AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

1.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 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.).

1.2 Purpose

Food Nutrition Analysis 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.If the consumer has a clear idea about the food component, he or she may choose or reject specific food items according to his or her health condition. Nutritional Analysis detects the exact nutritional value of any given food item. It determines the percentage of macro and micronutrients present in that food item as well as the presence of inhibitors, toxic chemicals, or any other new component. It is also important in nutrition mapping where a variety of food items are regularly being tested and included in the standardized book of Nutritive Value of Indian Foods by the Indian Council of Medical Research.Nutrition facts labelling is a very important part of the food processing industry as there must be a detailed description of all available nutritional facts on the label of the food product with percentages and ingredients. Food testing laboratories conduct regular as well as surprise random testing of different batches of produced food to ensure a healthy and safe practice.

2. LITERATURE SURVEY

2.1 Existing problem

Inadequacies in nutritional intake can be considered as a major source of adverse effects on the growth and health of individuals in India. A proper balanced diet is essential from the very early stages of life for proper growth, development, to remain active and to reduce the risk of diseases. For those with diabetes, a proper diabetes diet is crucial which depends upon their energy requirements. So a need has been identified to develop educational software which should perform the routine task of analyzing, optimizing, and transforming diet by considering their energy requirements and medical problems. The different nutritional values present in a diet are generally affected by imprecision, which can be represented and analyzed by fuzzy logic. For diet balancing, a metaheuristic local search algorithm is proposed which works in a local search space recording the history of search to make it more effective and optimized. These proposed methods will help users to improve their nutritional intakes by providing detail analysis of their food intake, by providing an optimized diet plan and by suggesting possible changes to make their diet suitable according to their energy requirements

2.2 References

1.Sonakshi Khosla, DhutimaMalla, IshankDua, Deepa Bura,Pronika Chawla, *"Nutri-Mental" —An Android Application For Personal Health And Nutrition Management"*
View at: Publisher Site| IEEE

2.Sri Winiarti,Sri Kusumadewi, IzzatiMuhimmah,Herman Yuliansyah, *"Determining the nutrition of patient based on food packaging product using fuzzy C means algorithm."*
View at: Publisher Site| IEEE

3.AimiliaKagkini,*"Development of an Android Fitness App"*
View at: Publisher Site| IEEE

4. A.P. Adesiyan,O.A. Adepegba**,** S.A Adepegba, O.B.Lounge, "*Electronic Human Nutrition Analyzer for Managing Obesity (EHNAMO)"*

View at: Publisher Site| ResearchGate

5.L.K Gautam, S.A Ladhake, *"A Mathematical AI-Based Diet Analysis and Transformation Model"*

View at: Publisher Site|ResearchGate

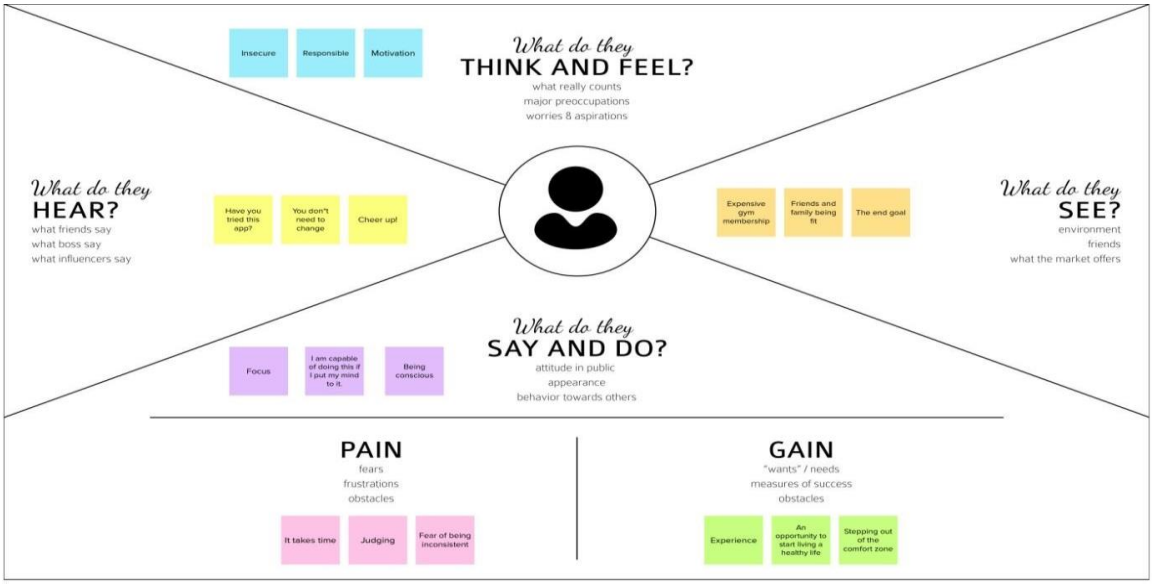
2.3 Problem Statement Definition

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 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.).

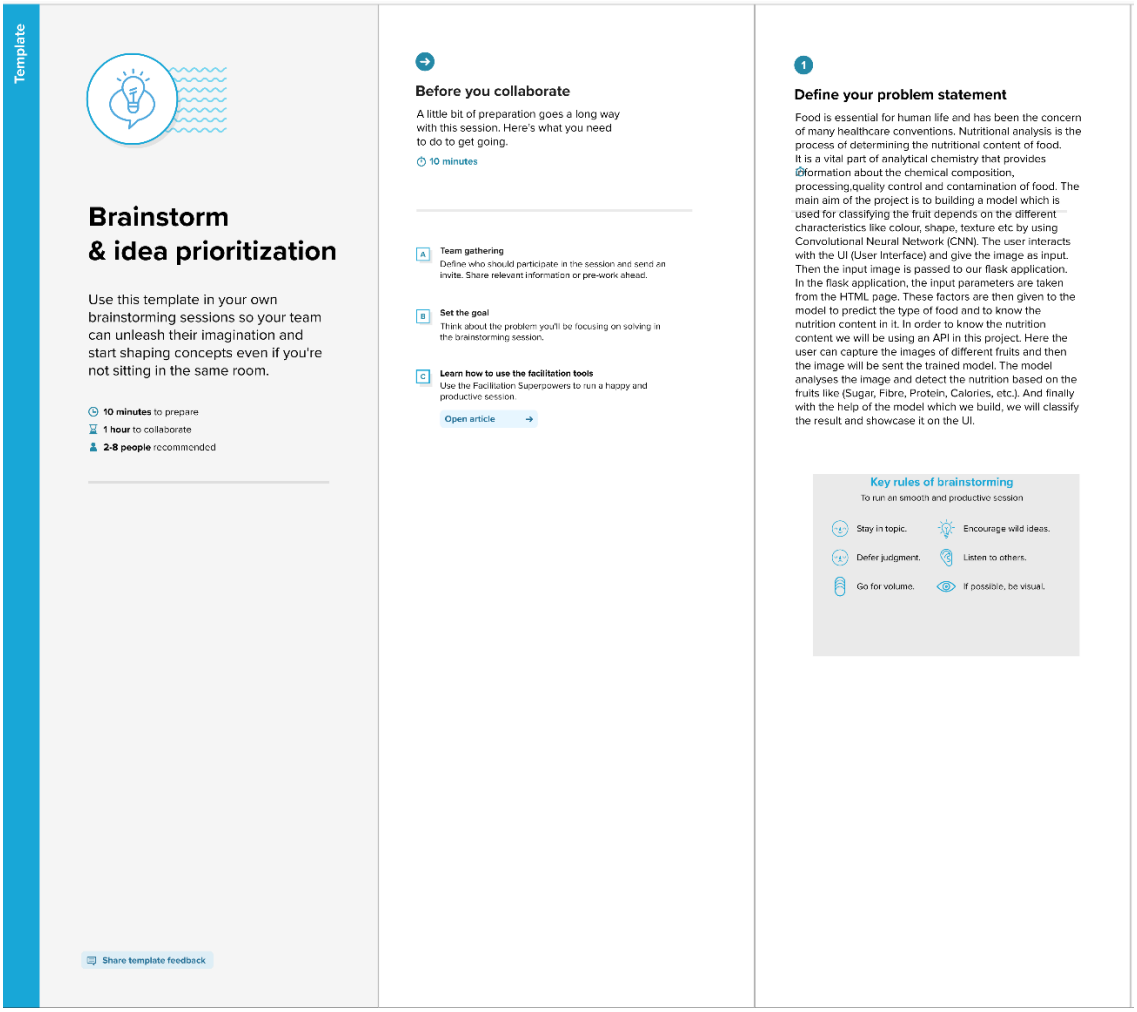
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



3.2 Ideation & Brainstorming



2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Neona Josita W

- Increasing awareness
- User friendly application
- Classifies fruits based on different characteristics
- Accessing the right level of nutrition

Akshaya R

- Time saving
- Easy and fast analysis
- Can be used by anyone
- Change in lifestyle

Helen Roshna A

- No need for experts
- Accurate results
- Analyzes the image and detects the nutrition
- Explores nutrition patterns

Girija

- Automated workflow
- Testing the app
- Results in maintaining a healthy diet
- Accurate data analysis

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Features

- User friendly application
- Automated workflow
- Accessing the right level of nutrition
- Accurate data analysis

Application

- Classifies fruits based on different characteristics
- Easy and fast analysis
- Can be used by anyone
- Explores nutrition pattern

