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: <u>Publisher Site</u>| IEEE

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

View at: <u>Publisher Site</u>| ResearchGate

5.L.K Gautam, S.A Ladhake, *"A Mathematical AI-Based Diet Analysis and Transformation Model"*
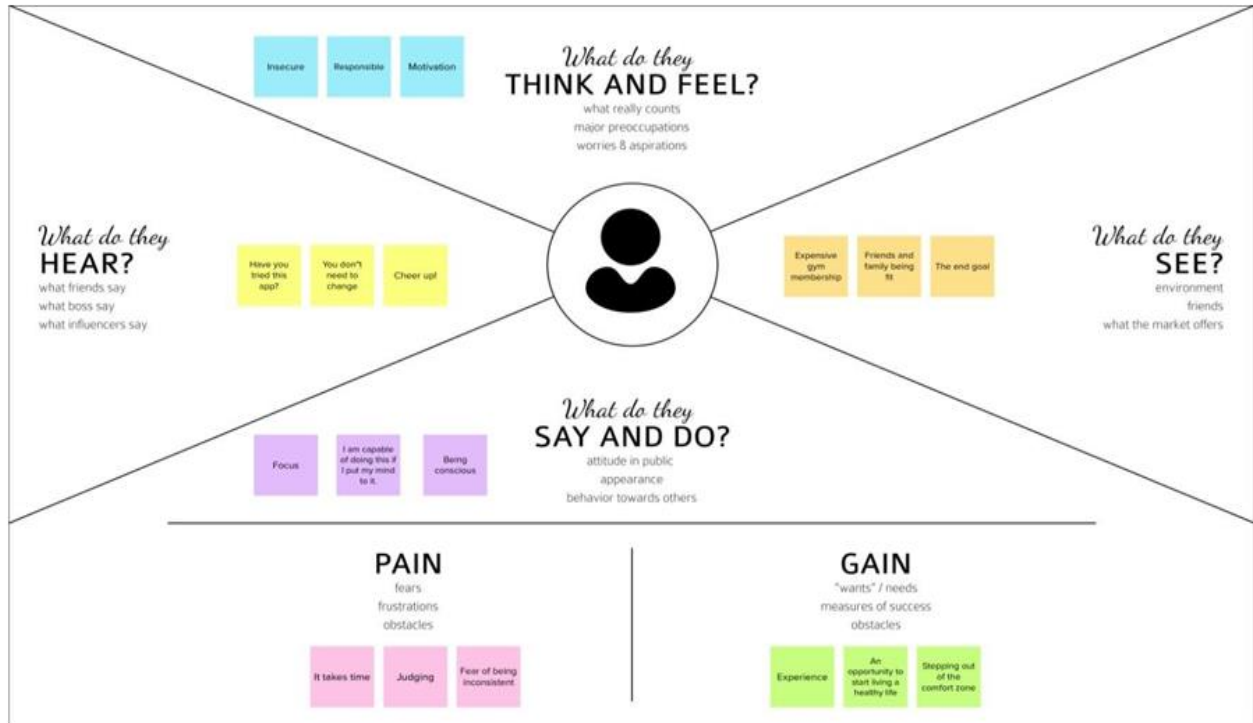
View at: <u>Publisher Site</u>|ResearchGate

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.

Empathy map diagram with a persona at the center.

What do they THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
- Insecure
- Responsible
- Motivation

What do they HEAR?
what friends say
what boss say
what influencers say
- Have you tried this app?
- You don't need to change
- Cheer up!

What do they SEE?
environment
friends
what the market offers
- Expensive gym membership
- Friends and family being fit
- The end goal

What do they SAY AND DO?
attitude in public
appearance
behavior towards others
- Focus
- I am capable of doing this if I put my mind to it.
- Being conscious

PAIN
fears
frustrations
obstacles
- It takes time
- Judging
- Fear of being inconsistent

GAIN
"wants" / needs
measures of success
obstacles
- Experience
- An opportunity to start living a healthy life
- Stepping out of the comfort zone

3.2 Ideation & Brainstorming

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 🕐 **10 minutes** to prepare
- 🖥 **1 hour** to collaborate
- 👤 **2-8 people** recommended

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕐 10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

Food is essential for human life and has been the concern of many healthcare conventions. 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 by using Convolutional Neural Network (CNN). The user interacts with the UI (User Interface) and give the image as input. Then the input image is passed to our flask application. In the flask application, the input parameters are taken from the HTML page. These factors are then given to the model to predict the type of food and to know the nutrition content in it. In order to know the nutrition content we will be using an API in this project. 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.}. And finally with the help of the model which we build, we will classify the result and showcase it on the UI.

Key rules of brainstorming
To run an smooth and productive session

Stay in topic.	Encourage wild ideas.
Defer judgment.	Listen to others.
Go for volume.	If possible, be visual.

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
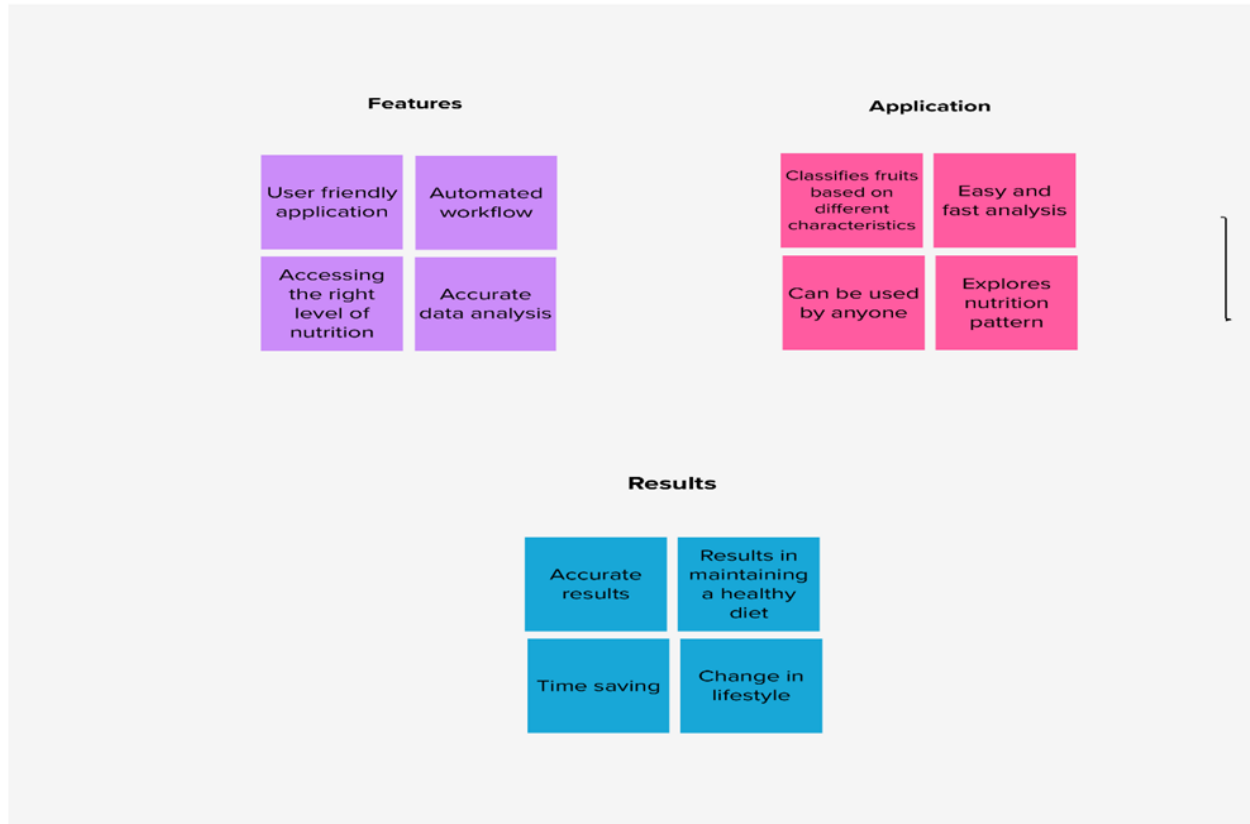
4

