AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

A PROJECT REPORT

Submitted by:

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1.INTRODUCTION

1.1 PROJECT OVERVIEW

Food is essential for human life and has been the concern of many health care 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.).

1.2 PURPOSE

Nutrition analysis refers to the process of determining the nutritional content of foods and food products. Nutritional Analysis detects the exact nutritional value of any given fruit item. It determines the percentage of macro and micro-nutrients present in that fruit item as well as the presence of inhibitors, toxic chemicals, or any other new component. Nutrition is the process by which important beneficial biomolecules or Nutrients, after reaching their destination within the body, positively helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenish malnourishment, and strengthening immunity. It helps the fitness enthusiast to maintain their body fitness and live a healthy live. It helps the people to know the nutritional values of the fruit .

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 plans based on actual data of nutrition present in various food, they tend to either give 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.

The model will detect the image but sometimes produce incorrect output because of less trained data. It requires large dataset to produce accurate result. It takes more time to predict the nutritional values of the fruit. The accuracy in predicting the image and displaying the nutritional value is low.

2.2 REFERENCES

TITLE: Fruit detection from images and displaying its nutrition value using Deep Alex Network

AUTHORS : B.Divya Shree, R.Brunda and N.Shobha Rani

ABSTRACT:

This paper presents a simple and efficient approach to perform fruit detection and predict nutrition information of the fruits using deep Alex networks (DAN).The datasets employed for analysis are acquired from fruit 360 database of image processing challenges. Fruit categories include apples, berries, banana, grape, papaya, peach, avocado, and multiple flavors of apple. And also, the experimentations are carried out on various other fruit samples collected from multiple Web repositories. The network architecture is as usual comprised of to five convolution layers and three fully connected layers including the max pooling, RELU layers.

TITLE : Fruit recognition system for calorie management

AUTHORS : Vishnu, B.Sindhushree, A.punith, Aishwarya

ABSTRACT:

Fruits contain important vitamins, minerals and fiber. A diet comprising mainly of fruits and vegetables can help prevent cancer, diabetes and heart diseases. In this paper we execute in an effective type of recognize, fruit recognition is carried out using CNN algorithm. A set of fruit image is trained in a CNN model for recognition a standard nutrition table is referred to measure calorie since using an image to measure calorie is an arduous task. the image is captured by the raspberry pi through the webcam.

TITLE : Object detection using convolutional neural network in the application of supplementary nutrition value of fruits.

AUTHORS : Anita Chaudhari, Shraddha More, Sushil Khane, Hemali Mane, Pravin Kamble

ABSTRACT:

Object image detection is unique most auspicious claims of visual object recognition, since it will help to estimate nutrition calories and improve commons ingestion habits. The robotic fruit harvesting system is developed with the help of fruit detection algorithm using multiple structures identical intensity, color, alignment and edge of the fruit images. With the help of improved multiple feature based algorithm the detecting effectiveness is attained up to 90% for various fruit items.

TITLE : Deep learning based fruit recognition

AUTHORS : Qian Yu , Dongyuan Mao, Jingfan Wang

ABSTRACT:

In this research paper, authors proposed a CNN-based fruit recognition method on the fruit recognition problem: the transfer learning and the fine-tuning on the whole architecture based on the Inception-ResNet and Inception V3 model. Here, algorithm is performed on the Fruit-101 dataset and obtained impressive recognition results: Inception-ResNet converges much faster and achieves top-1 accuracy of 72.55% and top-5 accuracy of 91.31%.

TITLE : Deep fruit : Deep learning - based fruit image recognition for computer-aided dietary assessment.

AUTHORS : Chang Liu, Yu Cao, Yan Luo, Guanling Chen, VinodVokkarane, Yunsheng Ma

ABSTRACT:

In this paper, authors have proposed a new deep learning-based approach to address the fruit image recognition problem. Deep learning, aims to learn multiple levels of representation and abstraction that help interpreting knowledge from data such as images, videos, audio, and text, is making astonishing gains in computer vision, speech recognition, multimedia analysis. Specifically, authors proposed Convolutional Neural Network (CNN)-based algorithms with a few major optimizations, such as an optimized model and an optimized convolution technique.

TITLE : Fruit Image Classification with Convolutional Neural

Network

AUTHORS : MdTohidul Islam, B.M. NafizKarimSiddique,

SagidurRahman, TaskeedJabid

ABSTRACT:

In this paper authors tried to classify fruit images using convolutional neural network. Fruit classification is very difficult task because there is high variance in same category of fruit images. Authors developed a convolutional neural network model to classify fruit images in fruit-11 dataset. Authors also used a pre-trained Inception V3 convolutional neural network model to classify fruit images.

2.3 PROBLEM STATEMENT DEFINITION

Consumption of fruits in day- to- day salutary plays an important part in the nutritive supplement input of humans. Estimation of right nutrient input through fruits consumption has come decreasingly significant in order to maintain the proper health of well- being.
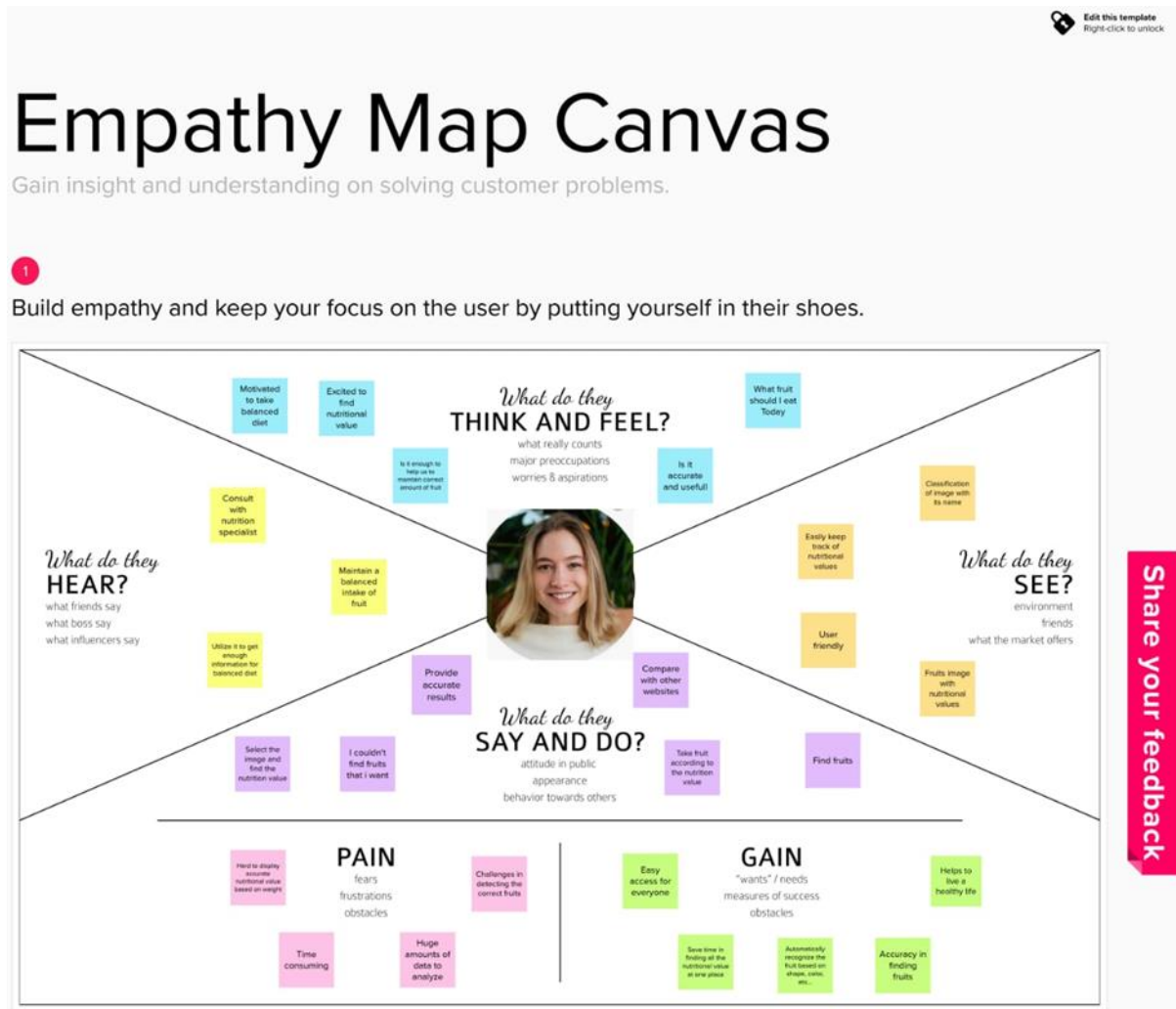
In this paper, the recommendations regarding the nutrition details of the fruits. In India, because of unhealthy and in ordinate input fruit causes weight gain, Diabetes. currently new salutary assessment and nutrition and nutrition analysis tool are available. nutritive analysis is the process of determining the nutritive content of food.

In this design we use AI technology to identify the fruit rightly and directly and also calculated the quantum of nutrition like sugar, fiber, protein, calories, etc. This helps the fitness sucker to track and cover their input nutrition and calorie input.
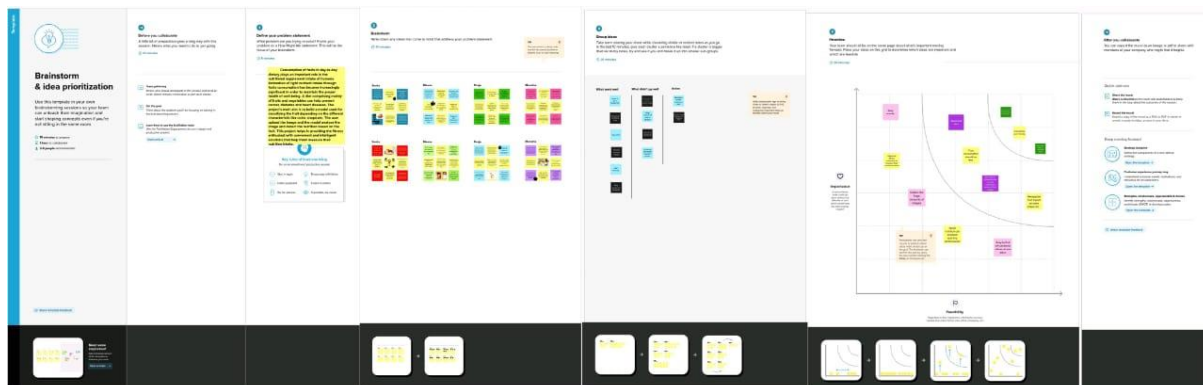
Fruits are a rich source of energy, minerals, and vitamins. There are many fruits types such as: 'apples': 'banana', 'orange', 'pineapple', 'watermelon'. The project's main aim is to build a model used for classifying the fruit depending on the different characteristics like color, shape, texture, etc. Here the user can capture images of different fruits and then the image will be sent to the trained model. The model analyses the image and detects the nutrition based on the fruits like (Sugar, Fiber, Protein, Calories, etc.). A diet comprising mainly of fruits and vegetables can help prevent cancer, diabetes, and heart diseases. In this paper we execute an effective type of recognition, fruit recognition is carried out using the CNN algorithm.

