AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

DOMAIN : ARTIFICIAL INTELLIGENCE

PROJECT REPORT

submitted by

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DEPARTMENT	**: INFORMATION TECHNOLOGY**
COLLEGE NAME	**: KONGU ENGINEERING COLLEGE**

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

1.2 PURPOSE

Nutrition Analyzer helps in the detailed and perfect determination of the component nutrients present in any food item. Food components have vast bio metabolic roles and could affect human health severely.

Purpose of the AI powered Nutrition Analyzer is to help individuals who needs a proper nutrition assistant to achieve fitness ,to cure diseases through foods or to lead a healthy lifestyle. With the help of Artificial Intelligence , it was possible to achieve a proper nutrition analyzer which is capable of showing the nutrition content of the food when we give the picture of it.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Controlled intake of nutrition is recommended as a condition for being a healthy individual. Knowing and monitoring how much food is consumed during the day, following the calorie and nutrition of these foods helps tocontrol healthy nutrition. However there is no proper assistance to achieve it. Nutritional intake is fundamental to human growth and health, and the intake of different types of nutrients and micro-nutrients can affect health. The content of the diet affects the occurrence of disease, with the incidence of many diseases increasing each year while the age group at which they occur is gradually decreasing. The consumption of a wide variety of food items is necessary in order for the human body to obtain the right amounts of nutrients. Failing to follow such a well- balanced diet, in combination with a generally unhealthyway of living, has been shown to increase the risk for cardiovascular disease, type II diabetes and some forms of cancer.

2.2 REFERENCES

1.“Approximate Estimation of the Nutritions of Consumed Food by Deep Learning” by İbrahim Berkan Aydilek Published in 2017 International Conference on Computer Science and Engineering (UBMK), IEEE, 2017.

2.“Validation of a deep learning system for the full automation of bite and meal duration analysis of experimental meal videos”D Konstantinidis, K Dimitropoulos, B Langlet, PDaras… - Nutrients, 2020

3.“Precision Nutrient Management Using Artificial Intelligence Based on Digital Data Collection Framework” by Hsiu-An Lee, Tzu-Ting Huang, Lo-Hsien Yen, Pin-Hua Wu, Kuan-Wen Chen, Hsin-Hua Kung, Chen-Yi Liu and Chien-Yeh Hsu Appl.Sci.2022,12,4167

4.“AI Nutrition Recommender System” by Thamos Theodoridis, Vassilios Solachidis, Kosmos Dimitropoulos, Lazaros Gymnopoulos and Petros Daras in the 12th Pervasive Technologies Related to Assistive Environments Conference.

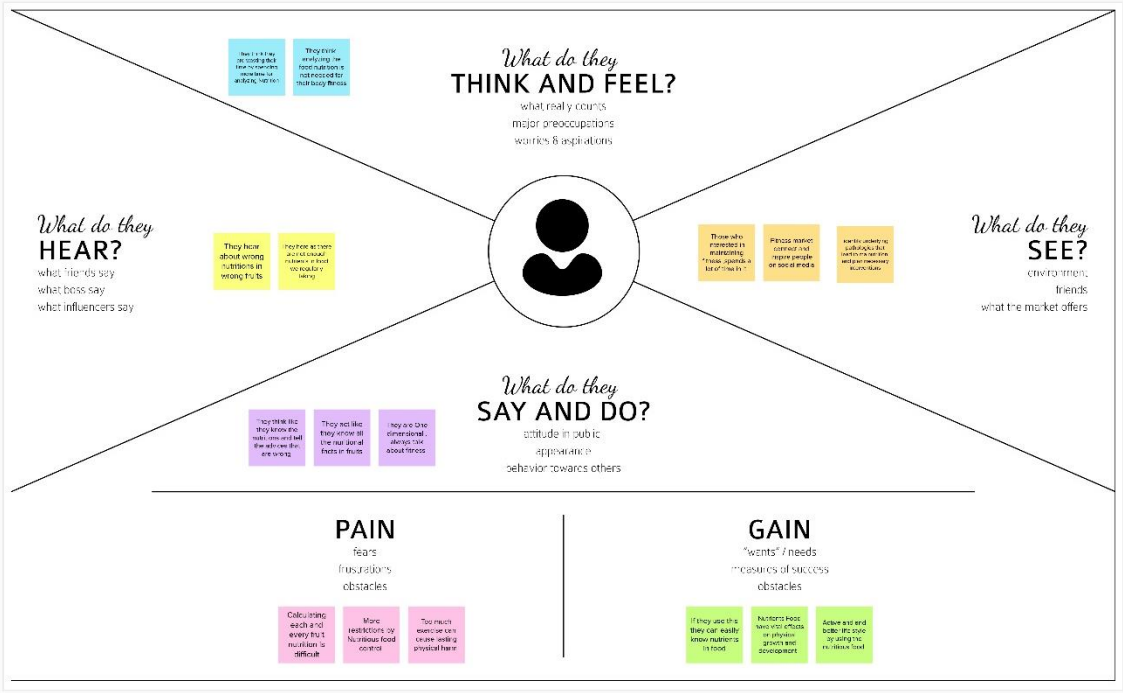
2.3 PROBLEM STATEMENT DEFINITION

Due to change in food habits people do not get aware of food items. Our project is to get details about food nutritions, carbohydrate, protein and fat. Nutritional awareness is also related to knowledge of the interrelationships between nutritional matters and human life, which may have an effect on a person’s life.

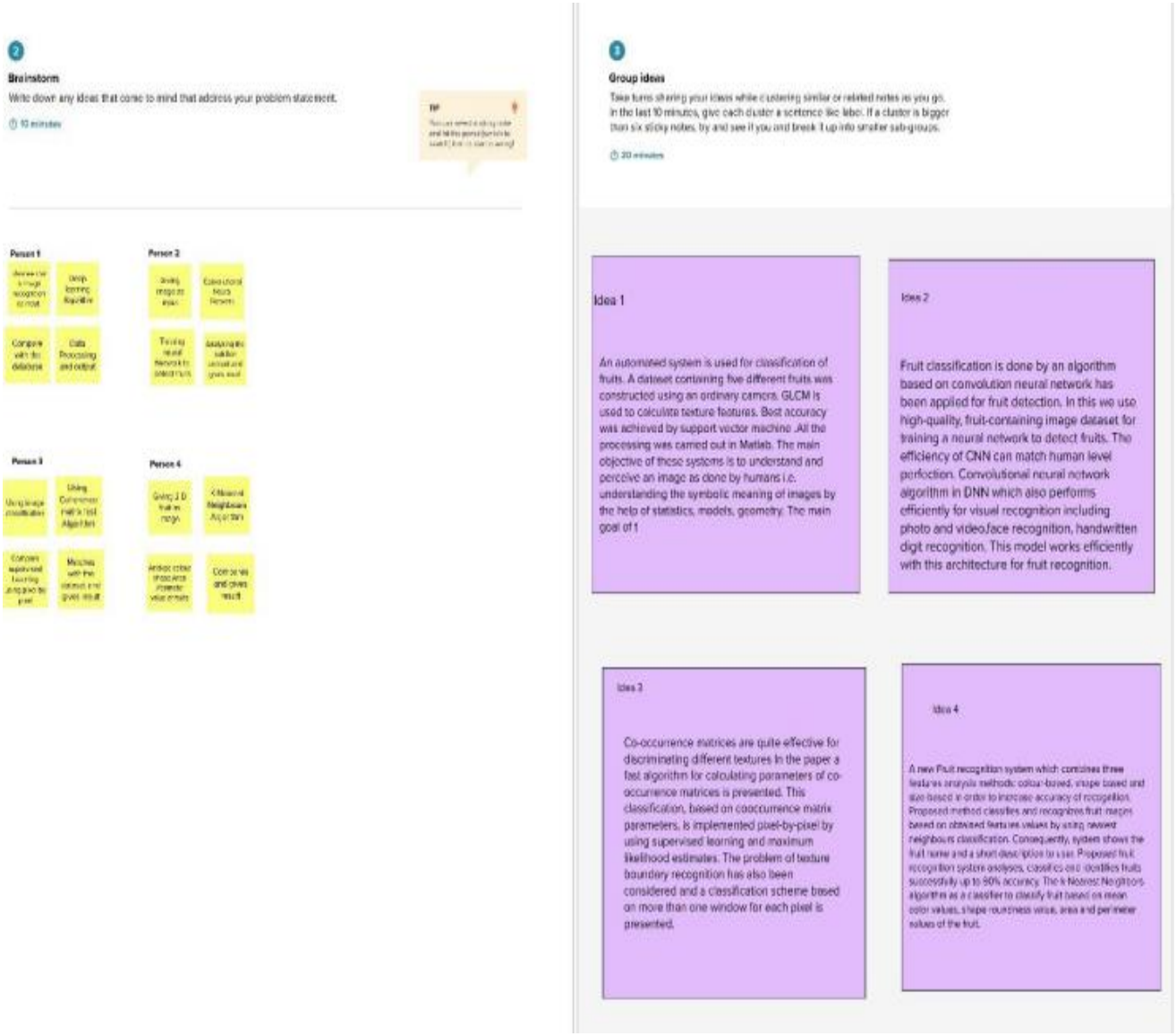
The World Health Organisation(WHO) data reveals that more than 60% of world’s population is not physically active enough to induce health benefits.