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?

- Can be used by anyone
- Accurate results
- User friendly application
- Results in maintaining a healthy lifestyle
- Accessing the right level of nutrition
- Time saving
- Classifies fruits based on different characteristics
- Accurate data analysis
- Easy and fast analysis
- Explores nutrition pattern
- Automated workflow

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
Team ID:PNT2022TMID00594

Project Design Phase-I - Solution Fit Template

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Patients are our customer	6. CUSTOMER CONSTRAINTS CC -Available Equipments/Devices - have to know basic image uploading skills. - have a cell phone / laptop. - have a Gmail / Google Account. - have proper images and medical records.	5. AVAILABLE SOLUTIONS AS or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking. - wearing a small portable ECG recording device for 24 hours or longer is usual of detection which is considered to be time consuming by users. -Timely treatment is not possible with using only ECG. - Traditional Clinical lab testing but does not use any automated systems related to CVDs. -Timely treatment is not possible with using only ECG.	Explore AS, differentia
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS J&P - People / users / patients want to share their reports with clinical experts and their prescribed doctors for further course of action that is need to be taken - People want do quick conformation anywhere anytime with just having only the images they have from tests. -The problem here is classification of arrhythmia takes more time and requires experts.	9. PROBLEM ROOT CAUSE RC -No proper maintenance of patient records in hospitals and labs and leading to privacy issues of patient documents being made publically available under health organizations. -Arrhythmia means heart is not beating properly .This can cause anything to form cardiac arrest to death	7. BEHAVIOUR BE i.e. directly related. find the right solar panel installer, calculate usage and benefits; indirectly associated. customers spend free time on volunteering work (i.e. Greenpeace) - People use different methods of classification techniques under the guidance of doctors and clinical experts for arrhythmia but there no automated systems been	Focus on J&P, tap into BE, understand RC
Identify strong TR & EM	3. TRIGGERS TR - People want to make their life easier, feel safe and connected anytime, anywhere. - Have a proper web application to make things automated and easy to detect their health with accuracy.	10. YOUR SOLUTION SL - to propose a 2-D CNN-based classification model for automatic classification of cardiac arrhythmias using ECG signals. -to make a web application as reliable as possible for the user/patient to fed his image into the model that is trained and the cited class is displayed on the webpage -to help experts diagnose CVDs by referring to the automated classification of ECG signals.	8. CHANNELS of BEHAVIOUR CH ONLINE: - Social media results regarding automated web application create awareness for other users on the efficiency and reliability about the automated classification of cardiac arrhythmias and also Expert advertise online test proofs OFFLINE: -Patients need to undergo scan to get images of the heartbeat	Identify strong TR & EM
	4. EMOTIONS: BEFORE / AFTER EM BEFORE: People / patients / users did feel reliable and efficient with traditional ECG methods so automated systems and the web application goal is to change it! AFTER: It is not required for the patients to wait for long time.If they have their ECG report,the work is almost done			

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.
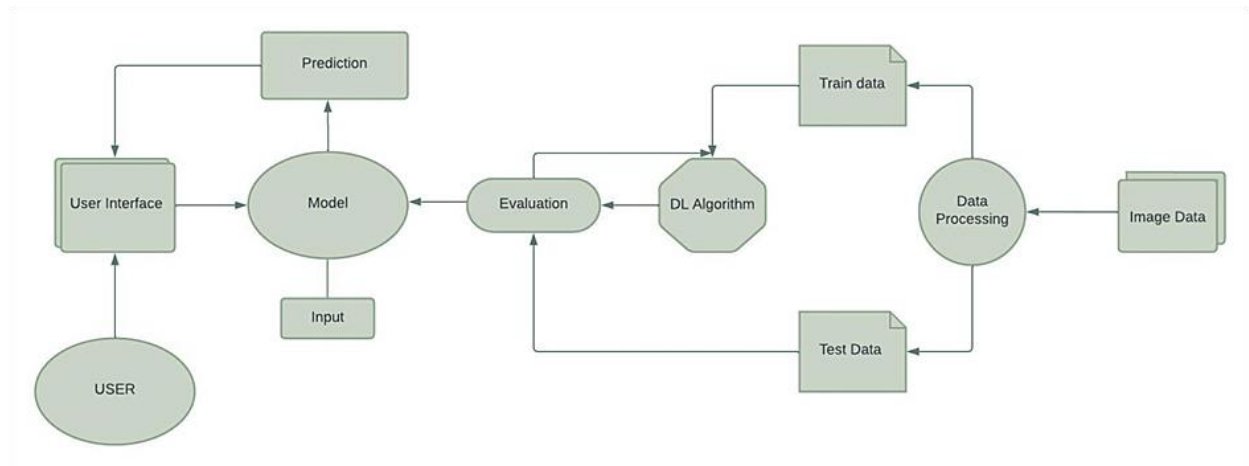
5.2 Solution & Technical Architecture

