AI - POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

A PROJECT REPORT

Submitted by

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in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

V V COLLEGE OF ENGINEERING, TISAIYANVILAI

ANNA UNIVERSITY: CHENNAI 600 025

DECEMBER 2022

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS"** is the bonafide work of **"ABIRAMI.M, ANGELIN NESAM.T, SARANYA RUKMANI.G, SATHYA.S"** who carried out the project under my supervision.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

PROJECT REPORT

AI-Powered Nutrition Analyser 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 contentof food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality controland 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 cancapture 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

- Know fundamental concepts and techniques of Convolutional NeuralNetwork.
- Gain a broad understanding of image data.
- Knowhow to pre-process/clean the data using different data pre-processing techniques.
- Know how to build a web application using the Flask framework.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Many people,have their own method or app to analyze their daily intake of nutrition, which they feel is one of the main factor for maintaining a healthy body and one of the important steps among many towards fitness. It is a good habit for a person to record daily intake of nutrition but due to unawareness and lack of proper applications to suit their privacy, lacking proper predefined plansbased on actualdata of nutrition present in various food, they tend to eithergive up, or use methods which are not that much helpful. Due to lack of a complete tracking system, there is a constant struggle to properly know the necessary amount of nutrition needed and the amount we intake, then the total estimation till the end of a certain period.

2.2 REFERENCE

S. NO	TITLE & AUTHOR	YEAR & PUBLICATION	METHODOLOGY	ADVANTAGE	DRAWBACK
1	Artificial intelligence in food science and nutrition Information Technologies Institute (ITI) Kosmas Demetriouslos	**April 2019** Published by Oxford University Press on behalf of the International Life Sciences Institute.	AI in areas such as immunity boosting Foods, dietary assessment, gut microbeam profile analysis and toxicity prediction of food ingredients techniques are growing rapidly. They are a type of ML algorithms that requires very little human supervision when training and can crunch huge amount of data in a short time. As for their application in healthcare, ANNs are used to analyze medical imaging, biochemical studies.	Tells exactly what to eat according to thebody type. All of this is packaged in a comprehensive nutrition and activity tracker.	The AI system may not always make the right decisions, but it will eventually learn from these errors and adjust itsdecision-making processes to improve over time.

2	Artificial Intelligence Nutrients Science BAKAJRISHNA.Y	**JUNE 2022** This article belongs to the Section Nutrition Methodology & Assessment	The possibilities of artificial intelligence in the field of medical diagnostics, risk prediction and support of therapeutic. AI algorithms may help better understand and predict the complex and nonlinear interactions between nutrition related data a health	Creation of global network that will be able to both actively support and monitor the personalized supply of nutrients.	The AI System May Be Buggy at First it can take time to work correctly. This is normal.
3	AI-Based Dietician Professor, Department of Computer Science, Dayananda Sagar Academyof Technology	**April 2022** International Journal of CreativeResearch Thought(IJCRT)	Consulting a dietician is something that everyone cannot afraid. Also, consulting a dietician should be time consuming. Am expert system method to recommend a personalized diet plan. AI could significantly improve packing, increasing shelf life, a combination of the menu by using AI algorithms and food safety by making a more transparent supply chain management system.	Helps the user tointeract better with the system,provide information to the system as inputand take the recommended diet plan as output	Doesn't have acknowledgeable dietician Don't value customer time Worst service

4	Virtual Nutritioning AI International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249-8958, Volume-8 Issue-5	**June 2019** Blue Eyes Intelligence Engineering and Science Publication	It will generate the diet plan as well as it also monitors the user health to classify the category of the decease and to create the diet plan. It will also reduce the cost of consulting the person nutritionist. Gradient boosting Regression was used to generate the model as the method non- linear relationship between PGGR and different factors in our dataset.	A user can track his/her progress towards his/her goal from the day he'd started using the application. Reminder for every meal. Inbuild personalized customization of meals depending upon one's preferred foods	High costs. No creativity. AI is that cannot think outside the box. Unemployment makes humans lazy. No improvement.

5	A computer Vision based Indian Food Detection and Nutrition Calculation App Durgesh Samariya	**May 2022** DEVELOPERS CORNER	The task of food detection/classification is not, all possible options related to the given image. For example, if a user uploads a dal image then the Foodify,ai app returns all dal's from the nutrition database sus as Dal fry. AI algorithms can help the food delivery system to manage the order accurately. It will reflect the customer's order to two different delivery partners one who is in the nearby location of the delivery address and the other who is in the nearby location of the restaurant where the customer has ordered the food	Easy to use. Highly productive. No more man power required	Calculation cannot be accurate. Software development is difficult image processing can always not be correct.

6	Diet Monitoring and Health Analysis using AI Author: R.Divya Final year student, CSE, Velammal Engineering College, Chennai.		The food recognize system employs visual sensors to capture food images as the source data. Due to the recent advantages of electronics, visual sensors are now available in many IoT devices. Additionally, AI increase the ability for healthcare professional to better understanding the day-to-day pattern and needs of the people they care for.	The diseases can be identified accurately by the classifiers. Intake of the food is taken into count and suggestions are provide to improve the health of the user.	By integrating AI with the user data, map its user's nutritional pattern and needs fitness of coach is an AI.

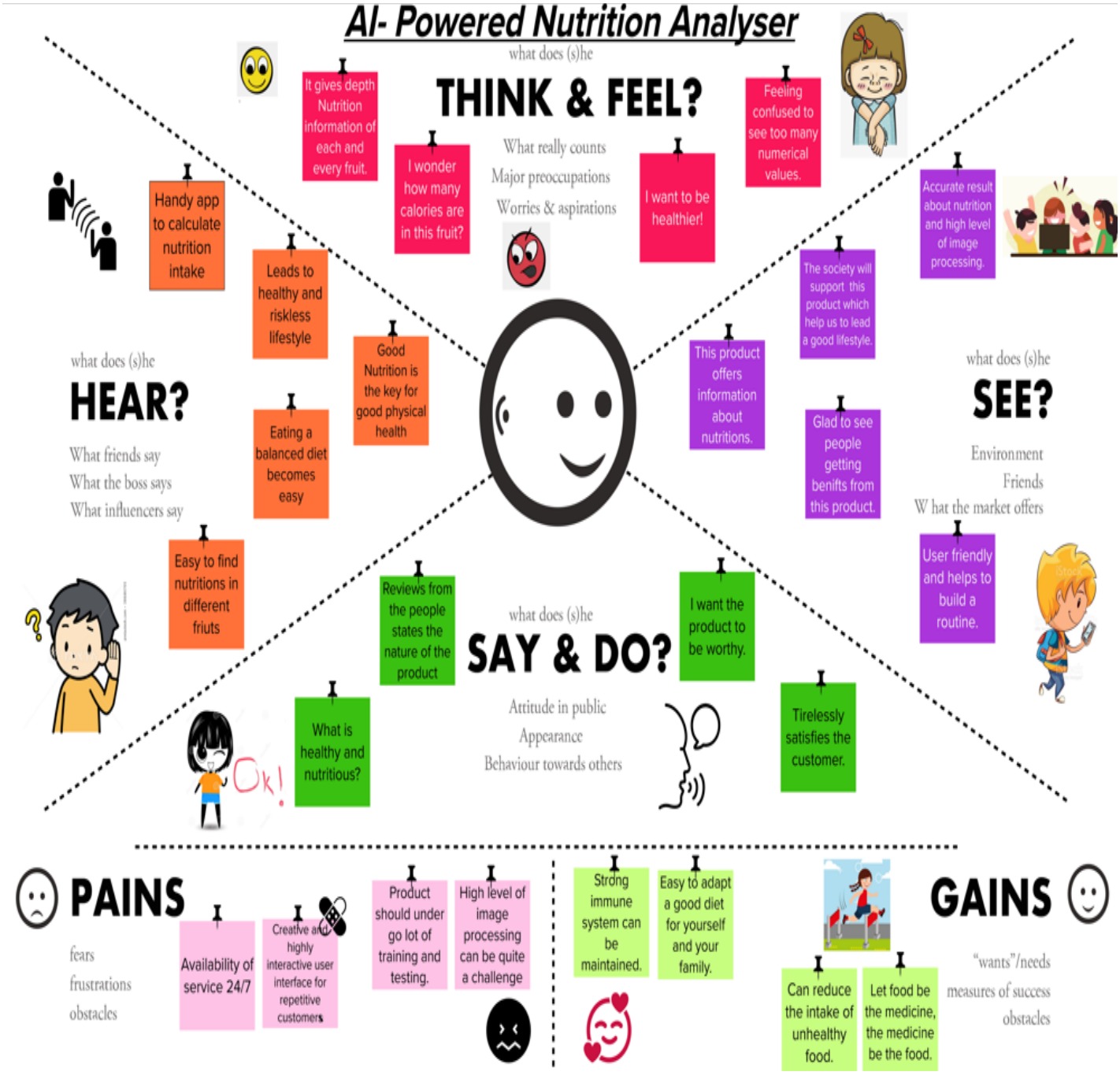
2.3 PROBLEM STATEMENT DEFINITION

The user needs information about the nutritional values of different types of food as accurately as possible to determine the necessary amount of calorie intake to maintain their health and also to manage their schedule.

