AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

DOMAIN: ARTIFICIAL INTELLIGENCE
TEAM ID : PNT2022TMID25831

PROJECT REPORT
submitted by

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INTRODUCTION

1.1 PROJECT OVERVIEW

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food. The main aim of the project is to build a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

1.2. PURPOSE

Nutrition Analyzer helps in the detailed and perfect determination of the component nutrients present in any food item. Food components have vast bio metabolic roles and could affect human health severely.

Purpose of the AI powered Nutrition Analyzer is to help individuals who needs a proper nutrition assistant to achieve fitness ,to cure diseases through foods or to lead a healthy lifestyle. With the help of Artificial Intelligence , it was possible to achieve a proper nutrition analyzer which is capable of showing the nutrition content of the food when we give a picture of it.

LITERATURE SURVERY

2.1 EXISTING SYSTEM

Controlled intake of nutrition is recommended as a condition for being a healthy individual. Knowing and monitoring how much food is consumed during the day, following the calorie and nutrition of these foods helps to control healthy nutrition. However there is no proper assistance to achieve it. Nutritional intake is fundamental to human growth and health, and the intake of different types of nutrients and micro-nutrients can affect health. The content of the diet affects the occurrence of disease, with the incidence of many diseases increasing each year while the age group at which they occur is gradually decreasing. The consumption of a wide variety of food items is necessary in order for the human body to obtain the right amounts of nutrients. Failing to follow such a well-balanced diet, in combination with a generally unhealthy way of living, has been shown to increase the risk for cardiovascular disease, type II diabetes and some forms of cancer.

2.2 REFERENCES

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5. Computer learning based on Food recognition system Chang Liu, Yu Cao, Guanling Chen, Peng Hou are with the University of Massachus etts. JANUARY 2019 Procedia Computer publications

6. Virtual Nutritionist using AI Internation al Journal of Engineerin g and Advanced Technology (IJEAT) ISSN: 2249- 8958, Volume-8 Issue-5,June 2019 Blue Eyes Intelligence Engineering and science publication .

2.3 PROBLEM STATEMENT DEFINITION

Ideal situation :

Ideally, a Nutrition Analyzer is available which will help people in assisting the nutrition analysis and help them in maintaining good health.

Reality :

Currently there is no ideal nutrition analyzer is available. Those which are available, fails to satisfy the needs of the people. Some are not personalized while some are very complicated to be accessed by everyone. Hence, there is no Nutrition analyzer to guide and assist people.

Consequences :

People tend to consume food without the knowledge of nutrition content of the food. This results in nutrition imbalance leading to nutrition deficiencies and diseases.

Proposal :

Our project of Nutrition Analyzer for Fitness Enthusiasts Focus on Developing a simple Nutrition Analyzer which is capable of analyze the nutrition in the food by giving the picture of the food. This is achieved by Artificial Intelligence with Python, Deep learning ,CNN etc..

IDEATION AND PROPOSED SOLUTION

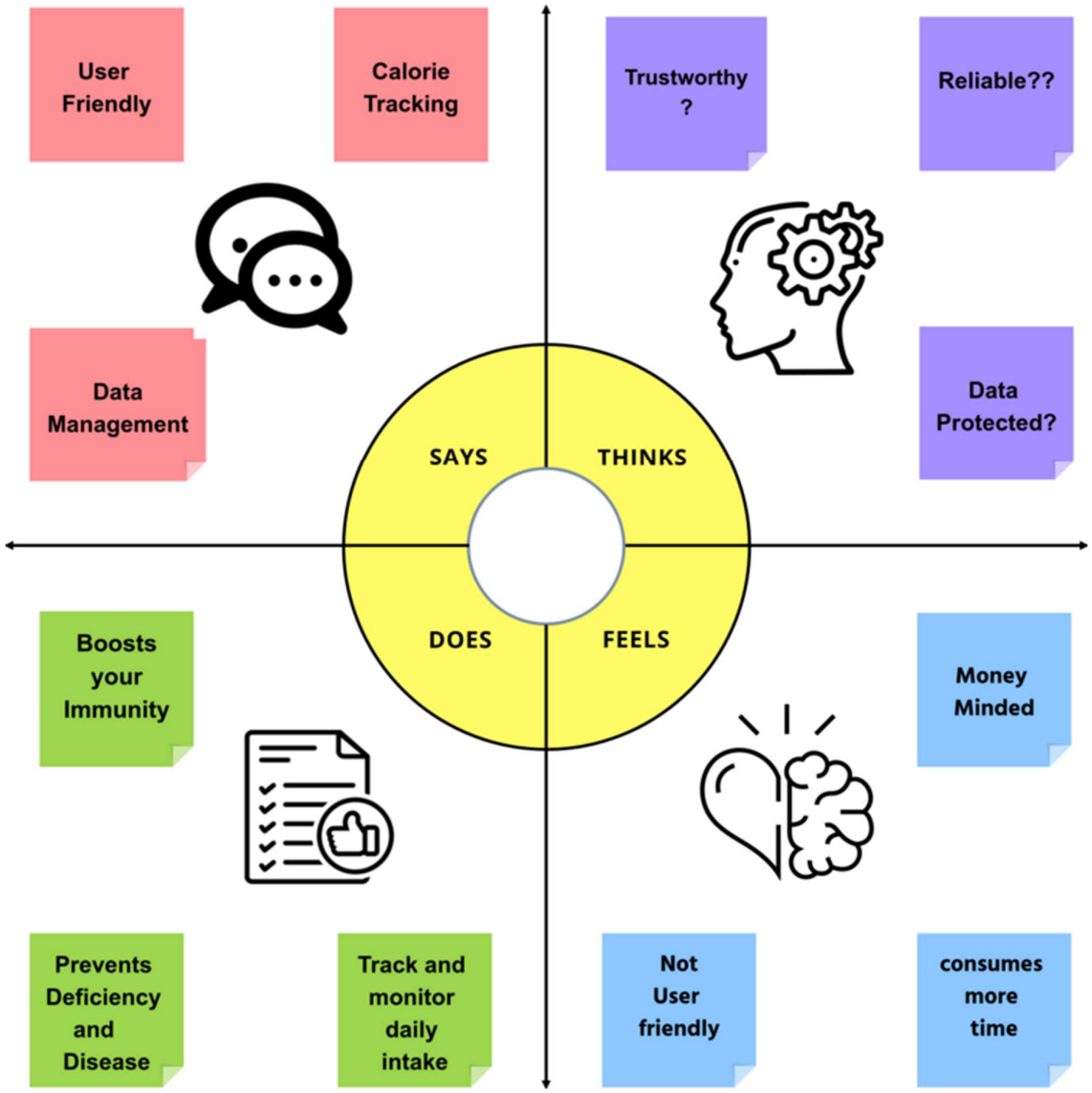
3.1 EMPATHY MAP CANVAS

Empathy mapping is a simple yet effective workshop that can be conducted with a variety of different users in mind, anywhere from stakeholders, individual use cases, or entire teams of people. It can be conducted by many different teams such as design teams, sales, product development or customer service. Essentially, it is an exercise that seeks to get inside the head of the customer as they interact with your product/service.