Results

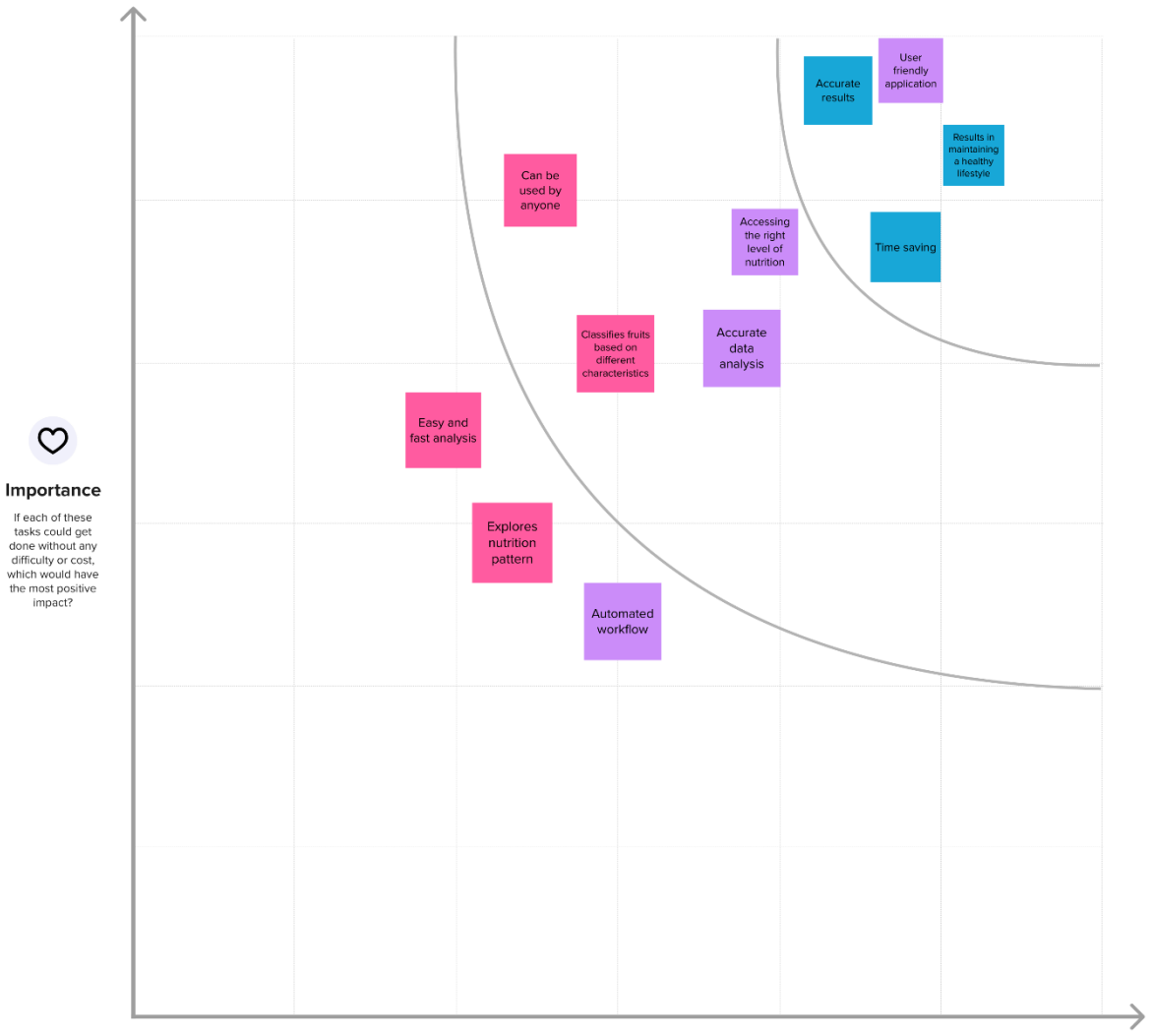
- Accurate results
- Results in maintaining a healthy diet
- Time saving
- Change in lifestyle

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



Importance

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

Feasibility

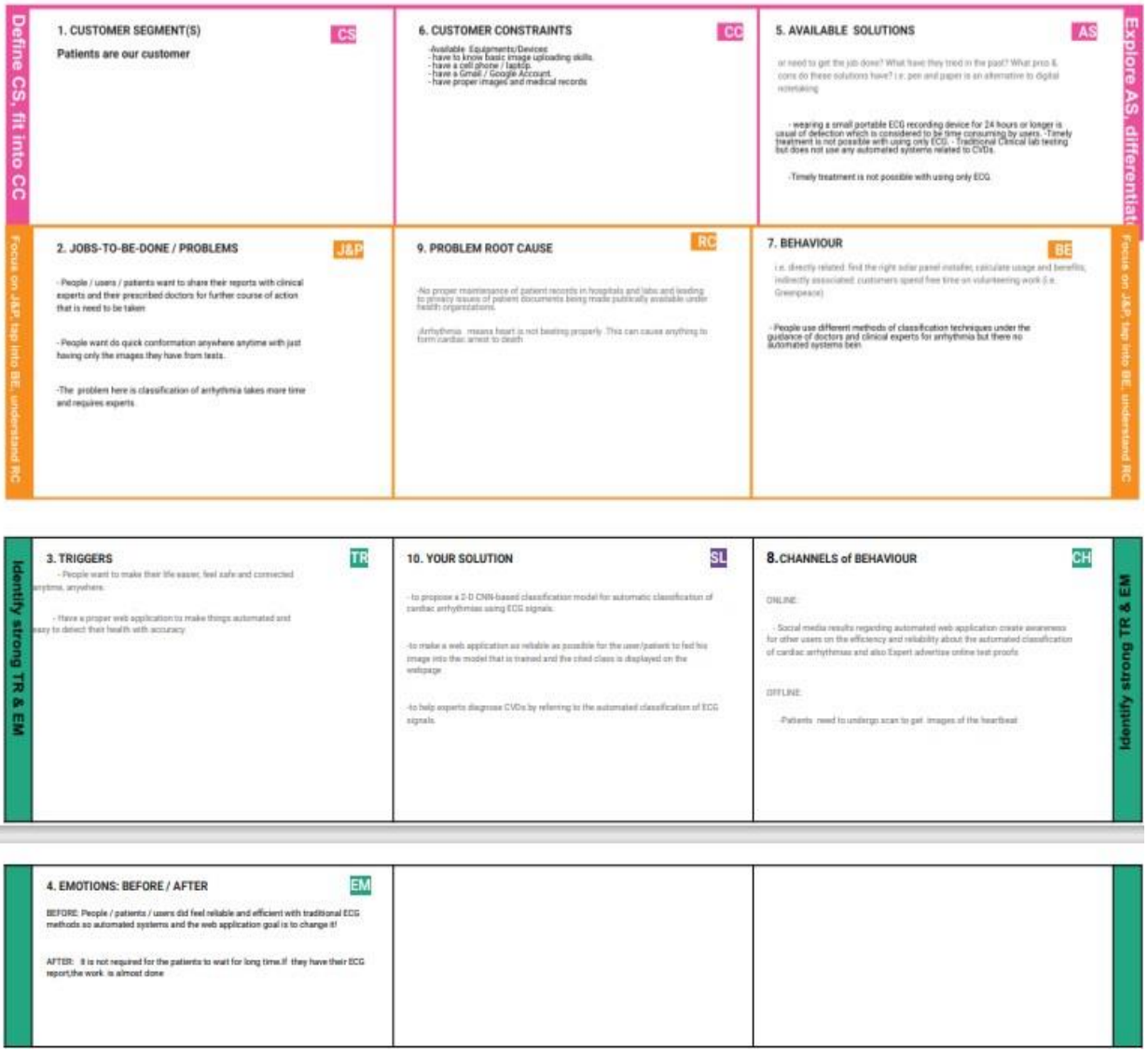
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement(Problem to be solved)	AI-powered Nutrition Analyzer for Fitness Enthusiasts
2.	Idea / Solution description	To create an application that is used for classifying fruit and detect the nutrition based on the fruit. Here we use deep learning techniques and with the help of different fruit image to classify the fruit.
3.	Novelty / Uniqueness	Provides accurate results and detailed information required by the users.
4.	Social Impact / Customer Satisfaction	Users can easily use the app because of its user friendly interface and simplicity. Can be used by anyone at anytime.
5.	Business Model (Revenue Model)	As this application can be very useful and fast classification of fruits it can be used by many users to maintain a healthy diet.
6.	Scalability of the Solution	Experts guidance is not required when we have a app that can be used by anyone. It can be easily accessed by the users.

3.4.Problem Solution Fit

Project Title: Classification of Arrhythmia By Using Deep Learning With 2-D ECG Spectral Image Representation **Project Design Phase-I - Solution Fit Template**
Team ID:PNT2022TMID00594



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Selection	Usage of good quality images Select the image to be classified
FR-4	User Input	Upload image as jpeg Upload image as png
FR-5	Save Image	Images are saved in uploads folder
FR-6	Report Generation	Get the nutrition data of the fruit

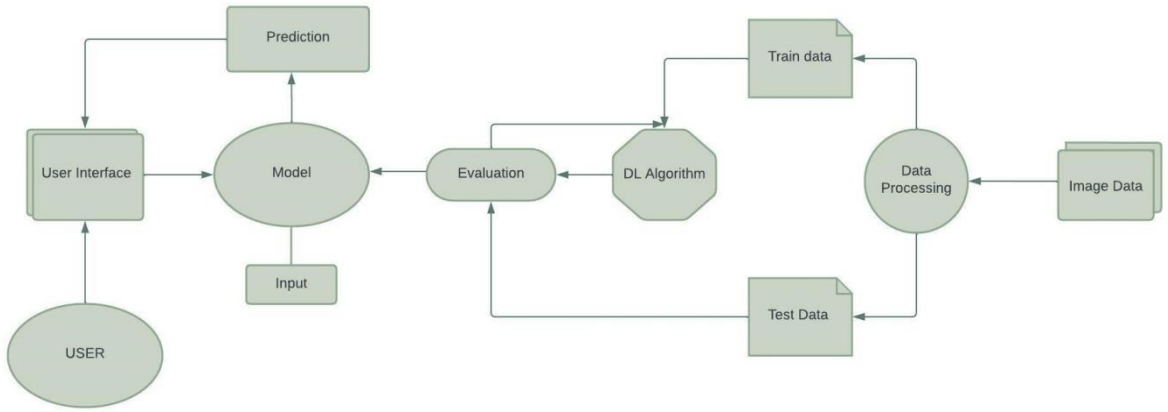
4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	An user friendly and simple AI application. Classification of fruits with the help of AI.
NFR-2	**Security**	User's data cannot be accessed by unauthorised people
NFR-3	**Reliability**	Accurate Results and easy to use.
NFR-4	**Performance**	Quick classification of fruits and shows the accurate values of nutrition.
NFR-5	**Availability**	Anyone can access