3. IDEATION &PROPOSED SOLUTION

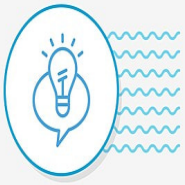
3.1 EMPATHY MAP CANVAS

Gain insight and understanding on solving customerproblems.



3.2 IDEATION & BRAINSTORMING

Template



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

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

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

The main idea of this nutrition assistant application is to track food based on the user's consumption and helping the users to lead a healthy lifestyle.

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!

Saranya Rukmani

- Talk to your provider
- Choose milk and juice
- Avoid non-nutritiols bevarages

- Try to eat more protein
- Take less simple sugars
- Walk or participate in light activity

Sathya

- Drink bevarages after a meal

- Avoid non nutritional foods

- Plan meals

- Try to eat high calorie foods

- Choose high protein snacks

Angelin Nesam

- Drink milk

- Try high calorie recipes
- Drink more water

- Ask dietition about nutrition supplement
- Get the right amount of nutrition everyday

- Check body weight frequently

Abirami

- Avoid low calorie food

- Avoid unhealthy food habit

- Calorie Boosters

- Eat more vegetables

- Have oilly foods

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

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Physical Health

- Exercise regularly
- Consult fitness trainer
- 
- Practice yoga
- Sleep well

Consult a Dietition

- Follow dietition advice
- Follow regular plan
- 
- Follow healthy behaviours
- Monitor plan

Nutritional needs

- Eat fibre filled foods
- Eat fruits and vegetables
- 
- Drink enough water
- Choose healthy snacks

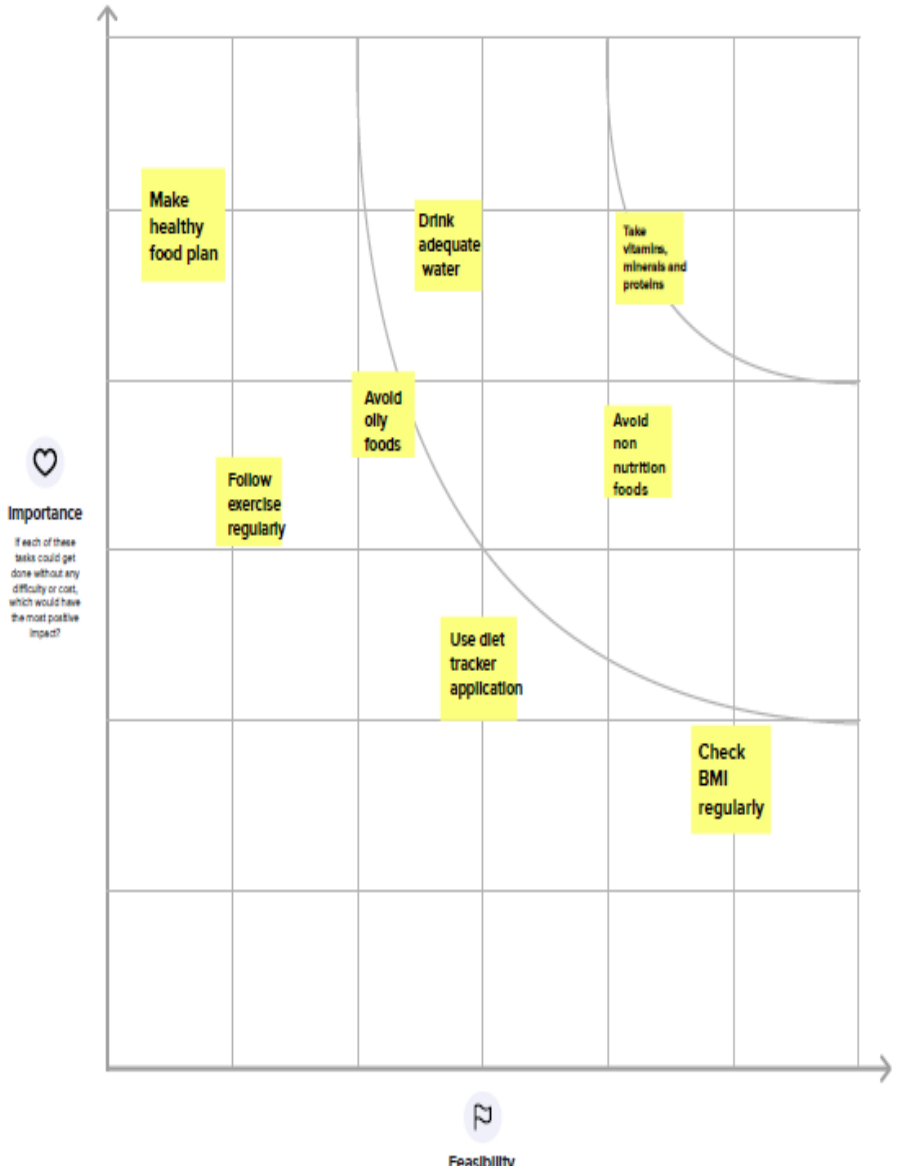
Nutrition Tracker Application

- use diet tracking application
- Use smart gadgets to monitor body condition
- 
- Calculate minerals intake using apps
- Set daily, weekly goals in application

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



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

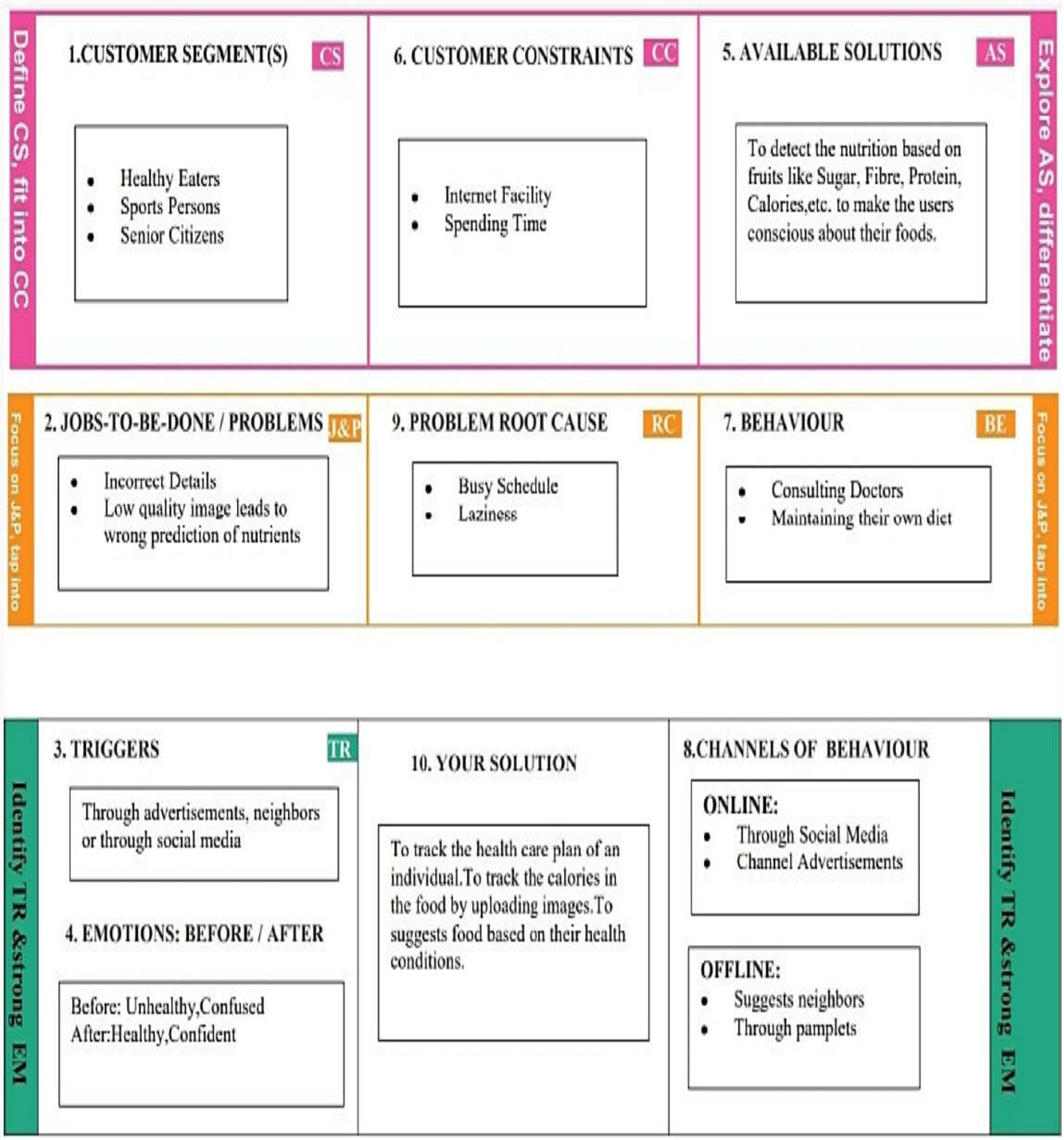
Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback

3.3 PROPOSED SOLUTION

S.NO	PARAMETERS	SOLUTIONS
1.	Problem Statement	• Main objective is to detect the nutrition in a fruit from camera captured image. • The identification of nutrition and calories from a image is quite an interesting field. • Since nutrition monitoring plays an important role in leading healthy lifestyle, this product has the potential to become an essential in our day to day life.
2.	Idea / Solution description	• The solution is to develop AI-powered nutrition analyzer application. • By giving the image of the fruit as the input to the application, it will display the nutrition content in it. • By training the model with various inputs, image processing can be improved as well as the accuracy of the result.
3.	Novelty / Uniqueness	• Personalized nutrition for individuals. • Providing science based guidance for healthy living. • Balanced food diet and measured intake. • 24/7 support. • Serving size.
4.	Social Impact / Customer Satisfaction	• Economically stable product. • Change one's view towards health and fitness. • Quality of service. • High fiber food. • Accurate amount of nutrition.
5.	Business Model (Revenue Model)	• User friendly interface which improves the constant use of the product. • Hence, Economical growth improves. • Product will be delivered in pocket size which results in consuming low memory. • Nutrition and fitness related ads to earn profit
6.	Scalability of the Solution	• Offers ingredients substance detail in food • Suggest best health solution and meal plans for different criteria proposed by different individuals. • Virtualization of your long term plan to provide motivation to the customer.

3.4 PROPLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQURIEMENT

PROJECT DESIGN PHASE II

FUNCTIONAL REQUIREMENTS

Date	17 October 2022
Team ID	PNT2022TMID50892
Project Name	NAI-Powered Nutrition.

Project description:

This project is aimed at developing a desktop-based application named Nutrition Assistant Application for estimates food attributes such as ingredients and nutritional value by classifying the input images of food. The Nutrition Assistant Application refers to the system and processes to help the user to analyse the intake of food with the involvement of a Technology system. This system can be used to store the details of the user's health, calculating the BMI, Classifying the food image to know the nutritional value, update the status of their health condition based on the information provided, and generate health reports weekly or monthly based. This project is categorizing individual health condition of the user. The Nutrition Assistant Application is important to control their daily calorie intake by eating healthier foods, which is the most basic method to avoid obesity. Without proper diet control, and this is reflective of the risks to people's health. A good Nutrition Assistant Application will alert the users when it is time to avoid. This project aims at building a web App that automatically estimates food attributes such as ingredients and nutritional value by classifying the input image of food.

Scope:

- **Maintains good health**: The application can help in guiding them on how to remain healthy and how to take good nutrition. The application will help them without personally going to the doctor. Promote better nutrition in the community by educating about better diet and nutrition.
- **Functional limitation**: The user to be specific can't access the web or admin module, whereas the administrator has all the rights to modify and manage the contents such as news, tips, etc
- **Improve Usability:** In the part of user's just the internet connection is enough in order to access the news, updates and other contents provided by the admin regarding their health condition.
- **Health conscious**: This will provide convenience to persons/users who wants to learn about nutrition and other related health topics by just using the Nutrition Assistant Application

Purpose:

The users continue to demand to know the nutritional value that is in their food. The users learn about the effect of different foods on human health. Evidently, the ultimate aim of this application is to provide the ways in which one can lead a healthy life by maintaining his/her diet. The user can access the nutritional information by taking a photo of the food, uploading a photo from the gallery, or by entering manually.

Nutrition is more than just obtaining nutrients and calories from food. It's more than just eating the healthy stuff. It's more than just following the most recent fad diet. Nutrition, the food we eat and the way we eat it, is an integral part of life. Nutrition is an experience. It evokes memories, helps us celebrate good times, and is there for us in times of grief. I believe the purpose of nutrition is to nourish the body and soul.

The Nutrition Assistant Application helps the users to eat nutritional rich food which yield to lead a healthy life.

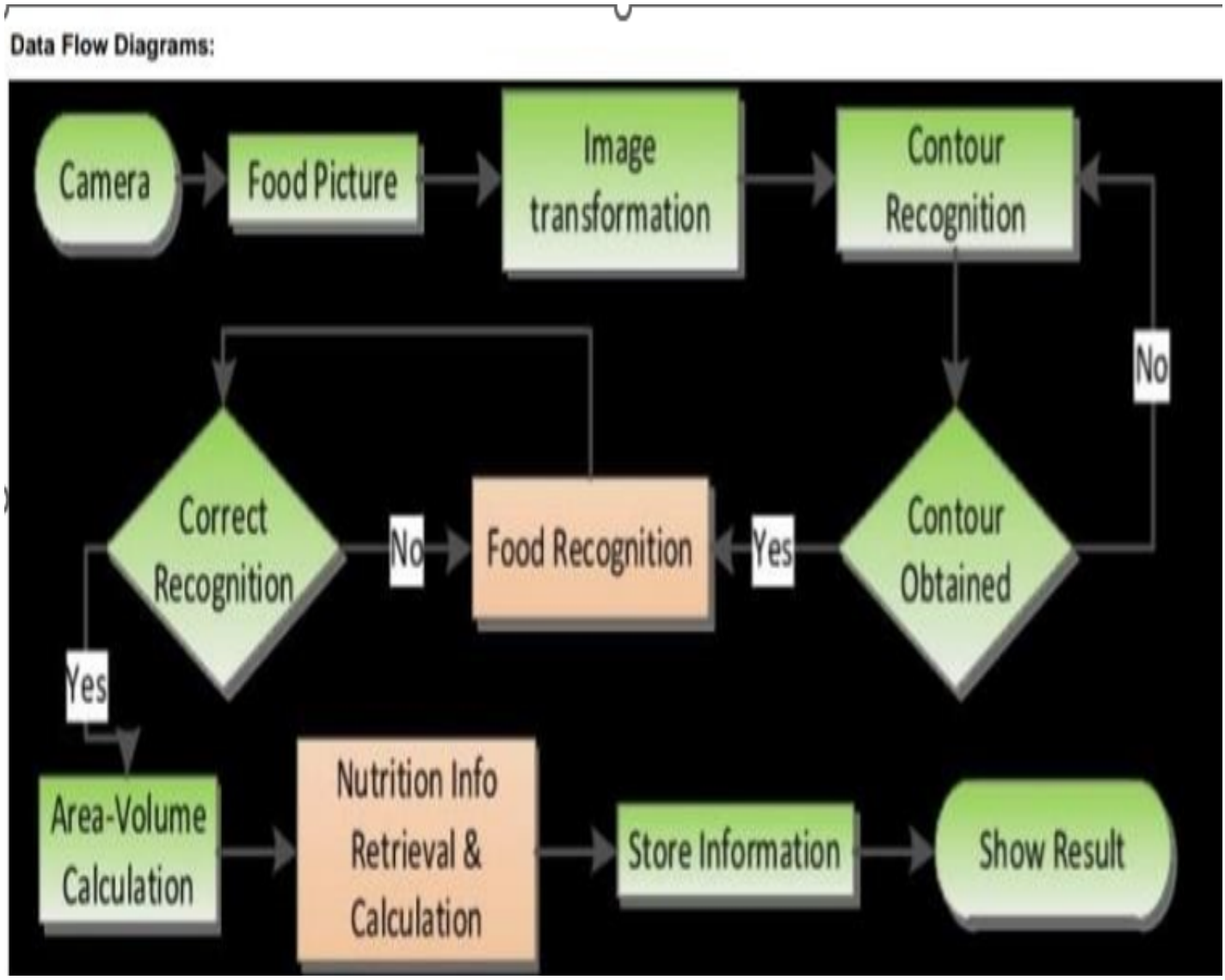
IDENTIFIER	REQUIREMENTS
1. Add health information	This application will allow to add health related information of the user.
2. Delete health information	This application will allow to delete the unwanted details about their health.
3. Categories of nutritional food	The categories of food.
4. View of Dashboard	Application will allow user to view the dashboard containing nutrition details.
5. Mail Notification	This application will allow to send mail notification to user when there are any issues regarding their health
6. Tracking System	The health can be tracked with this application.
7. Graph analysis	This application will demonstrate health condition by means of nutritional content
8. Identifying the high calorie food	The high calorie ingredients will be shown via this application.
9. Identifying the low calorie food	The high calorie ingredients will be shown via this application.
10. Passcode	This application has the option to set a passcode to keep their medical reports safe.
12. Add multiple accounts	This application has the option of creating multiple accounts for the users.
13. Selection of health report duration	This application has the ability to select the duration for displaying the health report as weekly or monthly.
14. Update account	This application will allow the user to update their profile.
15. Add account	This application will allow the user to add their profile.