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.
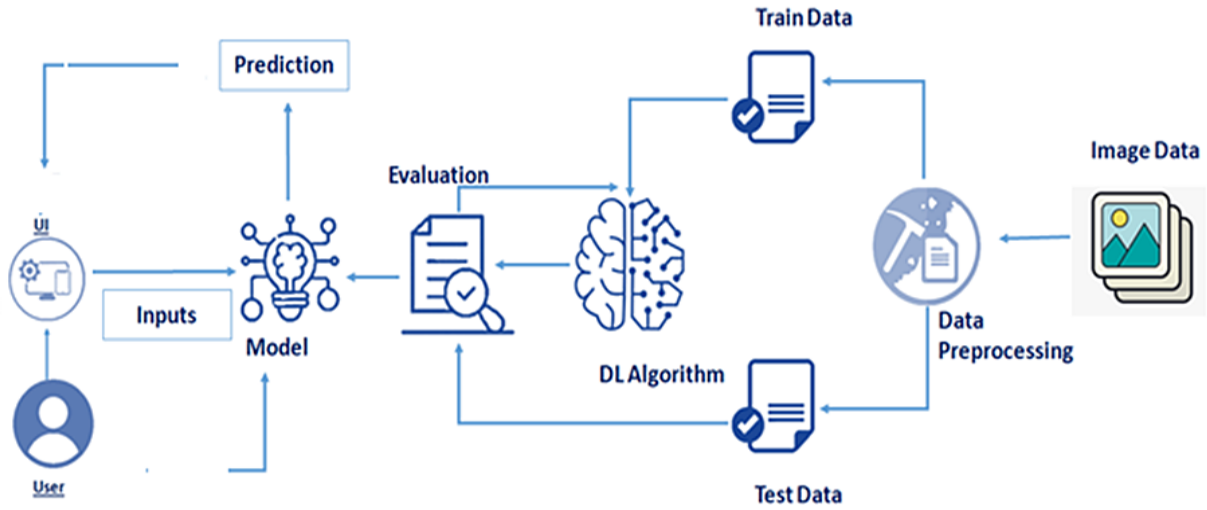
5.3.User Stories
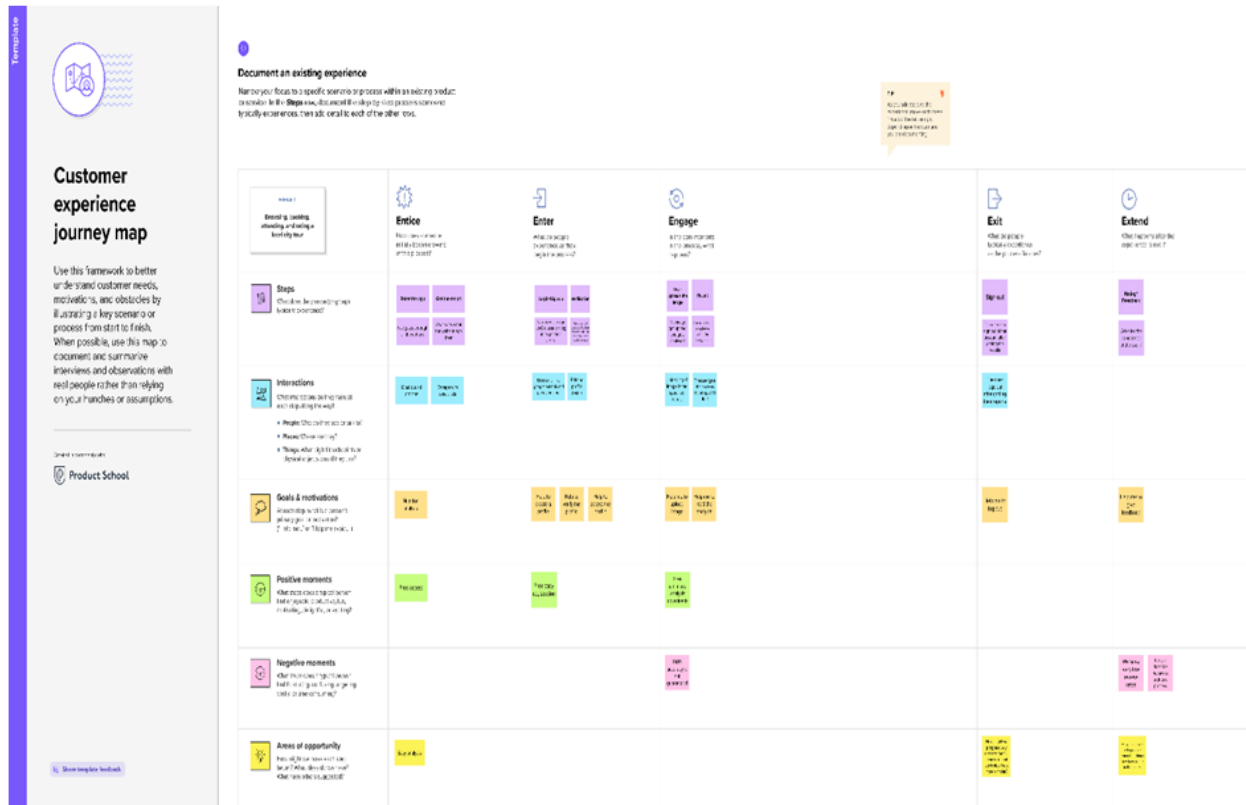
6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation

SPRINT 1

1.Download the dataset
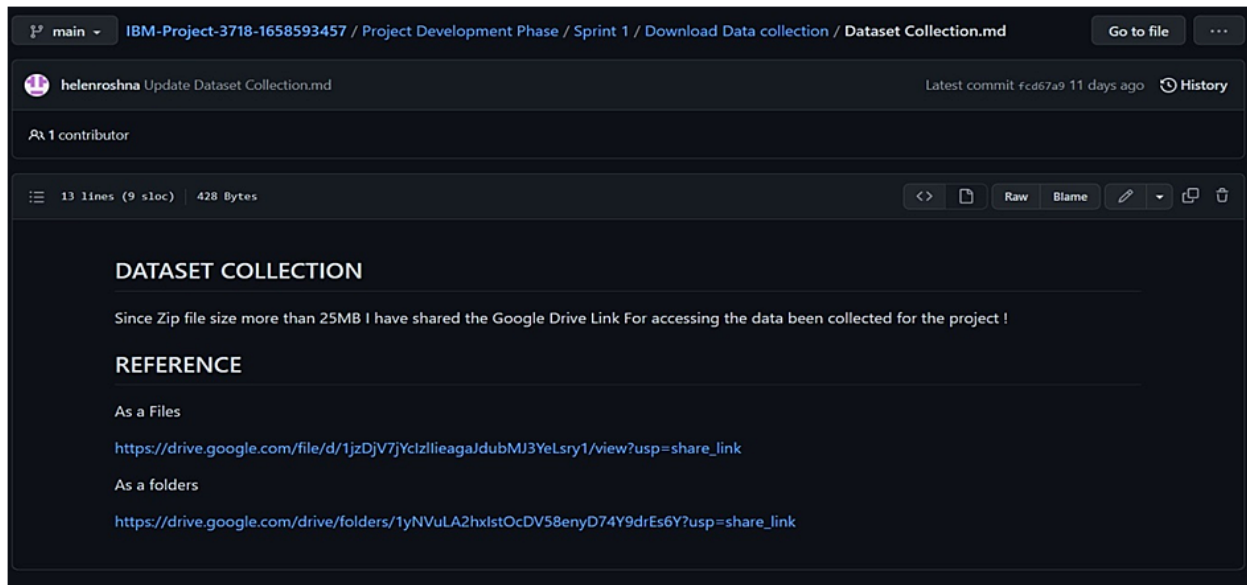
2. Image Preprocessing