3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

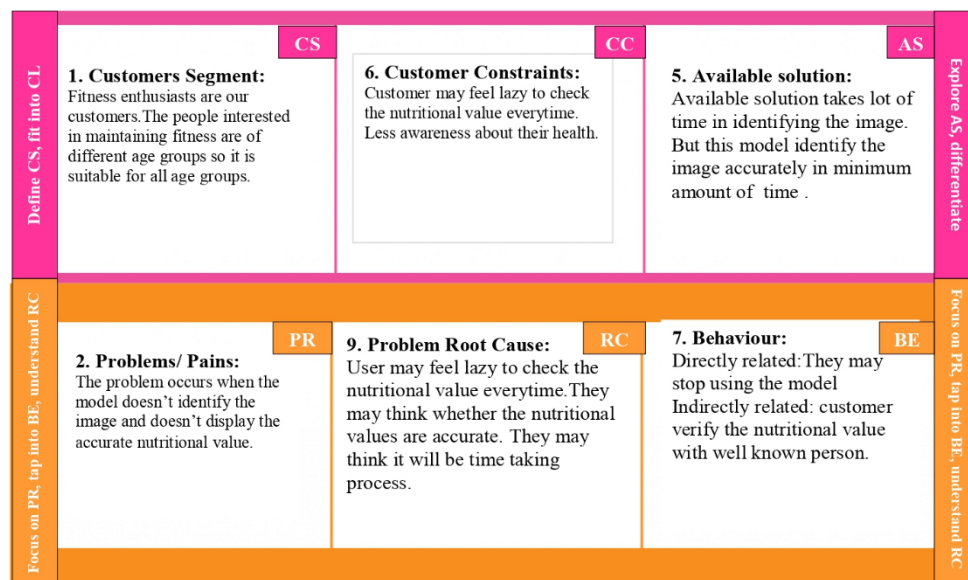## 3.2 IDEATION AND BRAINSTORMING

3.3 PROPOSED SOLUTION

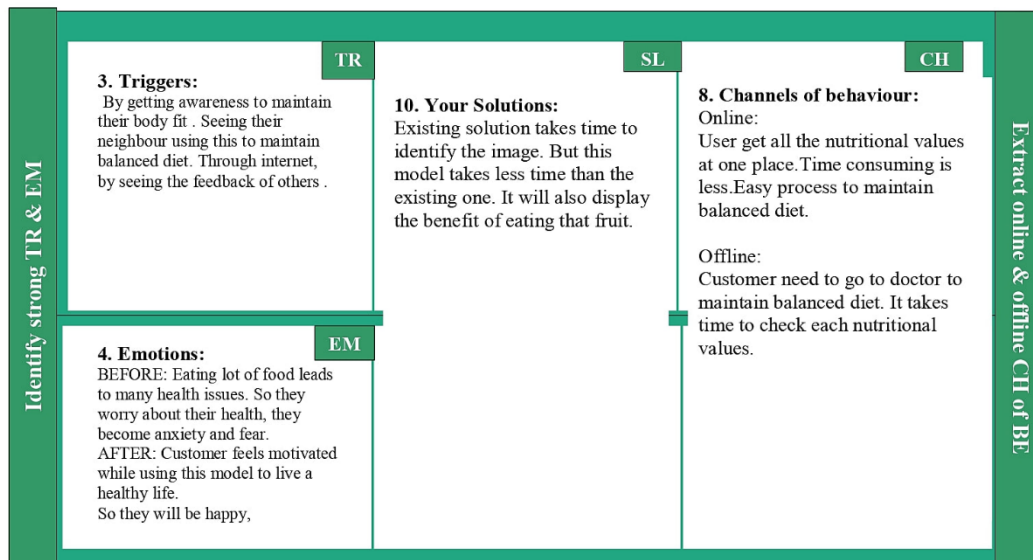| S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	Nutritional analysis is the process of determining the nutritional content of food. Consumption of fruits in day-to-day dietary plays an important role in the nutritional supplement intake ofhumans. Estimation of right nutrient intake through fruits consumption has become increasingly significant inorder to maintain the proper health of well-being. The model should helps to analyses the image and detects the nutrition based on the fruits.
2.	Idea / Solution description	The user can capture images of different fruits and then the image willbe sent to the trained model. The model analyses the image and detects the nutrition based on the fruits. In this project we use AI and image classification technology to identify the fruit correctly and accurately. It also calculates the amount of nutrition like sugar, fiber, protein, calories, etc.
3.	Novelty / Uniqueness	This model is user friendly. It is more accurate in identifying the fruits. It will display the nutritional values of the fruit. The model also displays the benefit of eating the fruit. This will help the fitness enthusiast to know the medicinal value of the fruit and motivate them to take the fruit.
4.	Social Impact / Customer Satisfaction	People will get motivated while using this model. They can do weight management, strengthen their bones and muscles, manage chronic health condition & disabilities. The fitness enthusiast and other people can easily use this model. They can find the all the nutritional value at one place which attract more people to use this model. This will provide more accuracy in identifying the correct image. This will make the customer to use this model with full satisfaction. This helps the people to maintain healthy diet to live a healthy life.

5.	Business Model (Revenue Model)	Social media is the best way to spread the word about our application. And with the influencers we can attract the normal people. It helps in Clustering and targeting the fitness people with the help of local gyms. We can also provide this model with subscription basis so that the user can get additional information to keep their body fit and healthy.
6.	Scalability of the Solution	This model can be easily accessed by all the people. This will attract more people to use this model. It keeps the people motivated and engaged. By tracking the nutritional value, the people can have correct intake of fruits which helps them to live a healthy life.

3.4 PROBLEM SOLUTION FIT

Project Title: AI-powered nutrition analyzer for fitness enthusiasts

Team ID: PNT2022TMID39906

3. Triggers:
By getting awareness to maintain their body fit . Seeing their neighbour using this to maintain balanced diet. Through internet, by seeing the feedback of others .

10. Your Solutions:
Existing solution takes time to identify the image. But this model takes less time than the existing one. It will also display the benefit of eating that fruit.

8. Channels of behaviour:
Online:
User get all the nutritional values at one place.Time consuming is less.Easy process to maintain balanced diet.

Offline:
Customer need to go to doctor to maintain balanced diet. It takes time to check each nutritional values.

4. Emotions:
BEFORE: Eating lot of food leads to many health issues. So they worry about their health, they become anxiety and fear.
AFTER: Customer feels motivated while using this model to live a healthy life.
So they will be happy,

Identify strong TR & EM

Extract online & offline CH of BE

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
FR-2	User Confirmation	• Confirmationvia Email • Confirmationvia OTP
FR-3	User Login	• Login throughEmail • Login throughGoogle
FR-4	Uploading image	• Upload image from gallery • Upload imagefromInternet
FR-5	Storing the result	• Store the result in Downloads • Store the result in a folder

4.2 NON-FUNCTIONAL REQUIREMENTS

NFR No	Non-Functional Requirement	Description
NFR-1	Usability	Easy to use by all user.
NFR-2	Security	User information willnot be shared to anyone.
NFR-3	Reliability	The result of nutritional value willbe displayed for all the fruits.
NFR-4	Performance	Accuracy of nutritional value will be high.
NFR-5	Availability	The nutritional value of the fruit will be available all the time.
NFR-6	Scalability	Supports variousfruit items.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