4.2 NON-FUNCTIONAL REQUIREMENTS

FR.No	Functional Requirement(Epic)	Sub Requirement(Story/Sub-task)
NFR-1	Usability	**The means by which the system will be usable by users who require special or unconventional accessibility requirements**
NFR-2	**Security**	**Describe the extend to which data must be safeguarded and kept private**
NFR-3	**Capacity**	**ability to maintain functionality as circumstances change based on the input we provide**
NFR-4	**performance**	**rapid response is accomplish ed**
NFR-5	**Availability**	**the minimal amount of time allocate to online the service should be accessible during these times**
NFR-6	**Scalability**	**the program's capacity to deal with a rise in without performance reduction or the capacity to grow quickly**

5. PROJECT DESIGN

5.1 DATAFLOW DIAGRAM



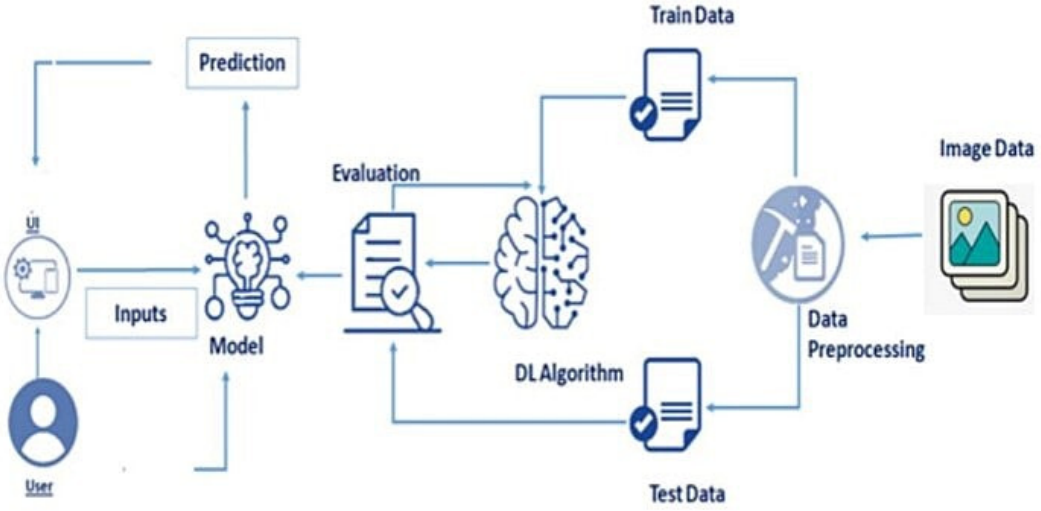
5.2 SOLUTION ARCHITECTURE

AI-powered Nutrition Analyzer for Fitness Enthusiasts

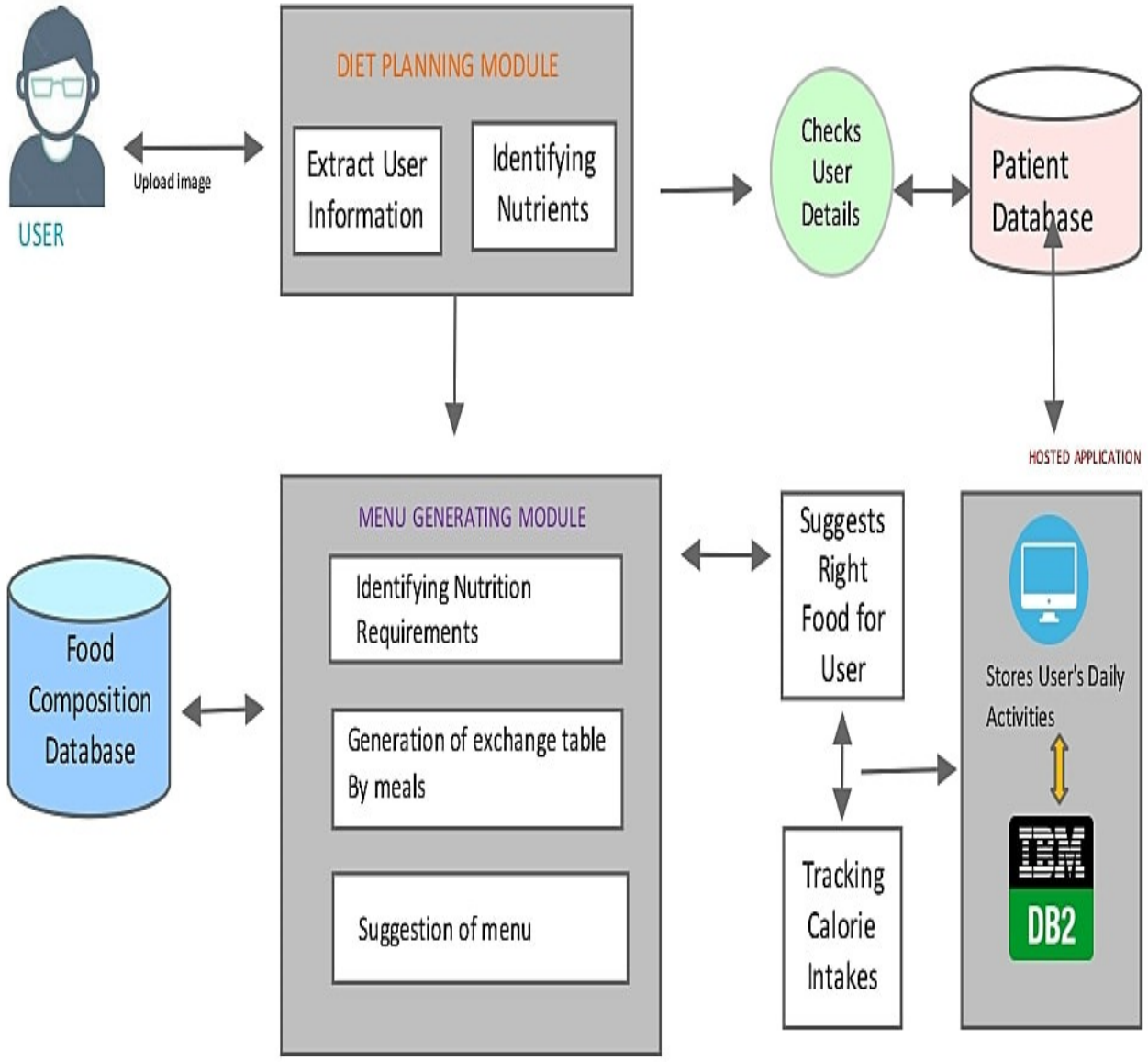
Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis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

Architecture



5.2.1 TECHNICAL ARCHITECTURE



5.3 USER STORIES

Use the below template to list user stories for the project

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Google	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Microsoft	I can access the Dashboard with Microsoft.	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login the Application by entering password	High	Sprint-1
	Main Interface	USN-6	As a user I can view my calorie intake by clicking photo of the food I eat	Access the proper information about the nutrition and the calorie intake	High	Sprint-2
	Package DB, Dashboard	USN-7	As a user I can choose variety of packages based on my requirement	Selecting an appropriate package	Medium	Sprint-2
Customer Care Executive	Feedbacks DB , Tollfree number, chat bot	USN-8	As a customer care executive, I collect feedbacks from customers	Maintaining proper environment for the customers	High	Sprint-2
Dietitian	Customer Record	USN-9	As a dietitian I provide daily plans for the betterment of the user	Positive results from user	High	Sprint-2
Administrator	Dashboard	USN-10	As an administrator I take care of all the operations which takes place in the app	Zero issues from the user	High	Sprint-2

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

ACTIVITY LIST

Project Name	AI Powered Nutrition analyser for Fitness Enthusiasts

Project Tracker, Velocity & Burndown Chart:

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	03 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

6.2 Sprint Delivery Schedule

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Download Food Nutrition Dataset	2	Medium	ANGELIN NESAM T
Sprint-1	Data Preprocessing	USN-2	Importing The Dataset into Workspace	1	Low	ABIRAMI M
Sprint-1		USN-3	Handling Missing Data	3	Medium	SATHYA S
Sprint-1		USN-4	Feature Scaling	3	Low	SARANYA RUKMANI G
Sprint-1		USN-5	Data Visualization	3	Medium	SATHYA S
Sprint-1		USN-6	Splitting Data into Train and Test	4	High	ANGELIN NESAM T
Sprint-1		USN-7	Creating A Dataset with Sliding Windows	4	High	SARANYA RUKMANI G
Sprint-2	Model Building	USN-8	Importing The Model Building Libraries	1	Medium	ABIRAMI M
Sprint-2		USN-9	Initializing The Model	1	Medium	ANGELIN NESAM T

Sprint-2		USN-10	Adding LSTM Layers	2	High	SATHYA S
Sprint-2		USN-11	Adding Output Layers	3	Medium	ABIRAMI M
Sprint-2		USN-12	Configure The Learning Process	4	High	SARANYA RUKMANI G
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-2		USN-13	Train The Model	2	Medium	ANGELIN NESAM T
Sprint-2		USN-14	Model Evaluation	1	Medium	SATHYA S
Sprint-2		USN-15	Save The Model	2	Medium	ABIRAMI M
Sprint-2		USN-16	Test The Model	3	High	SARANYA RUKMANI G
Sprint-3	Application Building	USN-17	Create An HTML File	4	Medium	ANGELIN NESAM T
Sprint-3		USN-18	Build Python Code	4	High	SARANYA RUKMANI G
Sprint-3		USN-19	Run The App in Local Browser	4	Medium	ABIRAMI M
Sprint-3		USN-20	Showcasing Prediction On UI	4	High	SATHYA S
Sprint-4	Train The Model On IBM	USN-21	Register For IBM Cloud	4	Medium	ANGELIN NESAM T
Sprint-4		USN-22	Train The ML Model On IBM	8	High	SATHYA S
Sprint-4		USN-23	Integrate Flask with Scoring End Point	8	High	SARANYA RUKMANI G

