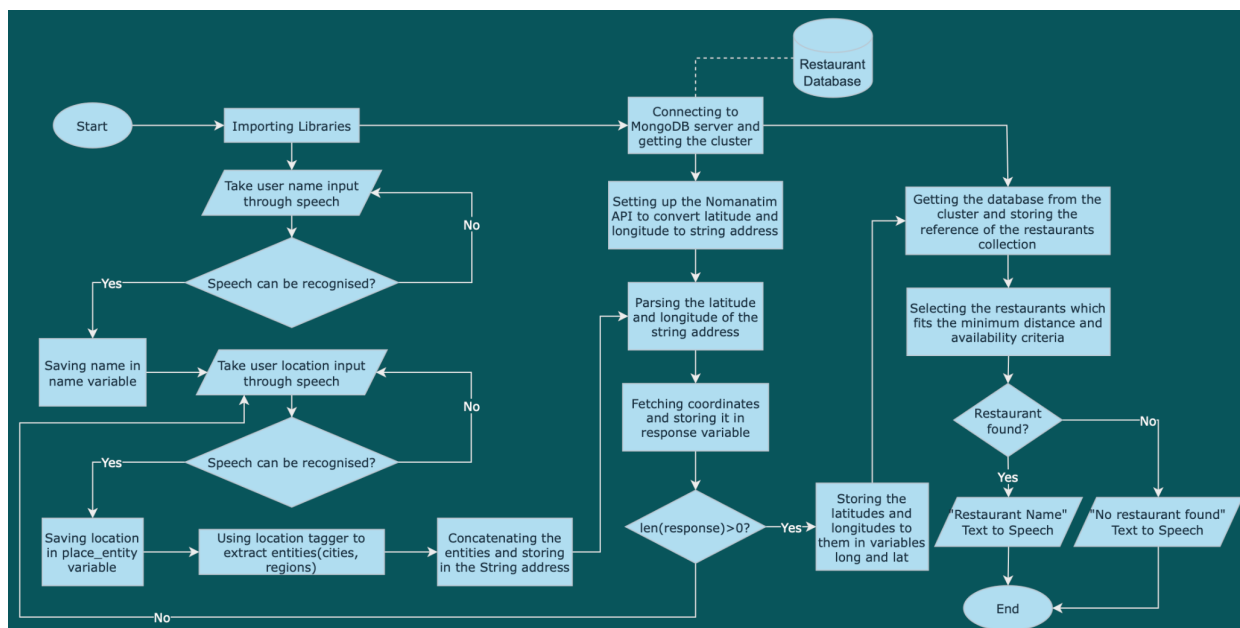
We start with importing the necessary libraries for using NLP techniques. Our first input is to take the user's name using speech recognition. Until the speech is properly recognised the input is taken again and again. After successful speech recognition the name is stored in a variable and the next input is the user's location. Just like name the location input is taken again and again until properly recognised and then storing it in a variable too. A location tagger method is used from the library to extract the location entities like cities, regions, etc. After extracting those entities, they are concatenated in the form of one string address. Before moving on to the next steps, we first connect our python file to the MongoDB server(cloud) where the restaurant database is stored. The Nominatim API is then set up and using it the coordinates of the address are fetched and stored in the response variable. We then check for address validation. If the address is valid then the response variable won't be an empty string, hence its length should be greater than zero. In case the length is zero then the user will be asked again to tell his/her right address. Once the address has been validated the latitude and longitude from the coordinates will be used to select the restaurant that fits the minimum distance and availability criteria. If the restaurant is found then the restaurant name and address is stored in a variable which is then converted from text to speech. The user can therefore hear from the phone call the restaurant name and its address.

System Design for Android Application:

System design is the process of designing the elements of a system such as the architecture, modules and components, the different interfaces of those components and the data that goes through that system.

Hunger Android Application is designed specifically for the Restaurants willing to donate leftover food.