5.PROJECT DESIGN

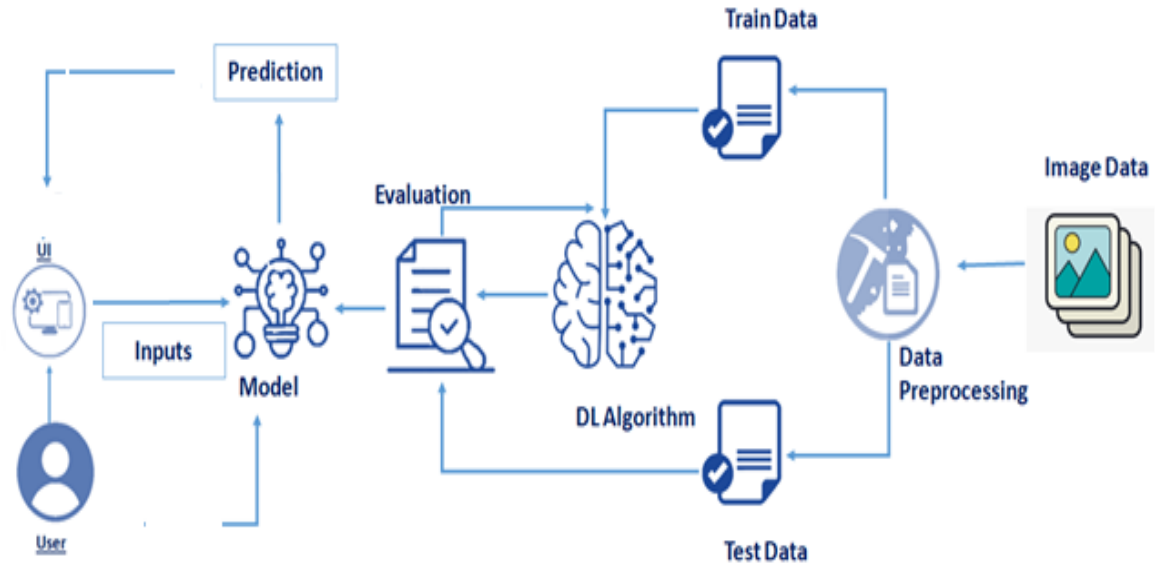
5.1 Data Flow Diagrams

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination.

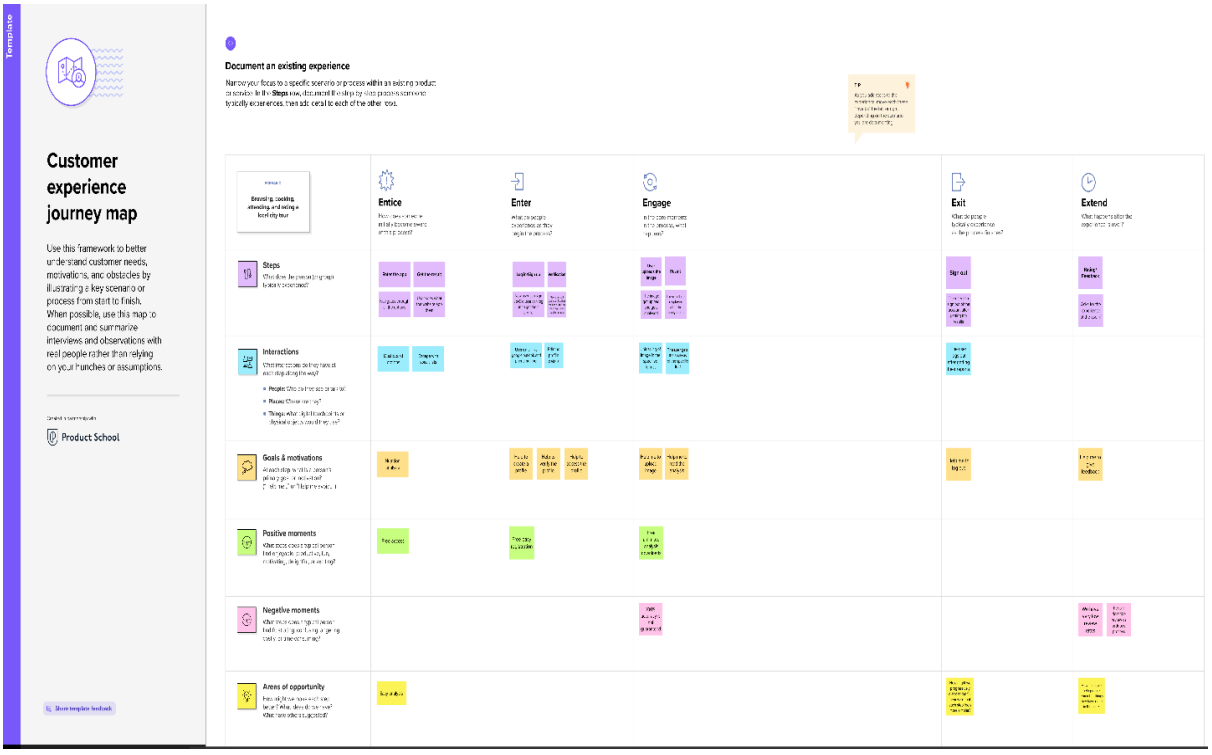


5.2 Solution & Technical Architecture

Technical architecture—which is also often referred to as application architecture, IT architecture, business architecture, etc.—refers to creating a structured software solution that will meet the business needs and expectations while providing a strong technical plan for the growth of the software application through its lifetime. IT architecture is equally important to the business team and the information technology team.Technical architecture includes the major components of the system, their relationships, and the contracts that define the interactions between the components. The goal of technical architects is to achieve all the business needs with an application that is optimised for both performance and security.



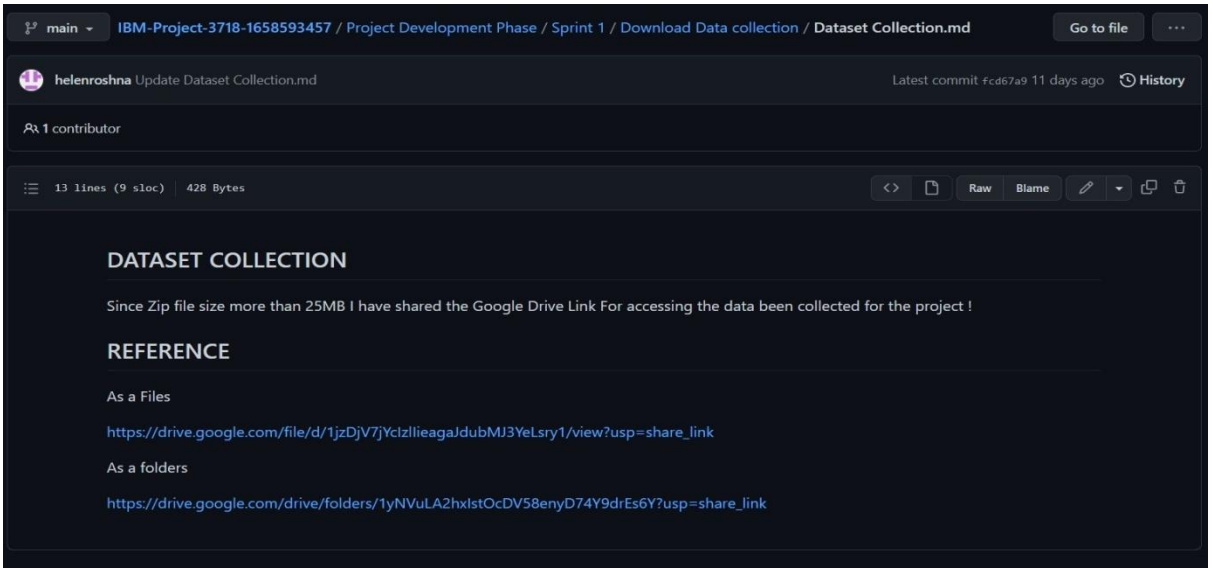
5.3.User Stories



6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation

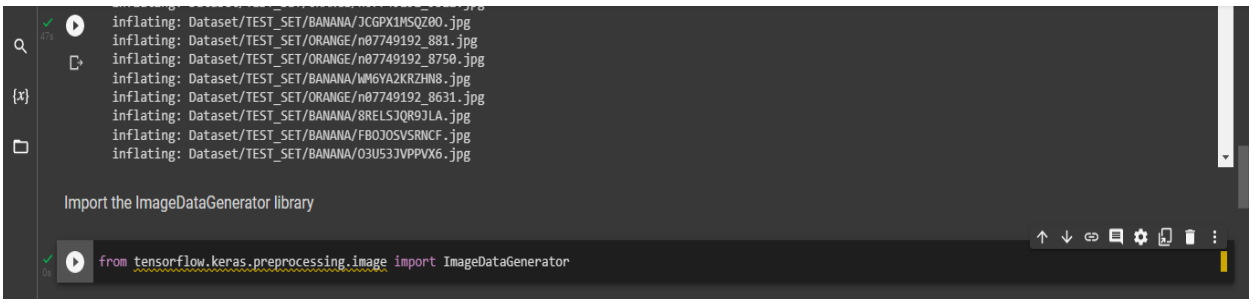
SPRINT 1



1.Download the dataset

2. Image Preprocessing

a)Import the ImageDataGenerator Library



b)Configure ImageDataGenerator Class

c)Apply ImageDataGenerator functionality to trainset and test set

```
Apply ImageDataGenerator functionality to trainset and testset

[9] x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/CNN-IBM/Dataset/TRAIN_SET",target_size=(64,64),class_mode="categorical",batch_size=120)

    Found 4118 images belonging to 5 classes.

[11] x_test=test_data.flow_from_directory(r"/content/drive/MyDrive/CNN-IBM/Dataset/TEST_SET",target_size=(64,64),class_mode="categorical",batch_size=120)

    Found 929 images belonging to 5 classes.

[12] x_train.class_indices

    {'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
```