7.CODING AND SOLUTIONS

7.1 FEATURE 1:

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

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

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

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

@ app.route('/predict' ,methods=['GET','POST']) # route to show the
predictions in a Web UI
def lanuch():

if request.method=='POST':
f=request.files['file'] # requesting the file
basepath=os.path.dirname('__file__') #storing the file directory
filepath=os.path.join(basepath,"uploads",f.filename) #storing the file in
uploads folder
f.save(filepath) #saving the file

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

pred=np.argmax(model.predict(x), axis=1)
print("prediction",pred) #printing the prediction
index=['APPLE','BANANA','ORANGE','PINEAPPLE','WATERMELO']
result=str(index[pred[0]])
```

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

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

import requests

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

querystring = {"query":index}

headers = {

"X-RapidAPI-Key":
"85887549f4msh51e7315b280a87ep1f43e0jsn585c940f2ea6",
"X-RapidAPI-Host": "calorieninjas.p.rapidapi.com"
}

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

print(response.text)
```

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

7.2 FEATURE 2: Building CNN Model

```
# Part 1 - Building the CNN
# Importing the Keras libraries and packages
from keras.models import Sequential
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense
from keras.models import model_from_json
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
batch_size = 32

from tensorflow.keras.preprocessing.image import ImageDataGenerator
# All images will be rescaled by 1./255
train_datagen = ImageDataGenerator(rescale=1/255)
# Flow training images in batches of 128 using train_datagen generator
```

```
train_generator = train_datagen.flow_from_directory(
'Data', # This is the source directory for training images
target_size=(200, 200), # All images will be resized to 200 x 200
batch_size=batch_size,
# Specify the classes explicitly
classes =
['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON'],
# Since we use categorical_crossentropy loss, we need categorical labels
class_mode=;categorical’
import tensorflow as tf

model = tf.keras.models.Sequential([
# Note the input shape is the desired size of the image 200x 200 with 3 bytes color
# The first convolution
tf.keras.layers.Conv2D(16, (3,3), activation='relu', input_shape=(200, 200, 3)),
tf.keras.layers.MaxPooling2D(2, 2),
# The second convolution
tf.keras.layers.Conv2D(32, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The third convolution
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The fourth convolution
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The fifth convolution
```

```
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# Flatten the results to feed into a dense layer
tf.keras.layers.Flatten(),
# 128 neuron in the fully-connected layer
tf.keras.layers.Dense(128, activation='relu'),
# 5 output neurons for 5 classes with the softmax activation
tf.keras.layers.Dense(5, activation='softmax')

model.summary()
from tensorflow.keras.optimizers import RMSprop
early = tf.keras.callbacks.EarlyStopping(monitor='val_loss',patience=5)
model.compile(loss='categorical_crossentropy',
optimizer=RMSprop(lr=0.001),
metrics=['accuracy'])
total_sample=train_generator.n
n_epochs = 10
history = model.fit_generator(
train_generator,
steps_per_epoch=int(total_sample/batch_size),
epochs=n_epochs,
verbose=1)
model.save('model.h5')
acc = history.history['accuracy']
loss = history.history['loss']
```

```
epochs = range(1, len(acc) + 1)
# Train and validation accuracy
plt.plot(epochs, acc, 'b', label=' accurarcy')
plt.title(' accurarcy')
plt.legend()
plt.figure()
# Train and validation loss
plt.plot(epochs, loss, 'b', label=' loss')
plt.title(' loss')
plt.legend() plt.show()
```

8.TESTING

8.1 TEST CASES

A test case has components that describe input, action and an expected response, inorder to determine if a feature of an application is working correctly. A test case is a setof instructions on “HOW” to validate a particular test objective/target, which when followedwill tell us if the expected behaviour of the system is satisfied or not.

Characteristics of a good test case:

Accurate: Exacts the purpose.

Economical: No unnecessary steps or words.

Traceable: Capable of being traced to requirements.

Repeatable: Can be used to perform the test over and over.

Reusable: Can be reused if necessary.

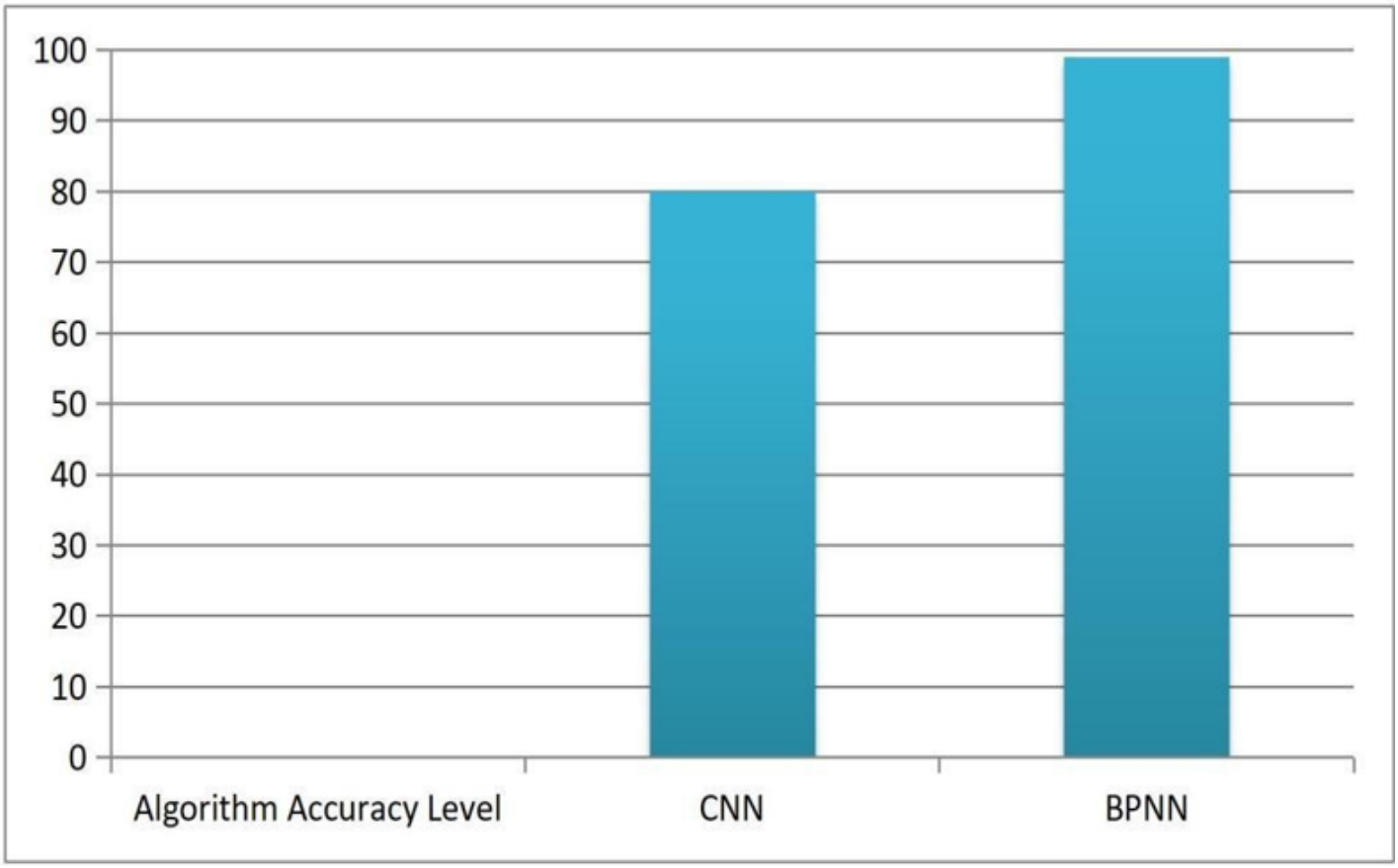
S.NO	Scenario	Input	Excepted output	Actual output
1	User login	User name and password	Login	Login success.
2	Upload Image	Upload input image (fruits and vegetables)	Predicting calorie, fat, carbsand food content of given image	Details are stored in a database

8.2 USER ACCEPTANCE TESTING

This sort of testing is carried out by users, clients, or other authorised bodies to identify the requirements and operational procedures of an application or piece of software. The most crucial stage of testing is acceptance testing since it determines whether or not the customer will accept the application or programme. It could entail the application's U.I., performance, usability, and usefulness. It is also referred to as end-user testing, operational acceptance testing, and user acceptance testing (UAT).