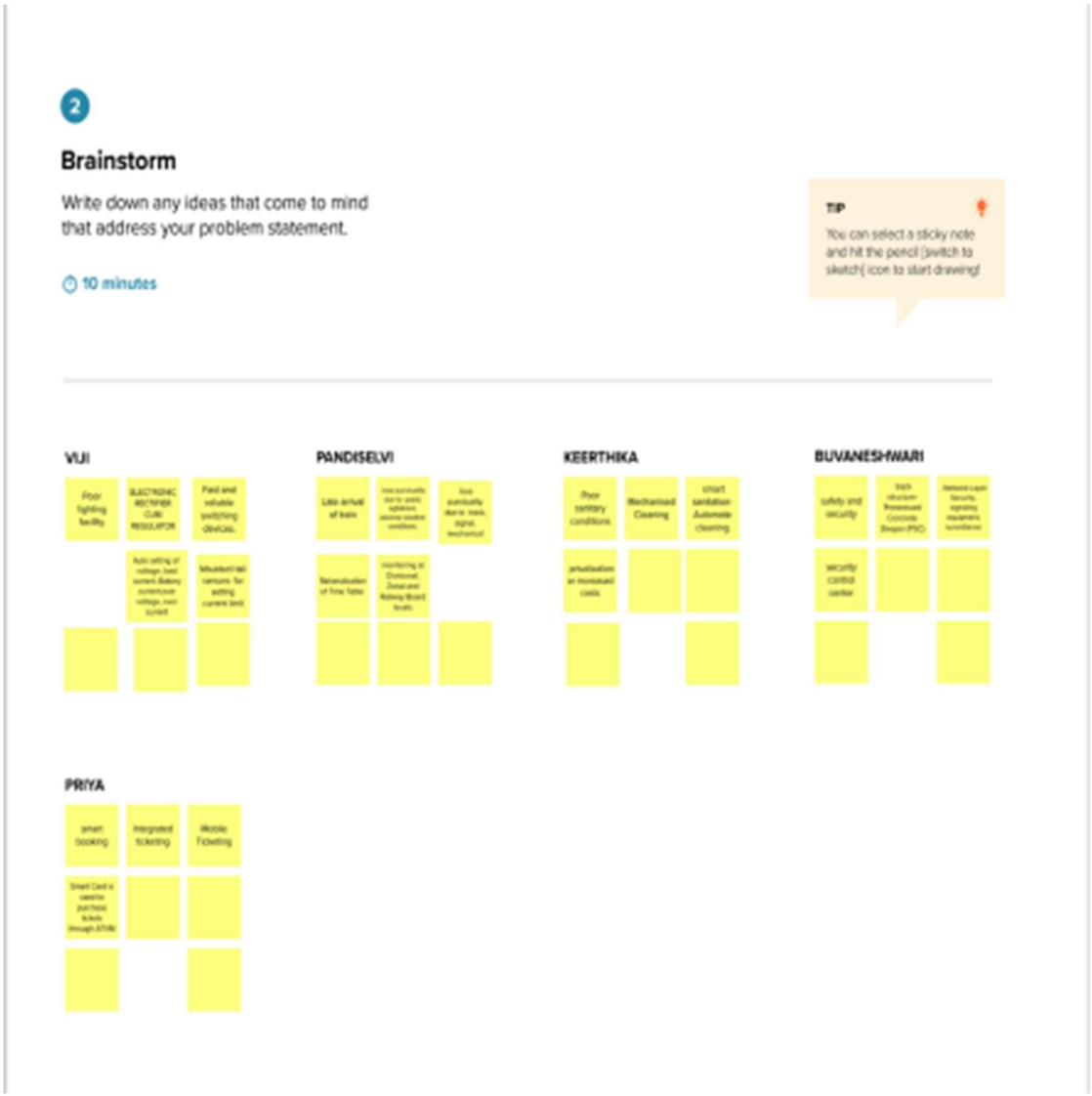
Nutrition Analyzer does the process of determining the nutritional contet of the food that provides information about chenical composition , processing, quality conntrol and containation of food

The following empathy map helped us to understand the customer needs and their expections and to develop our Nutrition Analyser

Empathy Map


User Friendly
Calorie Tracking
Trustworthy ?
Reliable??
Data Management
Data Protected?
SAYS
THINKS
DOES
FEELS
Boosts your Immunity
Money Minded
Prevents Deficiency and Disease
Track and monitor daily intake
Not User friendly
consumes more time

3.2 IDEATION & BRAINSTORMING

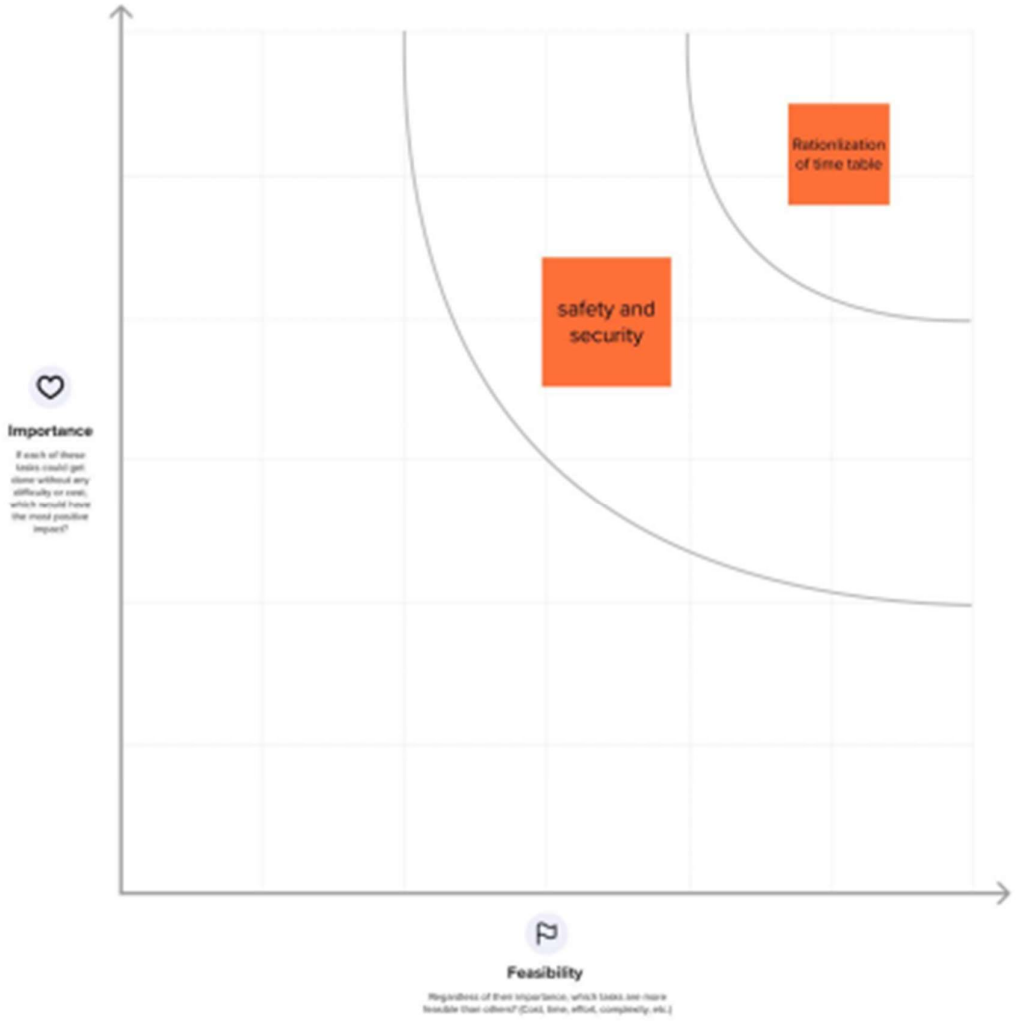


4

Prioritize

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

20 minutes



3.3 PROPOSED SOLUTION:

S.NO	PARAMETERS	DESCRIPTIONS
1	Problem Statement (Problem to be solved)	Food is essential for human life and has been the concern of many healthcare conventions. Nowadays it has become even more difficult for people to understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.
2	Idea / Solution description	In order to guide people to follow healthier eating habits nutrition analyzer has to be introduced. Nutritional analyzer does the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality controland contamination of food
3	Novelty / Uniqueness	Consult Online Doctor/ Nutritionist, Research on some websites based on the nutrition and Chat- bots in which we can able to answer all our queries based on importantly in Calories, Nutritional Food content, Diet plans, Balanced food based charts etc..This also gives the correct solution and answer for the Nutrition to get fit in our life.
4	Social Impact / Customer Satisfaction	Being Healthy is very important and our project will help those who are trying to maintain their health. There are different food available and there are many undesirable contents in the food. Many people consume them unconsciously. Our project paves way for conscious eating and to control what we eat. This will help many people who are trying to eat according to their body needs like people with health conditions or some people who like to consume healthy content.

5	Business Model (Revenue Model)	The person using nutrition analyzer may avoid spending time and money for nutrition analyst instead by paying the less premium amount can communicate with nutritional specialists and get benefited.
6	Scalability of the Solution	AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food maintain a healthy diet. According to their tracking system for the person nutrients intake can increased or decreased.