a)Import the ImageDataGenerator Library
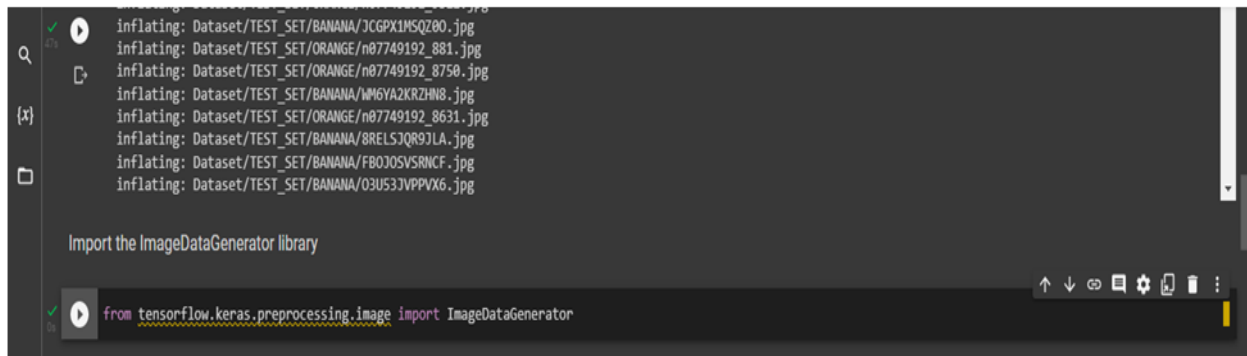
b)Configure ImageDataGenerator Class
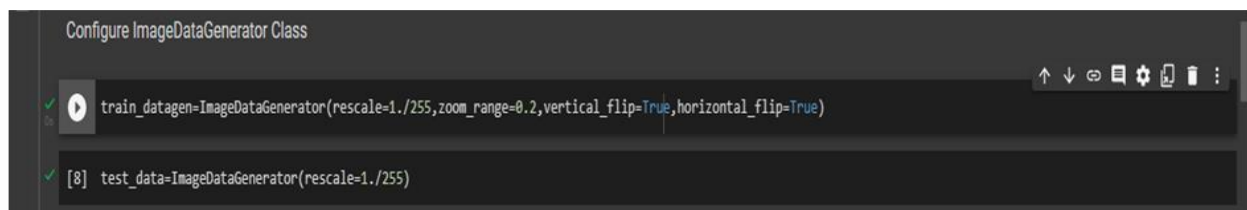
c)Apply ImageDataGenerator functionality to trainset and test set

```
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 model

```
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

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

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

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

```python
[119] img
```



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

```python
[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.],
             ....
```

```python
[121]      [[ 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.]],
```

```python
[121]      [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)
```

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

```python
[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

```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)
```



```python
        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':"5d797ab107msheG68f26bdo44eG4p1ffd34jsnf47bfa9a8ee4",
        '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)
```

2.CREATE HTML FILES

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

            </div>
            <br>
            <br>

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

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;
```

```
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;
}
```

```html
        <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 Prediction.html

```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 %}
```

```
<!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;
```

```
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;
```

```
                    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>
```