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION&BRAINSTORMING



3.3 PROPOSED SOLUTION

1. Problem Statement

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays it has become even more difficult for people to understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.

2.Solution Description

In order to guide people to follow healthier eating habits nutrition analyzer has to be introduced. Nutritional analyzer does 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.

3.Novelty/Uniqueness

Consult Online Doctor/ Nutritionist, Research on some websites based on the nutrition and Chat- bots in which we can able to answer all our queries based on importantly in Calories, Nutritional Food content, Diet plans, Balanced food based charts etc..This also gives the correct solution and answer for the Nutrition to get fit in our life.

4. Social Impact/ Customer Satisfaction

Being Healthy is very important and our project will help those who are trying to maintain their health. There are different food available and there are many undesirable contents in the food. Many people consume them unconsciously. Our project paves way for conscious eating and to control what we eat. This will help many people who are trying to eat according to their body needs like people with health conditions or some people who likes to consume healthy content. This can create a great awareness among the people and help them in many ways.

5.Business Model

The person using nutrition analyzer may avoid spending time and money for nutrition analyst instead by paying the less premium amount can communicate with nutritional specialists and get benefited.

6.Scalability of Solution

AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food maintain a healthy diet. According to their tracking system for the person nutrients intake can increased or decreased.

3.4 PROBLEM SOLUTION FIT

1.Customer Segments:

Consults on Nutrition

2.Jobs-to-be-done:

- Healthy diet plan
- Quality control of food
- Nutrition rich food recommendations
- Different nutrition pattern exploration
- Classification of food based on its nutrients

3.Triggers:

To maintain good health and to regulate their eating. Good intake of foods

4.Emotion Before/After

Before : Depressed, Exhausted, Confused, Tense on body shape

After : Confidence, Delightful, Encouraged, Motivated, Customer became mentally and physically fit

5.Available Solutions

- They can hire a personal nutritionist.
- They can consult dietitians
- They can use apps such as My Fitness Pal, Chronometer, Life Sum, etc...

6.Customer

Lack of knowledge on understanding everything and go beyond on calorie counting, scared on getting help from the resources on analyzer, whether the premium amount for the premium is acceptable for the customers.

7. Behaviour

Consulting doctors or nutritionist, enquires about the food to be consumed, refer articles such as magazine, newspaper, watching exercises and yoga , searching it in websites ,etc.....

8. Channels of Behaviour

Referring Articles, Checking websites related on nutrition, Consulting nutritionist on online, etc....

9. Problem Root cause

- Fast paced lifestyle
- Availability of low quality food
- Nutrition less food
- Improper diet plan
- Lack of health related awareness
- Emotional Eating
- Improper food timings

10. Solution

Food has the power to influence metabolism and health directly. If food is the reason nutrition is the result, Hence we should give high importance to proper nutrition. Our project "AI Powered Nutrition Analyzer" helps people to get to know the nutrition content in their food and improve body health.

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

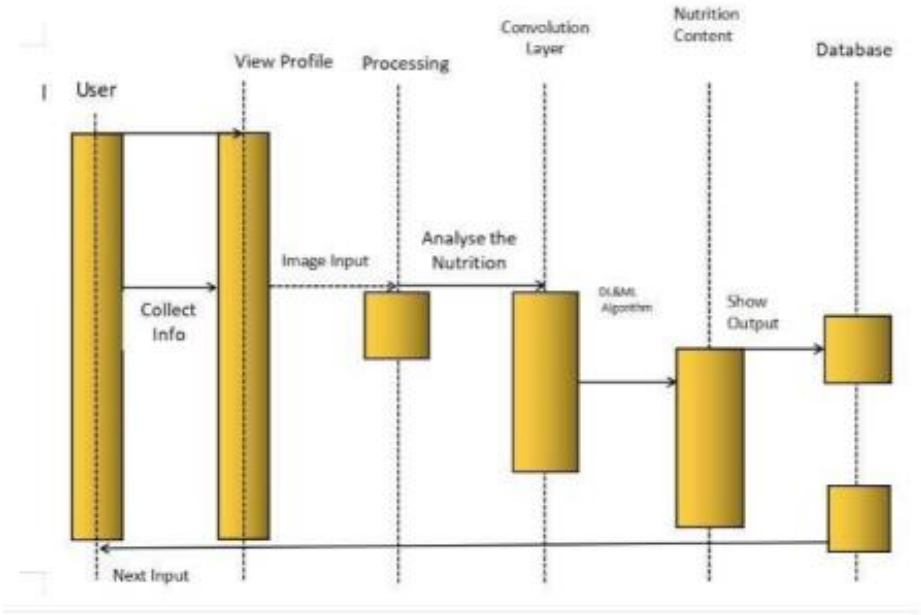
FR NO.	FUNCTIONAL REQUIREMENT (EPIC)	SUB REQUIREMENT (STORY / SUB-TASK)
FR-1	USER REGISTRATION	Registration through Form Registration through Gmail
FR-2	USER CONFIRMATION	Confirmation via Email Confirmation via OTP
FR-3	USER LOGIN	Give the login ID Give the password that is created during registration
FR-4	DATASET	Uploading the dataset consists of variety of fruit images
FR-5	IMAGE INPUT	Analyzing the image input provided by the user
FR-6	PROCESS	Testing the image by various convolution layers
FR-7	RESULT	The nutrient content in the particular fruit is displayed