9.RESULTS

9.1 PERFORMANCE METRICS



10. ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGE

- Provide the nutrition content of Multifoods
- Helps for fitness people to maintain and know the proteins and calories of the food
- Gives accurate results in real-time application

10.2 DISADVANTAGE

- Hard to know the details of nutrition and calories of food
- Doesn’t ask to provide the users health condition
- Required more time to know the Multifoods

11.CONCLUSION

The approach for an automated food nutrition detection system that can determine the amount of nutrients in food is proposed in this project work The machine has so far been able to place the meal into one of the many categories listed in the dataset. The well-known food dataset was used for the categorization. The classification of the food photos into their appropriate classifications using a deep learning approach. By reducing noise from the dataset, the classification process may be made better. The same research may be done with a larger dataset, more classes, and more photos in each class since a larger dataset increases accuracy by teaching the algorithm additional features and lowers the loss rate. The model's weights may be saved and used to create designs for food categorization, calorie extraction, and picture classification.

12.FUTURE SCOPE

The food photographs in this research study are categorised into the appropriate groups using a deep learning approach. In terms of future improvement, the classification task may be made better by reducing noise from the dataset. The same research may be done with a larger dataset, more classes, and more photos in each class since a larger dataset increases accuracy by teaching the algorithm additional features and lowers the loss rate. The model's weights may be saved and utilised to create a web or mobile application that classifies images and also extracts the calories from the food that has been identified.

13.APPENDIX

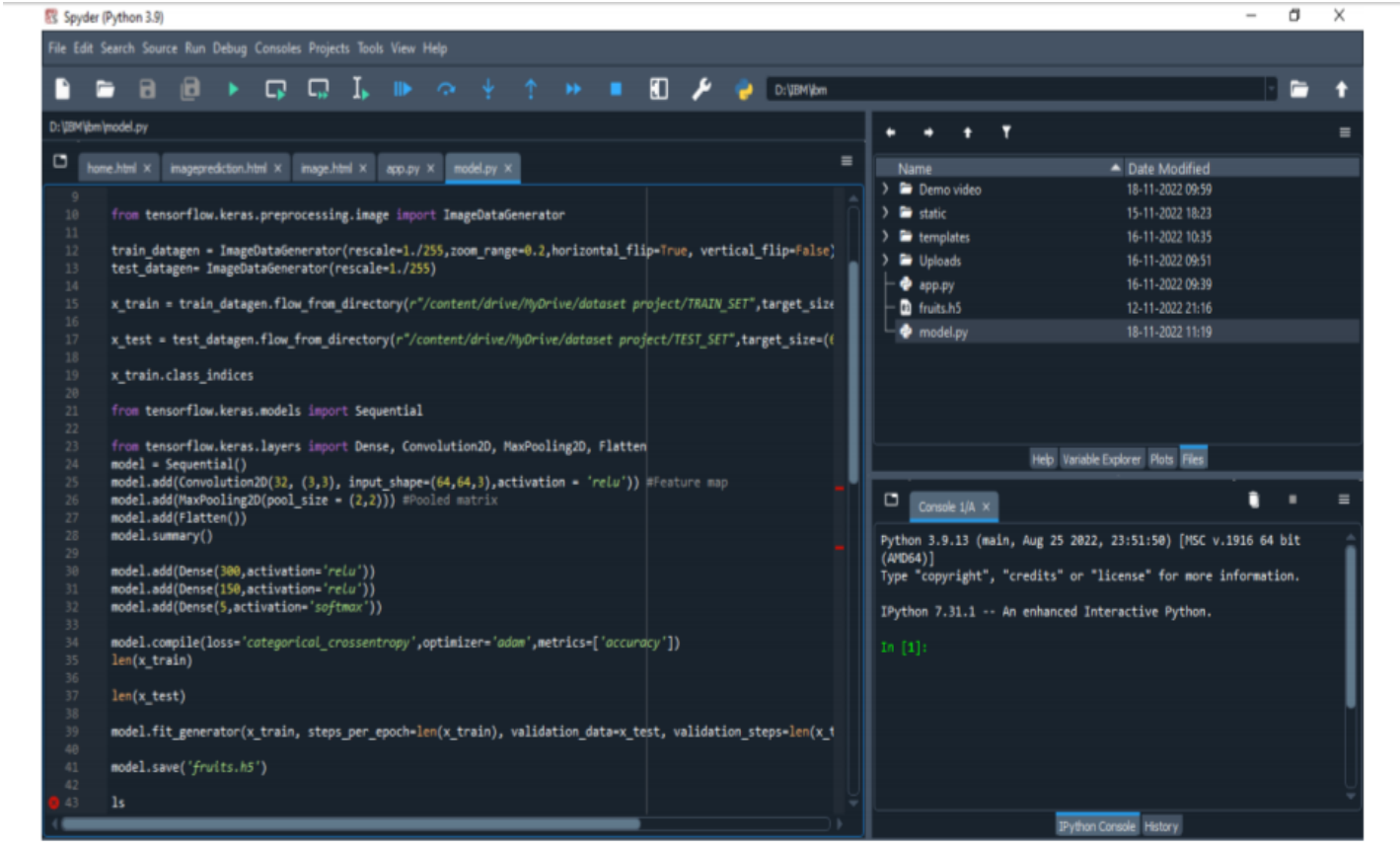
SOURCE CODE

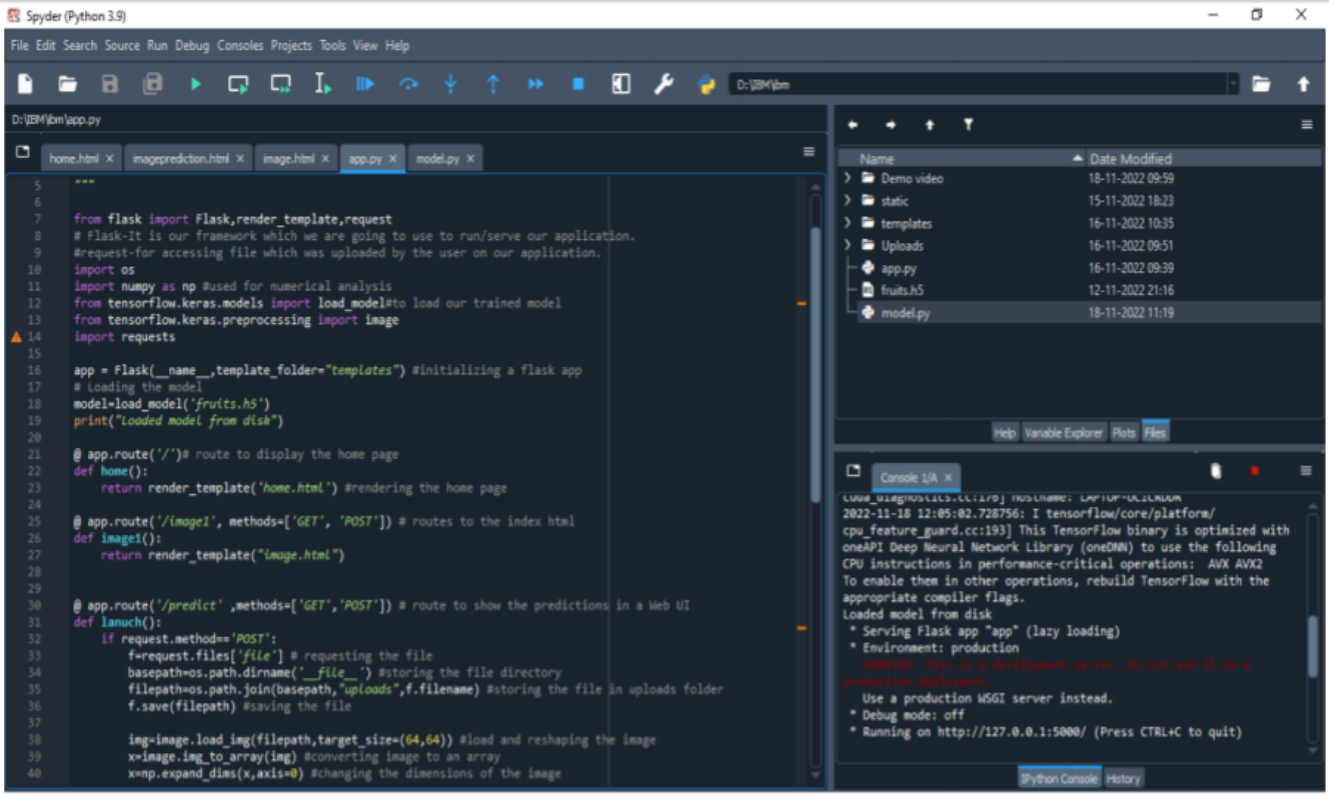
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator

train_datagen =
ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,
vertical_flip=False)
test_datagen= ImageDataGenerator(rescale=1./255)

 x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset
project/TRAIN_SET",target_size=(64,64),class_mode='categorical')

x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset
```

```
project/TEST_SET",target_size=(64,64),class_mode='categorical')


x_train.class_indices

from tensorflow.keras.models import Sequential

from tensorflow.keras.layers import Dense, Convolution2D, MaxPooling2D,
Flatten
model = Sequential()

