NALAIYA THIRAN PROGRAM

AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

PROJECT REPORT

SUBMITTED BY

RAMYA K	**722819205031**
ABINAYAA A	**722819205002**
RITHIKA S	**722819205033**
SOUNDARYA P S	**722819205045**

INDUSTRY MENTOR	**Ms. SRI TULASI**
FACULTY MENTOR	**Ms. MINU BALAKRISHNAN**

SRI ESHWAR COLLEGE OF ENGINEERING

AN AUTONOMOUS INSTITUITION

COIMBATORE

CONTENTS

7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**
    a. Feature 1
    b. Feature 2
8. **TESTING**
    a. Test Cases
    b. User Acceptance Testing
9. **RESULTS**
    a. Performance Metrics
10. **ADVANTAGES & DISADVANTAGES**
11. **CONCLUSION**
12. **FUTURE SCOPE**
13. **APPENDIX**

    Source Code

    GitHub & Project Demo Link

1. INTRODUCTION

1.1 PROJECT OVERVIEW

As the world becomes more health-conscious, there is an increasing need for technical solutions to meet this growing need. Numerous firms and websites that target this market have benefited in India from this global trend. These platforms have made use of AI and its different subsets to calculate calorie consumption and provide food suggestions for a balanced diet. The majority of the time, what we observe is that these platforms serve as a data repository, making real-time information available to many clients that work in this industry in exchange for a set of fees. In this article, we examine the top deep learning and artificial intelligence (AI)-based online services that offer real-time reports on dietary intake. The primary goal of the project is to construct a model that will be used to categorize fruits according to their various properties, such as color and form.

1.2 PURPOSE

Fruit features include color, shape, texture, and others. Here, users can take pictures of various fruits, which are subsequently uploaded to a trained algorithm for analysis. The main goal of the project is to construct a model that is used for classifying the fruit depending on the different nutrients. The model analyses the image and detects the nutrients based on the fruits, including glucose, fiber, protein, etc.

2. LITERATURE SURVEY

2.1. EXISTING PROBLEM

Over time, poor nutrition can increase the risk of contracting certain diseases and other health issues, including being overweight or obese, tooth decay, and high blood pressure. In the short term, it can increase tension, fatigue, and our capacity to function. Low intakes of specific nutrients are now strongly linked to the risk of acquiring chronic illnesses, such as various malignancies, heart disease, diabetes, osteoporosis, and depression. Inadequate vitamin consumption during pregnancy may have long-term effects on the unborn child's health.

2.2 REFERENCES

- T. Akram, H. H. Rizvi, S. A. Ali, S. M. Hamza and A. Ifthikhar, "OCR and Barcode based Halal and Health Analyzer," *2020 International Conference on Information Science and Communication Technology (ICISCT)*, 2020, pp. 1-5

- S. Majumder, T. Mondal and M. J. Deen, "A Simple, Low-Cost and Efficient Gait Analyzer for Wearable Healthcare Applications," in *IEEE Sensors Journal*, vol. 19, no. 6, pp. 2320-2329, 15 March15, 2019, doi: 10.1109/JSEN

- C. Martinez and J. D. Velasquez, "An Efficient New Scheme of Fitness Evaluation in Genetic Programming using the R Language," in *IEEE Latin America Transactions*, vol. 14, no. 4, pp. 1866-1869, April 2016

- R. Sugawara and M. Nakata, "Theoretical Analysis of Accuracy-Based Fitness on Learning Classifier Systems," in *IEEE Access*, vol. 10, pp. 64862-64872, 2022