Input - Upload Image

UI

Image Segmentation

CNN
- Feature Learning
- Classification

Nutrition Analaysis

Display the fruit nutrition

DATASET

Trained Image Dataset

Test Image Dataset
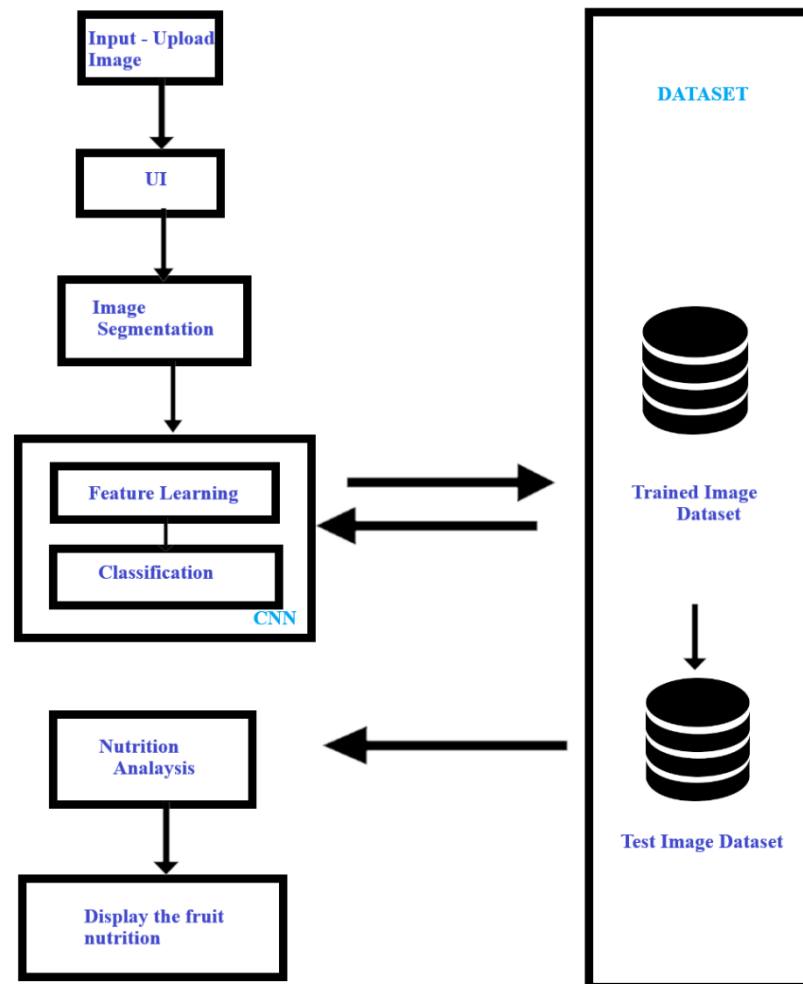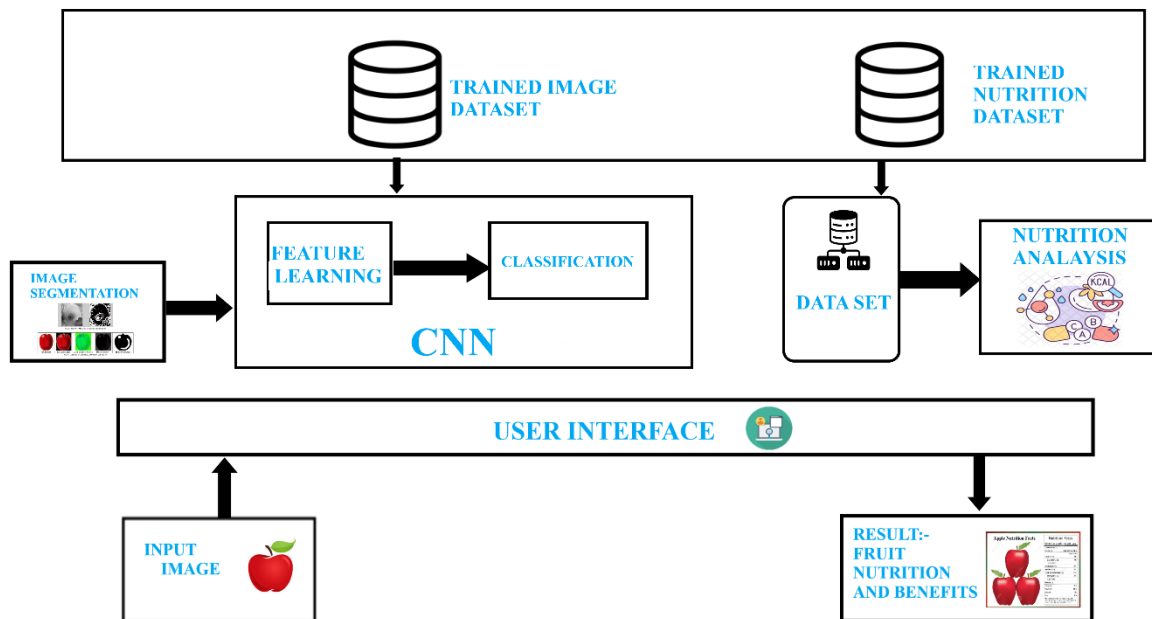
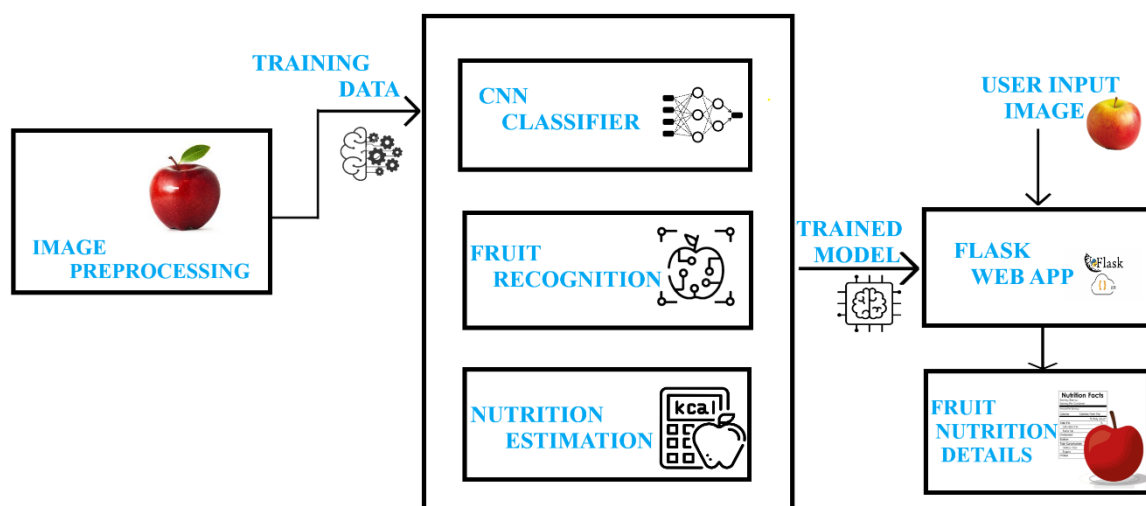## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

FIGURE : 6- Solution Architecture

FIGURE : 7- Technical Architecture

5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Relea-se
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-2
		USN-3	As a user, I can register for the application through Google.	I can register & access the dashboard with Google Login.	Low	Sprint-3
	Login	USN-4	As a user, I can log into the application by entering username & password	I can login the application by entering password	High	Sprint-1
	Dashboard	USN-5	As a user, I can access any of the options available there.	I can access my resource	High	Sprint-4
	Rating	USN-6	As a user, Rating the services	Maintain and Improve the performance	High	Sprint-4
Cust o-mer Care Exec-utive	Feature Extraction	USN-1	As a user, I can input any of the image of fruit in the upload field and will get the results of the image.	As a user I will know the nutrients in the fruit.	High	Sprint-1
Diet Chart	Customer record	USN-1	Based on the customer height , weight etc… suggest the nutrition fruit for the customer	Improve the customer health results	High	Sprint-4
Administr-ator	Prediction	USN-1	Here the model will predict the image using deep learning algorithms Such as CNN.	In this I can have correct prediction on the particular algorithms.	High	Sprint-2
	Classifier	USN-2	Here I will send all the model outputs to classifier in order to produce final results.	In this I will find the correct answers for producing the results.	Medium	Sprint-3

6 . PROJECT PLANNING & SCHEDULING

6.1 PREPARE MILESTONE AND ACTIVITY LIST

Milestone	Activity
Data Collection	Collecting images of food items apples,bananas, oranges, pineapples, watermelons for analysis.
Image Preprocessing	Increasing the amount of data by generating new datapoints from existing data. Applying image data generator functionality to train and test dataset.
Modeling Phase	Building the model using a deep learning approach and adding CNN layers. Training, saving, testing and predicting the model. Database creation for the input classes.
Development phase	Dashboard creation. Creating input page. Creating result page.
Application Phase	Building the python code and importing the flask module into the project. Create the Flask application and load the model. Connecting front end and back end and performing routing and running the application.
Testing Phase	Checking usability and accessibility. Checking scalability and performance of the application.

6.2 SPRINT DELIVERY PLAN

Product Backlogs , Sprint Schedule , Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story point	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	Sneha V Pooja S Monisha S Meena S
Sprint 2	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	2	High	Sneha V Pooja S Monisha S Meena S
Sprint 3	Registration	USN-3	As a user, I can register for the application through Phone number	1	Low	Sneha V Pooja S Monisha S Meena S
Sprint 1	Login	USN-4	As a user, I can log into the application by entering username & password	2	High	Sneha V Pooja S Monisha S Meena S
Sprint 4	Dashboard	USN-5	As a user, I can access any of the options available there.	2	High	Sneha V Pooja S Monisha S Meena S

Sprint 4	Rating	USN-6	As a user, Rating the services	1	Low	Sneha V Pooja S Monisha S Meena S
Sprint 1	Feature Extraction	USN-7	As a user, I can input any of the image of fruit in the upload field and will get the results of the image.	2	High	Sneha V Pooja S Monisha S Meena S
Sprint 4	Customer record	USN-8	Based on the customer height , weight etc… suggest the nutrition fruit for the customer.	1	Low	Sneha V Pooja S Monisha S Meena S
Sprint 2	Prediction	USN-9	Here the model will predict the image using deep learning algorithms Such as CNN.	2	High	Sneha V Pooja S Monisha S Meena S
Sprint 3	Classifier	USN-10	Here I will send all the model outputs to classifier in order to produce final results.	2	High	Sneha V Pooja S Monisha S Meena S

Project Tracker , Velocity And 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 202
Sprint – 2	20	6 days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint – 3	20	6 days	07 Oct 2022	12 Nov 2022	20	12 Nov 2022
Sprint – 4	20	6 days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 REPORT FROM JIRA

VELOCITY:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint).Let's calculate the team's average velocity (AV) per iteration unit (story points per day).

$$Average\ Velocity = 20\ /\ 6 = 3.33$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.
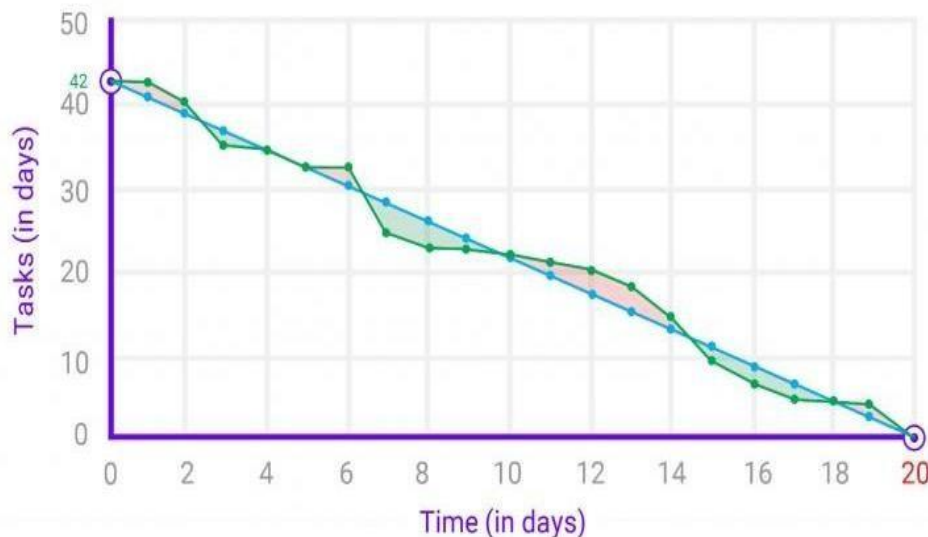
7. CODING AND SOLUTIONING