```
  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>
```
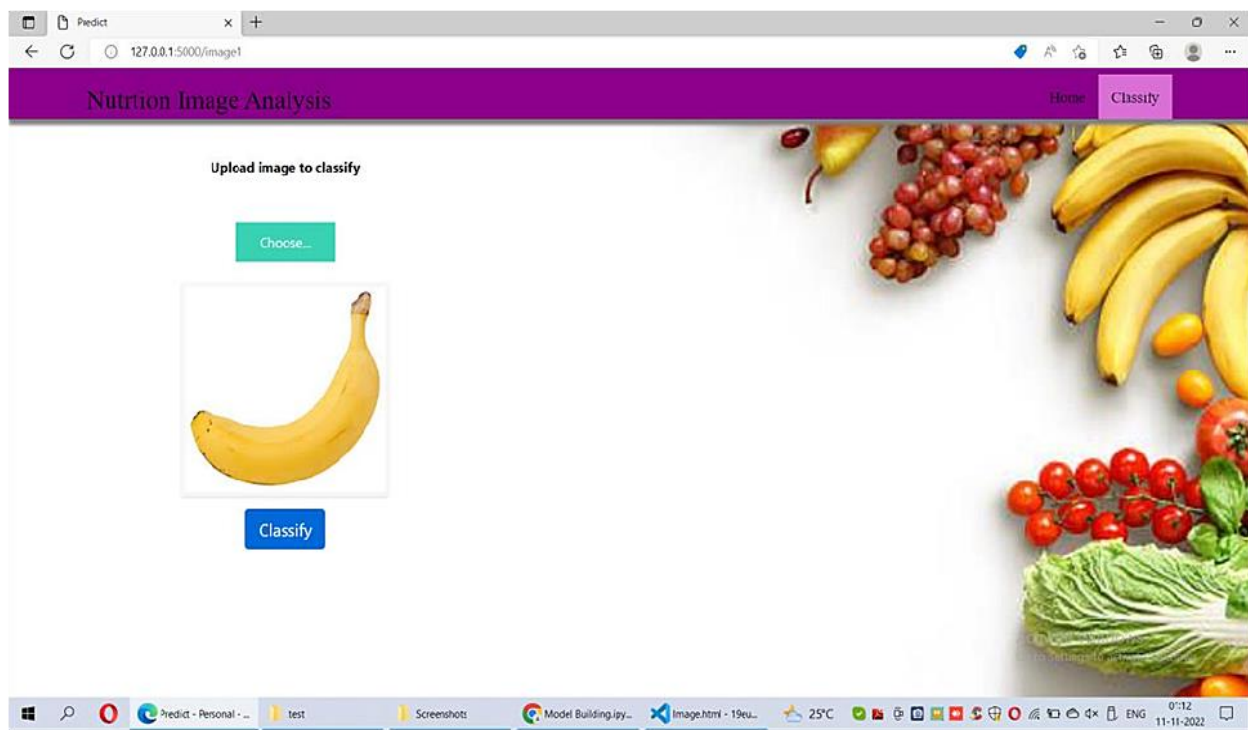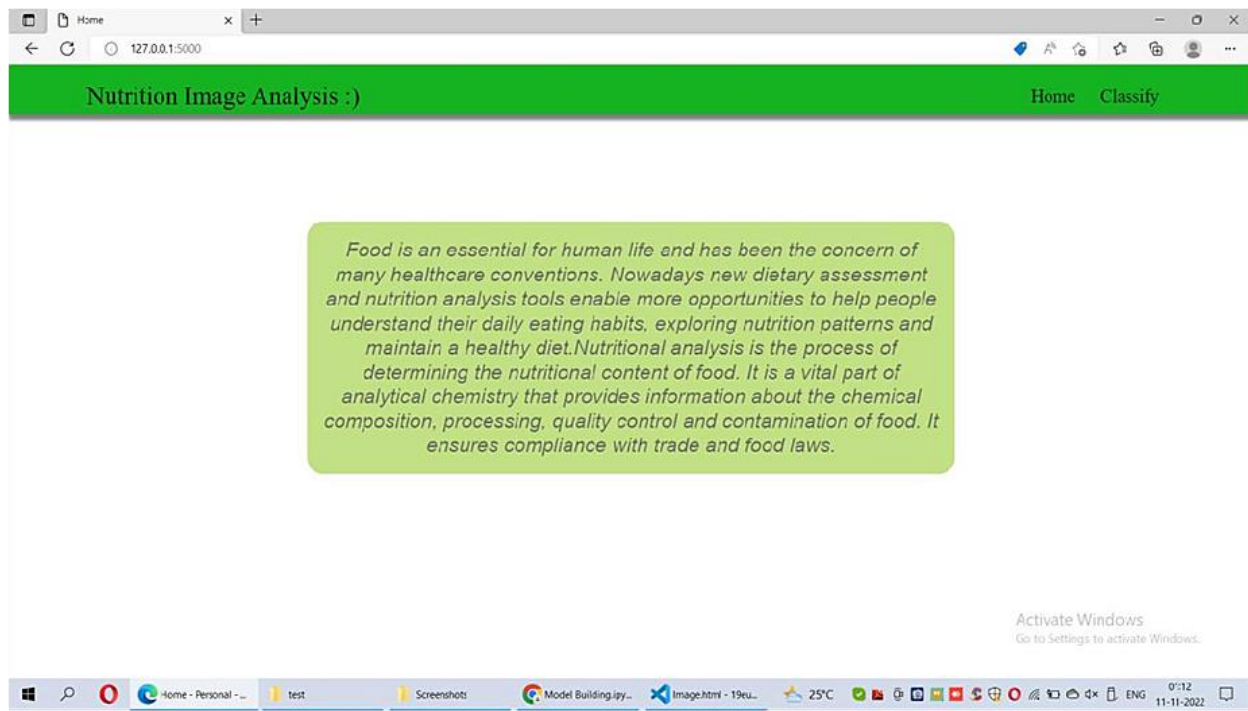
SPRINT 4

1.Run the App
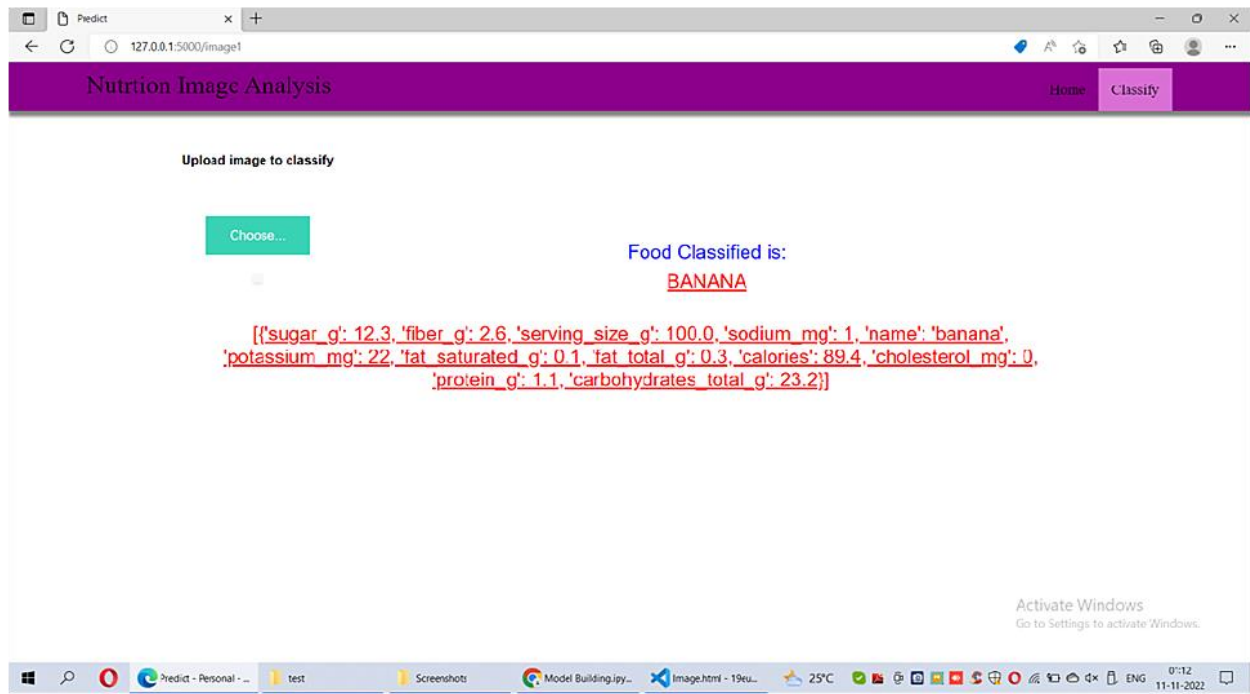
2.Register for IBM Cloud
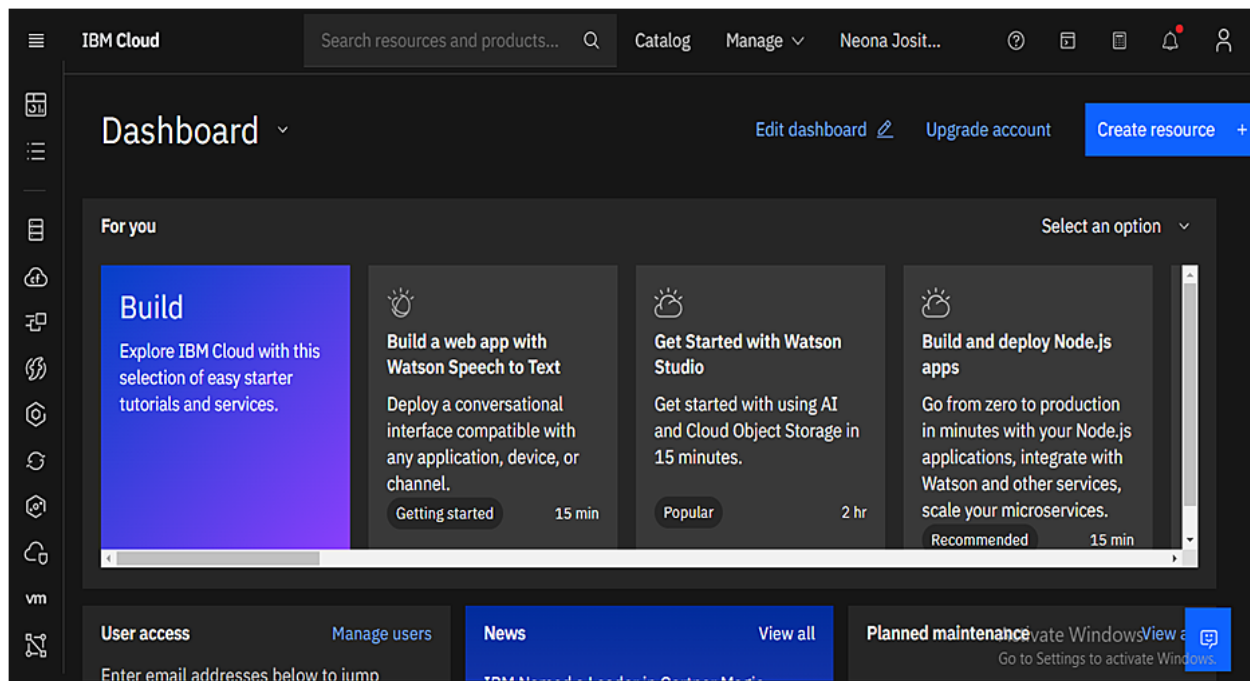
3.Train the Model on IBM Cloud

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-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
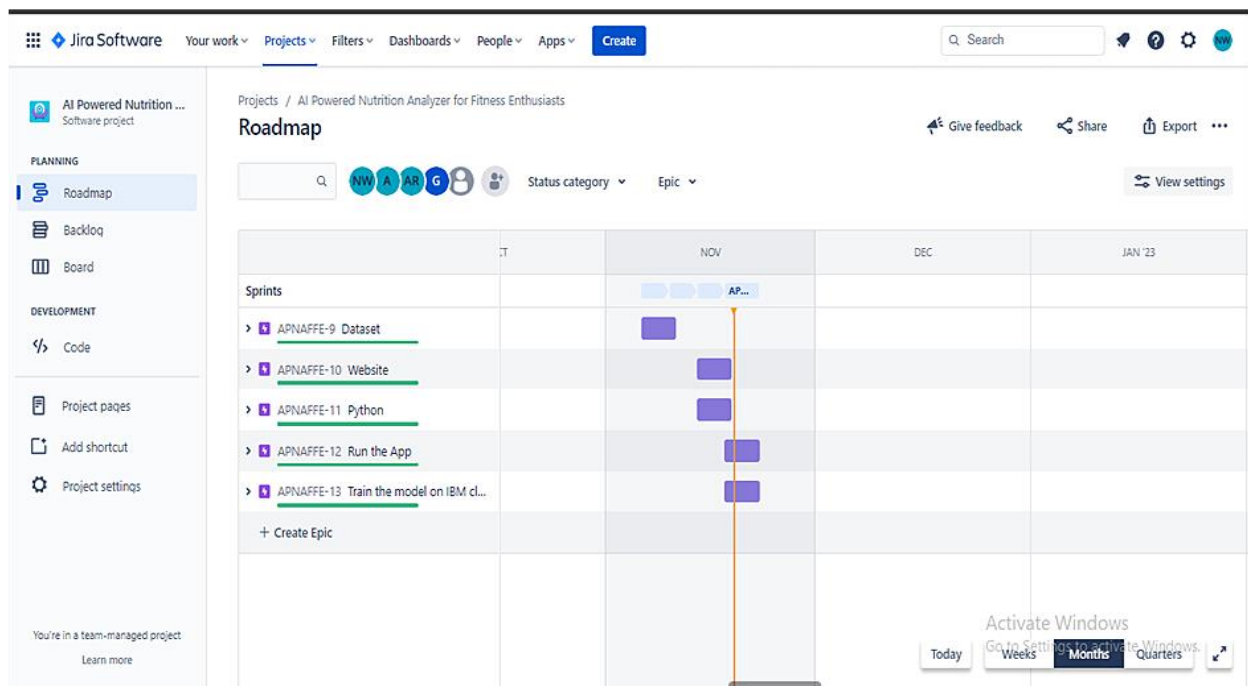
7.CODING AND SOLUTION

7.1 Feature 1