It's features include:
- Login/ Sign-up
- Food availability status update.
- Delivery status updation
- Viewing booked meals.
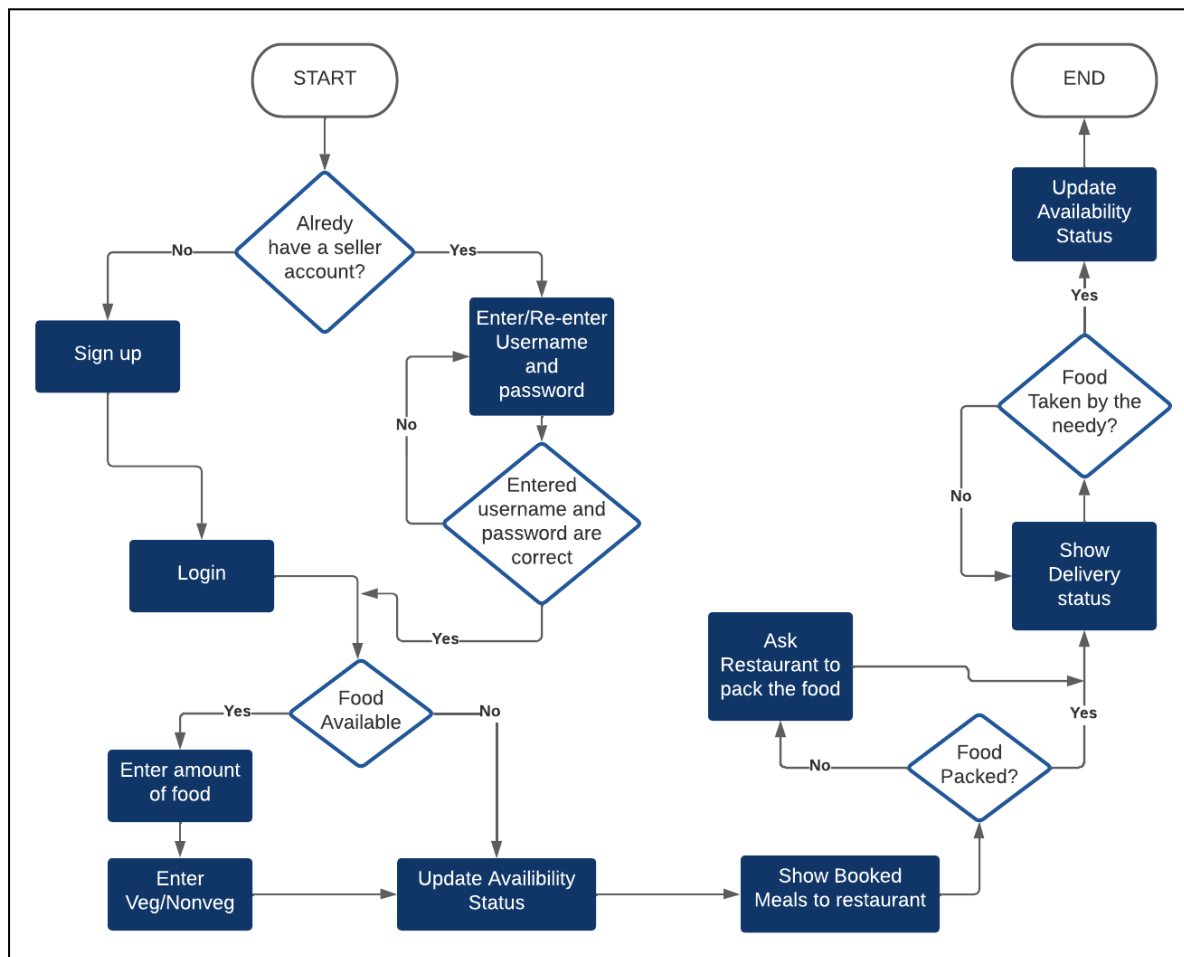
The above flowchart shows a detailed framework of the android application. To begin with, a restaurant can sign up for the application. Next, the restaurant can update the amount of food available and if it is vegetarian or non vegetarian. The application will display the booked meals. Then the application will update the packing status of the booked meals. The application will also show and update the delivery status. And once the food is delivered, it will re-update the food availability status.
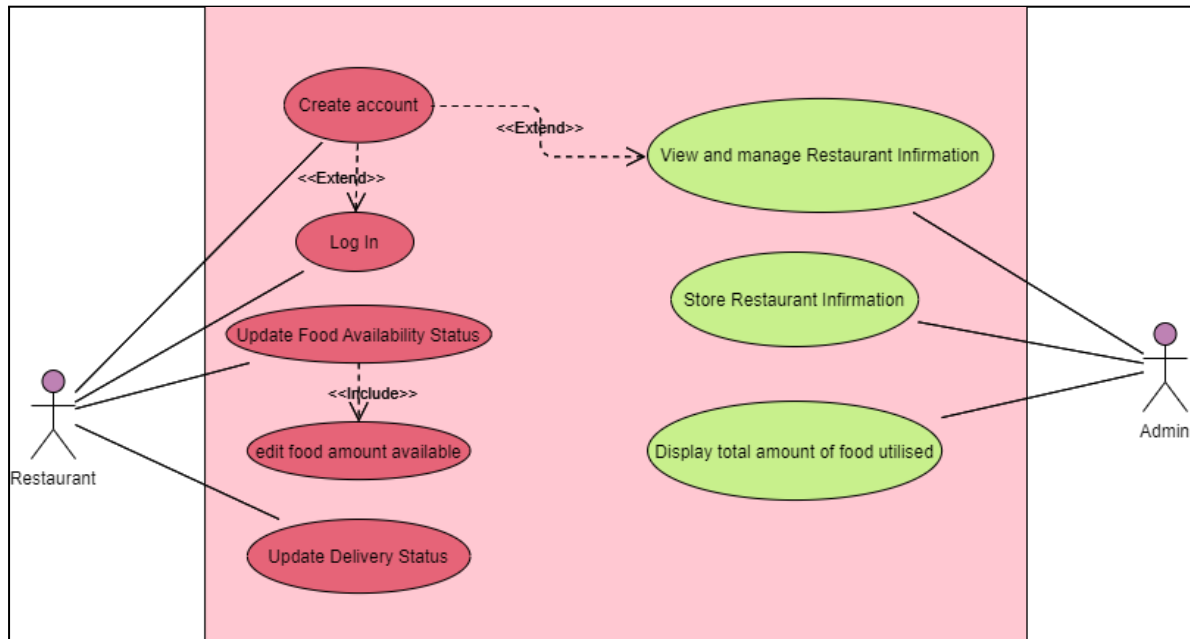
The above figure shows the use case diagram of the application. A use case diagram is a graphical depiction of a user's possible interactions with a system. This use case diagram shows various use cases and different types of users i.e. the restaurant and the admin the android application has. The use cases are represented by either circles or ellipses. The actors are often shown as stick figures. The restaurant can manage their account, the food availability status, and the delivery status. The admin can view and manage the restaurant information, store it in the database.