SPRINT 2

Model Building

1. Import the libraries

```
MODEL BUILDING

Import the libraries

[89] from tensorflow.keras.models import Sequential
     from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
```

2.Initialize the mode

```
Initialize the model

[90] model=Sequential()
```

3.Adding CNN layers

```
Adding CNN layers

[94] model.add(Convolution2D(32,(3,3),activation="relu",strides=(1,1),input_shape=(64,64,3)))

[95] model.add(MaxPooling2D(pool_size=(2,2)))

[96] model.add(Flatten())

[97] model.summary()

    Model: "sequential_2"
    _________________________________________________________________
     Layer (type)                 Output Shape              Param #
    =================================================================
     conv2d_2 (Conv2D)            (None, 62, 62, 32)        896

     conv2d_3 (Conv2D)            (None, 60, 60, 32)        9248

     max_pooling2d_3 (MaxPooling  (None, 30, 30, 32)        0
     2D)

     flatten_2 (Flatten)          (None, 28800)             0
```



```
model.summary()

Model: "sequential_2"
_________________________________________________________________
 Layer (type)                 Output Shape              Param #
=================================================================
 conv2d_2 (Conv2D)            (None, 62, 62, 32)        896

 conv2d_3 (Conv2D)            (None, 60, 60, 32)        9248

 max_pooling2d_3 (MaxPooling  (None, 30, 30, 32)        0
 2D)

 flatten_2 (Flatten)          (None, 28800)             0

=================================================================
Total params: 10,144
Trainable params: 10,144
Non-trainable params: 0
_________________________________________________________________
```

4.Adding Dense layer

```
Adding Dense layer

Hidden layer

[98] model.add(Dense(500,activation="relu"))

[99] model.add(Dense(500,activation="relu"))

Output layer

[100] model.add(Dense(6,activation="softmax"))
```

5. Configure the learning process

```
Configure the learning process

[101] model.compile(loss="categorical_crossentropy",optimizer="adam",metrics=['accuracy'])

[104] len(x_train)

      33
```

6. Train the model

```
Train the model

[ ] model.fit(x_train,epochs=5,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test))

    Epoch 1/5
    120/120 [==============================] - 140s 1s/step - loss: 0.1920 - accuracy: 0.9401 - val_loss: 0.4968 - val_accuracy: 0.8731
    Epoch 2/5
    120/120 [==============================] - 147s 1s/step - loss: 0.1607 - accuracy: 0.9512 - val_loss: 0.5703 - val_accuracy: 0.8727
    Epoch 3/5
    120/120 [==============================] - 142s 1s/step - loss: 0.1358 - accuracy: 0.9572 - val_loss: 0.4914 - val_accuracy: 0.8831
    Epoch 4/5
    120/120 [==============================] - 140s 1s/step - loss: 0.1181 - accuracy: 0.9640 - val_loss: 0.5450 - val_accuracy: 0.8794
    Epoch 5/5
    120/120 [==============================] - 133s 1s/step - loss: 0.1109 - accuracy: 0.9666 - val_loss: 0.4703 - val_accuracy: 0.8801
    <keras.callbacks.History at 0x7f527adbd750>
```

7. Save the model

```
Save the model

[111] model.save('nutrition.h5')

[112] from tensorflow.keras.models import load_model

[113] model=load_model('nutrition.h5')
```

8. Testing the model

```
Testing the model

[114] import numpy as np
      from tensorflow.keras.models import load_model
      from tensorflow.keras.preprocessing import image

[115] model=load_model('nutrition.h5')

[118] img=image.load_img("/content/drive/MyDrive/CNN-IBM/Dataset/TRAIN_SET/ORANGE/n07749192_1008.jpg",target_size=(64,64))

[119] img
```

```
[120] x=image.img_to_array(img)

[121] x

array([[[ 51.,  23.,  19.],
        [ 52.,  22.,  20.],
        [ 52.,  24.,  21.],
        ...,
        [ 36.,  33.,  28.],
        [ 41.,  38.,  33.],
        [ 38.,  39.,  31.]],

       [[ 50.,  25.,  21.],
        [ 56.,  25.,  22.],
        [ 60.,  26.,  24.],
        ...,
        [ 35.,  34.,  29.],
        [ 40.,  37.,  32.],
        [ 31.,  32.,  24.]],

       [[ 55.,  24.,  22.],
        [ 59.,  25.,  23.],
        [ 61.,  30.,  27.],
        ...
```



```
[121]  array([[[ 55.,  24.,  22.],
               [ 59.,  25.,  23.],
               [ 61.,  30.,  27.],
               ...,
               [ 52.,  52.,  40.],
               [ 46.,  48.,  37.],
               [ 51.,  49.,  37.]],

              ...,

              [[  7.,   7.,   5.],
               [  8.,   8.,   8.],
               [ 10.,   8.,   9.],
               ...,
               [113.,  41.,  42.],
               [110.,  39.,  37.],
               [109.,  38.,  44.]],

              [[  8.,   8.,   8.],
               [  9.,   7.,   8.],
               [  9.,   9.,   9.],
               ...,
               [101.,  40.,  39.],
               [107.,  37.,  37.],
               [107.,  37.,  39.]],
```



```
[121]  array([[[ 55.,  24.,  22.],
               [ 59.,  25.,  23.],
               [ 61.,  30.,  27.],
               ...,
               [ 52.,  52.,  40.],
               [ 46.,  48.,  37.],
               [ 51.,  49.,  37.]],

              ...,

              [[  7.,   7.,   5.],
               [  8.,   8.,   8.],
               [ 10.,   8.,   9.],
               ...,
               [113.,  41.,  42.],
               [110.,  39.,  37.],
               [109.,  38.,  44.]],

              [[  8.,   8.,   8.],
               [  9.,   7.,   8.],
               [  9.,   9.,   9.],
               ...,
               [101.,  40.,  39.],
               [107.,  37.,  37.],
               [107.,  37.,  39.]],

              [[  7.,   7.,   7.],
               [  7.,   7.,   7.],
               [  9.,   9.,   9.],
               ...,
               [103.,  41.,  44.],
               [104.,  35.,  38.],
               [102.,  36.,  38.]]], dtype=float32)

[122] x=np.expand_dims(x,axis=0)

[123] x

array([[[[ 51.,  23.,  19.],
         [ 52.,  22.,  20.],
         [ 52.,  24.,  21.],
         ...,
         [ 36.,  33.,  28.],
         [ 41.,  38.,  33.],
         [ 38.,  39.,  31.]],

        [[ 50.,  25.,  21.],
```



```
[123] x

array([[[[ 51.,  23.,  19.],
         [ 52.,  22.,  20.],
         [ 52.,  24.,  21.],
         ...,
         [ 36.,  33.,  28.],
         [ 41.,  38.,  33.],
         [ 38.,  39.,  31.]],

        [[ 50.,  25.,  21.],
         [ 56.,  25.,  22.],
         [ 60.,  26.,  24.],
         ...,
         [ 35.,  34.,  29.],
         [ 40.,  37.,  32.],
         [ 31.,  32.,  24.]],

        [[ 55.,  24.,  22.],
         [ 59.,  25.,  23.],
         [ 61.,  30.,  27.],
         ...,
         [ 52.,  52.,  40.],
         [ 46.,  48.,  37.],
         [ 51.,  49.,  37.]],
```

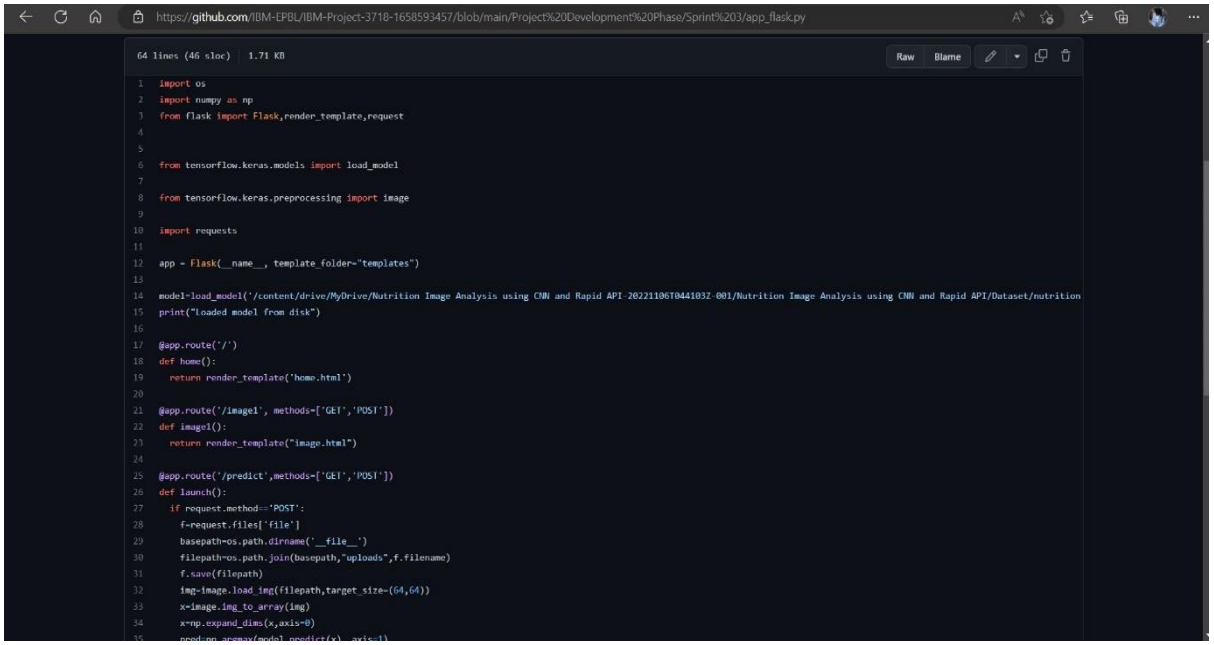
```
        ...,

        [[  7.,   7.,   5.],
         [  8.,   8.,   8.],
         [ 10.,   8.,   9.],
         ...,
         [113.,  41.,  42.],
         [110.,  39.,  37.],
         [109.,  38.,  44.]],

        [[  8.,   8.,   8.],
         [  9.,   7.,   8.],
         [  9.,   9.,   9.],
         ...,
         [101.,  40.,  39.],
         [107.,  37.,  37.],
         [107.,  37.,  39.]],

        [[  7.,   7.,   7.],
         [  7.,   7.,   7.],
         [  9.,   9.,   9.],
         ...,
         [103.,  41.,  44.],
         [104.,  35.,  38.],
         [102.,  36.,  38.]]], dtype=float32)
```


```
[124] pred=model.predict(x)

      1/1 [==============================] - 0s 124ms/step

[125] pred

      array([[3.0380558e-15, 8.5699292e-13, 9.9998498e-01, 5.6462517e-07,
              1.4380068e-05, 3.1803251e-21]], dtype=float32)

[126] index=['APPLES','BANANA','ORANGE','WATERMELON','PINEAPPLE']

[127] index[np.argmax(pred)]

      'ORANGE'
```