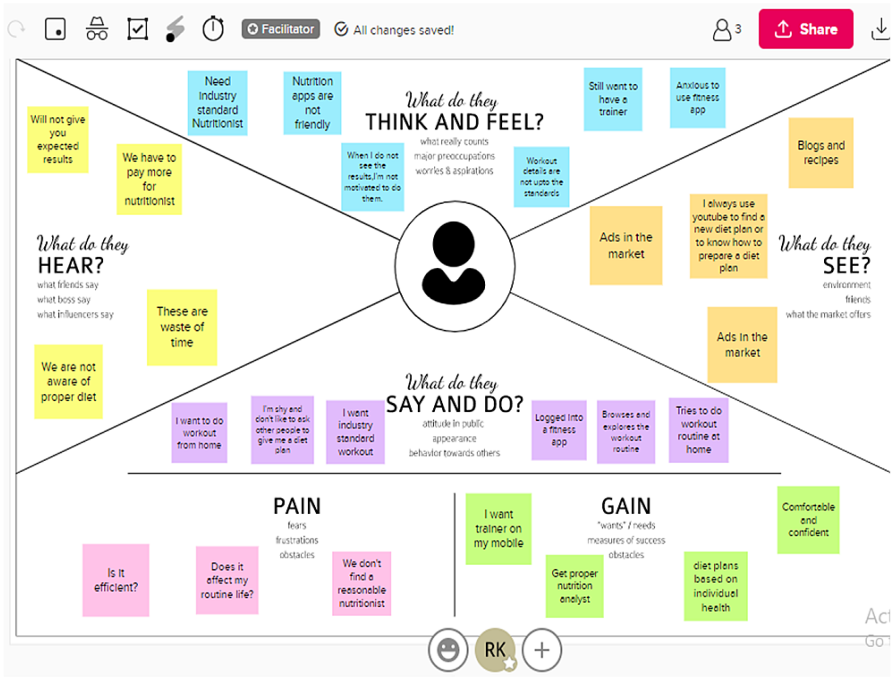
- Y. Qiu, X. Zhu and J. Lu, "Fitness Monitoring System Based on Internet of Things and Big Data Analysis," in *IEEE Access*, vol. 9, pp. 8054-8068, 2021

2.3 PROBLEM STATEMENT DEFINITION

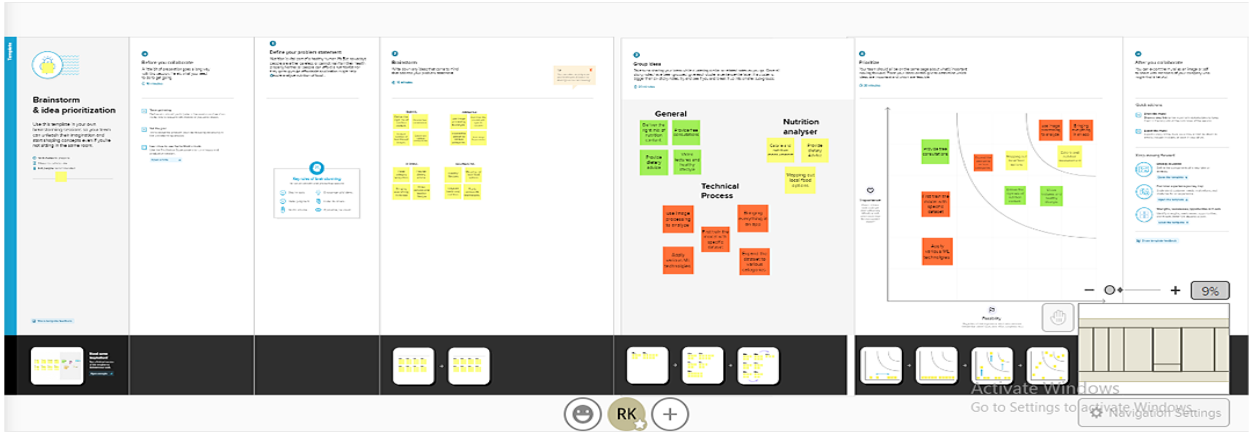
Your specific fitness objectives and current level of fitness will determine how much exercise you require. It's crucial to begin within your capabilities and pay attention to your body's signals regarding pain and injury.Being overweight, which is characterised by a high percentage of body fat, is a widespread health problem.Your risk of dying from hypertension, coronary heart disease, sleep apnea, endometrial, breast, prostate, and colon cancer increases if you are overweight or obese.Junk food has a high caloric content but little nutritional value, which causes obesity by increasing metabolic weight.A person who is obese is more likely to develop serious illnesses, including stoke and NCDs, in addition to the serious illnesses like diabetes or high cholesterol. The immune system could become compromised by overtraining.It makes the heart work harder. Inadequate exercise may result in fractures, sprains, strains, and other painful injuries.