3.4 PROBLEM-SOLUTION FIT

1.Customer Segments:

Consults on Nutrition

2.Jobs-to-be-done:

- Healthy diet plan
- Quality control of food
- Nutrition rich food recommendations
- Different nutrition pattern exploration
- Classification of food based on its nutrients

3.Triggers

To maintain good heath and to regulate their eating. Good intake of foods

4.Emotion Before/After

Before: Depressed, Exhausted, Confused, Tense on body shape

After : Confidence, Delightful, Encouraged, Motivated, Customer became mentally and physically fit

5. Available Solutions

- They can hire a personal nutritionist.
- They can consult dietitians
- They can use apps such as My Fitness Pal, Chronometer, Life Sum, etc...

6.Customer

Lack of kowledge on understanding everything and go beyond onn calorie counting, scared on getting help from the resources on anlayzer, whether the premiun amount for the premium is acceptable for the customers.

7. Behaviour

Consulting doctors or utritionist, enquiuries about the food to be consumed, refer articles such as magazine, newsapaper, watching excercises and yoga , searching it in websites ,etc.....

8. Channels of Behavior

Refering Articles, Checking websites related on nutrition, Consulting nutritionist on online, etc....

9. Problem Rootcause

- Fast paced lifestyle
- Availability of low quality food
- Nutrition less food
- Improper diet plan
- Lack of health related awareness
- Emotional Eating
- Improper food timings

10. Solution

Food has the power to influence metabolismm and health directly. If food is the reason nutrition is the result, Hence we should give high importance to proper nutritiion. Our project "AI Powered Nutrition Analyzer" helpspeople to get to know the nutrition content in their food and improve body health.

REQUIREMENT ANALYSIS

4.1. FUNCTIONAL REQUIREMENTS

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	USER REGISTRATION	• Registration through Gmail • Registration through Mobile Number • Registration through Facebook
FR-2	USER CONFIRMATION	• Confirmation via Email • Confirmation via OTP
FR-3	USER DETAILS	PERSONAL DETAILS FOOD DETAILS Age,Food,Height,Recipe,Weight,Added ingredients,Diseases if anyAge,Conditions is any,Allergies is any
FR-4	USER REQUIREMENTS	• The user simply inputs your recipe ingredients and amounts. The software will instantly produce an accurate readout of your dish in terms of nutritional analysis in a readable format that consumers are familiar with. • With already given details the system can alert the consumer if any content of their allergies ,it can alert the consumer

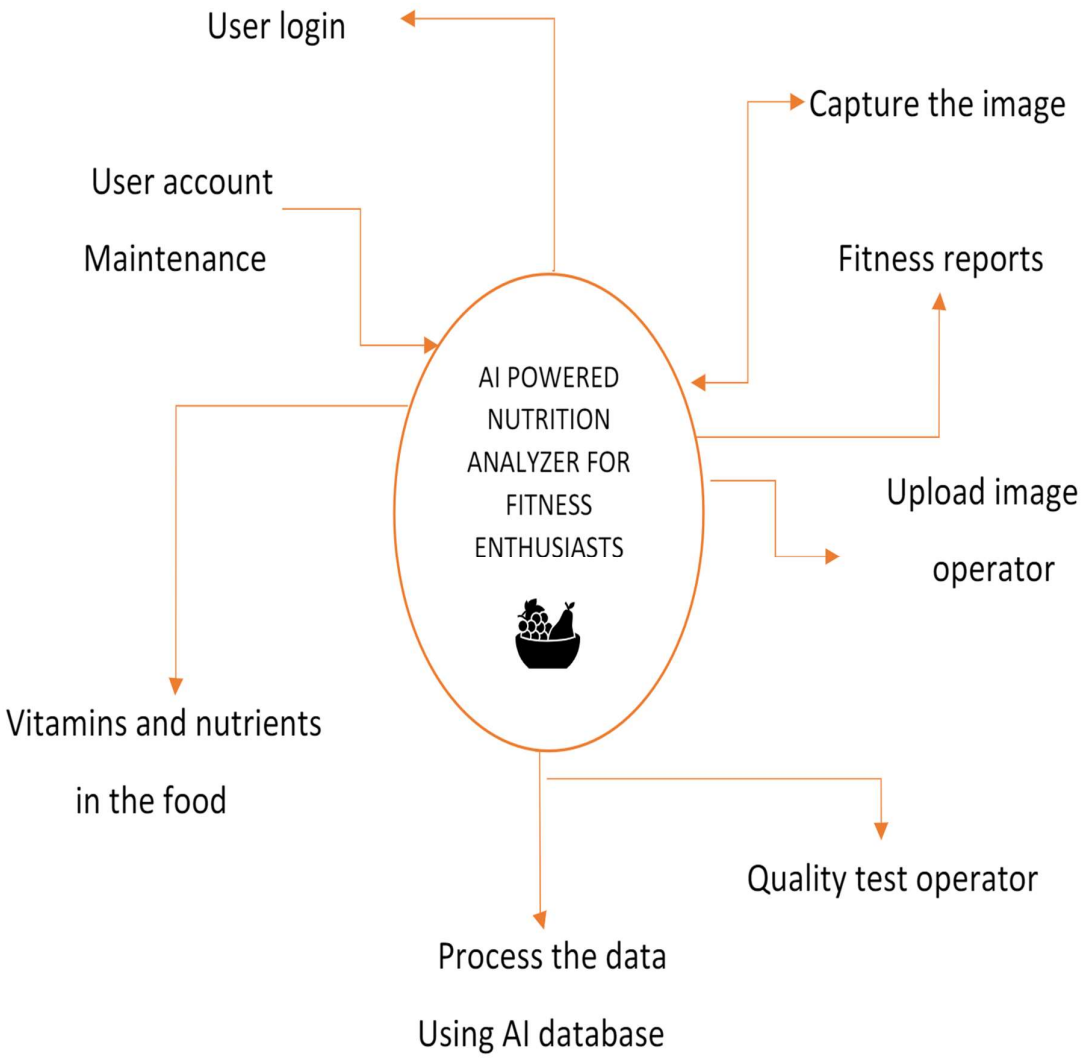
4.2. NON-FUNCTIONAL REQUIREMENTS

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	• No training is required to access the Nutrition Analyzer. • The results should be loaded within 30 seconds. • It should be user friendly and comfortable. • It should be simple and easy to use. • The results should be self explanatory so that it can be understood by common people.
NFR-2	**Security**	• AI powered nutrition analyzer for fitness should contain more security in which our data which entered or maintained should be more security. • With the help of the username and password it provides more security in which it can access more securable and the data are private. • It should be social-economic which should access to sufficient and safe to use.
NFR-3	**Reliability**	• It is Important that the AI powered nutrition analyzer for fitness provides should Must reliable. • How a person can find it is reliable? It is easy to find that is he/she can compare the nutrition based food with other nutrition related application so, it can easily rectify whether it is reliable or not. • But it take too much time, to avoid this a reliable application should made in which it itself produces whether we can get correct solution or not. So, it is necessary that the AI powered nutrition analyzer for fitness should have proper data and information in which we can get a correct information about it and also get

		a proper guidance about it. • With the proper guideness and proper information in which we can get a nutrition properly and we can have get a proper fitness plan.
NFR-4	**Performance**	• It should provide more number of users to consume at any time and at any place. • It should provide Reliability, Scalability, Security and Usability. • It should contain minimum data while over-paging the websites or application and it is necessary that it should not exceed more than 20mb. • While consuming the page it should provide the response as much as possible without any delay or time traffic. • The connection should e properly maintained so that it can use while travelling or in remote places
NFR-5	**Availability**	• Easy to access Data. • Avoids Data redundancy and inconsistency. • Fast and Efficient. • User Friendly.
NFR-6	**Scalability**	• The architecture for AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food and helps the user to maintain a healthy diet. • According to their tracking system implemented in architecture provide the proper mechanism to the every individual of their nutrients intake which can be increased or decreased.The premium amount for analyzer is very much optimus

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION & TECHNICAL ARCHITECTURE

TECHNICAL ARCHITECTURE:

ABSTRACT :

- The main aim of the project is to building a model which is used for classifying the fruit, vegetables, spinach, fish, meat, Green leafy vegetables etc….. depends on the different characteristics like colour, shape, texture etc.