SPRINT 3

1.BUILD PYTHON CODE

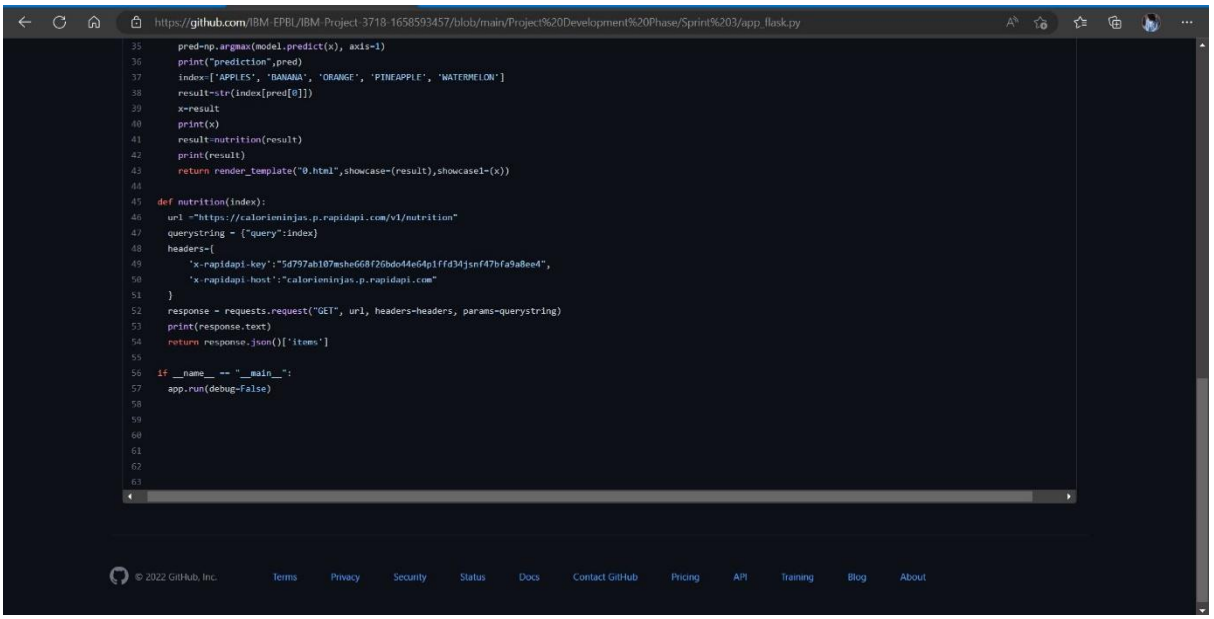
app_flask.py



https://github.com/IBM-EPBL/IBM-Project-3718-1658593457/blob/main/Project%20Development%20Phase/Sprint%203/app_flask.py

64 lines (46 sloc) | 1.71 KB — Raw | Blame

```python
import os
import numpy as np
from flask import Flask,render_template,request


from tensorflow.keras.models import load_model

from tensorflow.keras.preprocessing import image

import requests

app = Flask(__name__, template_folder="templates")

model=load_model('/content/drive/MyDrive/Nutrition Image Analysis using CNN and Rapid API-20221106T044103Z-001/Nutrition Image Analysis using CNN and Rapid API/Dataset/nutrition
print("Loaded model from disk")

@app.route('/')
def home():
  return render_template('home.html')

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

@app.route('/predict',methods=['GET','POST'])
def launch():
  if request.method=='POST':
    f=request.files['file']
    basepath=os.path.dirname('__file__')
    filepath=os.path.join(basepath,"uploads",f.filename)
    f.save(filepath)
    img=image.load_img(filepath,target_size=(64,64))
    x=image.img_to_array(img)
    x=np.expand_dims(x,axis=0)
```



2.CREATE HTML FILES

0.html

0 - Notepad

File Edit Format View Help

```
<html lang="en" dir="ltr">
<head>
<style>

</style>
                <meta charset="utf-8">
                <title>Nutrition Image Analysis</title>
                <link rel="shortcut icon" href="{{ url_for('static', filename='diabetes-favicon.ico') }}">
                <link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.css') }}">
                <script src="https://kit.fontawesome.com/5f3f547070.js" crossorigin="anonymous"></script>
                <link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap" rel="stylesheet">
        </head>

                <!-- Result -->
                <div class="results">
                        <p style="padding-top: 150px; color:blue;"><h4 style="color:blue;">Food Classified is: <h4><b><h4 style="color:red;"><u>{{showcase1}}<h4><br><h4

                </div>
                <br>
                <br>

    </div>
        </body>
</html>
```

Home.html

home - Notepad

File Edit Format View Help

```
<!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;
```


home - Notepad

File Edit Format View Help

```
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;
}
```

home - Notepad

File Edit Format View Help

```
.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;
}
```


home - Notepad

File Edit Format View Help

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

*image - Notepad

File Edit Format View Help

```
{% 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 %}
```


Image Prediction.html

image prediction - Notepad

File Edit Format View Help

```
<!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;
```

*image prediction - Notepad

File Edit Format View Help

```
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;
```


*image prediction - Notepad

File Edit Format View Help

```
                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>
```