b)   Working Principle

Working Principle for NLP Model:

The NLP model can currently understand the English language only. Hence we are assuming that the user can speak and understand English. In future we plan to add more local languages.

The main working principle of this model is information extraction and processing. Sometimes the user may not directly give an answer to the question asked. In such cases the tagging concept is used to extract main keywords and remove stopwords. For example, let's say when the user is asked to tell its location he/she says, "I am in the area Nanda Nagar Indore." Now the only relevant keywords in the entire sentence are "Nanda Nagar" which is the name of the area and "Indore" which is the name of the city he is present. The rest of the sentence is not relevant in finding the nearest restaurant name and location and therefore we omit the words, "I", "am", "in", "the" and "area". All this is done with the help of location_tagger.

The verification of a given address is also done by searching its coordinates in maps (Open Street Maps) with the help of Nominatim API so that there is no trouble or errors in the program later when finding the nearest restaurant location.

Working Principle for Android Application:

Our android application 'Hunger' is a software that provides an easy user interface for the people with access to surplus food. It allows any restaurant manager or event manager or in fact anyone with access to excess food to update the food availability status as and when required.

An activity is the starting point for user interaction. It represents a single user interface screen. We have the following four activities with their respective functions-
1. Splash Screen - The concerned people can install the app on their phones and launch it.
2. Sign Up - For a first time user, they have to go to the sign up page and enter all the details like the restaurant's name, complete address, email id, contact no, username and password.
3. Log In - Then they can log in using the registered username and password. If they already have an account, they can directly log in.
4. Status Update - After logging in, they can update the food availability status as yes or no. They can also mention whether it's veg/non veg.

If there is a needy person nearby and they are directed to pick up food from that particular restaurant via the IVRS call system, the restaurant can pack the required amount and update the food availability status accordingly, once the pick up is successful.

The Android system helps implement the principle of least privilege.That is, by default, each app only gets access to the components it needs to accomplish its job and nothing else. This creates an extremely secure environment where a programme can't access sections of the system for which it hasn't been granted access.

Our application has been integrated with the Firebase database which grants it access to perform the CRUD operations i.e create, read, update and delete data from the database.

A type of NoSQL cloud database, it can store and sync data. Data is synced in real time across all clients and is available even if the app is turned off. Data is saved in JSON format and synchronized in real time across all connected clients.

The realtime database Firebase helps manage our backend infrastructure. It enables us to -
1. Authentication - It helps authenticate and manage the user credentials and grant access to the right people only.
2. Storage - Store and save all the relevant data given as input by the user.
3. Retrieval - Retrieve the user generated information as and when needed.
4. Realtime Updates - Get instant updates regarding food availability status.