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION AND BRAINSTORMING



3.3 PROPOSED SOLUTION

Problem Statement: To identify the amountofnutrition presentin the food and to help for their nutrientfitness. 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 color, 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, Fiber, Protein, Calories, etc.).

Idea / Solution Description: In this project we are going to identify amount of calories present in the food and recommend the nutrition food for their fitness. Providing accurate identification of the input data and nutritional information based on the data collected in accordance with the user's physical circumstances

Novelty / Uniqueness: It uses AI for classifying various nutrients in the fruit which will provide various recommendations as per the person’s BMI. These days, additional opportunities exist to assist people in understanding their daily eating habits, examining nutrition patterns, and maintaining a balanced diet thanks to new dietary evaluation and nutrition analysis technologies. • Food contamination, composition processing, and quantity control are all provided by analytical chemistry, which includes the process of analyzing the nutritional content of food. We just eat on a diet during the day. And a balanced diet is one that has the right amount of each vitamin we need each day. • A lifetime of healthy eating is necessary for optimal health. The risk of obesity, coronary heart disease, stroke, some malignancies, type 2 diabetes, high blood pressure, osteoporosis, and tooth decay can all be decreased by eating a balanced diet.

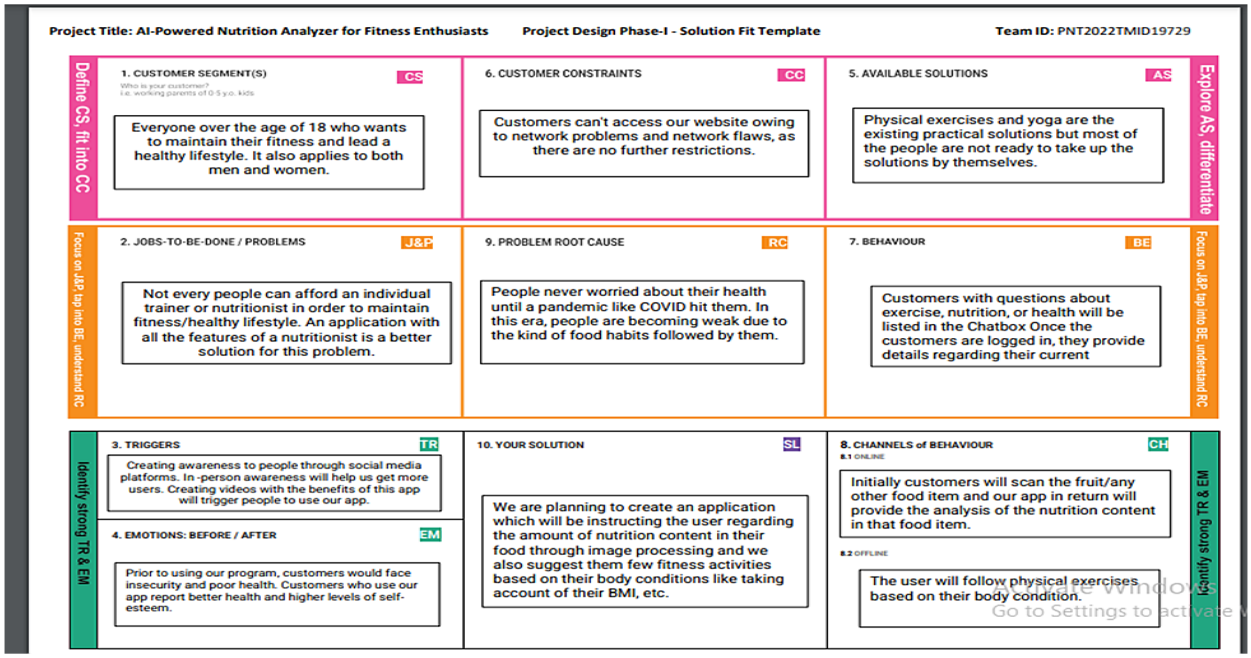
Social Impact / Customer Satisfaction: It doesn’t require individuals to afford their own fitness trainer . It is cost efficient and they can very well maintain their fitness. An individual's nutritional status and social, psychological, and cultural circumstances are related in a causeand-effect manner. One's eating habits are influenced by cultural norms, economic stability, and views toward health and disease. • A nutritious diet lowers children's chance of developing chronic diseases and promotes healthy growth and development. Adults who follow a healthy diet have a lower risk of obesity, heart disease, type 2 diabetes, and several malignancies. • In addition, diet culture influences the rising prevalence of anorexia, bulimia, binge eating disorder,