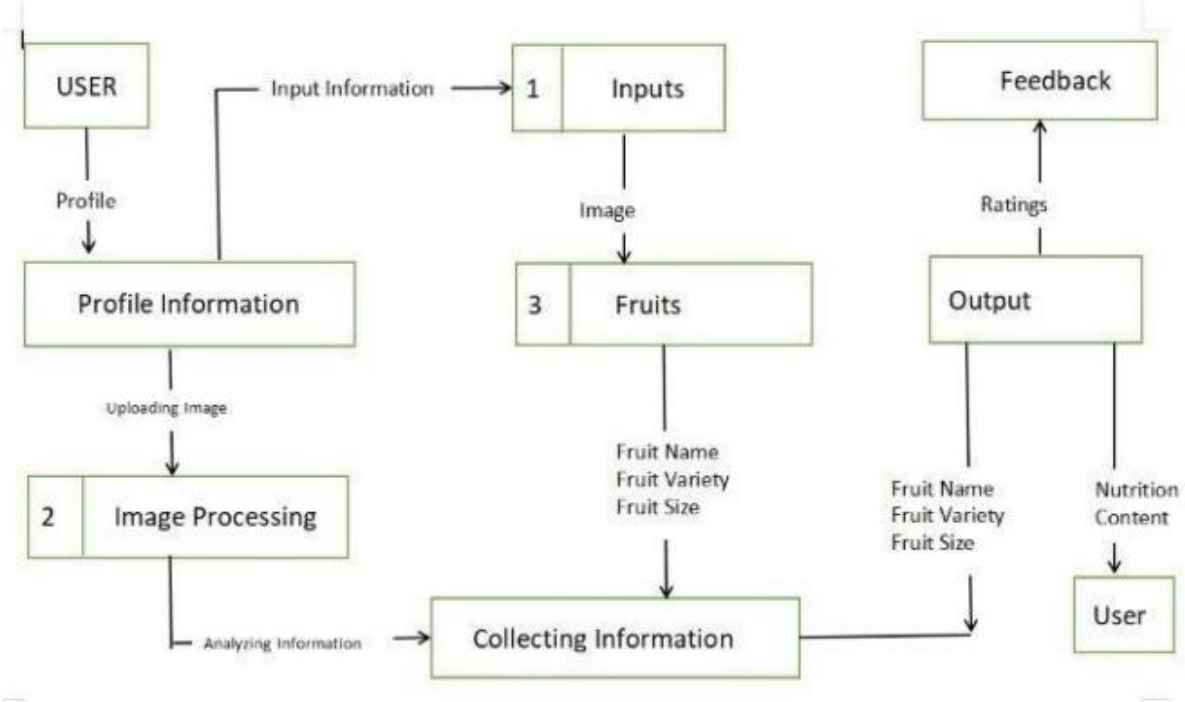
4.2 NON FUNCTIONAL REQUIREMENTS

NFR NO.	NON-FUNCTIONAL REQUIREMENT	DESCRIPTION
NFR-1	USABILITY	The ways in which the system will accessible to users with particular or non-standard accessibility Requirements
NFR-2	SECURITY	Extend to which data needs to be protected and kept confidential.
NFR-3	CAPACITY	Ability to continue to function well as it changes in according to input that we give.
NFR-4	PERFORMANCE	Fast response is achieved.
NFR-5	AVAILABILITY	The minimum proportion of time given in online service hours that the service should be available.
NFR-6	SCALABILITY	Ability of the application to handle an increase in workload without performance degradation, or its ability to quickly enlarge.

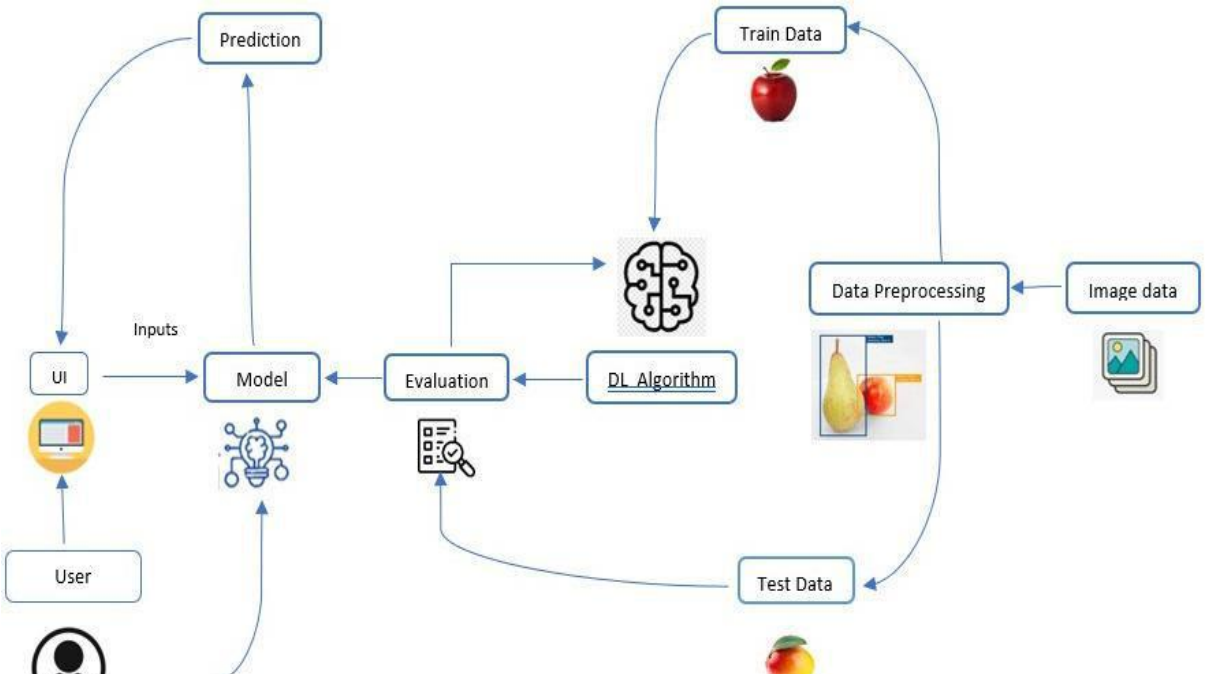
5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS





5.2 SOLUTION & TECHNICAL ARCHITECTURE



S.No	Component	Description	Technology
1.	User Interface	How user interacts with application like Web UI, Mobile App, etc.,	HTML, CSS, JavaScript
2.	Application Logic-1	Image processing is done using convolution layers	Python
3.	Application Logic-2	Implementing backend tech stack and size analysis	Python, HTML
4.	Application Logic-3	Texture and colour analysis using the input data	IBM Watson
5.	Database	Datasets and Configurations	MySQL, NoSQL, etc.,
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.

7.	File Storage	Dataset storage on Cloud	IBM Block Storage or other Storage Service or Local Filesystem
8.	External API-1	Training the model on IBM ,integrate it with flask Application	CNN IBM Deployment
9.	External API-2	Input parameters are taken from HTML page to the Flask application	Python Flask, HTML
10.	Deep Learning Model	DL is used for achieving superior performance in predicting and supporting the feasibility of using artificial intelligence in nutrition analysis	Image Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud	Local, Cloud Foundry, Kubernetes, etc.

APPLICATION CHARACTERISTICS

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Pycharm, Python, Anaconda Navigator, Flask, HTML	Deep learning
2.	Security Implementations	Two factor authentication and Strong password	Encryption
3.	Scalable Architecture	supports higher workloads without any	Python

		fundamental changes to it Micro-services	
4.	Availability	Provided inputs Eg: Datasets	Kaggle
5.	Performance	Layers of convolution network for more number of inputs	Artificial Neural Network

5.3USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can do registration by my mobile and get confirmation email	I can access my account / dashboard	High	Sprint-1
Customer (Web user)	Registration	USN-2	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-3	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-4	As a user, I can register for the application through other social media	I can register & access the dashboard with Login	Low	Sprint-2
	Login	USN-5	As a user, I can log into the application by entering email & password	I can successfully logged in to the home page	High	Sprint-1
	Dashboard	USN-6	As a user, I can select the list of options provided in the dashboard	I can access the options according to my need	Medium	Sprint-1
	Search	USN-7	As a user, I can search for different variety of fruits	I can get the nutrition content of different fruits	High	Sprint-2
	View	USN-8	As a user, I can view the list of fruits	I will get the information such as calories, vitamins, etc.,	High	Sprint-2
	Notifications	USN-9	As a user, I will receive notification about variety and textures of different fruits	I will get the frequent updates of different fruits	Low	Sprint-2
Customer Care Executive	Mediator	USN-10	As a customer care executive, they could take care of customer feedbacks and solve user requirements	Users can get help and support from customer care executives	Medium	Sprint-2
Administrator	Database	USN-11	As a admin, I will store the user databaseconfidentially	I can store and access data if it is needed in future	High	Sprint-1
	Data Information	USN-12	As a admin, I will include the dataset for performing various processes	I can store dataset and analyze it	High	Sprint-2
	Processing	USN-13	As a admin, I will use various convolution layers for image analysis	I can process using various convolution layers	High	Sprint-2
	Nutrition Analyzer	USN-14	As a admin, I will predict the fruit that has send as input	I can get the nutrition content of particular food after processing and display it	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING

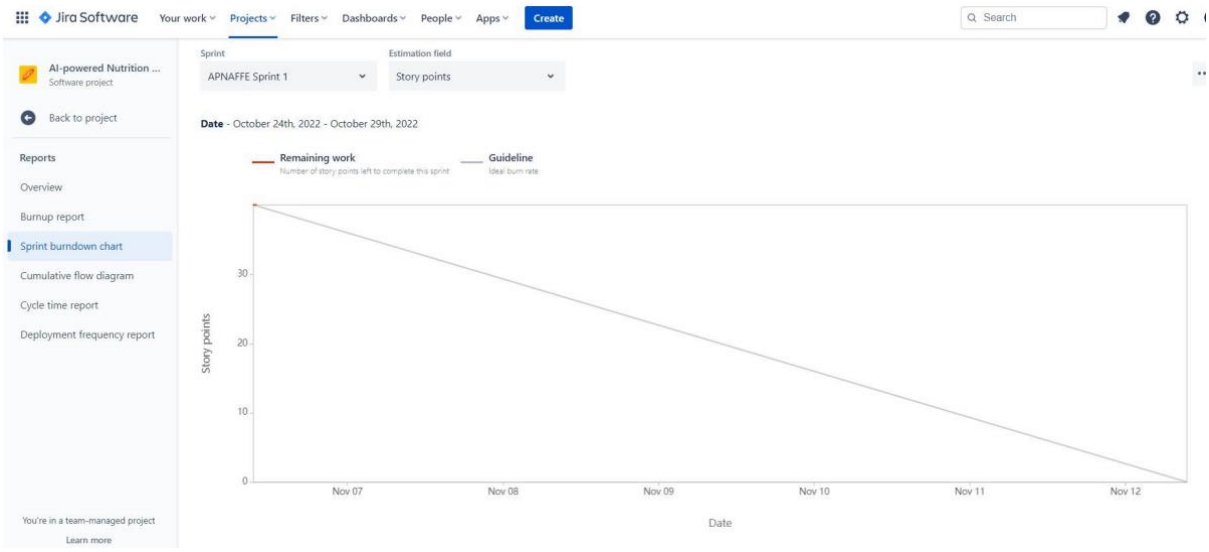
6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Dataset - Collecting images of food items apples,banana, orange, pineapple, watermelon for analysis	3	High	Narendranath R
Sprint-1	Image Preprocessing	USN-2	Image data augmentation - Increasing the amount of data by generating new data points from existing data	3	Medium	Mounika S
Sprint-1		USN-3	Image Data Generator Class - Used for getting the input of the original data	3	Medium	Nandhini B
Sprint-1		USN-4	Applying image data generator functionality to trainset and testset	3	High	Nandhini C S M
Sprint-2	Modelling Phase	USN-5	Defining the model architecture - Building the model using deep learning approach and adding CNN layers	4	High	Mounika S
Sprint-2		USN-6	Training, saving, testing and predicting the model	4	High	Nandhini B
Sprint-3	HTML Page Creation	USN-7	Home page creation - It shows options of the application	4	Medium	Narendranath R
Sprint-3		USN-8	User Input and Prediction Page Creation - It is for the user to feed the input images and display predicted output	4	Medium	Nandhini C S M
Sprint-4	Application Phase	USN-9	Building the python code and importing the flask module into the project	10	High	Mounika S
Sprint-4		USN-10	Importing the flask module into the project and perform routing the HTML pages	10	High	Nandhini C S M
Sprint-4	Deployment Phase	USN-11	Cloud deployment – Deployment of application by using IBM cloud	10	High	Narendranath R
Sprint-4	Testing Phase	USN-12	Checking usability and accessibility and performance	10	High	Nandhini B

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	12	6 Days	24 Oct 2022	29 Oct 2022	12	28 Oct 2022
Sprint-2	8	4 Days	30 Oct 2022	02 Nov 2022	6	02 Nov 2022
Sprint-3	8	3 Days	03 Nov 2022	05 Nov 2022	8	05 Nov 2022
Sprint-4	40	7 Days	06 Nov 2022	12 Nov 2022	30	18 Nov 2022

6.3 REPORTS FROM JIRA



7. CODING & SOLUTIONING

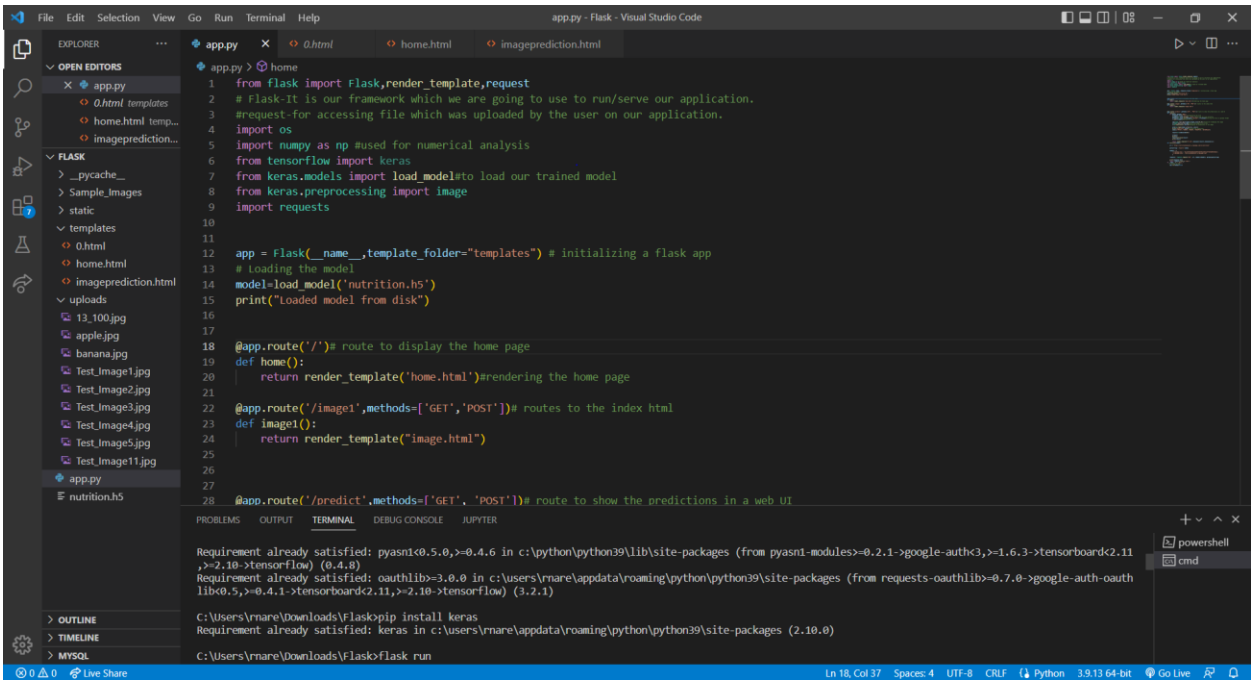
7.1 FEATURE-1

App.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 import keras
from keras.models import load_model#to load our trained model
from 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

        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://nutritionanalyzer.p.rapidapi.com/v1/nutrition"