This is how our app helps connect the ones with excess food to the ones who are in need.

c)   Results and Discussion

The project model is tested under a real environment and it gave a satisfactory result. Our team collected a sample data of over 45 restaurants in Indore, Madhya Pradesh (452006). The data is cleaned, ordered and processed to remove unwanted information. The ample data is then fitted into the database with the help of the created android application.

The model performs as expected by giving the information of the restaurant (Name, full address including pin-code) which is near to the hungry person. This was tested for more than 30 locations in Indore, Madhya Pradesh.

The outcome and flow of the whole project is as follows:
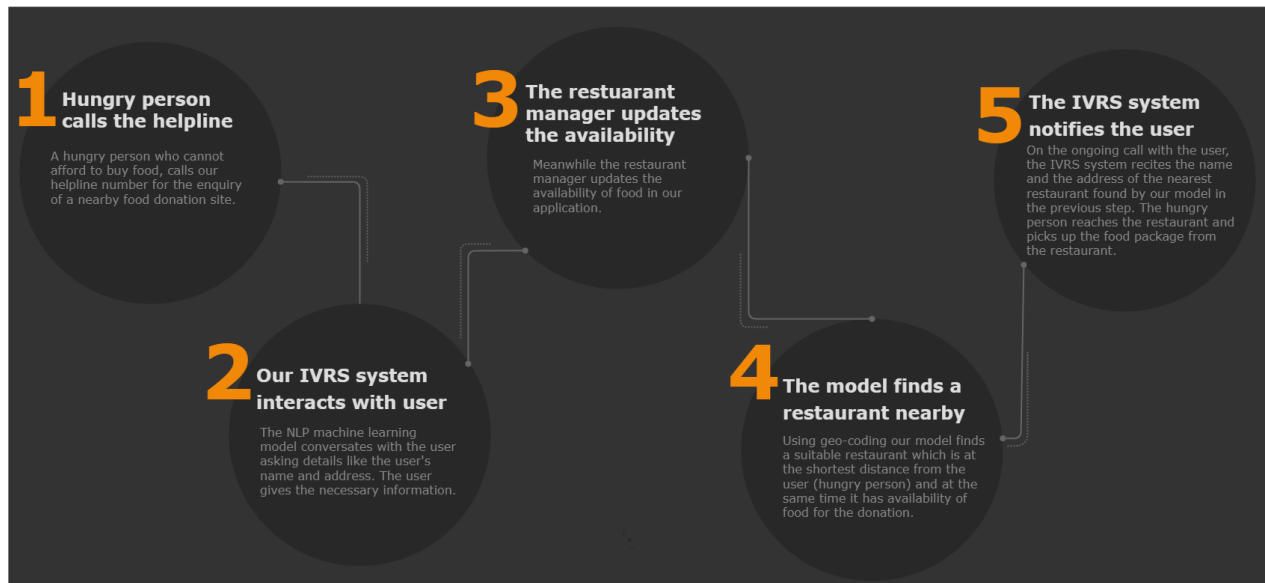
We have thousands and lakhs of restaurants that waste huge amounts of food on a daily basis. Our application ensures that when a person is hungry, and the person is not able to afford food to extinguish his/her hunger, then the person can use our model to find out a food donation site/restaurant nearby and can reach and take food from there.

If we want people in our society to be independent and responsible i.e. capable of taking care of themselves and others, then the first step is to solve the problem of hunger from which many people in our society are currently suffering. A living being is only capable of dreaming and having ambitions once their hunger has been taken care of. This project provides the solution for the most basic yet important necessity to the people suffering from poverty and that is food.

This project will contribute in decreasing the national hunger rate and increasing the food utilization rate in the country. This will result in a healthier and a self-sufficient economy.

d)   Individual Contribution:

19BAI10139, Shalini Das - Domain Leader - NLP-IVRS Model:

In this project I have contributed to the building of the Interactive Voice Response System(IVRS) in python (voice2.py) using NLP techniques. I have chosen Python language as it has a very simple syntax, is transparent and provides some of the most powerful NLP libraries and is therefore very apt for this project. I have implemented NLP techniques like Speech to Text

conversion, Text to Speech Conversion, Information Extraction, Tagging, etc. to properly use the input information and get the desired output.