- Here the user can capture the images of different fruits, vegetables, spinach, Green leafy vegetables, fish, meat , etc.. and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

- Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.

- Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

- This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.

- The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.

OBJECTIVES:

➤ Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments.

➤ What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health.

➤ The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life.

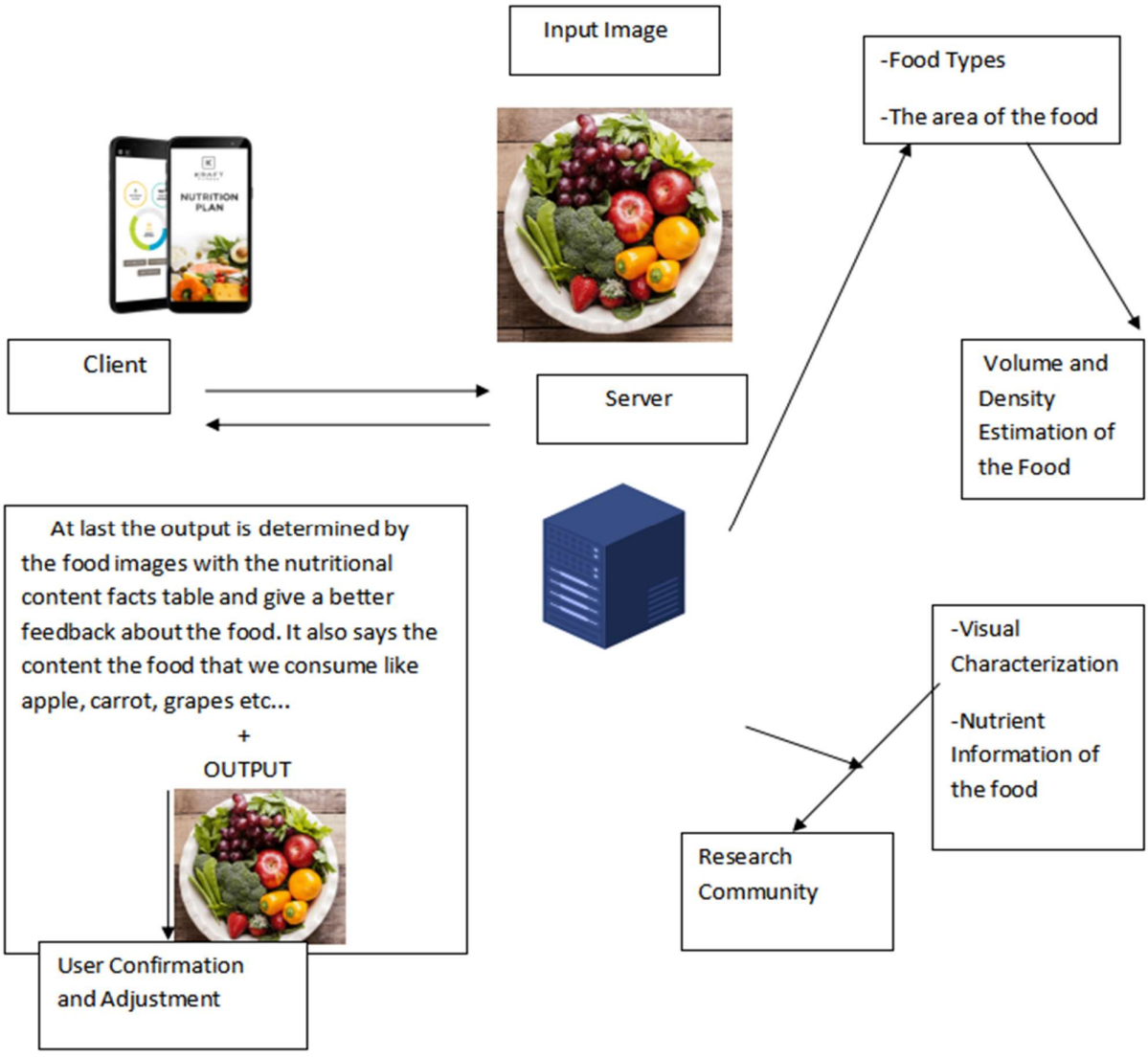
➤ It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods.

➤ Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenish malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result.

➤ Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and biochemical composition of foods is important to the health, well-being, and safety of the consumers.

➤ We consume food so that we can obtain proper nutrition. Hence it is very important for us to know the composition of nutrients in our food.

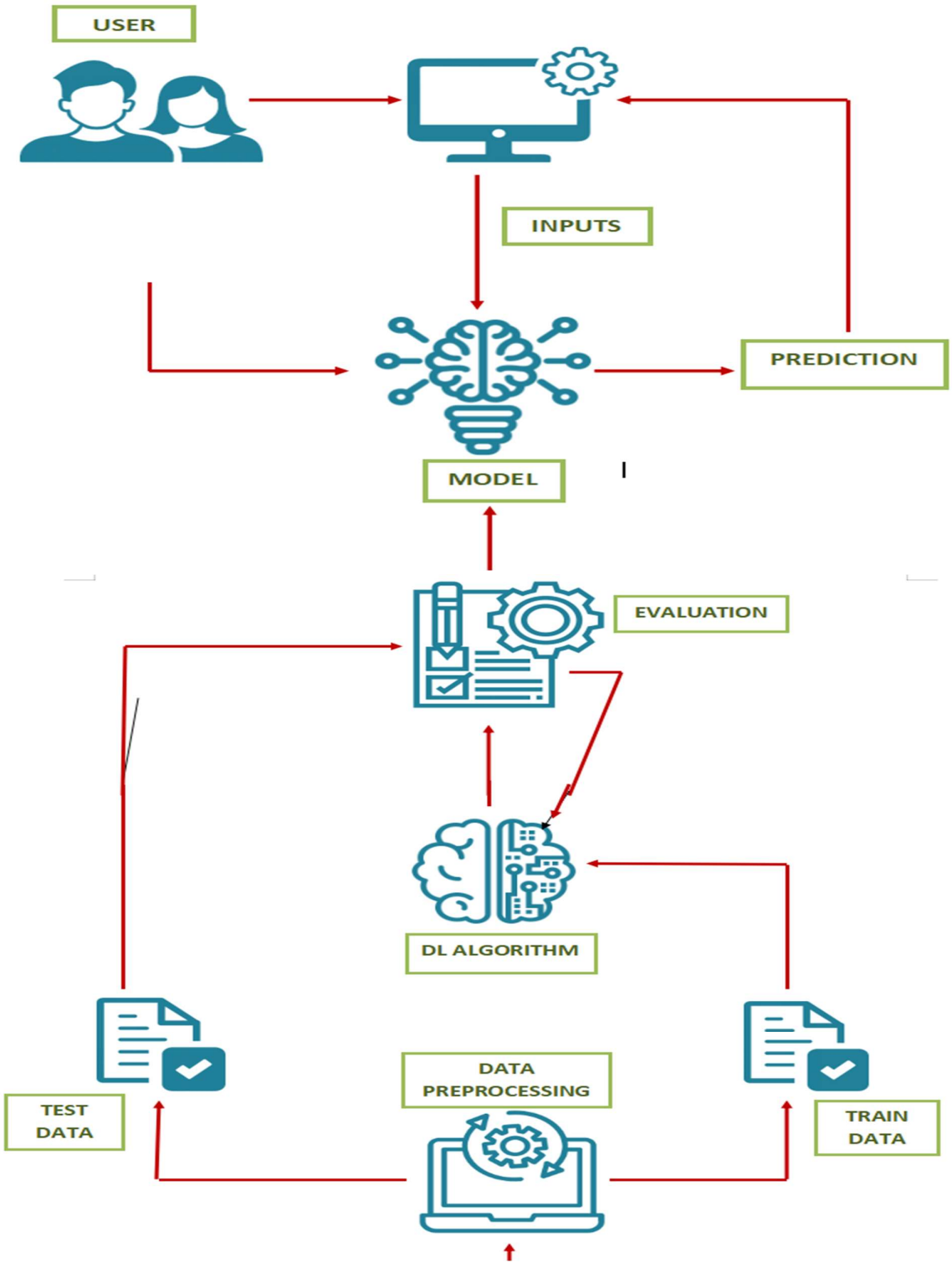
➤ Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding nutrients required for our body and excluding which is not good for health.