    querystring = {"query":index}

    headers = {
        'x-rapidapi-key': "5jsnf47bfa9a8ee4e668f26d797ab107mshffd34bd044e64p1",
        'x-rapidapi-host': "nutritionanalyzer.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)
```


File Edit Selection View Go Run Terminal Help
app.py - Flask - Visual Studio Code
EXPLORER
OPEN EDITORS
app.py
0.html templates
home.html temp...
imageprediction...
FLASK
__pycache__
Sample_Images
static
templates
0.html
home.html
imageprediction.html
uploads
13_100.jpg
apple.jpg
banana.jpg
Test_Image1.jpg
Test_Image2.jpg
Test_Image3.jpg
Test_Image4.jpg
Test_Image5.jpg
Test_Image11.jpg
app.py
nutrition.h5
OUTLINE
TIMELINE
MYSQL
app.py
0.html
home.html
imageprediction.html
app.py > home
from flask import Flask,render_template,request
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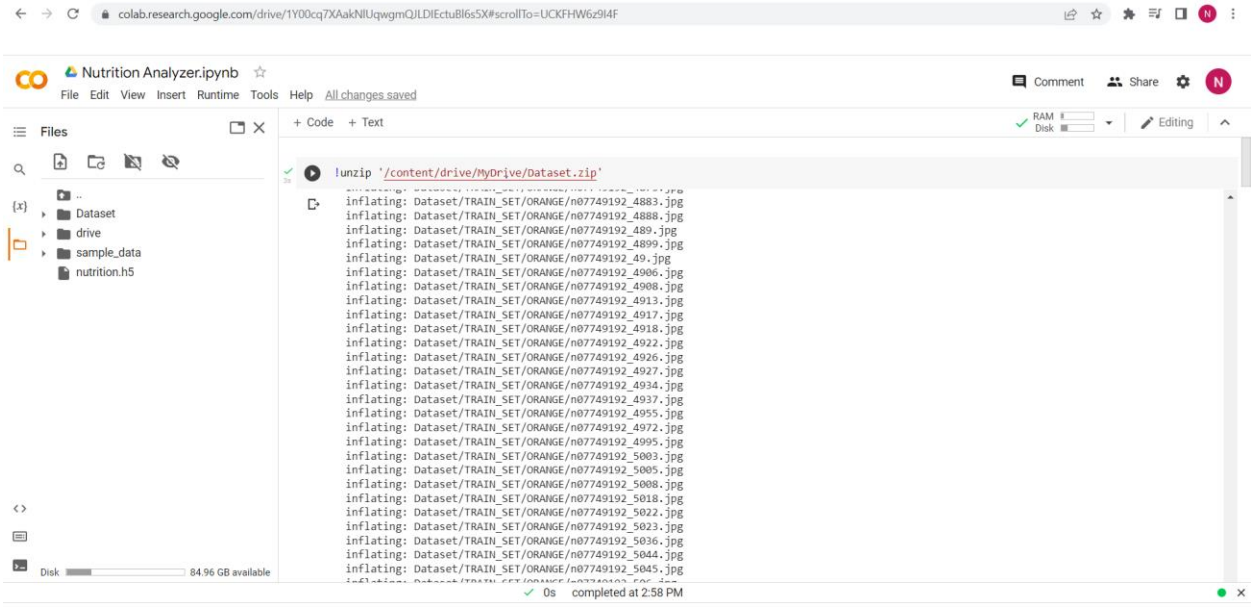
def image1():
return render_template("image.html")
@app.route('/predict',methods=['GET', 'POST'])# route to show the predictions in a web UI
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE JUPYTER
powershell
cmd
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\python\python39\lib\site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<2.11,>=2.10->tensorflow) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in c:\users\rnare\appdata\roaming\python\python39\site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.11,>=2.10->tensorflow) (3.2.1)
C:\Users\rnare\Downloads\Flask>pip install keras
Requirement already satisfied: keras in c:\users\rnare\appdata\roaming\python\python39\site-packages (2.10.0)
C:\Users\rnare\Downloads\Flask>flask run
Live Share
Ln 18, Col 37 Spaces: 4 UTF-8 CRLF Python 3.9.13 64-bit Go Live

7.2 FEATURE-2


colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDIEctu8l6s5X#scrollTo=UCKFHW6z9I4F
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
Files
+ Code + Text
RAM
Disk
Editing
!unzip '/content/drive/MyDrive/Dataset.zip'
..
Dataset
drive
sample_data
nutrition.h5
inflating: Dataset/TRAIN_SET/ORANGE/n07749192_4883.jpg
inflating: Dataset/TRAIN_SET/ORANGE/n07749192_4888.jpg
inflating: Dataset/TRAIN_SET/ORANGE/n07749192_489.jpg
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inflating: Dataset/TRAIN_SET/ORANGE/n07749192_5044.jpg
inflating: Dataset/TRAIN_SET/ORANGE/n07749192_5045.jpg
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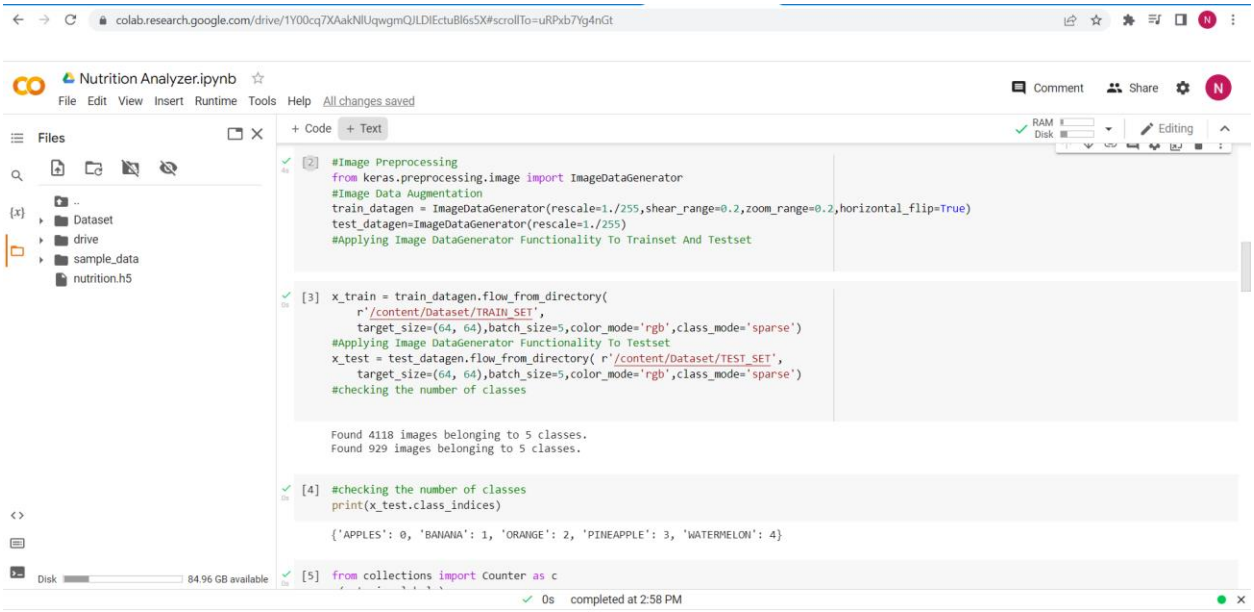
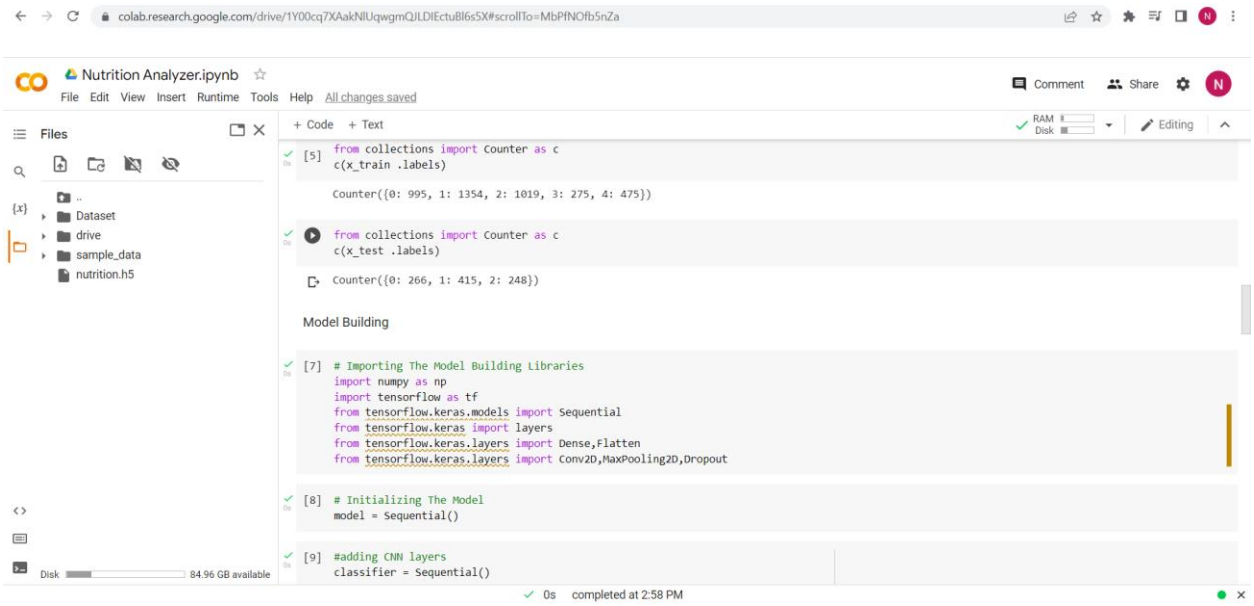
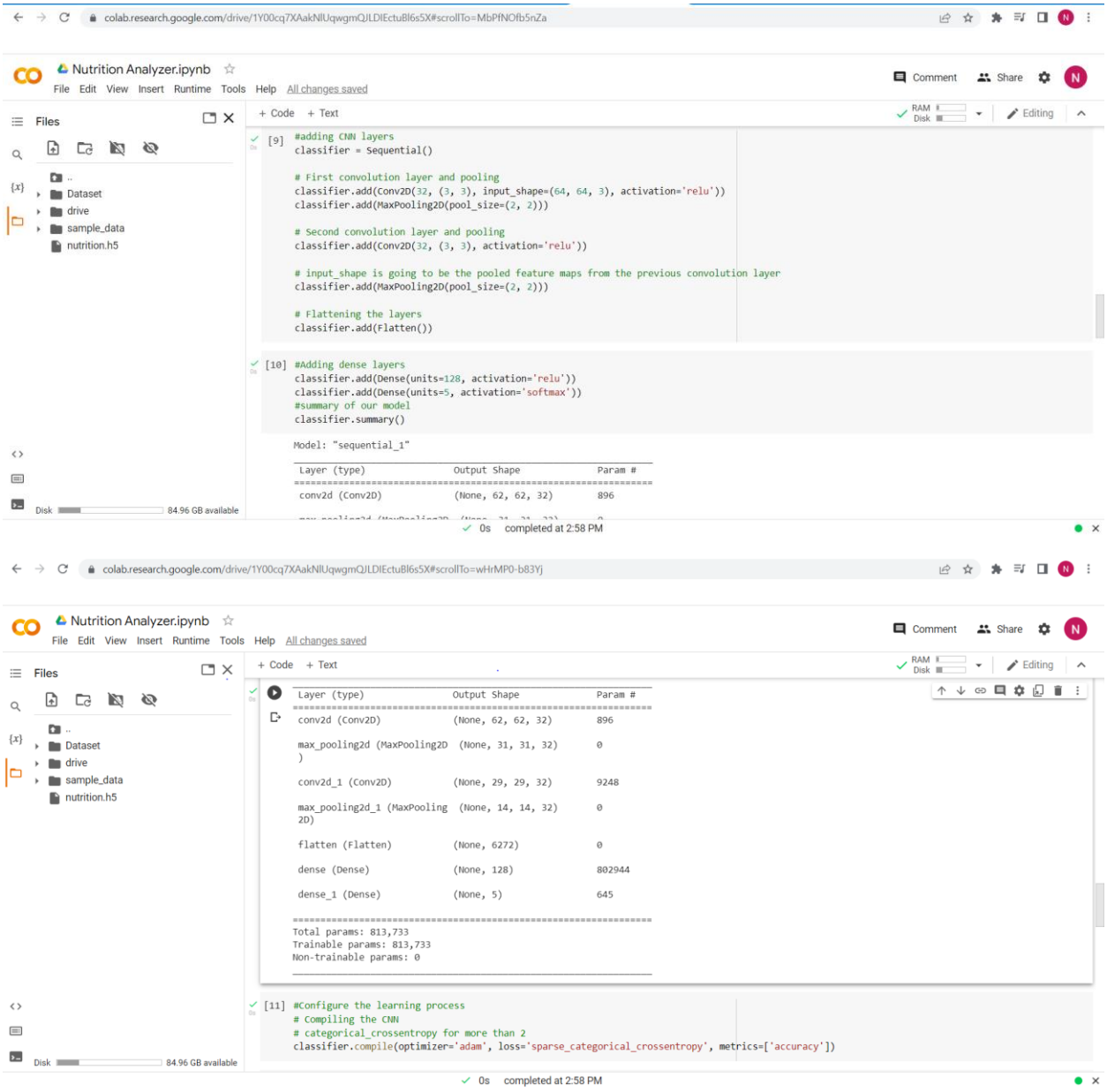
0s completed at 2:58 PM


colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDlEctuBl6s5X#scrollTo=uRPxb7Yg4nGt
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
Files
+ Code + Text
RAM
Disk
Editing
Dataset
drive
sample_data
nutrition.h5
#Image Preprocessing
from keras.preprocessing.image import ImageDataGenerator
#Image Data Augmentation
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
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')
#checking the number of classes
Found 4118 images belonging to 5 classes.
Found 929 images belonging to 5 classes.
#checking the number of classes
print(x_test.class_indices)
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
from collections import Counter as c