and avoidant/restrictive food intake disorder, even though negative cultural standards are only one of many factors that contribute to the development of mental health issues and eating disorders.

Business Model: Business model for this application is to reducethe people weightwith healthy nutrition. Consultation with local nutritionists and trainers for customized strategies. Adopt a particular diet under the guidance of a professional. Promote nutritional supplements and fitness equipment. Advertising for health clubs and hospitals.

Scalability: Scalability of the application is high as it can be used by all age group of people and people with any kind of co-morbidities. Make at least half of the grains you eat each day whole grains. Whole grain products are a significant source of fibre and energy. A healthy diet can help you avoid many chronic, non-communicable diseases like cancer, diabetes, and heart disease. A balanced diet that limits salt, sugar, saturated fats, and trans fats from industrial production is crucial for good health.

3.4 PROBLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

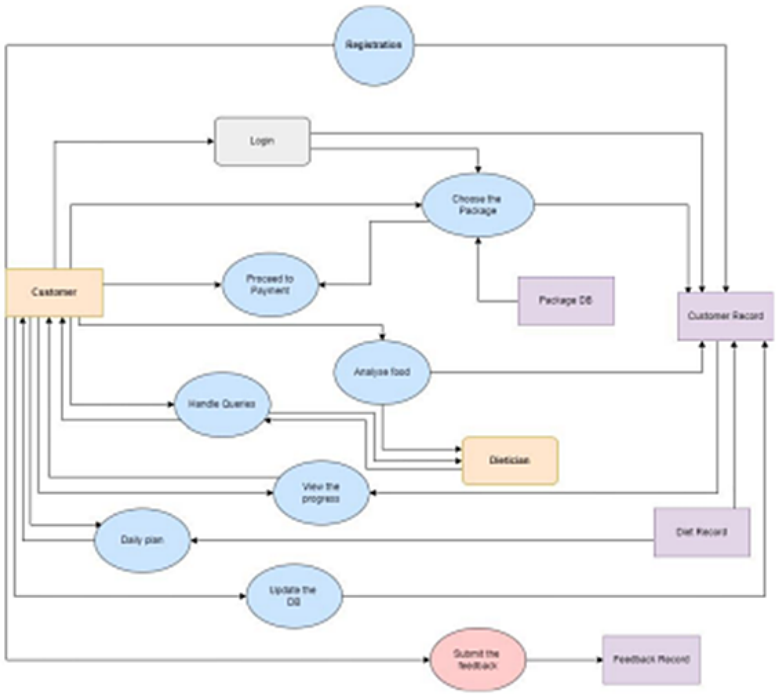
- User Registration
- User Confirmation
- User Login
- Choose package
- Generate the daily plan
- Query