Input Image
-Food Types
-The area of the food
NUTRITION PLAN
Client
Server
Volume and Density Estimation of the Food
At last the output is determined by the food images with the nutritional content facts table and give a better feedback about the food. It also says the content the food that we consume like apple, carrot, grapes etc...
+
OUTPUT
-Visual Characterization
-Nutrient Information of the food
Research Community
User Confirmation and Adjustment

SOLUTION ARCHITECTURE:

Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments. What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health. The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life. It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods.Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenish malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result. Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and Biochemical composition of foods is important to the health, well-being, and safety of the consumers. We consume food so that we can obtain proper nutrition. Hence it is very important for us to know the composition of nutrients in our food. Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding nutrients required for our body and excluding which is not good for health.

- ➤ This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.
- ➤ The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.
- ➤ First, the user captures the images of the food and uploads it.
- ➤ Next, the image will be sent to the trained model.
- ➤ The model will classify the food based on the different characteristics like colour


USER
INPUTS
PREDICTION
MODEL
EVALUATION
DL ALGORITHM
TEST DATA
DATA PREPROCESSING
TRAIN DATA

RELIABILITY:

- It is Important that the AI powered nutrition analyzer for fitness provides should Must reliable.
- How a person can find it is reliable? It is easy to find that is he/she can compare the nutrition based food with other nutrition related application so, it can easily rectify whether it is reliable or not.
- But it take too much time, to avoid this a reliable application should made in which it itself produces whether we can get correct solution or not. So, it is necessary that the AI powered nutrition analyzer for fitness should have proper data and information in which we can get a correct information about it and also get a proper guidance about it.
- With the proper guidness and proper information in which we can get a nutrition properly and we can have get a proper fitness plan.
- It should also provides the information on nutrition and health which it should prevents from health information on diseases, health risks and prevention guidelines. It should also provides an extension a research based online learning network with several resource areas, so it provides more reliability in that area. For more reliable it can also contains the calorie information, balanced diet plans, what type food can consumed at what time etc..... So, by this way it can reliable.

SCALABILITY:

- The architecture for AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food and helps the user to maintain a healthy diet.
- According to their tracking system implemented in architecture provide the proper mechanism to the every individual of their nutrients intake which can be increased or decreased.
- The premium amount for analyzer is very much optimum.

PERFORMANCE:

- It should provide more number of users to consume at any time and at any place.
- It should provide Reliability, Scalability, Security and Usability.
- It should contain minimum data while over-paging the websites or application and it is necessary that it should not exceed more than 20mb.
- While consuming the page it should provide the response as much as possible without any delay or time traffic.

- The connection should e properly maintained so that it can use while travelling or in remote places.
- The nutritious food to meet their dietary needs and the food preferences for an active and healthy life.
- It should be consistently access, availability and affordability of foods and beverages that promote well-being and prevent from diseases.
- It should suitable in all situations that exists to all people, at all times.

SECURITY:

- AI powered nutrition analyzer for fitness should contain more security in which our data which entered or maintained should be more security.
- With the help of the username and password it provides more security in which it can access more securable and the data are private.
- It should be social-economic which should access to sufficient and safe to use.

USABILITY:

- No training is required to access the Nutrition Analyzer.
- The results should be loaded within 30 seconds.
- It should be user friendly and comfortable.
- It should be simple and easy to use.
- The results should be self explanatory so that it can be understood by common people.

5.3 USER STORIES-

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user, Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	Visit the dashboard for accessing the features of the application	The dashboard is user-friendly	Low	Sprint-1
	Upload Image	USN-7	Uploading the images of the food in the website	As a user, they are able to attend the food images	High	Sprint-3
	Predict	USN-8	The model is able to classify and predict the nutrients present in the food	From the images uploaded, I can access the nutrition facts	High	Sprint-3
		USN-9	We train the model to test various images and ensure that the output accuracy is good	'm able to train and test the application till the results are as accurate as possible	Medium	Sprint-4

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Login	USN-10	As a user, I can use the application by entering my email and password.	I can access my account	Medium	Sprint-4
Customer Care Executive	Dashboard	USN-11	Upload the image	Recognizing and get the output	High	Sprint-1
Administrator	Security	USN-12	updated the features	checking the security	Medium	Sprint-1

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Functional Requirement (Epic)	User Story Number	User Story / Task
SPRINT - I	**Data Collection & Image Processing**	
	USN-1	Collect images of different food items organized into subdirectories based on their respective names
	USN-2	Import and configure the Image data generator library from Keras
	USN-3	Apply Image data generator functionality to training set and testing set
	USN-4	Improving the image data that suppresses unwilling distortions or enhances some image features important for further processing
SPRINT - II	**Model Building & Testing**	
	USN-5	Importing the model building libraries and Initializing the model
	USN-6	Adding CNN layers, Dense layers & other necessary layers and Compile the model
	USN-7	Train & Test the model based on the image dataset
SPRINT - III	**Application building**	
	USN-8	Create HTML pages to design the front-end part of the web page
	USN-9	Create the flask application and loading the model file
	USN-10	Routing to the HTML page and Running the application
SPRINT - IV	**Cloud integration**	
	USN-11	Train the model on Cloud

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)	Sprint Final submission date (last updates)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022	18.11.2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022	18.11.2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022	19.11.2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022	19.11.2022

7. CODING & SOLUTIONING

7.1.Feature 1

- AI-powered Nutrition Analyzer for Fitness Enthusiasts
- The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).
- Languages : Python
- Tools/IDE : Google collaboratory , Spyder
- Libraries : Recommendation

APP.PY

```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our
application.
#request-for accessing file which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import load_model#to load our trained model
from tensorflow.keras.preprocessing import image
import requests


app = Flask(__name__,template_folder="templates") # initializing a flask app
# Loading the model
model=load_model('nutrition.h5')
print("Loaded model from disk")
```

```
@app.route('/')# route to display the home page
def home():
    return render_template('home.html')#rendering the home page

@app.route('/image1',methods=['GET','POST'])# routes to the index html
def image1():
    return render_template("image.html")



@app.route('/predict',methods=['GET', 'POST'])# route to show the predictions
in a web UI
def launch():
    if request.method=='POST':
        f=request.files['file'] #requesting the file
        basepath=os.path.dirname('__file__')#storing the file directory
        filepath=os.path.join(basepath,"uploads",f.filename)#storing the file
in uploads folder
        f.save(filepath)#saving the file

        img=image.load_img(filepath,target_size=(64,64)) #load and reshaping
the image
        x=image.img_to_array(img)#converting image to an array
        x=np.expand_dims(x,axis=0)#changing the dimensions of the image

        pred=np.argmax(model.predict(x), axis=1)
        print("prediction",pred)#printing the prediction
        index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']

        result=str(index[pred[0]])

        x=result
        print(x)
        result=nutrition(result)
        print(result)

        return render_template("0.html",showcase=(result),showcase1=(x))
def nutrition(index):


    url = "https://calorieninjas.p.rapidapi.com/v1/nutrition"

    querystring = {"query":index}

    headers = {
        'x-rapidapi-key':
"5d797ab107mshe668f26bd044e64p1ffd34jsnf47bfa9a8ee4",
```

```
        'x-rapidapi-host': "calorieninjas.p.rapidapi.com"
        }

    response = requests.request("GET", url, headers=headers,
params=querystring)

    print(response.text)
    return response.json()['items']
if __name__ == "__main__":
   # running the app
    app.run(debug=False)
```