```
1   import os
2   import numpy as np
3   from flask import Flask,render_template,request
4   from tensorflow.keras.models import load_model
5   from tensorflow.keras.preprocessing import image
6   import requests
7   app = Flask(__name__, template_folder="templates")
8   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')
9   print("Loaded model from disk")
10
11  @app.route('/')
12  def home():
```

```python
13    return render_template('home.html')

14

15  @app.route('/image1', methods=['GET','POST'])

16  def image1():

17    return render_template("image.html")

18

19  @app.route('/predict',methods=['GET','POST'])

20  def launch():

21    if request.method=='POST':

22      f=request.files['file']

23      basepath=os.path.dirname('__file__')

24      filepath=os.path.join(basepath,"uploads",f.filename)

25      f.save(filepath)

26      img=image.load_img(filepath,target_size=(64,64))

27      x=image.img_to_array(img)

28      x=np.expand_dims(x,axis=0)

29      pred=np.argmax(model.predict(x), axis=1)

30      print("prediction",pred)

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

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

33      x=result

34      print(x)

35      result=nutrition(result)

36      print(result)

37      return render_template("0.html",showcase=(result),showcase1=(x))

38

39  def nutrition(index):

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

41    querystring = {"query":index}
```

```
42   headers={
43     'x-rapidapi-key':"5d797ab107mshe668f26bdo44e64p1ffd34jsnf47bfa9a8ee4",
44     'x-rapidapi-host':"calorieninjas.p.rapidapi.com"
45   }
46   response = requests.request("GET", url, headers=headers, params=querystring)
47   print(response.text)
48   return response.json()['items']
49
50 if __name__ == "__main__":
51   app.run(debug=False)
```

7.2 Feature 2

1.0.html