model.add(Convolution2D(32, (3,3), input_shape=(64,64,3),activation = 'relu'))
#Feature map
model.add(MaxPooling2D(pool_size = (2,2))) #Pooled matrix
model.add(Flatten())
model.summary()

model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(5,activation='softmax'))


model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accura
cy'])
len(x_train)

len(x_test)

model.fit_generator(x_train, steps_per_epoch=len(x_train),
```

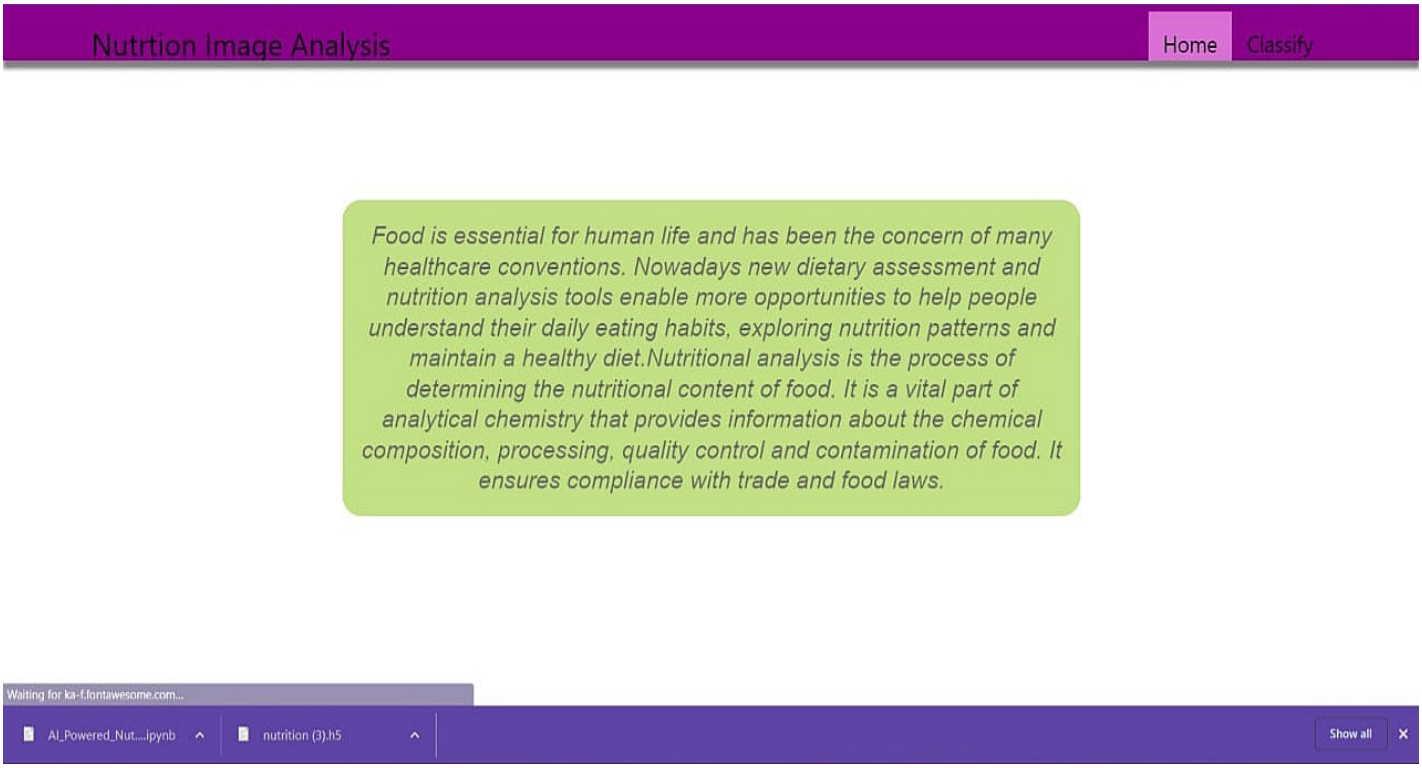
```
validation_data=x_test, validation_steps=len(x_test),epochs=10)

model.save('fruits.h5')

 ls

import numpy as np
from tensorflow.keras.models import load_model

from tensorflow.keras.preprocessing import image


model=load_model('fruits.h5')

pwd

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/WATERMELON/129_100.jpg')

img

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/WATERMELON/129_100.jpg',target_size=(64,64))
img
x=image.img_to_array(img)
x

x.shape
```

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


x.shape

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

x_train.class_indices

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

index[y[0]]

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/PINEAPPLE/123_100.jpg',target_size=(64,64))
img

x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
y

index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']
index[y[0]]
```

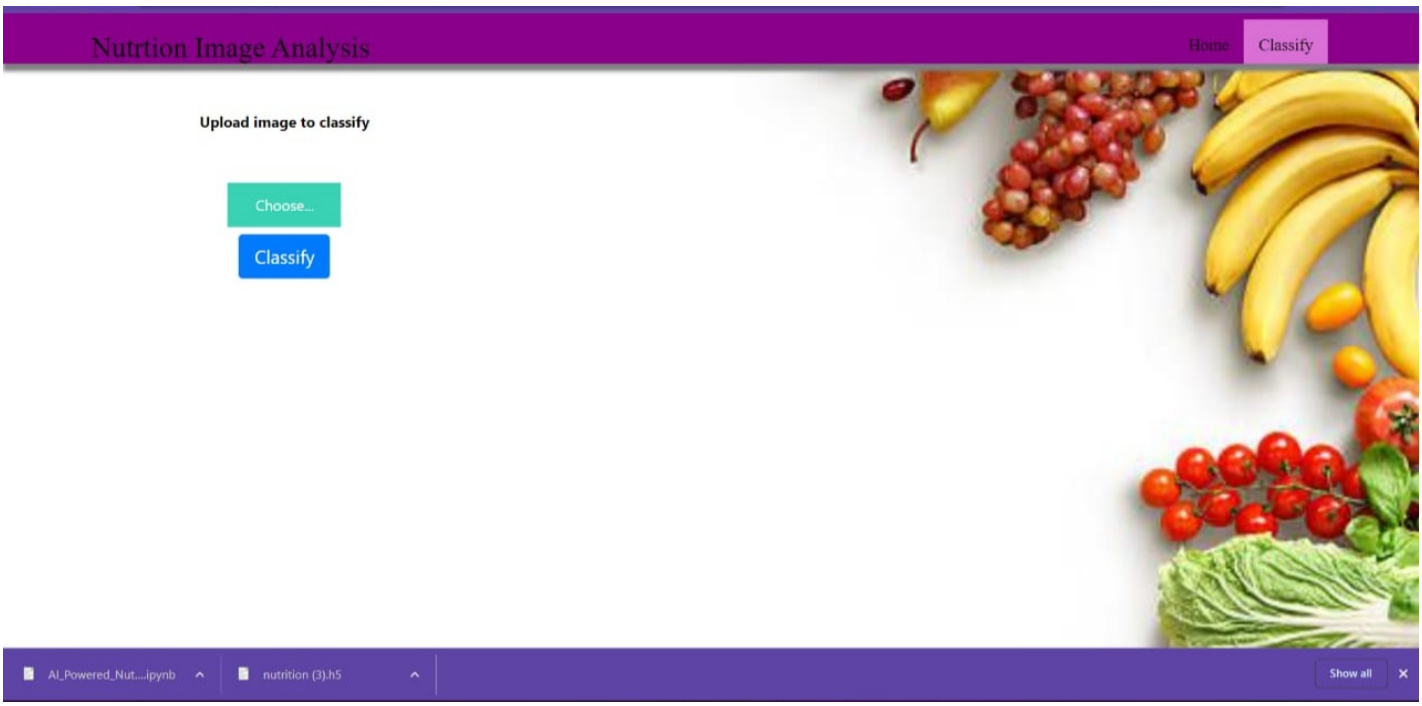

Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
D:\IBM\ibm\model.py
home.html
imageprediction.html
image.html
app.py
model.py
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True, vertical_flip=False)
test_datagen= ImageDataGenerator(rescale=1./255)
x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset project/TRAIN_SET",target_size
x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset project/TEST_SET",target_size=(
x_train.class_indices
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Convolution2D, MaxPooling2D, Flatten
model = Sequential()
model.add(Convolution2D(32, (3,3), input_shape=(64,64,3),activation = 'relu')) #Feature map
model.add(MaxPooling2D(pool_size = (2,2))) #Pooled matrix
model.add(Flatten())
model.summary()
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(5,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)
len(x_test)
model.fit_generator(x_train, steps_per_epoch=len(x_train), validation_data=x_test, validation_steps=len(x_t
model.save('fruits.h5')
ls
Name
Date Modified
Demo video
18-11-2022 09:59
static
15-11-2022 18:23
templates
16-11-2022 10:35
Uploads
16-11-2022 09:51
app.py
16-11-2022 09:39
fruits.h5
12-11-2022 21:16
model.py
18-11-2022 11:19
Help
Variable Explorer
Plots
Files
Console 1/A
Python 3.9.13 (main, Aug 25 2022, 23:51:50) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.
IPython 7.31.1 -- An enhanced Interactive Python.
In [1]:
IPython Console
History