HOME.HTML

```
<!DOCTYPE html>
<html>
<head>
   <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Home</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
    <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}"
rel="stylesheet">
<style>
            body
            {
                background-image: url("https://www.livingproofnyc.com/wp-
content/themes/livingproof/assets/img/hero-background.jpg");
                background-size: cover;
            }
            .bar
            {
            margin: 0px;
            padding:20px;
            background-color:white;
            opacity:0.6;
            color:black;
            font-family:'Roboto',sans-serif;
            font-style: italic;
            border-radius:20px;
```

```
font-size:25px;
}
h3
{
margin: 0px;
padding:20px;
background-color:#9ACD32;
width: 800px;
opacity:0.6;
color:#000000;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;
border-radius:15px;0
font-size:30px;
padding-left:10px;
}
.div1{
background-color: lightgrey;
width: 500px;
border: 10px solid peach;
padding: 20px;
margin: 20px;
height: 500px;
}




.header { position: relative;
            top:0;
            margin:0px;
            z-index: 1;
            left: 0px;
            right: 0px;
```

```
                        position: fixed;
                        background-color: #8B008B ;
                        color: white;
                        box-shadow: 0px 8px 4px grey;
                        overflow: hidden;
                        padding-left:20px;
                        font-family: 'Josefin Sans'
                        font-size: 2vw;
                        width: 100%;
                        height: 8%;
                        text-align: center;
                    }
                    .topnav {
            overflow: hidden;
            background-color: #FCAD98;
            }

            .topnav-right a {
            float: left;
            color: black;
            text-align: center;
            padding: 14px 16px;
            text-decoration: none;
            font-size: 22px;
            }

            .topnav-right a:hover {
            background-color: #FF69B4;
            color: black;
            }

            .topnav-right a.active {
            background-color: #DA70D6;
            color: black;
            }

            .topnav-right {
            float: right;
            padding-right:100px;
            }
</style>
</head>
<body>

<!--Brian Tracy-->

<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black;
padding-top:1%;padding-left:5%;">Nutrtion Image Analysis</div>
```

```
  <div class="topnav-right"style="padding-top:0.5%;">

    <a class="active" href="{{ url_for('home')}}">Home</a>
    <a   href="image.html">Classify</a>
  </div>
</div>
</div>
<br>
<br>
<br>
<br>
<br>
<br>
<br>
<br>
<h1>

<center>


<h3>Food is essential for human life and has been the concern of
many healthcare conventions. Nowadays new dietary assessment
and nutrition analysis tools enable more opportunities to help
people understand their daily eating habits, exploring nutrition
patterns and maintain a healthy diet.Nutritional analysis is the
process of determining the nutritional content of food. It is a
vital part of analytical chemistry that provides information about
the chemical composition, processing, quality control and contamination
of food. It ensures compliance with trade and food laws.</h3>

</center>



</h1>
</body>
</html>
```

IMAGE.HTML

```
{% extends "imageprediction.html" %} {% block content %}
<div style="float:left">
<br>
<br>
<h5><font color="black" size="3" font-family="sans-serif"><b>Upload image to
classify</b></font></h5><br><br>

<div>
```

```
    <form id="upload-file" method="post" enctype="multipart/form-data">
       <label for="imageUpload" class="upload-label">
            Choose...
        </label>
        <input type="file" name="file" id="imageUpload" accept=".png, .jpg,
.jpeg">
    </form>

   <center> <div class="image-section" style="display:none;">
        <div class="img-preview">
            <div id="imagePreview">
            </div></center>
        </div>
        <center><div>
            <button type="button" class="btn btn-primary btn-lg " id="btn-
predict">Classify</button>
       </center></div>
    </div>

    <div class="loader" style="display:none;margin-left: 450px;"></div>

    <h3 id="result">

        <span><p style="padding-top: 25px;"><h4>Food Classified is :
<h4><b><u>{{showcase}}{{showcase1}}</p> </span>
    </h3>

</div>
</div>



{% endblock %}
```

IMAGEPROCESSING.HTML

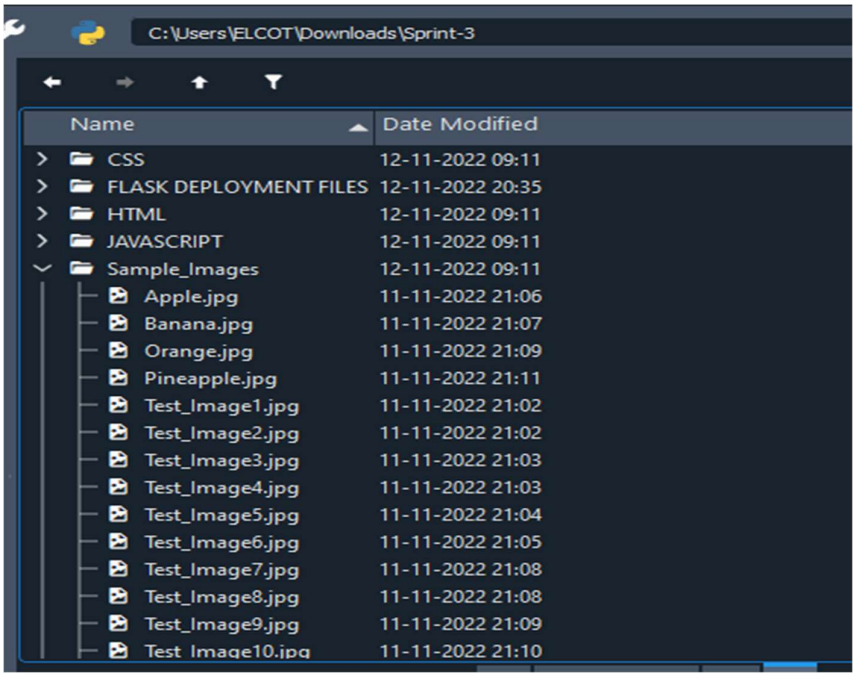
```
<!DOCTYPE html>
<html>
<head>
   <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Predict</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
    <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
```

```
    <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}"
rel="stylesheet">
<style>
body
{
    background-image:
url("https://i.pinimg.com/originals/be/21/1a/be211ad5043a8d05757a3538bdd8f450.
jpg");
    background-size: cover;
}
.bar
{
margin: 0px;
padding:20px;
background-color:white;
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;
border-radius:15px;0
font-size:30px;
padding-left:10px;
}
.div1{
  background-color: lightgrey;
  width: 500px;
  border: 10px solid peach;
  padding: 20px;
  margin: 20px;
  height: 500px;
}
```

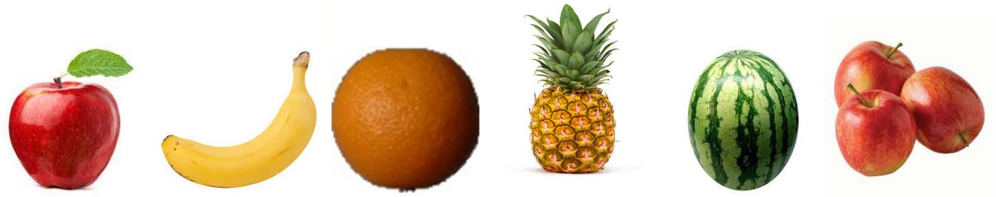
```
.header { position: relative;
      top:0;
      margin:0px;
      z-index: 1;
      left: 0px;
      right: 0px;
      position: fixed;
      background-color: #8B008B ;
      color: white;
      box-shadow: 0px 8px 4px grey;
      overflow: hidden;
      padding-left:20px;
      font-family: 'Josefin Sans';
      font-size: 2vw;
      width: 100%;
      height:8%;
      text-align: center;
    }
    .topnav {
  overflow: hidden;
  background-color: #FCAD98;
}

.topnav-right a {
  float: left;
  color: black;
  text-align: center;
  padding: 14px 16px;
  text-decoration: none;
  font-size: 18px;
}

.topnav-right a:hover {
  background-color: #FF69B4;
  color: black;
}

.topnav-right a.active {
  background-color: #DA70D6;
  color: black;
}

.topnav-right {
  float: right;
  padding-right:100px;
}
```

```
</style>
</head>
<body>
<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black;
padding-top:1%;padding-left:5%;">Nutrtion Image Analysis</div>
  <div class="topnav-right"style="padding-top:0.5%;">

    <a href="{{ url_for('home')}}">Home</a>
    <a  class="active" href="{{ url_for('image1')}}">Classify</a>
  </div>
</div>
<br>


</div>
<div class="container">
       <center>
<div id="content" style="margin-top:2em">{% block content %}{% endblock
%}</div></center>
    </div>
</body>

<footer>
    <script src="{{ url_for('static', filename='js/main.js') }}"
type="text/javascript"></script>
</footer>

</html>
```