4.2 NON-FUNCTIONAL REQUIREMENTS

- Usability
- Security
- Efficiency
- Portability
- Scalability
- Reliability

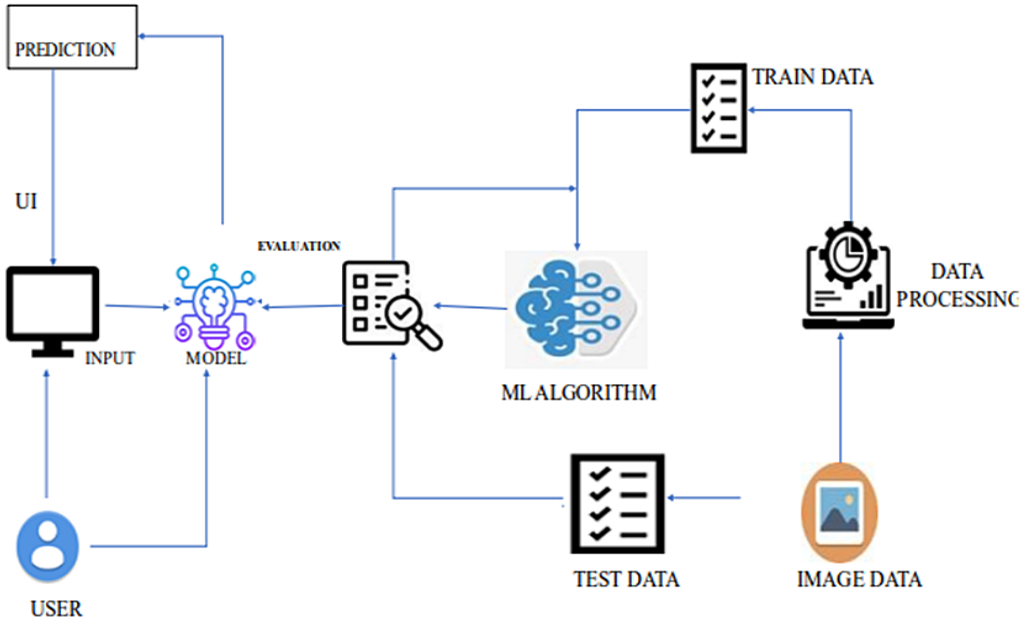
5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

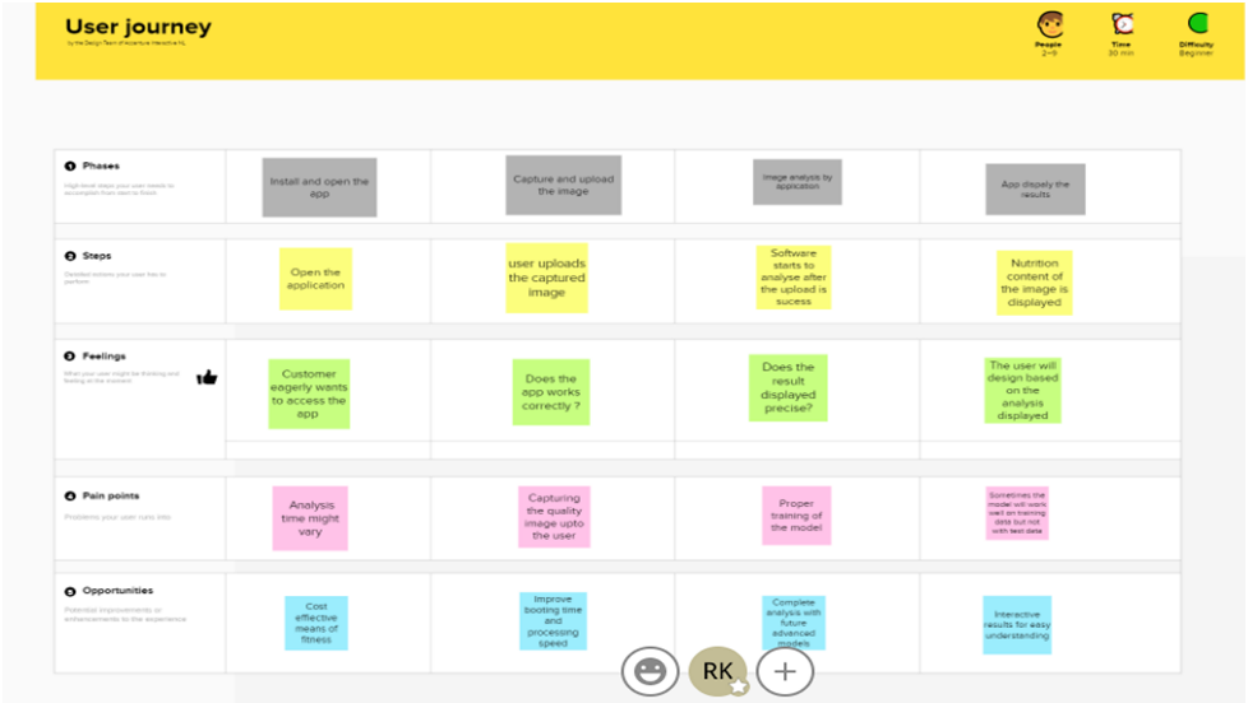


5.2 SOLUTION AND TECHNICAL ARCHITECTURE

We are planning to create an application which will be instructing the user regarding the amount of nutrition content in their food through image processing and we also suggest them few fitness activities based on their body conditions like taking account of their BMI, etc. Initially, User will give the image of the food item as input. Our model will process the image and predict the nutrition in the food item. To do this process without any errors, we will be training our model with more relatable training and testing dataset.