7.1 FEATURE 1 – FLASK FILE UPLOADING

Handling file upload in Flask is very easy. It needs an HTML form with its enctype attribute set to 'multipart/form-data', posting the file to a URL. The URL handler fetches file from request.files[] object and saves it to the upload folder.


```python
# -*- coding: utf-8 -*-
"""
Created on Wed Nov 16 22:46:44 2022

@author: SNEHA
"""

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


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


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

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



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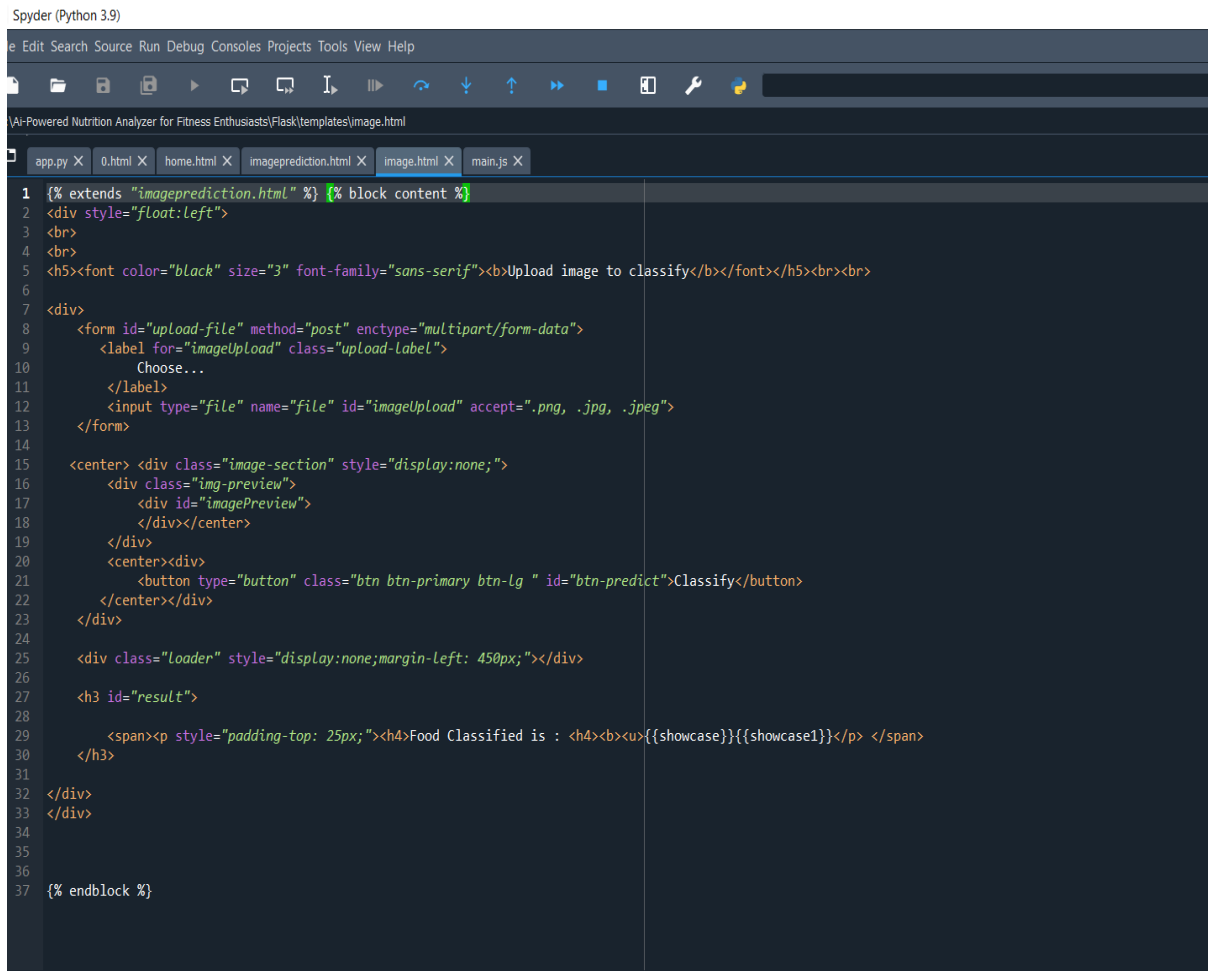
e Edit Search Source Run Debug Consoles Projects Tools View Help

\Ai-Powered Nutrition Analyzer for Fitness Enthusiasts\Flask\app.py

app.py ✕