*image prediction - Notepad

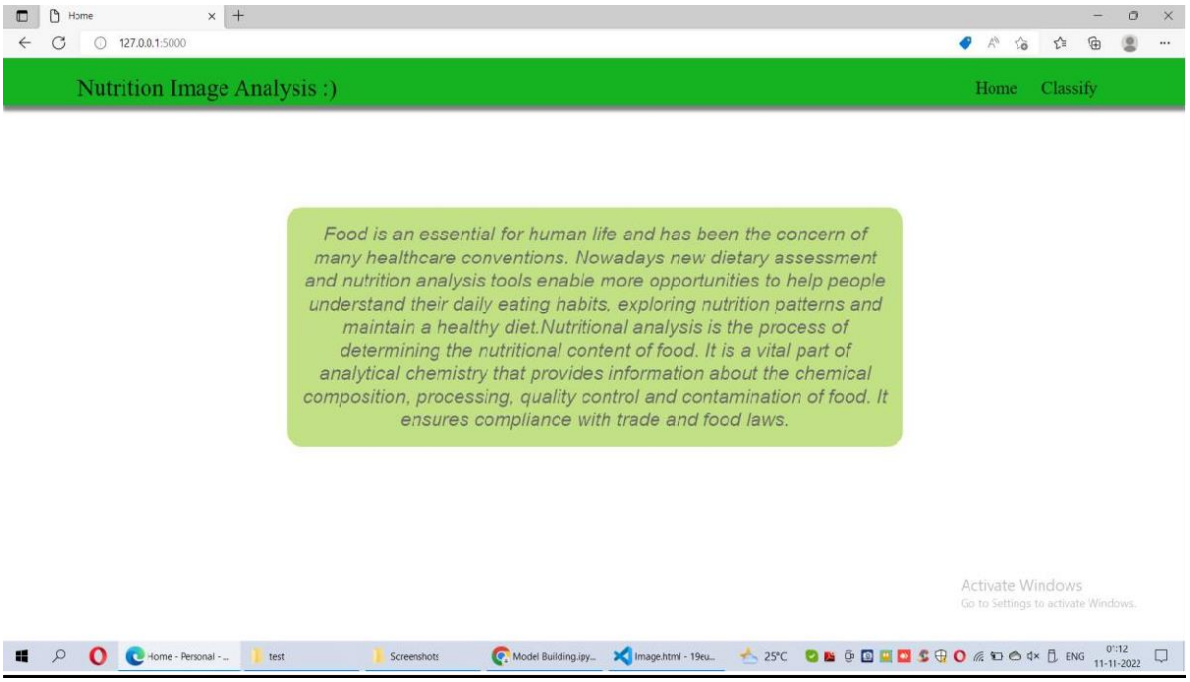
File Edit Format View Help

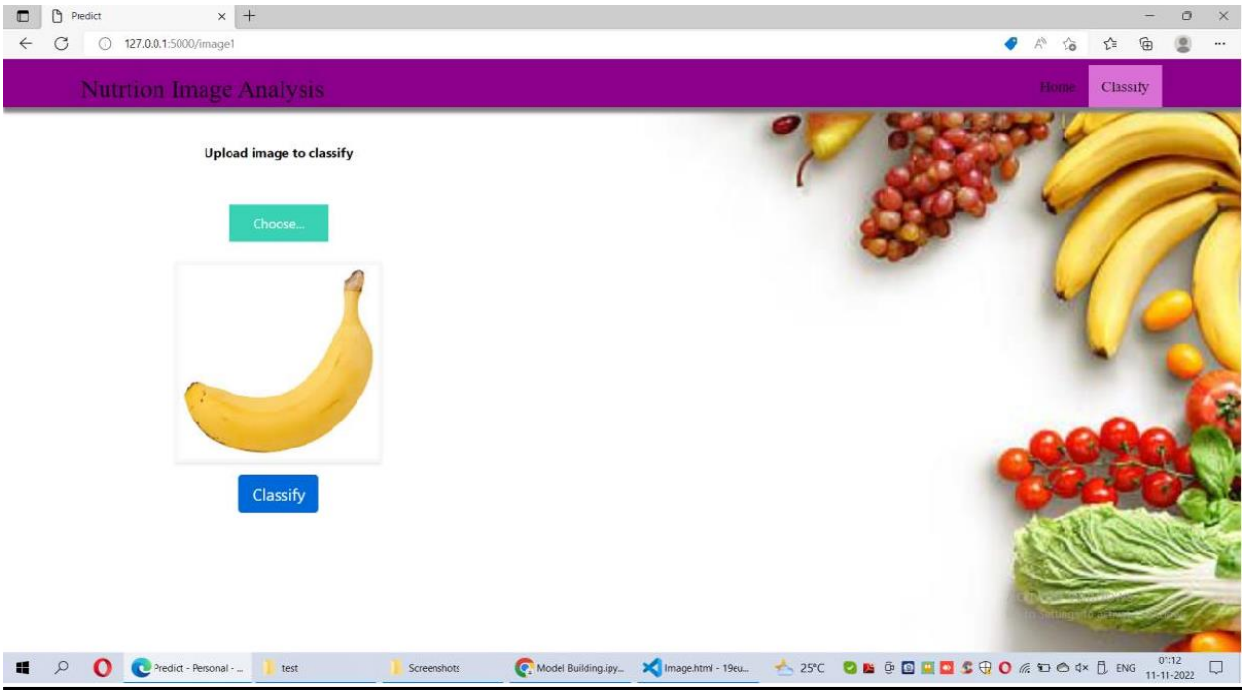
```
  background-color: #DA70D6;
  color: black;
}

.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>
```

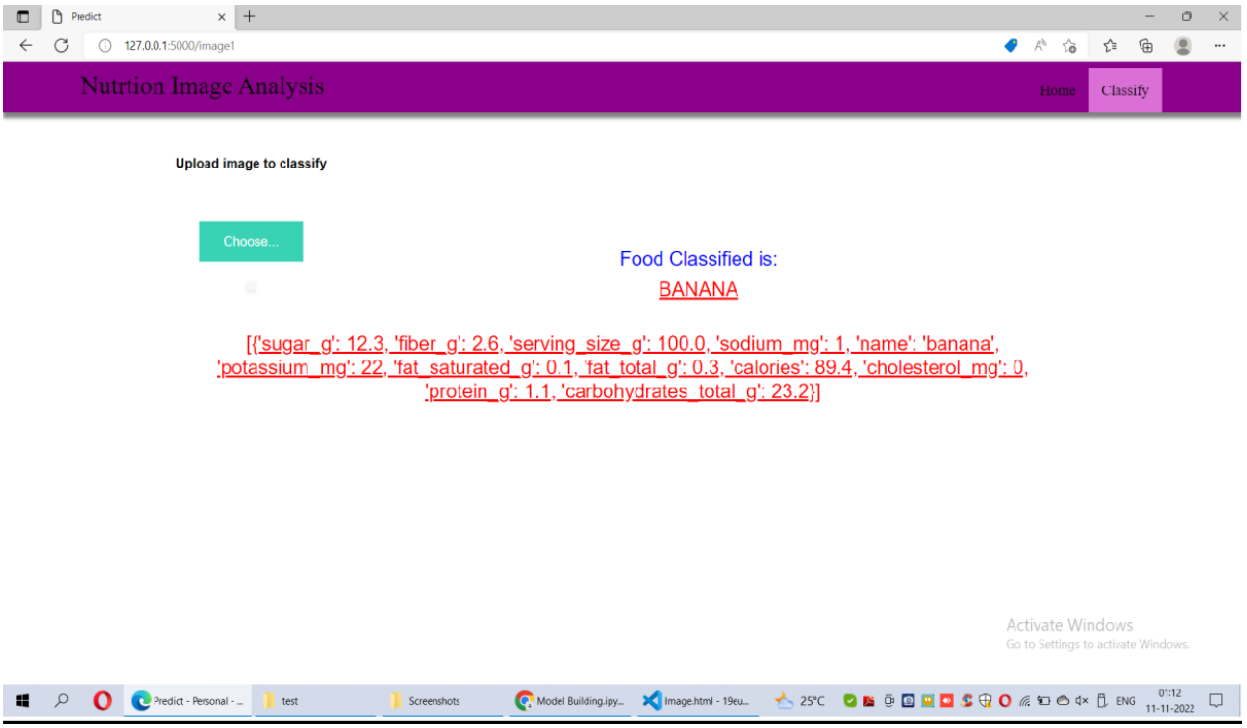
Activate Windows
Go to Settings to activate Windows.

SPRINT 4

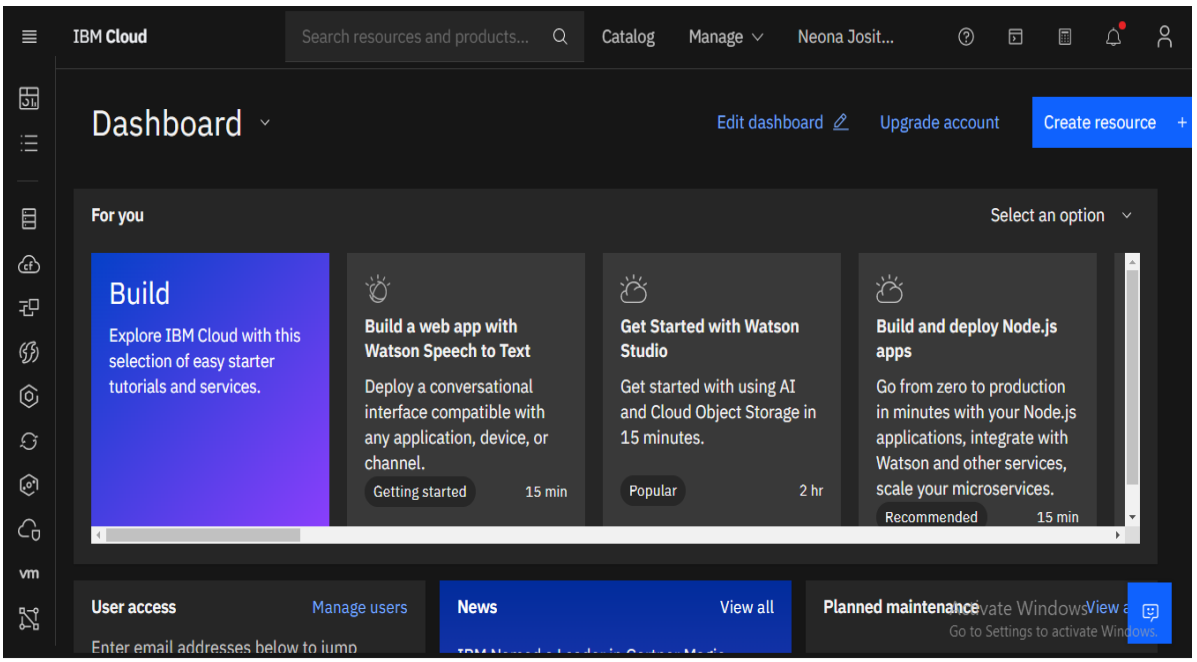
1.Run the App



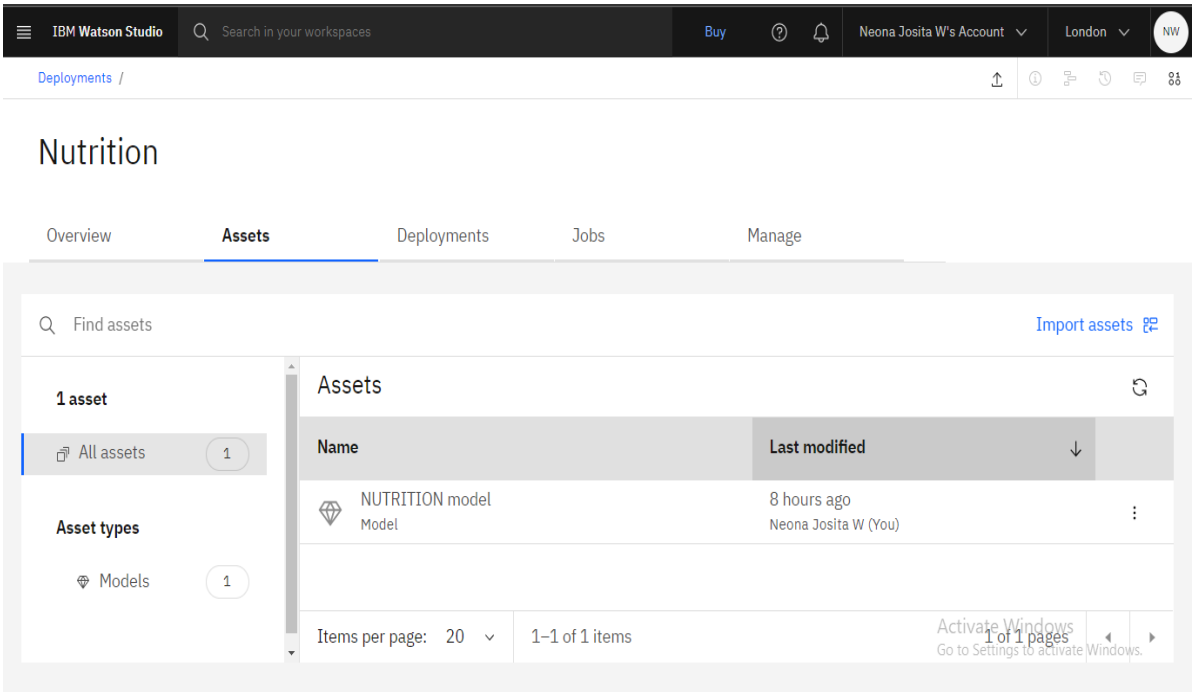

Predict
127.0.0.1:5000/image1
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Classify