5.3 USER STORIES



6. SPRINT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Abinayaa A Ramya K Rithika S Soundarya PS

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Fitness tips and basic exercises	USN-13	As a user, I can follow some fitness tips and I can maintain weight as required	5	Medium	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-4	Home Remedies	USN-14	As a user, I can follow some natural home remedies for common diseases like cold, caugh, fever and treat myself	5	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-4	Optimize the user experience with the app	USN-15	As a developer, I have to provide clean and smooth interface to my user	5	Hiigh	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-4	Payment Gateway for purchasing package	-	As a developer, I have to create an environment which makes user feel to compete his/her payments with payment options	3	Medium	Abinayaa A Ramya K Rithika S Soundarya PS

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Model Building	USN-6	Development of the model with the prepared dataset	2	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-2	Main Interface	USN-7	As a user, I can view my calorie intake by clicking the photo of the food I eat	2	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-2	Package,Dashboard	USN-8	As a user, I can choose variety of packages as per requirements	3	Medium	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-3	Diet plan for free users	USN-9	As a dietician, I provide daily plans for the betterment of the user	4	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-3	Personalized user food habit-based diet plan for premium users	USN-10	As a premium, user,I can use to follow diet plan based on my food habits or the generalized one	3	Medium	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-2	User image analysis	USN-11	As a user, I can track my calorie intake, and know about my food in detail	5	High	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-3	Improve efficiency of AI model	-	As a user, I have to give a better model that will analyse food precisely and provide accurate results	3	Medium	Abinayaa A Ramya K Rithika S Soundarya PS
Sprint-2	User Analysis Record	USN-12	As a user, I can check the previous records and I can analyse my food habits	4	Medium	Abinayaa A Ramya K Rithika S Soundarya PS

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	26	04 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	11	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	18	18 Nov 2022

7. CODING AND SOLUTIONING

7.1 FEATURE 1

In [ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

In [ ]:
```
# Unzipping the dataset
!unzip '/content/drive/MyDrive/Dataset.zip'
```

```
Archive:  /content/drive/MyDrive/Dataset.zip
replace Dataset/TEST_SET/APPLES/151_100.jpg? [y]es, [n]o, [A]ll, [N]one, [r]ename:
```

Image Preprocessing

In [6]:
```
#Importing The ImageDataGenerator Library
from keras.preprocessing.image import ImageDataGenerator
```

Image Data Augmentation

In [7]:
```
#Configure ImageDataGenerator Class
train_datagen = ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
```

Applying Image DataGenerator Functionality To Trainset And Testset

In [8]:
```
#Applying Image DataGenerator Functionality To Trainset And Testset
x_train = train_datagen.flow_from_directory(
    r'/content/Dataset/TRAIN_SET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')
#Applying Image DataGenerator Functionality To Testset
x_test = test_datagen.flow_from_directory(
    r'/content/Dataset/TEST_SET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')
```

```
Found 2626 images belonging to 5 classes.
Found 1055 images belonging to 5 classes.
```