8.1 TEST CASES



8.2 USER ACCEPTANCE TESTING



APPLE BANANA ORANGE PINEAPPLE WATERMELON TEST_IMAGE1

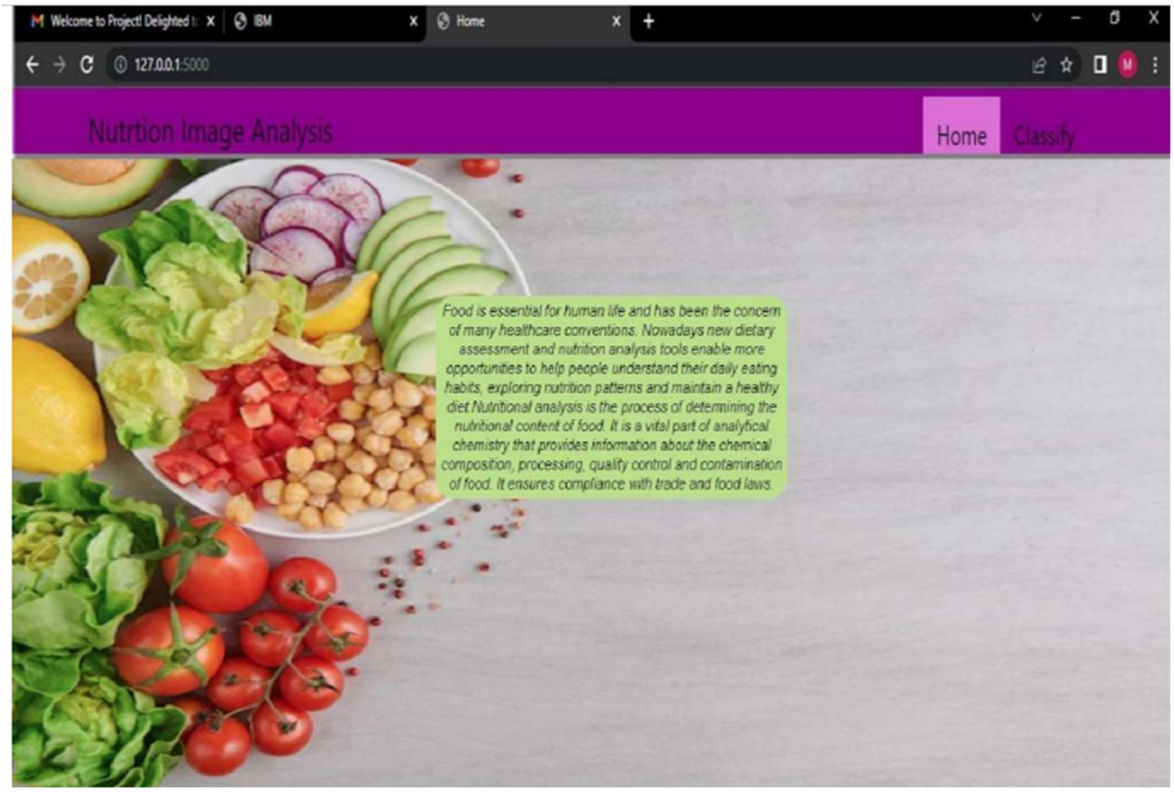
TEST_IMAGE2 TEST_IMAGE3 TEST_IMAGE4 TEST_IMAGE5 TEST_IMAGE6

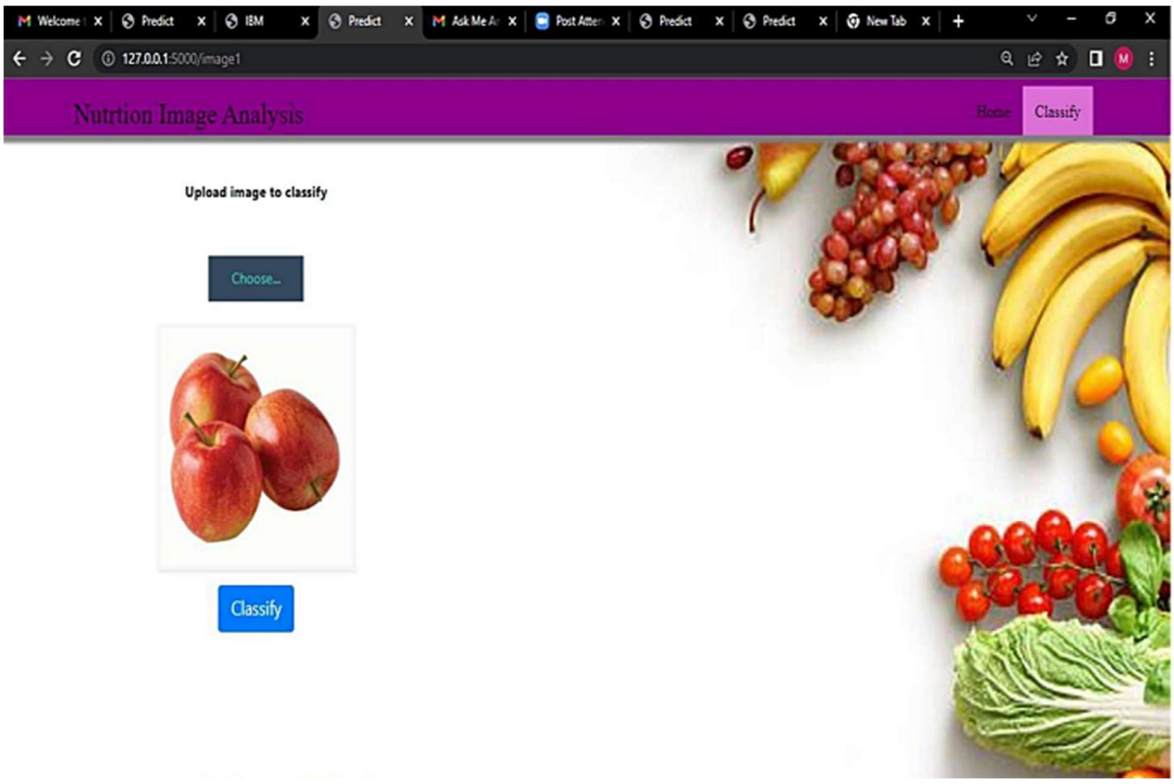
PERFORMANCE TESTING:

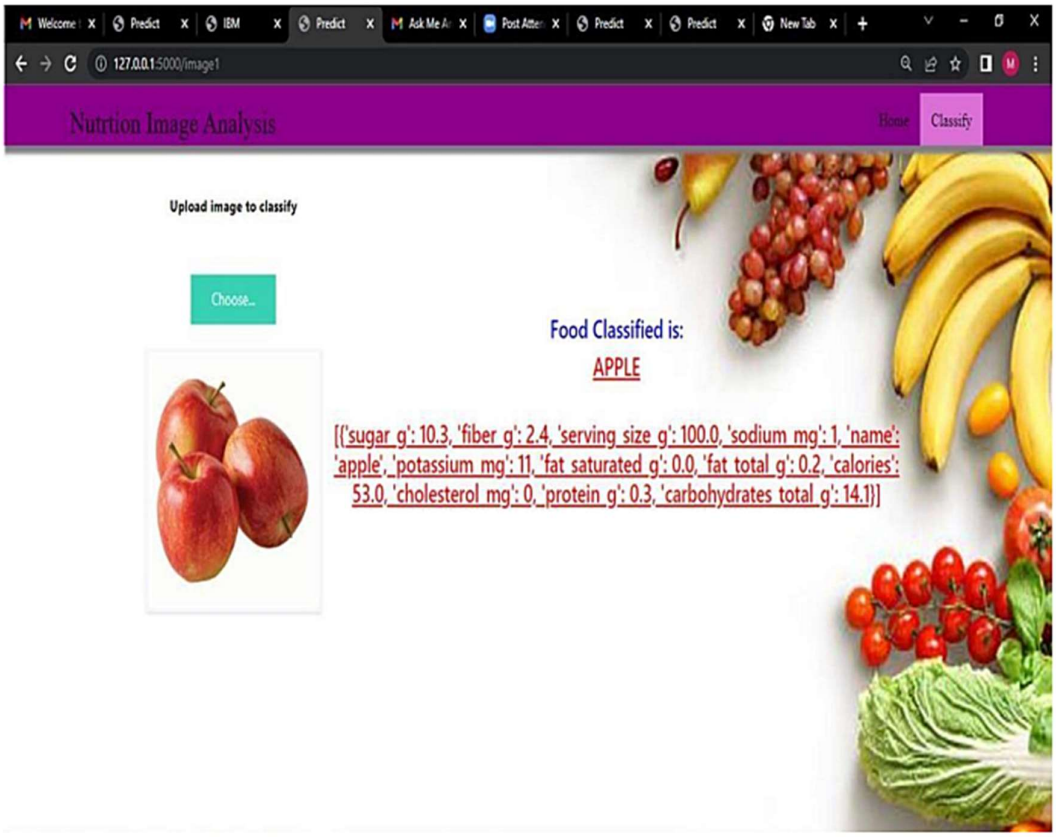
```
Epoch 1/10
110/110 [==============================] - 27s 242ms/step - loss: 0.4205 - accuracy:
0.8861 - val_loss: 48.9065 - val_accuracy: 0.1488
Epoch 2/10
110/110 [==============================] - 27s 245ms/step - loss: 0.0082 - accuracy:
0.9989 - val_loss: 62.1670 - val_accuracy: 0.1280
Epoch 3/10
110/110 [==============================] - 28s 255ms/step - loss: 0.0014 - accuracy:
1.0000 - val_loss: 66.6759 - val_accuracy: 0.1488
Epoch 4/10
110/110 [==============================] - 27s 242ms/step - loss: 3.3364e-04 - accuracy:
1.0000 - val_loss: 70.6794 - val_accuracy: 0.1488
Epoch 5/10
110/110 [==============================] - 27s 248ms/step - loss: 1.9990e-04 - accuracy:
1.0000 - val_loss: 74.1865 - val_accuracy: 0.1488
Epoch 6/10
110/110 [==============================] - 26s 236ms/step - loss: 4.5090e-04 - accuracy:
1.0000 - val_loss: 75.5190 - val_accuracy: 0.1308
Epoch 7/10
110/110 [==============================] - 27s 248ms/step - loss: 1.0600e-04 - accuracy:
1.0000 - val_loss: 78.4789 - val_accuracy: 0.1488
Epoch 8/10
110/110 [==============================] - 26s 237ms/step - loss: 7.9529e-05 - accuracy:
1.0000 - val_loss: 80.7918 - val_accuracy: 0.1403
Epoch 9/10
110/110 [==============================] - 26s 236ms/step - loss: 9.2201e-05 - accuracy:
1.0000 - val_loss: 80.3610 - val_accuracy: 0.1431
Epoch 10/10
110/110 [==============================] - 29s 266ms/step - loss: 9.1324e-05 - accuracy:
1.0000 - val_loss: 83.0943 - val_accuracy: 0.1393
<keras.callbacks.History at 0x7fbcb5cb4b10>
```

9.RESULTS:

9.1 Performance Metrics






127.0.0.1:5000/image1
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Food Classified is:
APPLE
[{'sugar_g': 10.3, 'fiber_g': 2.4, 'serving_size_g': 100.0, 'sodium_mg': 1, 'name': 'apple', 'potassium_mg': 11, 'fat_saturated_g': 0.0, 'fat_total_g': 0.2, 'calories': 53.0, 'cholesterol_mg': 0, 'protein_g': 0.3, 'carbohydrates_total_g': 14.1}]

10. ADVANTAGES AND DISADVANTAGES

Advantages:

- Food and food habits are ever-changing and evolving. People and professionals need to quickly adapt to new food products, diets, and changing preferences. The best way to instantly adapt to these changes is to have software that changes and adapts with you.
- Using automated nutrition analysis software will allow you to free up more time to innovate or grow your business. If you find a nutrition analysis software that has all the features you need, you can create much more time to focus on improving your business.
- Features such as a quick preview of nutrients while adding foods to diets, menus, and recipes give you the ability to save time when new recipes and food products are introduced.
- Having quick and easy software to help them plan their meals will save you tons of time.

Disadvantages:

- This methodology is still limited by its dependency on time-consuming and error-prone manual video annotations,with many studies resorting to the use of multiple human annotators.
- Often suffers from reliability issues.
- It is extremelyexpensive due to semantics analysismodel andnutritional analysis model.
- In order to make recommendations, the system needs tocollect nutritional needs from users. Most of the information is only provided through continuous interactions with users. However, in reality, recording nutritional intake from users cannot avoid faults because users usually forget or give wrong informationabout the foodsthey have consumed.
- Moreover deep learningrequires expensive GUIs andhundreds of machines. This increases the cost to the users.

11. CONCLUSION

Food is essential for human life and has been the concern of many health care conventions. In this project we have built a nutrition analysis model that classifies the nutritional content of the food through the image uploaded by the user. Such Nutritional analysis helps people understand their daily eating habits, exploring nutrition patterns and maintaining a healthy diet. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The nutritional analysis model is implemented using Convolutional neural network and the web application is built and implemented using Flask framework. As for the future work, the model can be trained and tested on more datasets to provide accurate results and better performance.

12. FUTURE SCOPE

The future scope of this project is very brod. Few of them are:

- The model could be trained using vast database in order to increase the accuracy of results.
- The Backend framework of the web application can be improved so that the uploaded images can be handled appropriately.
- In addition to the nutrition analysis, the application can also be designed to provide recipes that can be prepared using the nutrient-rich foods
- A database can also be implemented for the system so that users can save their data and relook into it later.
- The Web application can be further developed and launched as an Android App so that anyone anywhere with or without internet connection can access it and get benefited from its use cases.

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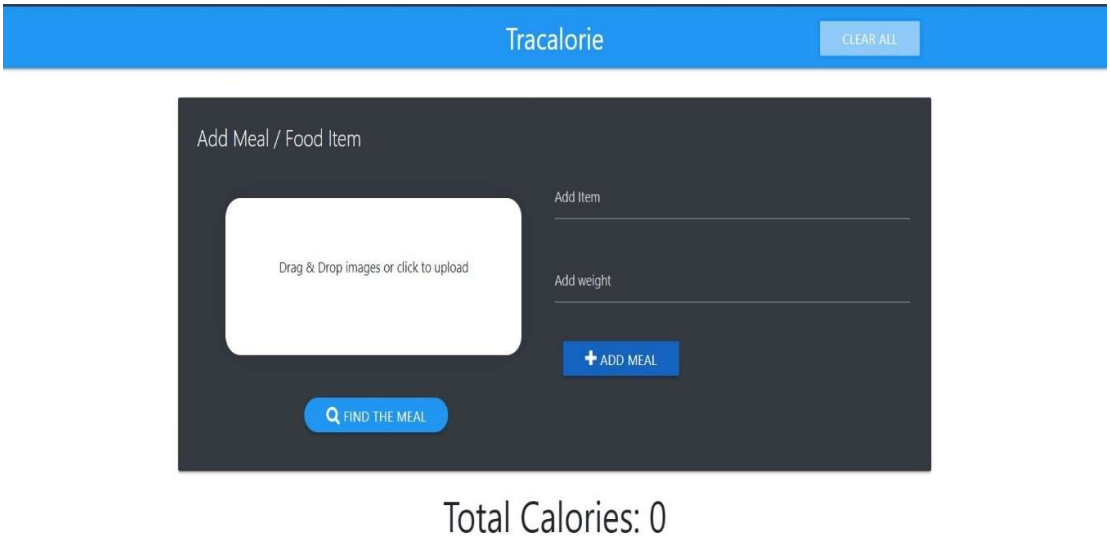
- The Web application can be further developed and launched as an Android App so that anyone anywhere with or without internet connection can access it and get benefited from its use cases.

13.FUTURE ENCHANCEMENT:



14.APPENDIX

Source code : https://github.com/IBM-EPBL/IBM-Project-4150-1658721721

Project Demo Video :
https://drive.google.com/drive/folders/19NUdGFZl5a7bHIYkfe2SuYk8Jjf-OCao?usp=share_link

Github : https://github.com/IBM-EPBL/IBM-Project-4150-1658721721