Disk
84.96 GB available
0s completed at 2:58 PM


colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDlEctuBl6s5X#scrollTo=MbPfNOfb5nZa
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
Files
+ Code + Text
RAM
Disk
Editing
Dataset
drive
sample_data
nutrition.h5
from collections import Counter as c
c(x_train .labels)
Counter({0: 995, 1: 1354, 2: 1019, 3: 275, 4: 475})
from collections import Counter as c
c(x_test .labels)
Counter({0: 266, 1: 415, 2: 248})
Model Building
# Importing The Model Building Libraries
import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras import layers
from tensorflow.keras.layers import Dense,Flatten
from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout
# Initializing The Model
model = Sequential()
#adding CNN layers
classifier = Sequential()
Disk
84.96 GB available
0s completed at 2:58 PM


colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDIEctuBl6s5X#scrollTo=MbPfNOfb5nZa
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
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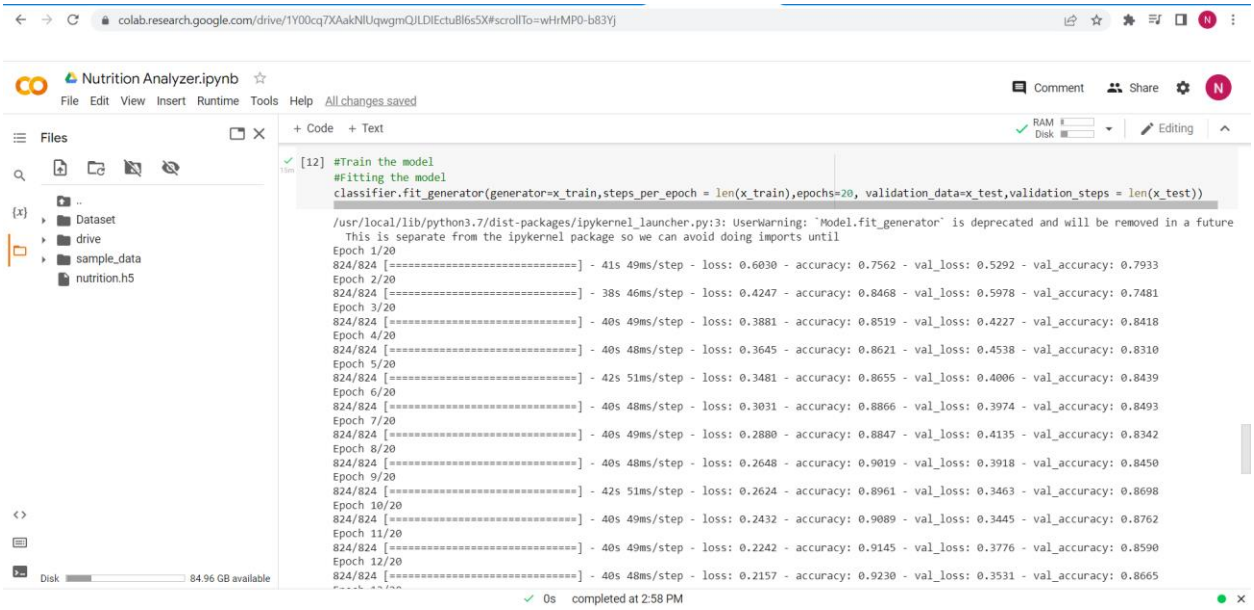
Editing
Dataset
drive
sample_data
nutrition.h5
[9] #adding CNN layers
classifier = Sequential()
# First convolution layer and pooling
classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))
# Second convolution layer and pooling
classifier.add(Conv2D(32, (3, 3), activation='relu'))
# input_shape is going to be the pooled feature maps from the previous convolution layer
classifier.add(MaxPooling2D(pool_size=(2, 2)))
# Flattening the layers
classifier.add(Flatten())
[10] #Adding dense layers
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=5, activation='softmax'))
#summary of our model
classifier.summary()
Model: "sequential_1"
Layer (type) Output Shape Param #
conv2d (Conv2D) (None, 62, 62, 32) 896
Disk 84.96 GB available
0s completed at 2:58 PM

colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDIEctuBl6s5X#scrollTo=wHrMP0-b83Yj
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
Files
+ Code + Text
RAM
Disk
Editing
Dataset
drive
sample_data
nutrition.h5
Layer (type) Output Shape Param #
conv2d (Conv2D) (None, 62, 62, 32) 896
max_pooling2d (MaxPooling2D (None, 31, 31, 32) 0
)
conv2d_1 (Conv2D) (None, 29, 29, 32) 9248
max_pooling2d_1 (MaxPooling (None, 14, 14, 32) 0
2D)
flatten (Flatten) (None, 6272) 0
dense (Dense) (None, 128) 802944
dense_1 (Dense) (None, 5) 645
Total params: 813,733
Trainable params: 813,733
Non-trainable params: 0
[11] #Configure the learning process
# Compiling the CNN
# categorical_crossentropy for more than 2
classifier.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
Disk 84.96 GB available
0s completed at 2:58 PM


colab.research.google.com/drive/1Y00cq7XAakNlUqwgmQJLDIEctuBl6s5X#scrollTo=wHrMP0-b83Yj
Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
Files
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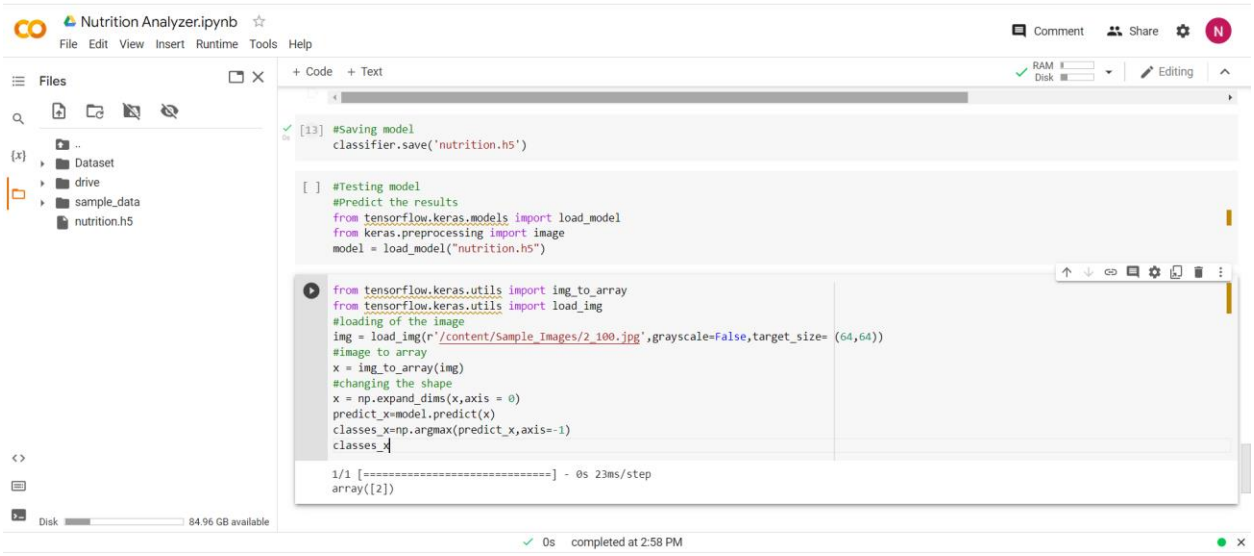
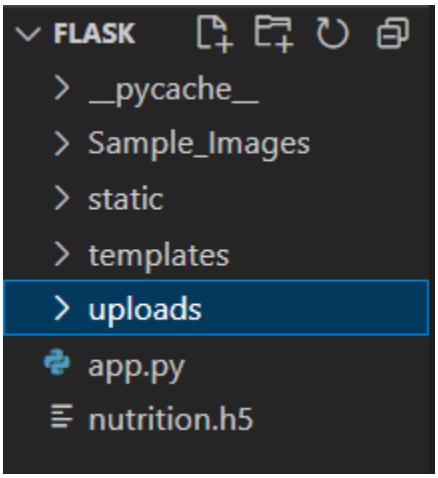
RAM
Disk
Editing
..
Dataset
drive
sample_data
nutrition.h5
[12] #Train the model
#Fitting the model
classifier.fit_generator(generator=x_train,steps_per_epoch = len(x_train),epochs=20, validation_data=x_test,validation_steps = len(x_test))