```python
38          basepath=os.path.dirname('__file__')#storing the file directory
39          filepath=os.path.join(basepath,"uploads",f.filename)#storing the file in uploads folder
40          f.save(filepath)#saving the file
41
42          img=image.load_img(filepath,target_size=(64,64)) #load and reshaping the image
43          x=image.img_to_array(img)#converting image to an array
44          x=np.expand_dims(x,axis=0)#changing the dimensions of the image
45
46          pred=np.argmax(model.predict(x), axis=1)
47          print("prediction",pred)#printing the prediction
48          index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']
49
50          result=str(index[pred[0]])
51
52          x=result
53          print(x)
54          result=nutrition(result)
55          print(result)
56
57          return render_template("0.html",showcase=(result),showcase1=(x))
58  def nutrition(index):
59
60
61      url = "https://calorieninjas.p.rapidapi.com/v1/nutrition"
62
63      querystring = {"query":index}
64
65      headers = {
66          'x-rapidapi-key': "5d797ab107mshe668f26bd044e64p1ffd34jsnf47bfa9a8ee4",
67          'x-rapidapi-host': "calorieninjas.p.rapidapi.com"
68          }
69
70      response = requests.request("GET", url, headers=headers, params=querystring)
71
72      print(response.text)
73      return response.json()['items']
74  if __name__ == "__main__":
75      # running the app
76      app.run(debug=False)
77
```

7.2 FEATURE 2- UPLOAD IMAGE WITH PREVIEW

A preview refers to a feature that lets you glimpse or view something in part or whole without it being opened. A picture preview would show a small version of the picture and give you a good idea what each picture is without opening each picture it is a useful feature created using JavaScript.

7.3 FEATURE 3 – PREDICT IMAGE

8. TESTING

8.1 TEST CASES

TestcaseID	Feature type	components	Test scenario	Pre-Requisites	Steps	TestData	Expected result	Actual result	Status
Home page_TC_1	Functional	Home page	Display then content in the home page.	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the content given in HTML code	Working as expected	pass
Classify page_TC_2	Functional	Classify page	Display the Classify button.	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the button to next page	Working as expected	pass
Home page_TC_3	Functional	Classify page	Show upload button in blue colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the button in the given colour.	Not working as expected	fail
Classify page_TC_4	Functional	Home page	Display the heading in colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the heading in the given colour	Not working as expected	fail
Classify page_TC_5	Functional	Classify page	Display the choose option in green colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the choose option in green colour	Not working as expected	fail

TEST CASE -2

TestcaseID	Feature type	components	Test scenario	Pre-Requisites	Steps	TestData	Expected result	Actual result	Status
Home page_TC_1	functional	Homepage	Display then content in the home page.	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run css File	localhost	Display the content given in HTML code	Not Working as expected	fail
Classify page_TC_2	functional	Classify page	Display the Classify button.	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run css file	localhost	Display the button to next page	Not Working as expected	fail

Home page_TC_3	functional	Classify page	Show upload buttonin blue colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run css File	localhost	Display the button in the given colour.	working as expected	pass