```
1  <html lang="en" dir="ltr">
2  <head>
3  <style>
4  </style>
5          <meta charset="utf-8">
6          <title>Nutrition Image Analysis</title>
7          <link rel="shortcut icon" href="{{ url_for('static',
   filename='diabetes-favicon.ico') }}">
8          <link rel="stylesheet" type="text/css" href="{{
   url_for('static',filename='style.css') }}">
9          <script src="https://kit.fontawesome.com/5f3f547070.js"
   crossorigin="anonymous"></script>
10         <link
   href="https://fonts.googleapis.com/css2?family=Pacifico&display=swa
   p" rel="stylesheet">
11  </head>
12  <!-- Result -->
13         <div class="results">
14         <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>
15          </div>
16          <br>
17          <br>
18 </div>
19   </body>
20 </html>
```

2.home.html

```
1  <!DOCTYPE html>
2  <html>
3  <head>
4  <meta charset="UTF-8">
5  <meta name="viewport" content="width=device-width, initial-
   scale=1.0">
6  <meta http-equiv="X-UA-Compatible" content="ie=edge">
7  <title>Home</title>
8  <link
   href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css
   " rel="stylesheet">
9  <script
   src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js">
   </script>
10<script
   src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
11<script
   src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"><
   /script>
12<link href="{{ url_for('static',
   filename='css/main.css'),rel="stylesheet">}}"
13<style>
14body
15{
```

```css
16    background-image: url("https://www.livingproofnyc.com/wp-
   content/themes/livingproof/assets/img/hero-background.jpg");
17    background-size: cover;
18 }
19 .bar
20 {
21 margin: 0px;
22 padding:20px;
23 background-color:white;
24 opacity:0.6;
25 color:black;
26 font-family:'Roboto',sans-serif;
27 font-style: italic;
28 border-radius:20px;
29 font-size:25px;
30 }
31 h3
32 {
33 margin: 0px;
34 padding:20px;
35 background-color:#
36 width: 800px;
37 opacity:0.6;
38 color:#000000;
39 font-family:'Roboto',sans-serif;
40 font-style: italic;
41 border-radius:20px;
42 font-size:25px;
43 }
44 a
45 {
46 color:grey;
47 float:right;
48 text-decoration:none;
49 font-style:normal;
```

```css
50 padding-right:20px;
51 }
52 a:hover{
53 background-color:black;
54 color:white;
55 border-radius:15px;0
56 font-size:30px;
57 padding-left:10px;
58 }
59 .div1{
60   background-color: lightgrey;
61   width: 500px;
62   border: 10px solid peach;
63   padding: 20px;
64   margin: 20px;
65   height: 500px;
66 }
67 .header {      position: relative;
68         top:0;
69         margin:0px;
70         z-index: 1;
71         left: 0px;
72         right: 0px;
73         position: fixed;
74         background-color: #8B008B ;
75         color: white;
76         box-shadow: 0px 8px 4px grey;
77         overflow: hidden;
78         padding-left:20px;
79         font-family: 'Josefin Sans'
80             font-size: 2vw;
81         width: 100%;
82         height:8%;
83         text-align: center;
84   }
```

```
85   .topnav {
86   overflow: hidden;
87   background-color:
88 }.topnav-right a {
89   float: left;
90   color: black;
91   text-align: center;
92   padding: 14px 16px;
93   text-decoration: none;
94   font-size: 22px;
95 }
96
97 .topnav-right a:hover {
98   background-color: #FF69B4;
99   color: black;
100 }
101
102 .topnav-right a.active {
103   background-color: #DA70D6;
104   color: black;
105 }
106
107 .topnav-right {
108   float: right;
109   padding-right:100px;
110 }
111 </style>
112 </head>
113 <body>
114 <div class="header">
115 <div style="width:50%;float:left;font-size:2vw;text-
    align:left;color:black; padding-top:1%;padding-left:5%;">Nutrtion
    Image Analysis</div>
116 <div class="topnav-right"style="padding-top:0.5%;">
117 <a class="active" href="{{ url_for('home')}}">Home</a>
```

```html
118 <a  href="{{ url_for('image1')}}">Classify</a>
119 </div>
120 </div>
121 </div>
122 <br>
123 <br>
124 <br>
125 <br>
126 <br>
127 <br>
128 <br>
129 <br>
130 <h1>
131 <center>
132 <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>
133 </center>
134 </h1>
135 </body>
136 </html>
```

3.image prediction.html

```
1  <!DOCTYPE html>
2  <html>
3  <head>
4  <meta charset="UTF-8">
5  <meta name="viewport" content="width=device-width, initial-
   scale=1.0">
6  <meta http-equiv="X-UA-Compatible" content="ie=edge">
7  <title>Predict</title>
8  <link
   href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
   rel="stylesheet">
9  <script
   src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></sc
   ript>
10 <script
   src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
11 <script
   src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></scri
   pt>
12 <link href="{{ url_for('static', filename='css/main.css') }}"
   rel="stylesheet">
13 <style>
14 body
15 {
16    background-image:
   url("https://i.pinimg.com/originals/be/21/1a/be211ad5043a8d05757a35
   38bdd8f450.jpg");
17    background-size: cover;
18 }
19 .bar
20 {
21 margin: 0px;
22 padding:20px;
23 background-color:white;
```

```css
24 opacity:0.6;
25 color:black;
26 font-family:'Roboto',sans-serif;
27 font-style: italic;
28 border-radius:20px;
29 font-size:25px;
30 }
31 {
32 color:grey;
33 float:right;
34 text-decoration:none;
35 font-style:normal;
36 padding-right:20px;
37 }
38 color:grey;
39 float:right;
40 text-decoration:none;
41 font-style:normal;
42 padding-right:20px;
43 }
44 a:hover{
45 background-color:black;
46 color:white;
47 border-radius:15px;0
48 font-size:30px;
49 padding-left:10px;
50 }
51 .div1{
52   background-color: lightgrey;
53   width: 500px;
54   border: 10px solid peach;
55   padding: 20px;
56   margin: 20px;
57   height: 500px;
58 }
59 .header {      position: relative;
60               top:0;
```