In [9]:
```
#checking the number of classes
print(x_train.class_indices)
```

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

In [10]:
```
#checking the number of classes
print(x_test.class_indices)
```

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

In [11]:
```
from collections import Counter as c
c(x_train .labels)
```

Out[11]:
```
Counter({0: 606, 1: 445, 2: 479, 3: 621, 4: 475})
```

7.2 FEATURE 2

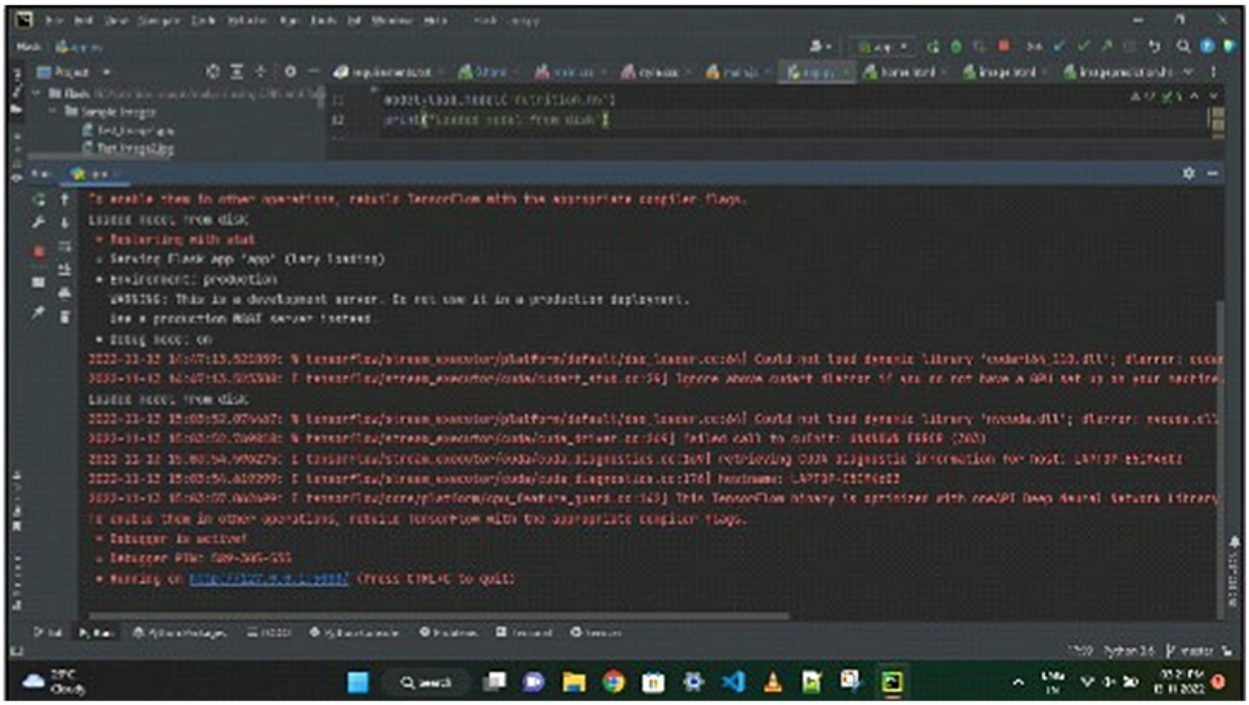
```python
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our application.
#request-for accessing file which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models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

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


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

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



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

8. TESTING

8.1 TESTCASES

8.2 USER ACCEPTANCE TESTING

9. RESULTS



10. ADVANTAGES

Nutritional analysis is the process of determining the nutritional content of food. Nowadays, new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, explore nutrition patterns, and maintain a healthy diet. The advantages of using this application include easy maintenance of our daily diet. It helps us maintain our health in proper condition. It replaces a physical trainer without compromising quality, at a lower cost, and with even more efficiency.

11. CONCLUSION

Good nutrition has been shown to support cognitive growth and academic performance in addition to enhanced physical health and a decreased risk of disease. This powered nutrition analyzer for fitness enthusiasts. If left to their own devices, kids won't always choose healthful food. Healthy body and mind depend on a balanced diet and proper meal scheduling. Nowadays, the majority of nations employ health education program in schools that involve student nutrition, vitamin and mineral supplements.

12. FUTURE SCOPE

AI is transforming the health sector. AI is currently being used to change people's habits, in addition to being primarily utilised to improve marketing and sales decisions.In future , this application can be implemented with even more specialized features like recommending dietary just by looking a person’s image , analyzing a person using person’s body parts or organs image. Image processing techniques can be very well exploited along with this application.

13. APPENDIX

GITHUB link

https://github.com/IBM-EPBL/IBM-Project-5567-1658808541