Classify page_TC_4	functional	Homepage	Display the headingin colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run css File	localhost	Display the heading in the given colour	working as expected	pass
Classify page_TC_5	functional	Classify page	Display the choose option in green colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run css File	localhost	Display the choose option in green colour	working as expected	pass

TEST CASE-3

TestcaseID	Feature type	components	Test scenario	Pre-Requisites	Steps	Test Data	Expecte dresult	Actual result	Status
Output page_TC_1	functional	Homepage	Run the python file and display output	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run app.pyfile	localhost	Execute the code	Working as expected	pass
Output page_TC_2	functional	Classify page	Run the python file and display output	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run app.py file	localhost	Execute the code	Not Working as expected	fail

TEST CASE-4

TestcaseID	Feature type	components	Test scenario	Pre-Requisites	Steps	TestData	Expected result	Actual result	Status
Home page_TC_1	functional	Homepage	Display then content in the home	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run	localhost	Display the content given in	Working as expected	pass

			page.		HTML file		HTML code		
Classify page_TC_2	functional	Classify page	Display the Classify button.	Anaconda Prompt	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the button to next page	Working as expected	pass
Home page_TC_3	functional	Classify page	Show upload button in blue colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the button in the given colour.	working as expected	pass
Classify page_TC_4	functional	Homepage	Display the heading in colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the heading in the given colour	working as expected	pass
Classify page_TC_5	functional	Classify page	Display the choose option in green colour	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run HTML file	localhost	Display the choose option in green colour	working as expected	pass
Classify page_TC_6	functional	Classify page	Display the output of the image	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run app.py file	localhost	Predict and display the correct nutritional value	working as expected	pass
Classify page_TC_7	functional	Classify page	Display the output of the image	Anaconda Prompt, spyder	1.open anaconda prompt 2.spyder 3.run app.py File	localhost	Predict and display the correct nutritional value	Not working as expected	fail

8.2 USER ACCEPTANCE TESTING

8.2.1 DEFECT ANALYSIS

This report shows the number of resolved or close bugs at each severity level, and how they were resolved.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20

Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not-Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

8.2.2 TEST CASE ANALYSIS

This report shows the number of test cases that have passed, failed, and untested.

Section	Total cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	5	0	0	5
Version Control	2	0	0	2

9. RESULT:

9.1 PERFORMANCE METRICS
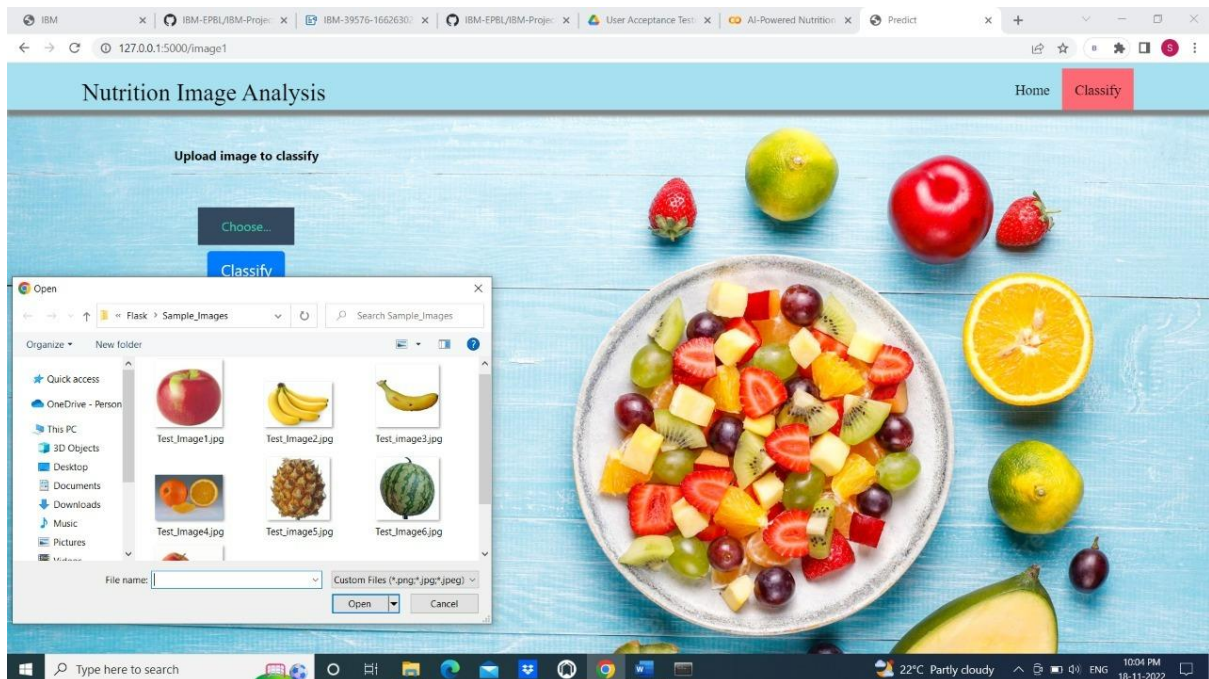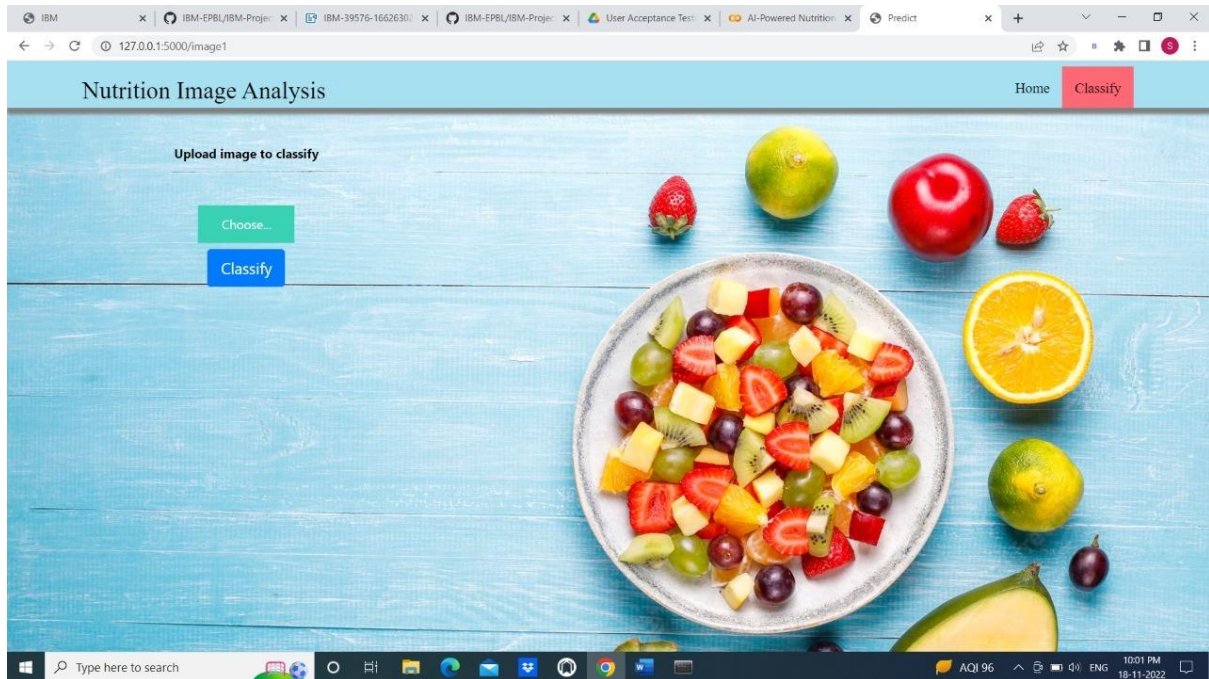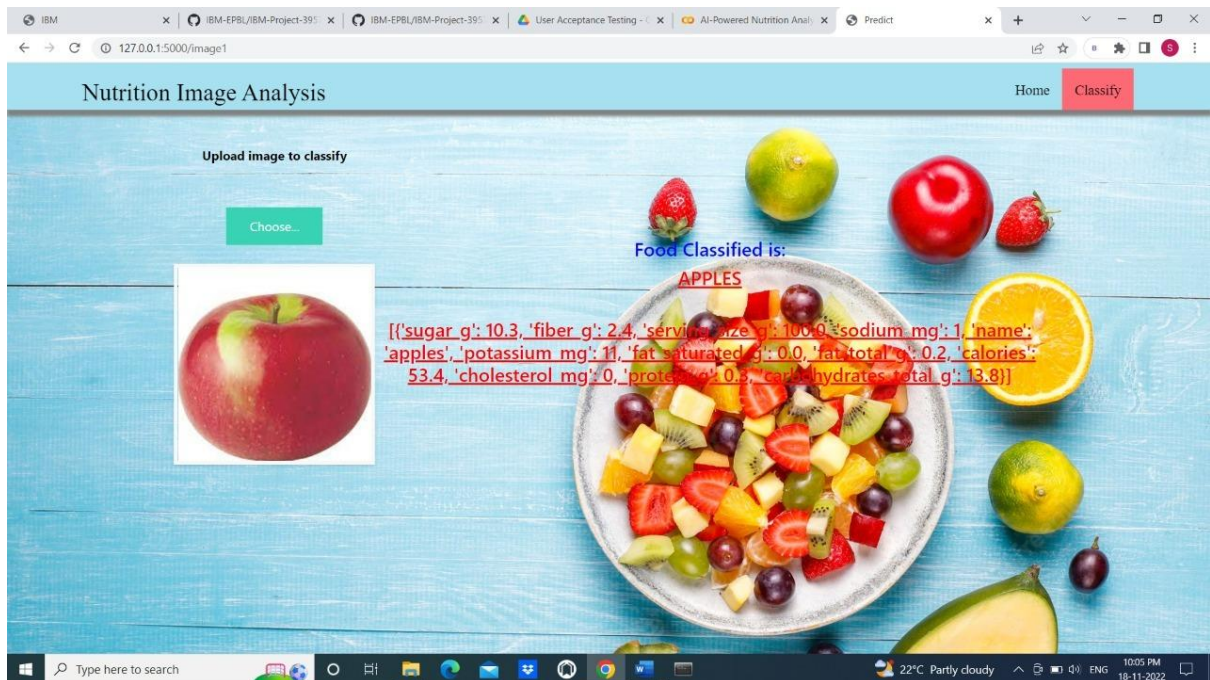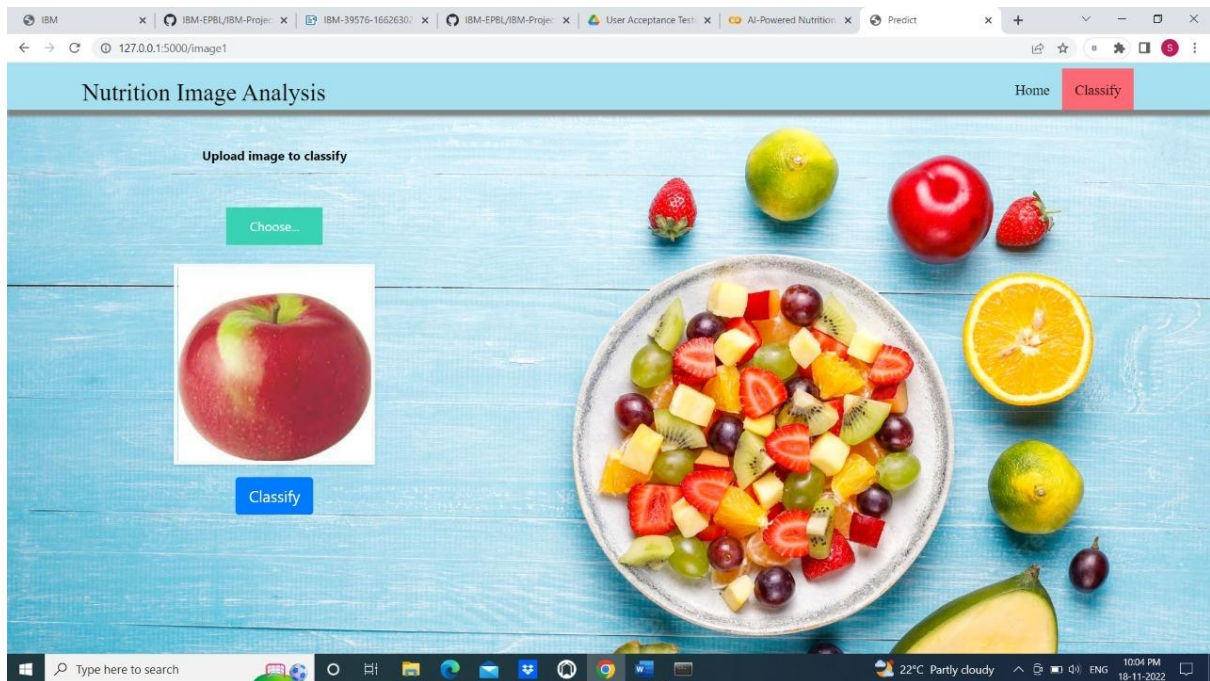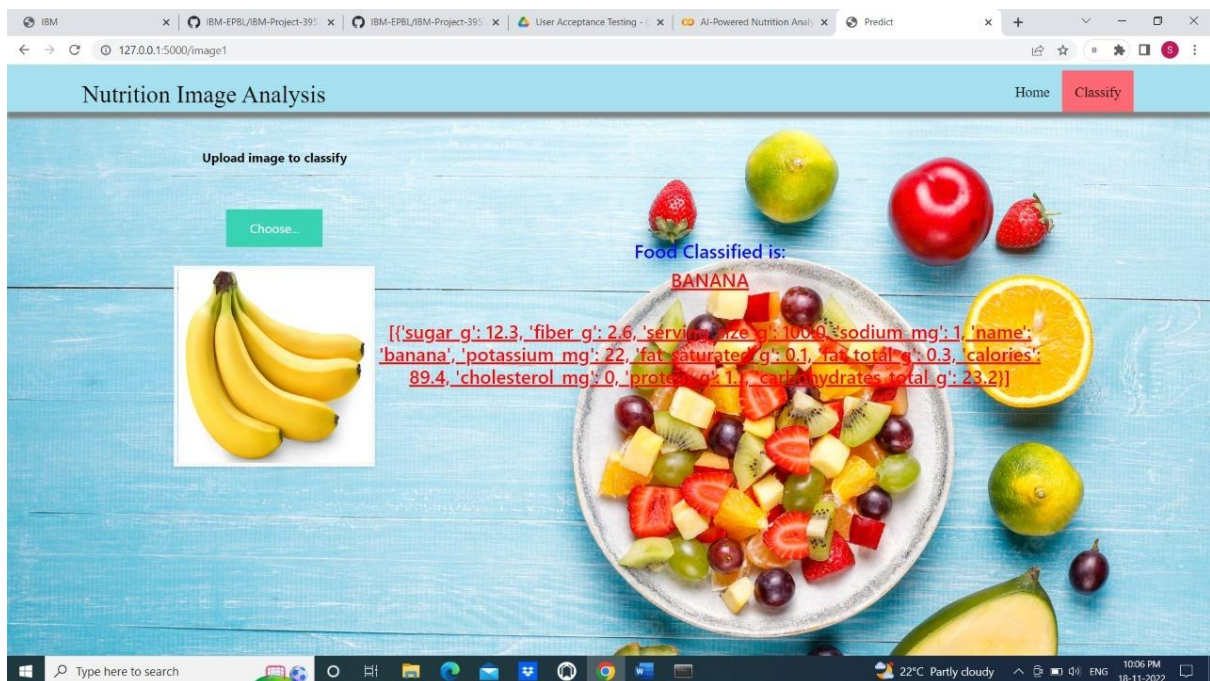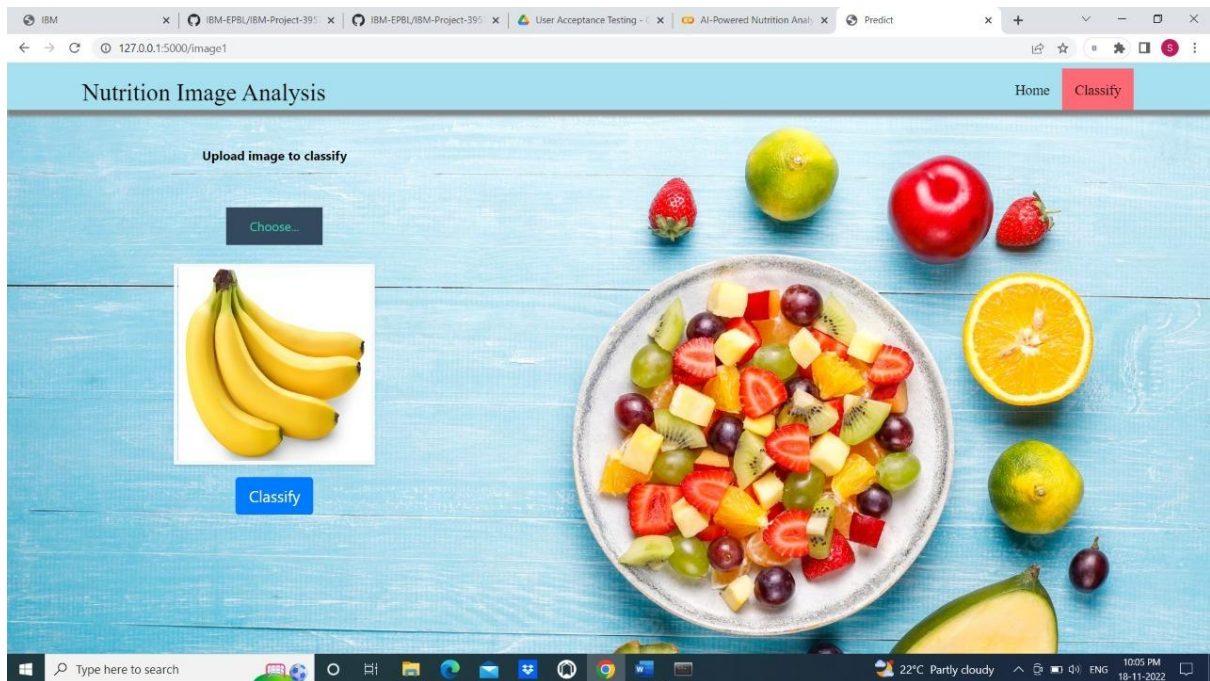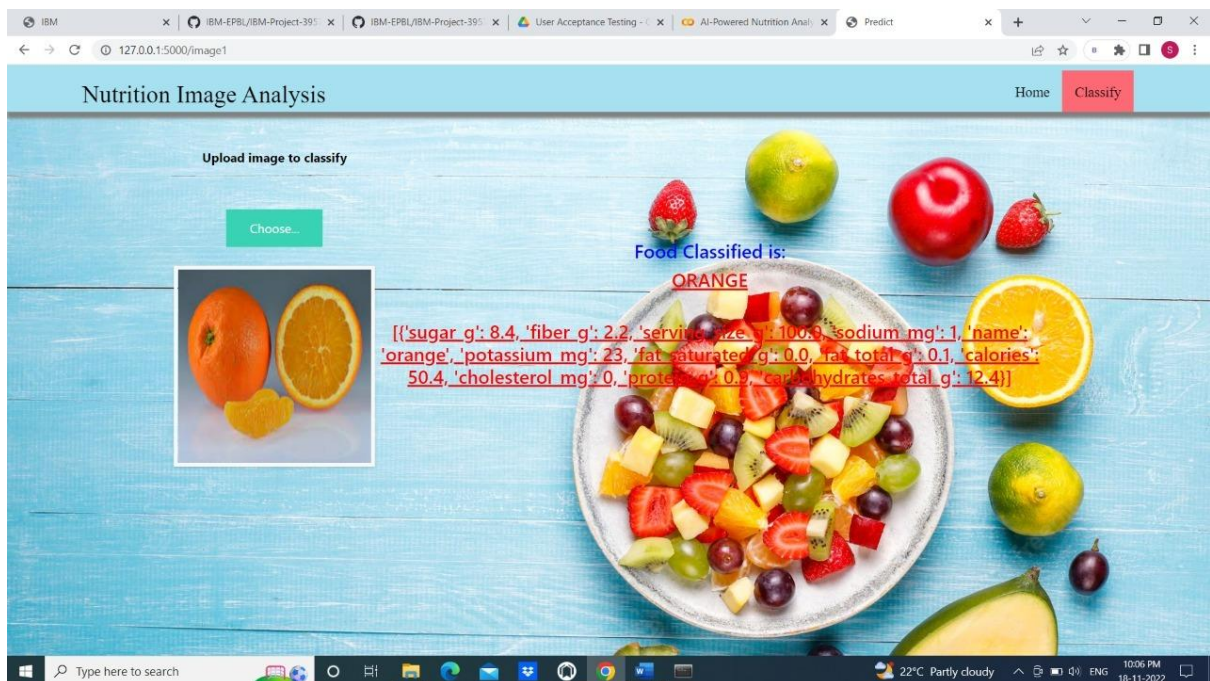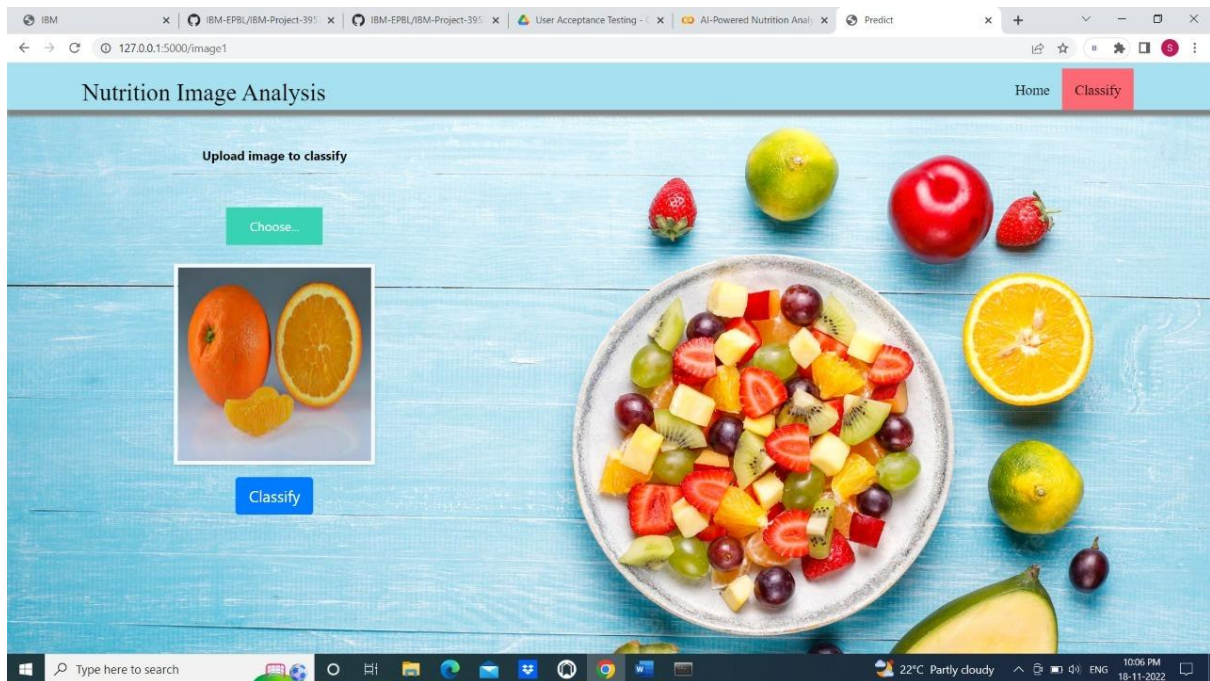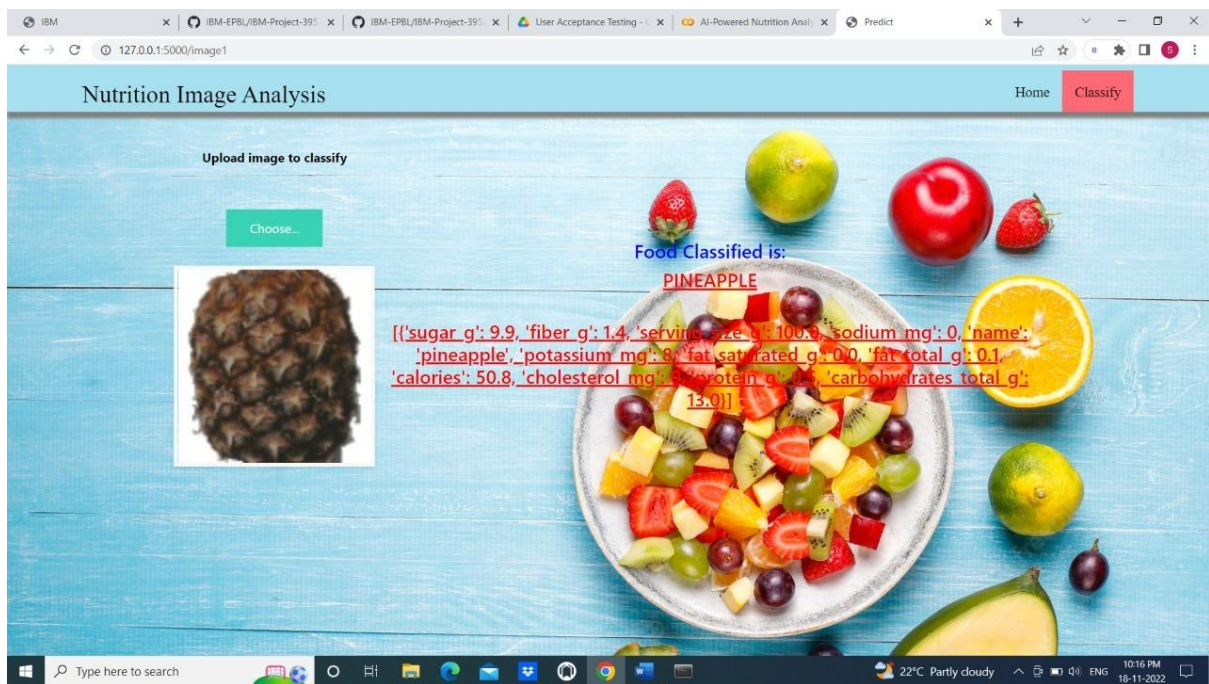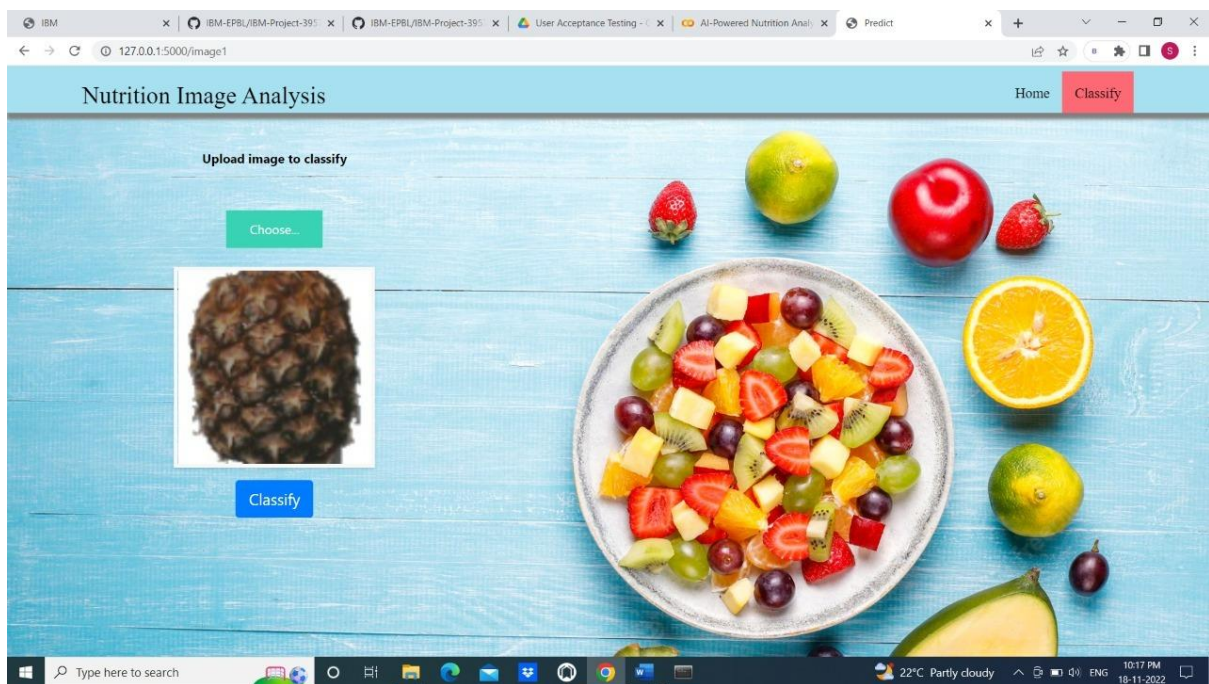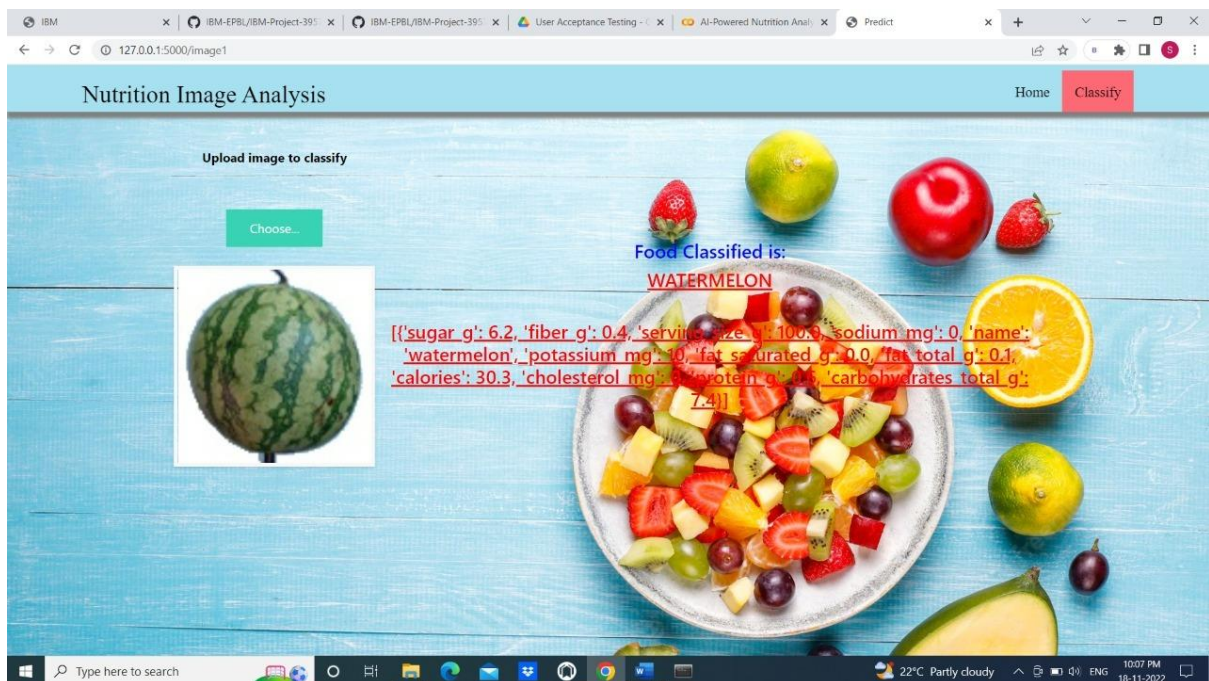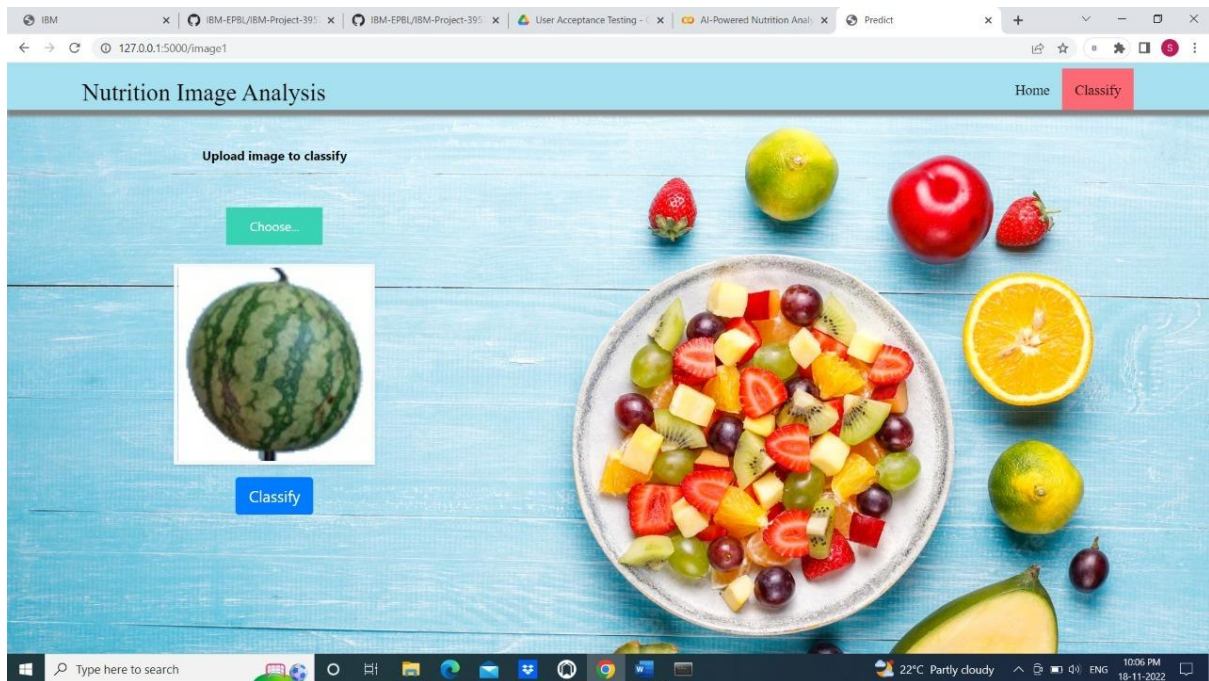
10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Simple and useful.

- More accurate result.

- Capable of handling a lot of data

- Can be used anywhere from any device