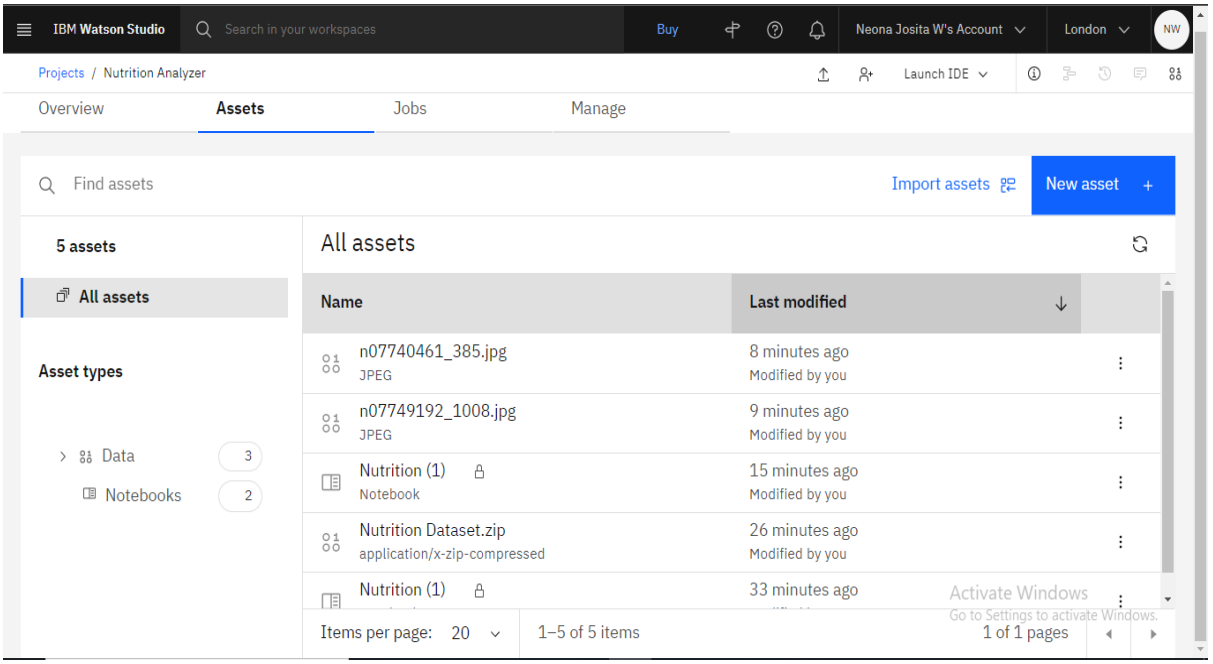

Predict
127.0.0.1:5000/image1
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Food Classified is:
BANANA
[{'sugar_g': 12.3, 'fiber_g': 2.6, 'serving_size_g': 100.0, 'sodium_mg': 1, 'name': 'banana', 'potassium_mg': 22, 'fat_saturated_g': 0.1, 'fat_total_g': 0.3, 'calories': 89.4, 'cholesterol_mg': 0, 'protein_g': 1.1, 'carbohydrates_total_g': 23.2}]
Activate Windows
Go to Settings to activate Windows.

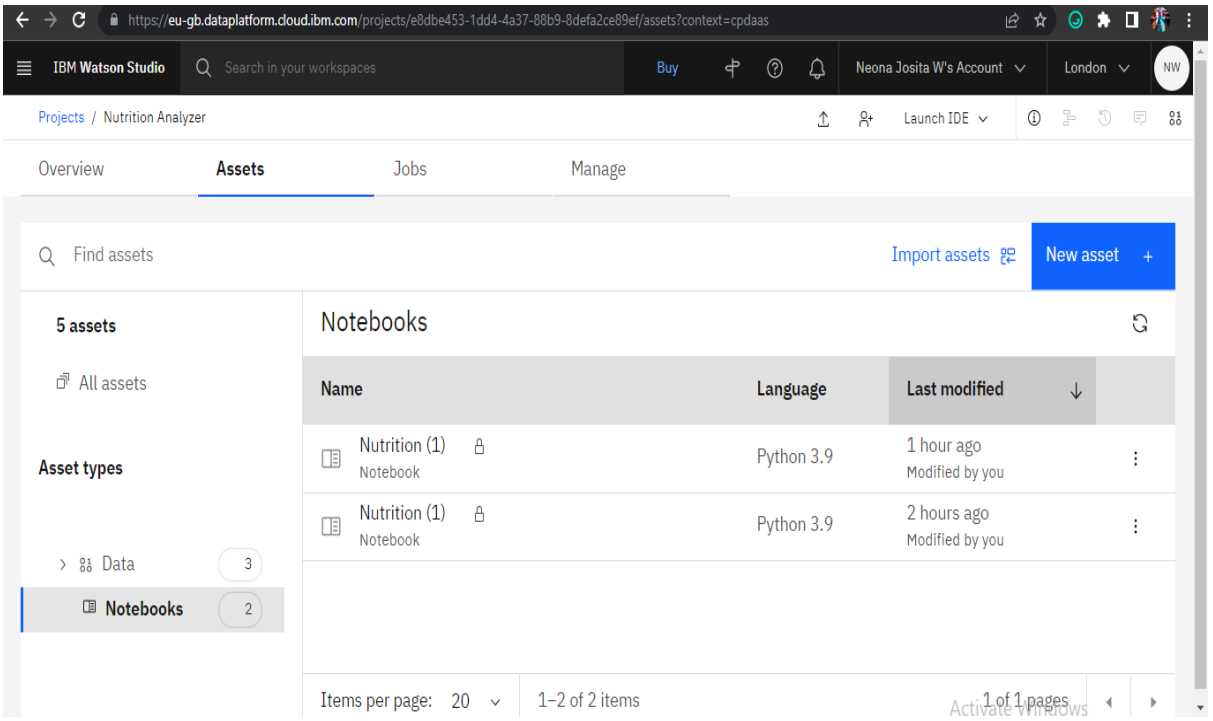
2.Register for IBM Cloud



3.Train the Model on IBM Cloud



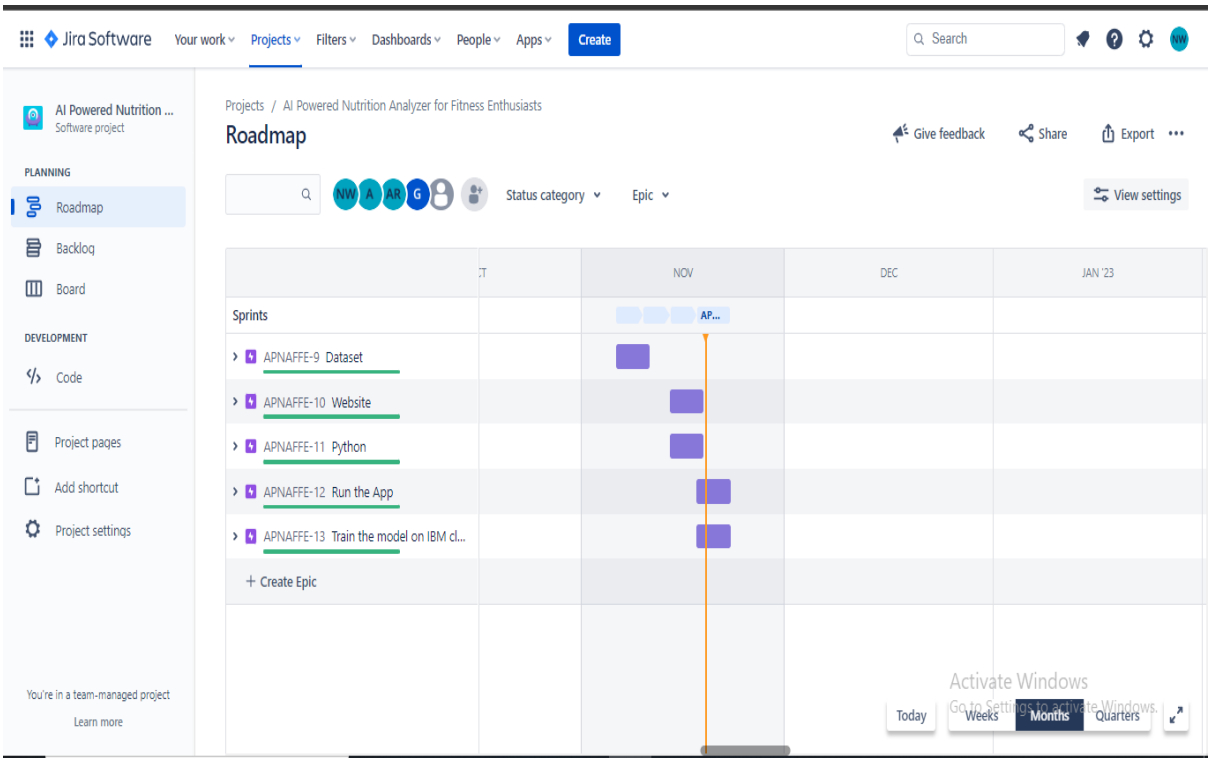

IBM Watson Studio
Search in your workspaces
Buy
Neona Josita W's Account
London
NW
Projects / Nutrition Analyzer
Launch IDE
Overview
Assets
Jobs
Manage
Find assets
Import assets
New asset +
5 assets
All assets
Asset types
Data 3
Notebooks 2
All assets
Name
Last modified
n07740461_385.jpg
JPEG
8 minutes ago
Modified by you
n07749192_1008.jpg
JPEG
9 minutes ago
Modified by you
Nutrition (1)
Notebook
15 minutes ago
Modified by you
Nutrition Dataset.zip
application/x-zip-compressed
26 minutes ago
Modified by you
Nutrition (1)
33 minutes ago
Activate Windows
Go to Settings to activate Windows.
Items per page: 20
1–5 of 5 items
1 of 1 pages


https://eu-gb.dataplatform.cloud.ibm.com/projects/e8dbe453-1dd4-4a37-88b9-8defa2ce89ef/assets?context=cpdaas
IBM Watson Studio
Search in your workspaces
Buy
Neona Josita W's Account
London
NW
Projects / Nutrition Analyzer
Launch IDE
Overview
Assets
Jobs
Manage
Find assets
Import assets
New asset +
5 assets
All assets
Asset types
Data 3
Notebooks 2
Notebooks
Name
Language
Last modified
Nutrition (1)
Notebook
Python 3.9
1 hour ago
Modified by you
Nutrition (1)
Notebook
Python 3.9
2 hours ago
Modified by you
Items per page: 20
1–2 of 2 items
1 of 1 pages
Activate Windows