```css
61              margin:0px;
62              z-index: 1;
63              left: 0px;
64              right: 0px;
65              position: fixed;
66              background-color: #8B008B ;
67              color: white;
68              box-shadow: 0px 8px 4px grey;
69              overflow: hidden;
70              padding-left:20px;
71          font-family: 'Josefin Sans';
72      font-size: 2vw;
73              width: 100%;
74              height:8%;
75              text-align: center;
76          }
77          .topnav {
78  overflow: hidden;
79  background-color: #FCAD98;
80 }
81
82 .topnav-right a {
83   float: left;
84   color: black;
85   text-align: center;
86   padding: : 14px 16px;
87   text-decoration: none;
88   font-size: 18px;
89 }
90 .topnav-right a:hover {
91   background-color: #FF69B4;
92   color: black;
93 }
94 .topnav-right a.active {
95   background-color: #DA70D6;
96   color: black;
97 }
```

```
98 .topnav-right {
99  ight;
100  padding-right:100px;
101 }
102 </style>
103 </head>
104 <body>
105 <div class="header">
106 <div style="width:50%;float:left;font-size:2vw;text-
    align:left;color:black; padding-top:1%;padding-left:5%;">Nutrtion
    Image Analysis</div>
107 <div class="topnav-right"style="padding-top:0.5%;">
108 <a href="{{ url_for('home')}}">Home</a>
109 <a  class="active" href="{{ url_for('image1')}}">Classify</a>
110 </div>
111 </div>
112 <br>
113 </div>
114 <div class="container">
115 <center>
116 <div id="content" style="margin-top:2em">{% block content %}{%
    endblock %}</div></center>
117 </div>
118 </body>
119 <footer>
120 <script src="{{ url_for('static', filename='js/main.js') }}"
    type="text/javascript"></script>
121 </footer>
122 </html>
```

4.image.html

```
1  {% extends "imageprediction.html" %} {% block content %}

2  <div style="float:left">

3  <br>

4  <br>
```

```
5   <h5><font color="black" size="3" font-family="sans-serif"><b>Upload image to
    classify</b></font></h5><br><br>
6   <div>
7   <form id="upload-file" method="post" enctype="multipart/form-data">
8   <label for="imageUpload" class="upload-label">
9           Choose...
10  </label>
11  <input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
12  </form>
13  <center><div class="image-section" style="display:none;">
14  <div class="img-preview">
15  <div id="imagePreview">
16  </div></center>
17  </div>
18  <center><div>
19  <button type="button" class="btn btn-primary btn-lg " id="btn-
    predict">Classify</button>
20  </center></div>
21  </div>
22  <div class="loader" style="display:none;margin-left: 450px;"></div>
23  <h3 id="result">
24  <span><p style="padding-top: 25px;"><h4>Food Classified is :
    <h4><b><u>{{showcase}}{{showcase1}}</p></span>
25  </h3>
26  </div>
27  </div>
28  {% 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

```
+ Code  + Text                                                                    Connect ▾    ✏ Editing    ⌃

[ ] model.fit(x_train,epochs=1,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test))

    120/120 [==============================] - 182s 2s/step - loss: 0.1781 - accuracy: 0.9447 - val_loss: 0.5165 - val_accuracy: 0.8362
    <keras.callbacks.History at 0x7efd403a8150>

[ ] history=model.fit(x_train,epochs=1,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test))

    120/120 [==============================] - 138s 1s/step - loss: 0.0979 - accuracy: 0.9687 - val_loss: 0.5897 - val_accuracy: 0.8620

▶  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 [==============================] - 132s 1s/step - loss: 0.0981 - accuracy: 0.9686 - val_loss: 0.5342 - val_accuracy: 0.8716
   Epoch 2/5
   120/120 [==============================] - 127s 1s/step - loss: 0.0900 - accuracy: 0.9727 - val_loss: 0.6108 - val_accuracy: 0.8668
   Epoch 3/5
   120/120 [==============================] - 126s 1s/step - loss: 0.0926 - accuracy: 0.9725 - val_loss: 0.6126 - val_accuracy: 0.8637
   Epoch 4/5
   120/120 [==============================] - 127s 1s/step - loss: 0.0836 - accuracy: 0.9737 - val_loss: 0.5963 - val_accuracy: 0.8623
   Epoch 5/5
   120/120 [==============================] - 129s 1s/step - loss: 0.0743 - accuracy: 0.9756 - val_loss: 0.4265 - val_accuracy: 0.8923
   <keras.callbacks.History at 0x7f866830d350>
```

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 nutrients present in their fruits.

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

```
1   Import the ImageDataGenerator library
2   from tensorflow.keras.preprocessing.image import
    ImageDataGenerator
3
4   Configure ImageDataGenerator Class
5   train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,ve
    rtical_flip=True,horizontal_flip=True)
6   test_data=ImageDataGenerator(rescale=1./255)
7   Apply ImageDataGenerator functionality to trainset and testset
8   x_train=train_datagen.flow_from_directory(r"/content/drive/MyDrive/
    CNN-
    IBM/Dataset/TRAIN_SET",target_size=(64,64),class_mode="categoric
    al",batch_size=128)
9   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)
10  x_train.class_indices
11
12  MODEL BUILDING
13  Import the libraries
14  from tensorflow.keras.models import Sequential
15  from tensorflow.keras.layers import
    Dense,Convolution2D,MaxPooling2D,Flatten
16
```

```python
17 Initialize the model
18 model=Sequential()
19
20 Adding CNN layers
21 model.add(Convolution2D(32,(3,3),activation="relu",strides=(1,1),input
   _shape=(64,64,3)))
22 model.add(MaxPooling2D(pool_size=(2,2)))
23 model.add(Flatten())
24 model.summary()
25
26 Adding Dense layer
27
28 Hidden layer
29 model.add(Dense(500,activation="relu"))
30 model.add(Dense(500,activation="relu"))
31
32 Output layer
33 model.add(Dense(500,activation="relu"))
34
35 Configure the learning process
36 model.compile(loss="categorical_crossentropy",optimizer="adam",met
   rics=['accuracy'])
37 len(x_train)
38
39 Train the model
40 model.fit(x_train, epochs=10,validation_data=x_test,
   steps_per_epoch=len(x_train), validation_steps=len(x_test))
41
42 Save the model
43 model.save('nutrition.h5')
44 from tensorflow.keras.models import load_model
45 model=load_model('nutrition.h5')
46
47 Testing the model
48
49 import numpy as np
50 from tensorflow.keras.models import load_model
51 from tensorflow.keras.preprocessing import image
52 model=load_model('nutrition.h5')
```

```
53 img=image.load_img("/content/drive/MyDrive/CNN-
   IBM/Dataset/TRAIN_SET/ORANGE/n07749192_1008.jpg",target_size
   =(64,64))
54 img
55 x=image.img_to_array(img)
56 x
57 x=np.expand_dims(x,axis=0)
58 x
59 pred=model.predict(x)
60 pred
61 index=['APPLES','BANANA','ORANGE','WATERMELON','PINEAP
   PLE']
62 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**