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:3: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future
This is separate from the ipykernel package so we can avoid doing imports until
Epoch 1/20
824/824 [==========] - 41s 49ms/step - loss: 0.6030 - accuracy: 0.7562 - val_loss: 0.5292 - val_accuracy: 0.7933
Epoch 2/20
824/824 [==========] - 38s 46ms/step - loss: 0.4247 - accuracy: 0.8468 - val_loss: 0.5978 - val_accuracy: 0.7481
Epoch 3/20
824/824 [==========] - 40s 49ms/step - loss: 0.3881 - accuracy: 0.8519 - val_loss: 0.4227 - val_accuracy: 0.8418
Epoch 4/20
824/824 [==========] - 40s 48ms/step - loss: 0.3645 - accuracy: 0.8621 - val_loss: 0.4538 - val_accuracy: 0.8310
Epoch 5/20
824/824 [==========] - 42s 51ms/step - loss: 0.3481 - accuracy: 0.8655 - val_loss: 0.4006 - val_accuracy: 0.8439
Epoch 6/20
824/824 [==========] - 40s 48ms/step - loss: 0.3031 - accuracy: 0.8866 - val_loss: 0.3974 - val_accuracy: 0.8493
Epoch 7/20
824/824 [==========] - 40s 49ms/step - loss: 0.2880 - accuracy: 0.8847 - val_loss: 0.4135 - val_accuracy: 0.8342
Epoch 8/20
824/824 [==========] - 40s 48ms/step - loss: 0.2648 - accuracy: 0.9019 - val_loss: 0.3918 - val_accuracy: 0.8450
Epoch 9/20
824/824 [==========] - 42s 51ms/step - loss: 0.2624 - accuracy: 0.8961 - val_loss: 0.3463 - val_accuracy: 0.8698
Epoch 10/20
824/824 [==========] - 40s 49ms/step - loss: 0.2432 - accuracy: 0.9089 - val_loss: 0.3445 - val_accuracy: 0.8762
Epoch 11/20
824/824 [==========] - 40s 49ms/step - loss: 0.2242 - accuracy: 0.9145 - val_loss: 0.3776 - val_accuracy: 0.8590
Epoch 12/20
824/824 [==========] - 40s 48ms/step - loss: 0.2157 - accuracy: 0.9230 - val_loss: 0.3531 - val_accuracy: 0.8665
Disk
84.96 GB available
0s completed at 2:58 PM


Nutrition Analyzer.ipynb
File Edit View Insert Runtime Tools Help
Comment
Share
Files
+ Code + Text
RAM
Disk
Editing
..
Dataset
drive
sample_data
nutrition.h5
[13] #Saving model
classifier.save('nutrition.h5')
[ ] #Testing model
#Predict the results
from tensorflow.keras.models import load_model
from keras.preprocessing import image
model = load_model("nutrition.h5")
from tensorflow.keras.utils import img_to_array
from tensorflow.keras.utils import load_img
#loading of the image
img = load_img(r'/content/Sample_Images/2_100.jpg',grayscale=False,target_size= (64,64))
#image to array
x = img_to_array(img)
#changing the shape
x = np.expand_dims(x,axis = 0)
predict_x=model.predict(x)
classes_x=np.argmax(predict_x,axis=-1)
classes_x
1/1 [==========] - 0s 23ms/step
array([2])
Disk
84.96 GB available
0s completed at 2:58 PM

8.TESTING

8.1 TEST CASE



8.2 USER ACCEPTENCE TESTING

1. PURPOSE OF DOCUMENT

The purpose of this document is to briefly explain the test coverage and open issues of the [AI-Powered Nutrition Analyzer For Fitness Euthusiasts] project at the time of the release to User Acceptance Testing (UAT).

2. DEFECT ANALYSIS

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

Resolution	Severity-1	Severity-2	Severity-3	Severity-4	Subtotal
By Design	15	4	2	3	25
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	0	0	0
Won't Fix	0	0	0	0	0
Totals	24	14	13	26	77

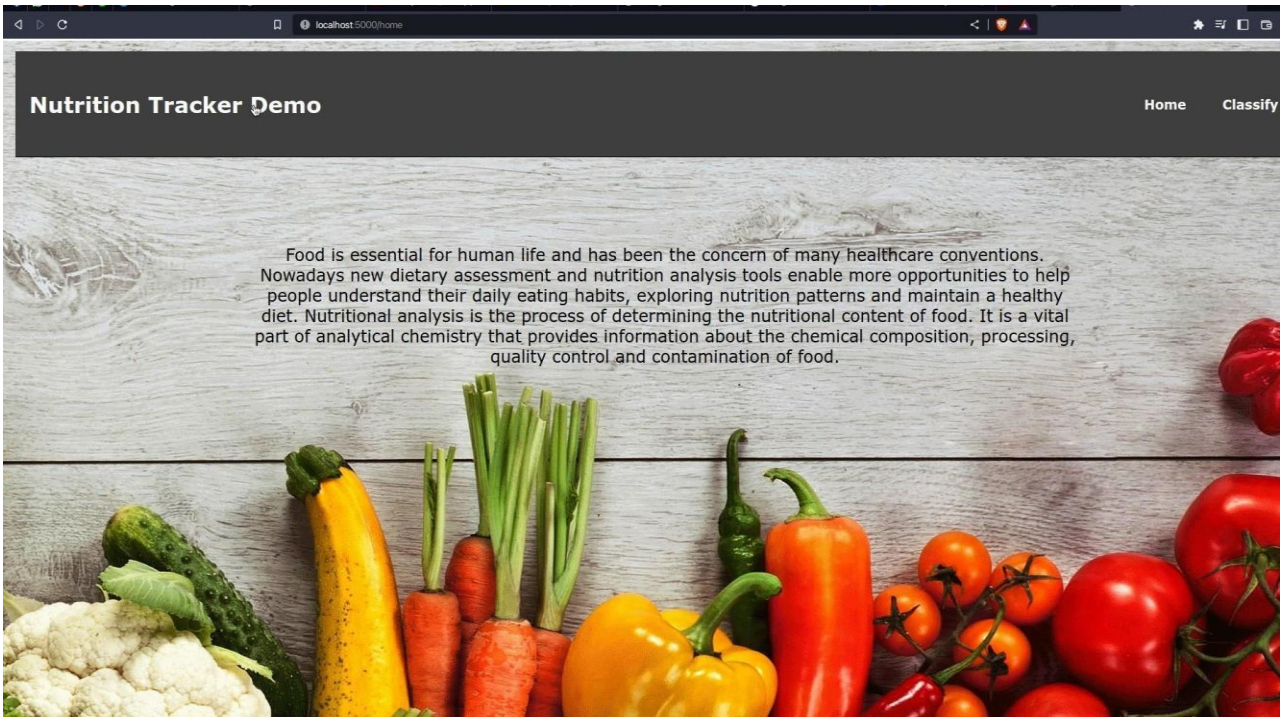
9.RESULTS

9.1 PERFORMANCE METRICS