- **Step 1:** At first the name and location of the hungry person is asked and that is done with the help of text to speech(TTS) conversion. The person's reply is then recognised using speech to text conversion(STT). Both TTS and STT is done with the help of pyttsx3 and speech_recognition libraries.
- **Step 2:** After successful conversion of speech to text the text is then used for information processing. I have done this with the help of nltk and spacy libraries. With the help of nltk library a lot of essential entity models were downloaded like 'maxent_ne_chunker', 'treebank', ''words', 'punkt', etc.
- **Step 3:** The downloaded entity models then helped in importing another library locationtagger. This library helped in extracting the location from the entire text input so that the unnecessary words/stopwords(like 'I', 'am', 'living', etc.) are removed and only the keywords(like name of area and name of city) can be used for further processing.
- **Step 4:** The keywords are then concatenated to form an address which is then passed to the MongoDB server.
- **Step 5:** From the server when we receive the nearest restaurant name and address we store it in a variable and convert it from text to speech to tell the hungry person where it needs to go to receive food.
- **Step 6:** In case no restaurant is found we convert the text, "No restaurant is available'" to speech to let the hungry person know that there is no restaurant near him/her that has extra food available.
- **Step 7:** The code gave the desired output after running the python file in the command prompt/terminal.

I also tried to integrate this python file with a softphone. I used a softphone as a substitute for a toll free number. It was connected to my PC's IP address and the calls worked just like a real phone. I did it with the help of Asterisk, an open source communication toolkit. I used Linux OS for this. Even though I was successfully able to run a simple python file that played audio, I couldn't run the voice2.py python file that I had created, most probably due to certain limitations and restrictions of the asterisk server.

4. CONCLUSION

This Project aims to provide a solution to the food that is wasted in the restaurants and hotels, the excess food that is not consumed in a wedding and ends up in the garbage bins, and the loads of food that is wasted in the hostel mess. This food can be utilized to quell the hunger of the poor population of the country.

This project introduces a medium for the poor hungry person to connect to a place nearby where food is available for the donation. The donation of the food comes from the excess food in weddings, parties, hotels and restaurants which was cooked but was not consumed.

The whole project is divided into four major domains:
- The NLP - IVRS model.

- The database domain.
- The Android application domain.
- The integration of the database with the NLP model and Android application.

The Interactive Voice Response System (IVRS) model converses with the hungry person asking his/her name and address (area, city and state) in the form of speech. The user speaks the required information and through Natural Language Processing (NLP) the model converts the speech information into the text information.

On the other hand, the Android application (another part of the project) collects the information from the hotel manager, like the name and address of the hotel, and food availability for donation.
This data is then synchronized to both the Firebase database (for authentication and infographics) and to the MongoDB database (as it supports geocoding).

Now restaurant's data is accessed and processed by the NLP model which first retrieves the latitude and longitude of the addresses of the restaurants from the MongoDB database. These are then converted in a geosphere circle and the minimum distance restaurant from the hungry person is obtained which also has availability of food.

This data of the nearest restaurant (if found with the food available for donation) is then converted to a single string text format and is recited to the hungry person in the form of speech. Then the hungry person can directly go and take the food from the recommended restaurant.

This is how our project helps the poor hungry person to get free of cost and quality food from a renowned source (hotel/parties/restaurants). This also helps to minimize the food wastage and maximize the food utilization.

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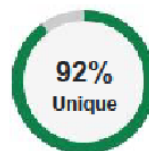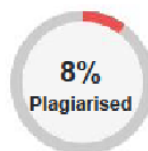- https://towardsdatascience.com/pythons-geocoding-convert-a-list-of-addresses-into-a-map-f522ef513fd6

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6. Plagiarism Report:

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"There are people in the world so hungry that God cannot appear to them except in the form of bread." - Mahatma Gandhi. This isn't a simple quote but has been an everyday situation for many people over the years. Crores of people sleeping on an empty stomach and tonnes of food being wasted every day have become all too common in India since British colonization. Observing a large amount of food mismanagement and the inability to serve a large quantity of food without compromising the quality of food for people who cannot afford a single meal for his/her family in a day.This project aims to maximize food utilization while reducing the graph of people suffering from starvation. 1.1 Motivation Aristophanes famously said, "Hunger knows no friend but its feeder." When people are hungry, they will seize any opportunity to fill their stomachs. Other people in society frequently take advantage of their crisis. According to research, some of the physical effects of hunger include malnutrition, stunted growth, wasting, premature births, low birth weights, and, in extreme cases, infant and child mortality. Poor health, physical symptoms such as stomachaches and headaches, signs of worry, anxiety, and behavioral issues are also side effects.Babies born with smaller brain size, poor performance on measures of infant cognitive development, lower scores on both IQ and achievement tests, increased likelihood of impaired mental and intellectual delays, and inability to fully engage in school are all cognitive effects of hunger. If we.
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