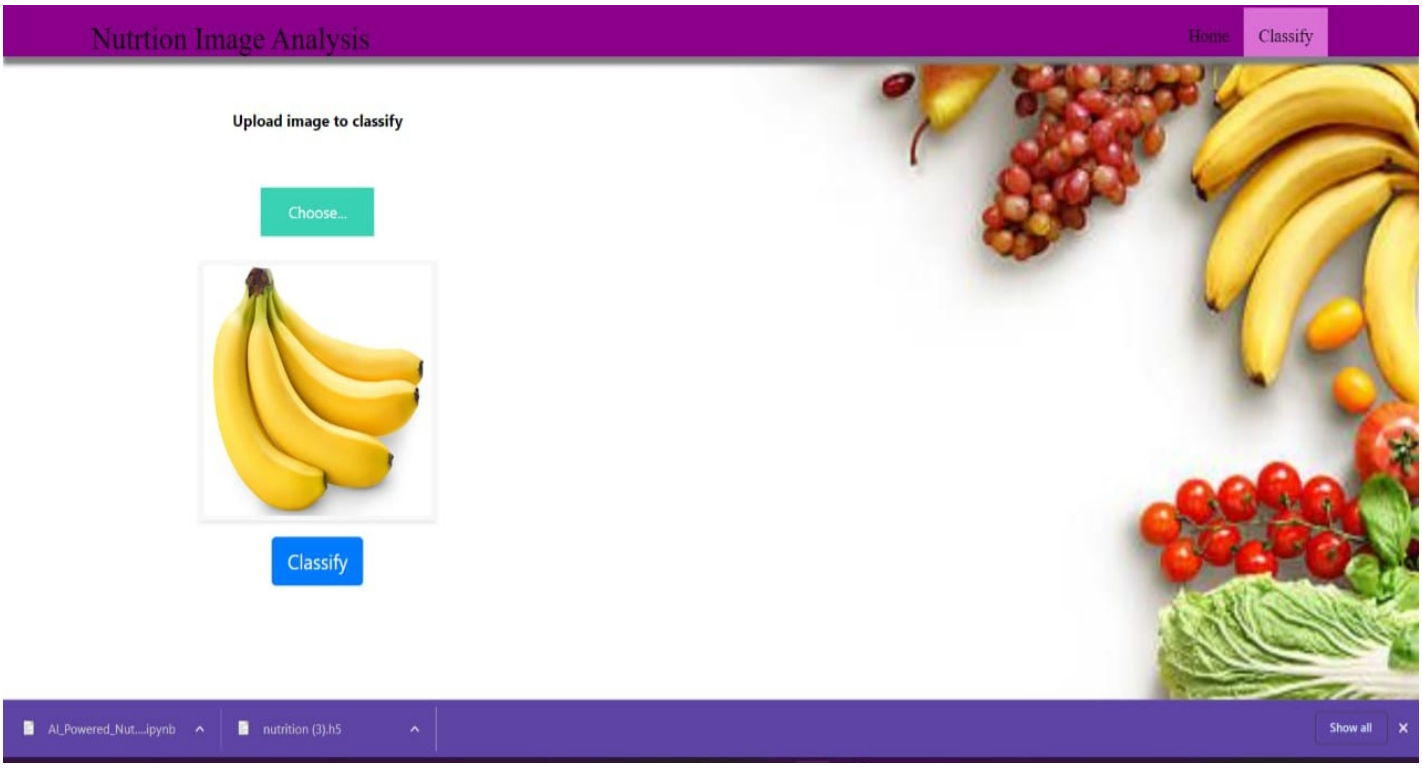

Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
D:\IBM\ibm\app.py
home.html
imageprediction.html
image.html
app.py
model.py
"""
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our application.
#request-for accessing file which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import load_model#to load our trained model
from tensorflow.keras.preprocessing import image
import requests
app = Flask(__name__,template_folder="templates") #initializing a flask app
# Loading the model
model=load_model('fruits.h5')
print("Loaded model from disk")
@ app.route('/')# route to display the home page
def home():
return render_template('home.html') #rendering the home page
@ app.route('/image1', methods=['GET', 'POST']) # routes to the index html
def image1():
return render_template("image.html")
@ app.route('/predict' ,methods=['GET','POST']) # route to show the predictions in a Web UI
def lanuch():
if request.method=='POST':
f=request.files['file'] # requesting the file
basepath=os.path.dirname('__file__') #storing the file directory
filepath=os.path.join(basepath,"uploads",f.filename) #storing the file in uploads folder
f.save(filepath) #saving the file
img=image.load_img(filepath,target_size=(64,64)) #load and reshaping the image
x=image.img_to_array(img) #converting image to an array
x=np.expand_dims(x,axis=0) #changing the dimensions of the image
Name
Date Modified
Demo video
18-11-2022 09:59
static
15-11-2022 18:23
templates
16-11-2022 10:35
Uploads
16-11-2022 09:51
app.py
16-11-2022 09:39
fruits.h5
12-11-2022 21:16
model.py
18-11-2022 11:19
Help
Variable Explorer
Plots
Files
Console 1/A
2022-11-18 12:05:02.728756: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Loaded model from disk
* Serving Flask app "app" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production deployment.
Use a production WSGI server instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
IPython Console
History

HOME PAGE

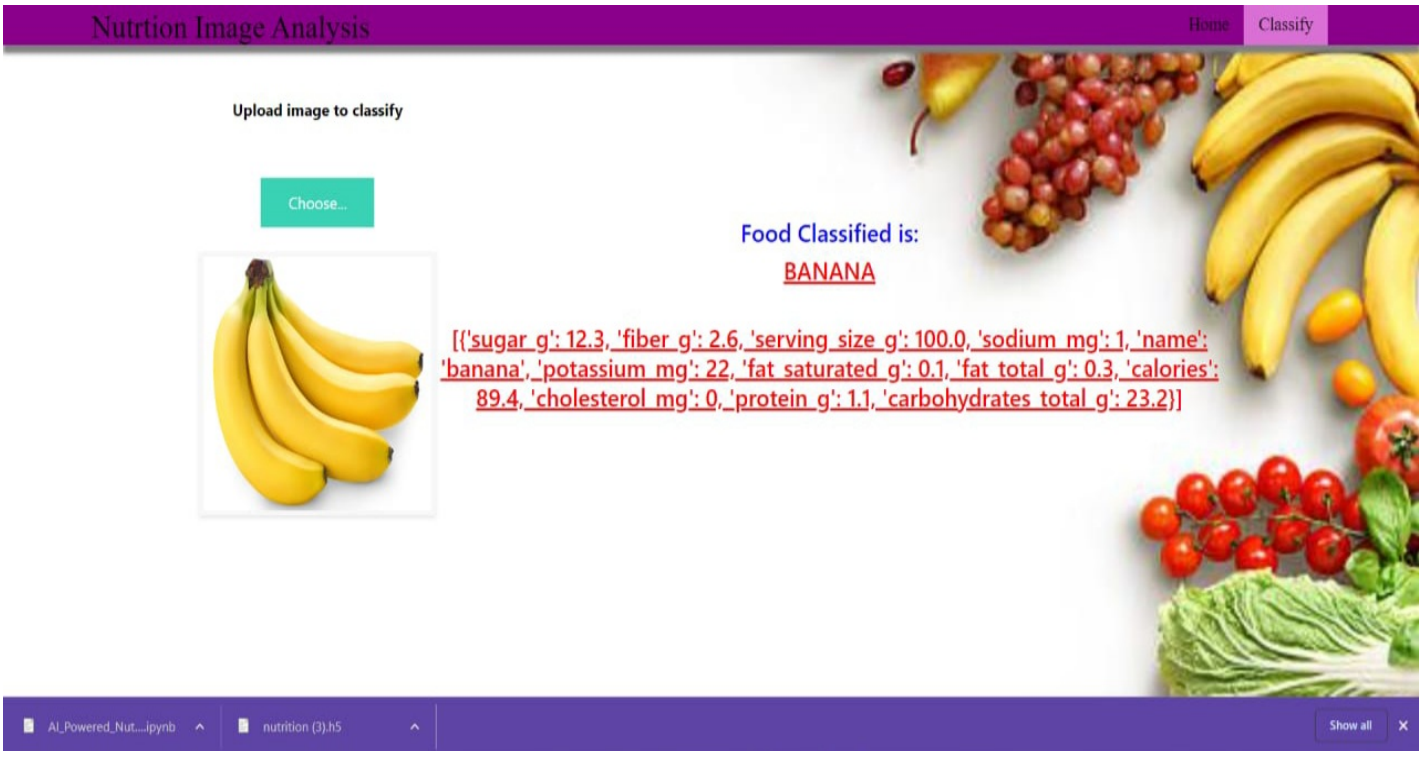


TEST PAGE





PREDICT PAGE



GITHUB AND PROJECT DEMO LINK

Github link:

https://github.com/IBM-EPBL/IBM-Project-42419-1660662385

Demo video link:

https://drive.google.com/drive/folders/1PkfOIoTF0rnSpScP2Uft7vQ1_Rv9IO0b