- Neural Network is used to train and identify fruit image for greater efficiency.

- The accuracy rate is very high.

- It helps the fitness enthusiasts to live a healthy life.

- Provides all nutritional values at one place.

- It helps the people to maintain diet.

DISADVANTAGES

- Requires more time to predict.

- Excessive intake of fruits causes several health issues.

- Requires a high performance server for faster predictions.

- Untrained images cannot be predicted.

- .Need to train more data to produces more accurate result.

- Customers must try with clear image to get accuracy in prediction.

- Unclear image will not give accurate results.

11.CONCLUSION

Nutrition is the process of consuming, absorbing, and using nutrients needed by the body for growth, development, and maintenance of life. To receive adequate, appropriate nutrition, people need to consume a healthy diet, which consists of a variety of nutrients—the substances in foods that nourish the body. Good nutrition promotes not only better physical health and reduced susceptibility to disease, but has also been demonstrated to contribute to cognitive development and academic success.

The deep neural network is trained with around 5 varieties of fruits. The intention is to get a neural network that can identify a wider array of objects from the image. The segmentation of image algorithm is a very useful processing of image method, and it is extremely useful for post-processing. An overall accuracy of 99% is achieved.

Convolutional Neural Network (CNN) adds its significant improvement to predicting the image of fruit .This paper tells us the effectiveness of CNN-based classification of data and pre-processing methods. A model is built 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.).

12.FUTURE SCOPE

In the future work, we plan to create a mobile application which takes the picture of fruits and labels them accordingly. Another object is to expand the training and testing sets to include more items. This is time-consuming process since we want to include the items that were not used in most other examples.

The deep neural network is trained with around 5 varieties of fruits. The intention is to get a neural network that can identify a wider array of objects from the image. The segmentation of image algorithm is a very useful processing of image method, and it is extremely useful for post-processing. An overall accuracy of 99% is achieved. We can also add other features like displaying the benefits of the fruit.

This project can be enhanced with a great field of Deep learning and artificial intelligence.

The recognition and classification of the fruits have several benefits that include agriculture, industrial inspection, automated fruit segregation systems, nutrition prediction based on the images of fruits. Thus, fruit recognition and classification systems are employed in various fields and can be integrated with the latest technology for day today . This model can be further modified into new one by providing diet value by getting the personal details and health details of the user.

Numerous experimentations are carried out on fruit detection and classification. The summary of some of the important contributions are as follows:

Banot and Mahajan [1] had proposed an approach for fruit detection and grading using fuzzy logic technique for feature analysis, and classification is done using artificial neural network. The results are compared with classifiers k-nearest neighbor's, support vector machine, RGB color space method, and color mapping techniques. Morphological features are used to identify the class of fruit using the neuronal net-work.

13.APPENDIX

SOURCE CODE

Home.html