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-1	20	4 Days	06 Nov 2022	10 Nov 2022	20	10 Nov 2022
Sprint-2	20	4 Days	10 Nov 2022	14 Nov 2022	20	14 Nov 2022
Sprint-3	20	4 Days	14 Nov 2022	18 Nov 2022	20	18 Nov 2022
Sprint-4	20	4 Days	22 Nov 2022	22 Nov 2022	20	22 Nov 2022

6.3 Reports from JIRA



7.CODING AND SOLUTION

7.1 Feature 1

```
import os
import numpy as np
from flask import Flask,render_template,request
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import requests
app = Flask(__name__, template_folder="templates")
model=load_model('/content/drive/MyDrive/Nutrition Image Analysis using CNN and Rapid API-20221106T044103Z-001/Nutrition Image Analysis using CNN and Rapid API/Dataset/nutrition.h5')
print("Loaded model from disk")

@app.route('/')
def home():
  return render_template('home.html')

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

@app.route('/predict',methods=['GET','POST'])
def launch():
  if request.method=='POST':
    f=request.files['file']
    basepath=os.path.dirname('__file__')
    filepath=os.path.join(basepath,"uploads",f.filename)
```

```
    f.save(filepath)
    img=image.load_img(filepath,target_size=(64,64))
    x=image.img_to_array(img)
    x=np.expand_dims(x,axis=0)
    pred=np.argmax(model.predict(x), axis=1)
    print("prediction",pred)
    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':"5d797ab107mshe668f26bdo44e64p1ffd34jsnf47bfa9a8ee4",
     '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__":
  app.run(debug=False)
```

7.2 Feature 2

1.0.html

```
<html lang="en" dir="ltr">
<head>
<style>


</style>
        <meta charset="utf-8">
        <title>Nutrition Image Analysis</title>
        <link rel="shortcut icon" href="{{ url_for('static', filename='diabetes-favicon.ico')
}}">
        <link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.css')
}}">
        <script src="https://kit.fontawesome.com/5f3f547070.js"
crossorigin="anonymous"></script>
        <link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap"
rel="stylesheet">
</head>


        <!-- Result -->
        <div class="results">
        <p style="padding-top: 150px; color:blue;"><h4 style="color:blue;">Food Classified
is: <h4><b><h4 style="color:red;"><u>{{showcase1}}<h4><br><h4
style="color:red;"><u>{{showcase}}<h4></p>


        </div>
        <br>
        <br>
```

```
</div>
</body>
</html>
```

2.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>



<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="{{ url_for('image1')}}">Classify</a>
</div>
</div>
</div>
<br>
<br>
<br>
<br>
<br>
<br>
<br>
```


<h1>

<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>

</h1>

</body>

</html>

3.image prediction.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>
```

4.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 %}
```

8.TESTING

8.1 User Acceptance Testing

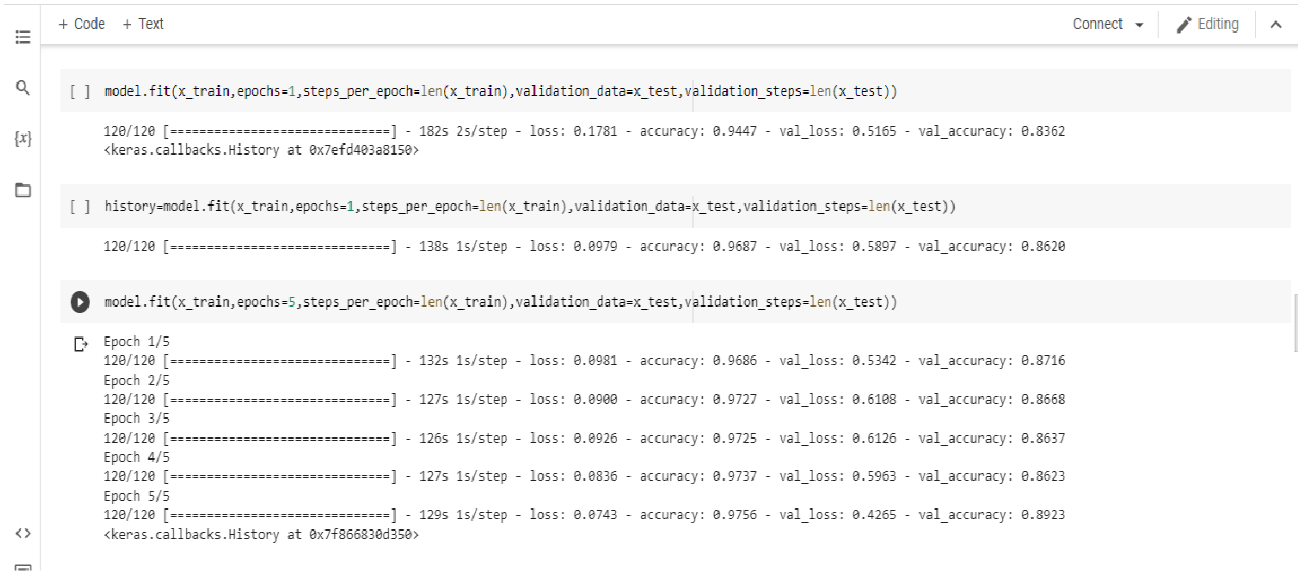
Test Case ID	Input given to the model	Expected Output	Actual Output	Result
1	APPLE	APPLE	APPLE	Pass
2	ORANGE	ORANGE	ORANGE	Pass
3	BANANA	BANANA	BANANA	Pass
4	PINEAPPLE	PINEAPPLE	PINEAPPLE	Pass
5	WATERMELON	WATERMELON	WATERMELON	Pass

9.RESULTS

9.1 Performance Metrics

Summary Screenshot

Accuracy Screenshot



10.ADVANTAGES AND DISADVANTAGES

1. Deliver an outstanding customer experience through additional control over the app.
2. Control the security of customer data
3. Boost the productivity of all the processes within the organization.
4. Increase efficiency and customer satisfaction with an app aligned to their needs.
5. Seamlessly integrate with existing infrastructure.
6. Ability to provide valuable insights.

11.CONCLUSION

After making this application, we assure that this application will help its users to analyze the nutrients in fruits. It will guide them through their daily intake of fruits. It will prove to be helpful for the people who are struggling to keep track of their everyday intake of fruits and its nutrients. In short, this application will help its users to become more healthy and to understand and analyze the nutrientspresent in theirfruits.

12.FUTURE SCOPE

The project assists well to analyze the nutrients in fruits. However, this project has some limitations:

1. The application is unable to maintain the backup of data once it is uninstalled.
2. This application does not provide higher decision capability.

To further enhance the capability of this application, we recommend the following features to be incorporated into the system:

3. Multiple language interface.
4. Allowing more fruits to be analyzed.
5. Provide better user interface for user.

13.APPENDIX

Source Code

Import the ImageDataGenerator library

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

Configure ImageDataGenerator Class

```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,vertical_flip=True,horiz
ontal_flip=True)
test_data=ImageDataGenerator(rescale=1./255)
```

Apply ImageDataGenerator functionality to trainset and testset

```
x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/CNN-
IBM/Dataset/TRAIN_SET",target_size=(64,64),class_mode="categorical",batch_size=128)
```

```
x_test=test_data.flow_from_directory(r"/content/drive/MyDrive/CNN-
IBM/Dataset/TEST_SET",target_size=(64,64),class_mode="categorical",batch_size=128)
```

```
x_train.class_indices
```

MODEL BUILDING

Import the libraries

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
```

Initialize the model

```
model=Sequential()
```

Adding CNN layers

```
model.add(Convolution2D(32,(3,3),activation="relu",strides=(1,1),input_shape=(64,64,3)))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.summary()
```

Adding Dense layer

Hidden layer

```
model.add(Dense(500,activation="relu"))
model.add(Dense(500,activation="relu"))
```

Output layer

```
model.add(Dense(500,activation="relu"))
```

Configure the learning process

```
model.compile(loss="categorical_crossentropy",optimizer="adam",metrics=['accuracy'])
len(x_train)
```

Train the model

```
model.fit(x_train, epochs=10,validation_data=x_test, steps_per_epoch=len(x_train), validatio
n_steps=len(x_test))
```

Save the model

```
model.save('nutrition.h5')
from tensorflow.keras.models import load_model
model=load_model('nutrition.h5')
```

Testing the model

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model=load_model('nutrition.h5')
img=image.load_img("/content/drive/MyDrive/CNN-IBM/Dataset/TRAIN_SET/ORANGE/n07749192_1008.jpg",target_size=(64,64))
img
x=image.img_to_array(img)
x
x=np.expand_dims(x,axis=0)
x
pred=model.predict(x)
pred
index=['APPLES','BANANA','ORANGE','WATERMELON','PINEAPPLE']
index[np.argmax(pred)]
```

GitHub & Project Demo Link

1.GitHub link

IBM-EPBL/IBM-Project-3718-1658593457: AI-powered Nutrition Analyzer for Fitness Enthusiasts (github.com)

2.Project Demo Link

https://drive.google.com/file/d/1kqlM457Q7AfKIXpzpc6Fima8gwSHfGda/view?usp=share_link