```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://wallpapersmug.com/download/3840x2400/6a4fff/fruits-dish-salad-
fresh.jpg");
  background-size: cover;
}
.bar
{
margin: 0px;
padding:20px;
```

```css
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:rgb(239, 237, 238);

width: 800px;

opacity:0.6;

color:black;

font-family:'Roboto',sans-serif;

font-style: italic;

border-radius:20px;

font-size:25px;

}

a

{

color:black;

float:right;

text-decoration:none;

font-style:normal;

padding-right:20px;

}

a:hover{
```

```css
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: grey ;

                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: #79c1db;

  color: black;

}


.topnav-right a.active {

  background-color: #79c1db;

  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%;">Nutrition Image Analysis</div>
  <div class="topnav-right"style="padding-top:0.5%;">


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

```
<h1>

<center>


<h3>Food is essential for human life and has been the concern of

many healthcare conventions. Nowadays new dietary assessment

and nutrition analysis tools enable more opportunities to help

people understand their daily eating habits, exploring nutrition

patterns and maintain a healthy diet.Nutritional analysis is the

process of determining the nutritional content of food. It is a

vital part of analytical chemistry that provides information about

the chemical composition, processing, quality control and contamination

of food. It ensures compliance with trade and food laws.</h3>


</center>



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

Image.html

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

```html
<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 %}

Imageprediction.html

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <meta http-equiv="X-UA-Compatible" content="ie=edge">
  <title>Predict</title>
  <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
  <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
  <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
  <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
  <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
<style>
body
{
    background-image: url("https://img.freepik.com/free-photo/fresh-fruit-berry-salad-
healthy-eating_114579-13588.jpg?w=2000");
    background-size: cover;
}
.bar
{
margin: 0px;
padding:20px;
```

```css
background-color:white;

opacity:0.6;

color:black;

font-family:'Roboto',sans-serif;

font-style: italic;

border-radius:20px;

font-size:25px;

}

a

{

color:grey;

float:right;

text-decoration:none;

font-style:normal;

padding-right:20px;

}

a:hover{

background-color:black;

color:white;

border-radius:15px;0

font-size:30px;

padding-left:10px;

}

.div1{

  background-color: lightgrey;

  width: 500px;

  border: 10px solid peach;

  padding: 20px;

  margin: 20px;

  height: 500px;
```

```css
}




.header {      position: relative;
                    top:0;
                    margin:0px;
                    z-index: 1;
                    left: 0px;
                    right: 0px;
                    position: fixed;
                    background-color: #a7e0f0 ;
                    color: white;
                    box-shadow: 0px 8px 4px grey;
                    overflow: hidden;
                    padding-left:20px;
                    font-family: 'Josefin Sans';
                    font-size: 2vw;
                    width: 100%;
                    height:8%;
                    text-align: center;
            }
            .topnav {
 overflow: hidden;
 background-color: #FCAD98;
}


.topnav-right a {
```

```
    float: left;

    color: black;

    text-align: center;

    padding: 14px 16px;

    text-decoration: none;

    font-size: 18px;

}


.topnav-right a:hover {

    background-color: #ff6976;

    color: black;

}


.topnav-right a.active {

    background-color: #ff6976;

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

```html
    <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>
```

0.html

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

</style>
                <meta charset="utf-8">
```

```html
<title>Nutrition Image Analysis</title>

<link rel="shortcut icon" href="{{ url_for('static', filename='diabetes-favicon.ico') }}">

<link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.css') }}">

<script src="https://kit.fontawesome.com/5f3f547070.js" crossorigin="anonymous"></script>

<link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap" rel="stylesheet">

</head>


<!-- Result -->


<div class="results">

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

<h4 style="color:red;"><u>{{showcase}}<h4></p>


</div>
<br>
<br>


</div>

</body>
</html>
```

main.css

```css
.img-preview {
    width: 256px;
    height: 256px;
    position: relative;
    border: 5px solid #F8F8F8;
    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;
    margin-bottom: 1em;
}

.img-preview>div {
    width: 100%;
    height: 100%;
    background-size: 256px 256px;
    background-repeat: no-repeat;
    background-position: center;
}

input[type="file"] {
    display: none;
}

.upload-label {
    display: inline-block;
    padding: 12px 30px;
    background: #39D2B4;
    color: #fff;
```

```css
    font-size: 1em;

    transition: all .4s;

    cursor: pointer;

}


.upload-label:hover{

    background: #34495E;

    color: #39D2B4;

}


.loader {

    border: 8px solid #f3f3f3; /* Light grey */

    border-top: 8px solid #3498db; /* Blue */

    border-radius: 50%;

    width: 50px;

    height: 50px;

    animation: spin 1s linear infinite;

}


@keyframes spin {

    0% { transform: rotate(0deg); }

    100% { transform: rotate(360deg); }

}
```

Style.css

```css
body{

        background-image:url(bg.jpg);

    background-size: 400% auto;

        background-repeat: no-repeat;
```

```css
        background-position:center;

        color:#555;

        font-family:Arial, Helvetica, sans-serif;

        font-size:16px;

        line-height:1.6em;

        margin:0;
}


.container{

        width:80%;

        margin:auto;

        overflow:hidden;
}


.justify{

   text-align:justify;

   text-justify: auto;
}


.parallax {
 /* The image used */
    background-image: url("C:\Users\SNEHA\Pictures\Saved
Pictures\istockphoto.jpg");


 /* Set a specific height */
 min-height: 750px;


 /* Create the parallax scrolling effect */
 background-attachment: fixed;

 background-position: center;
```

```css
  background-repeat: no-repeat;

  background-size: cover;

}


html {

  scroll-behavior: smooth;

}

#section2 {

  height: 500px;

  background: ;

}

div.background {

  background: url("static/bgg2.jpg");

  min-height: 5px;

 background-attachment: fixed;

  background-position: center;

  background-repeat: no-repeat;

  background-size: cover;

}



#navbar{

        background-color:#fff;

        color:#333;

}


#navbar ul{

        padding:0;

        list-style: none;

}
```

```css
#navbar li{
        display:inline;
}


#navbar a{
        color:#fff;
        text-decoration: none;
        font-size:18px;
        padding-right:15px;
}


#showcase{
        min-height:300px;
        margin-bottom:30px;
}



#showcase h1{
    width: 100%;
        color:#333;
        font-size:40px;
        text-align: center;
        line-height: 1em;
        padding-top:10px;
}
#showcase h2{
    width: 100%;
        color:#333;
        font-size:30px;
```

```css
        text-align: center;

        line-height: 1.6em;

        padding-top:10px;

}


#main{

        float:left;

        color:#fff;

        width:65%;

        padding:0 30px;

        box-sizing: border-box;

}


#sidebar{

        float:right;

        width:35%;

        background-color: #ffcccc;

        color:#000;

        padding-left:10px;

        padding-right:10px;

        padding-top:1px;

        box-sizing: border-box;

}


.img-preview{

    width: 10px;

    height: 10px;

    position: relative;

    border: 5px solid #F8F8F8;
```

```css
        box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);

        margin-top: 1em;

        margin-bottom: 1em;

}


.img-preview>div {

        width: 10%;

        height: 10%;

        background-size: 100px 10px;

        background-repeat: no-repeat;

        background-position: center;

}


input[type="file"] {

        display: none;

}


.upload-label{

        display: inline-block;

        padding: 12px 30px;

        background: #39D2B4;

        color: #fff;

        font-size: 1em;

        transition: all .4s;

        cursor: pointer;

}


.upload-label:hover{

        background: #34495E;

        color: #39D2B4;
```

```css
  }

  .myButton {
    border: none;
    text-align: center;
    cursor: pointer;
    text-transform: uppercase;
    outline: none;
    overflow: hidden;
    position: relative;
    color: #fff;
    font-weight: 700;
    font-size: 12px;
    background-color: #ff0000;
    padding: 10px 15px;
    margin: 0 auto;
    box-shadow: 0 5px 15px rgba(0,0,0,0.20);
  }

  .myButton span {
    position: relative;
    z-index: 1;
  }

  .myButton:after {
    content: "";
    position: absolute;
    left: 0;
    top: 0;
    height: 310%;
```

```css
  width: 150%;
  background: #f2f2f2;
  -webkit-transition: all .5s ease-in-out;
  transition: all .5s ease-in-out;
  -webkit-transform: translateX(-98%) translateY(-25%) rotate(45deg);
  transform: translateX(-98%) translateY(-25%) rotate(45deg);
}


.myButton:hover:after {
  -webkit-transform: translateX(-9%) translateY(-25%) rotate(45deg);
  transform: translateX(-9%) translateY(-25%) rotate(45deg);
}


.loader {
    border: 8px solid #f3f3f3; /* Light grey */
    border-top: 8px solid #ff0000; /* Red */
    border-radius: 50%;
    width: 50px;
    height: 50px;
    animation: spin 1s linear infinite;
}


@keyframes spin {
    0% { transform: rotate(0deg); }
    100% { transform: rotate(360deg); }
}


#main-footer{
        background: #333;
        color:#fff;
```

```css
        text-align: center;

        padding:1px;

        margin-top:0px;

}


@media(max-width:600px){

        #main{

                width:100%;

                float:none;

        }


        #sidebar{

                width:100%;

                float:none;

        }

}
```

main.js

```javascript
$(document).ready(function () {

    // Init

    $('.image-section').hide();

    $('.loader').hide();

    $('#result').hide();


    // Upload Preview

    function readURL(input) {

        if (input.files && input.files[0]) {

            var reader = new FileReader();
```

```javascript
        reader.onload = function (e) {
            $('#imagePreview').css('background-image', 'url(' + e.target.result + ')');
            $('#imagePreview').hide();
            $('#imagePreview').fadeIn(650);
        }
        reader.readAsDataURL(input.files[0]);
    }
}
$("#imageUpload").change(function () {
    $('.image-section').show();
    $('#btn-predict').show();
    $('#result').text('');
    $('#result').hide();
    readURL(this);
});


// Predict
$('#btn-predict').click(function () {
    var form_data = new FormData($('#upload-file')[0]);

    // Show loading animation
    $(this).hide();
    $('.loader').show();

    // Make prediction by calling api /predict
    $.ajax({
        type: 'POST',
        url: '/predict',
        data: form_data,
        contentType: false,
```

```javascript
            cache: false,

            processData: false,

            async: true,

            success: function (data) {

                // Get and display the result

                $('.loader').hide();

                $('#result').fadeIn(600);

                $('#result').html(data);

                console.log('Success!');

            },

        });

    });

});
```

app.py

```python
# -*- coding: utf-8 -*-
"""
Created on Wed Nov 16 22:46:44 2022

@author: SNEHA
"""

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
```

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```python
from tensorflow.keras.models import load_model#to load our trained model
from tensorflow.keras.preprocessing import image
import requests


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


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


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


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

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

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

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

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

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

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

    querystring = {"query":index}

    headers = {
      'x-rapidapi-key': "5d797ab107mshe668f26bd044e64p1ffd34jsnf47bfa9a8ee4",
      'x-rapidapi-host': "calorieninjas.p.rapidapi.com"
      }
```

```python
    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)
```

GITHUB

https://github.com/IBM-EPBL/IBM-Project-39576-1660461159

PROJECT DEMO LINK

https://drive.google.com/file/d/15lh2dsDG1SUAFYX5ATmQx_o21ycOVI7m/view?usp=drivesdk