```
Epoch 20/20
824/824 [==============================] - 42s 51ms/step - loss: 0.1486 - accuracy: 0.9449 - val_loss: 0.3911 - val_accuracy: 0.8870
```

9.2 OUTPUTS

Home Page



Uploading Page

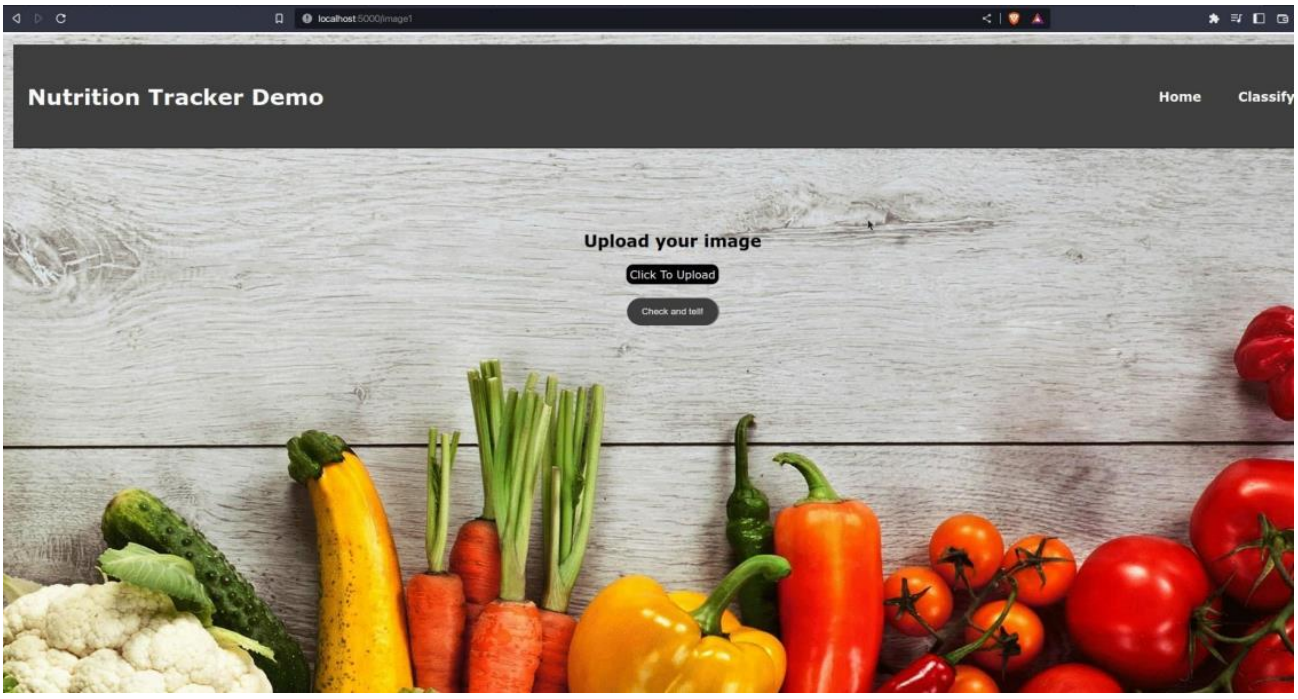
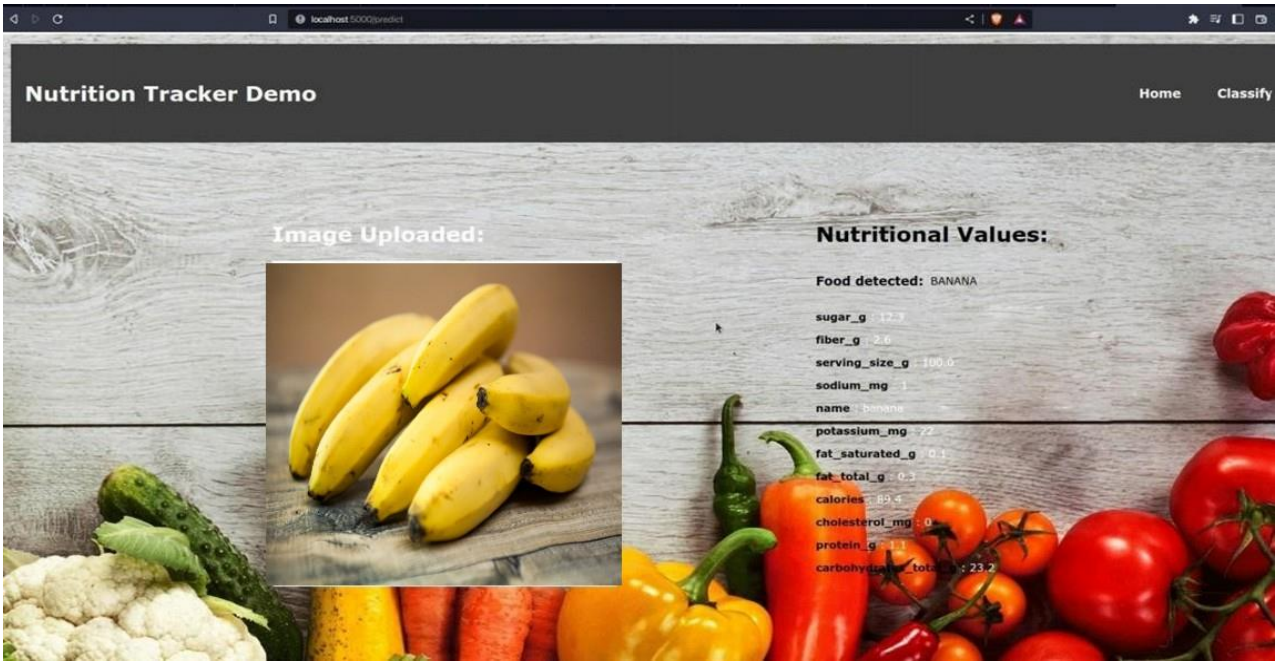


Image Classification Page



10. ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGES

- Picture of body identifying benefits of healthy eating for adults.
- May help you live longer.
- Keeps skin, teeth, and eyes healthy.
- Supports muscles.
- Boosts immunity.
- Strengthens bones.
- Lowers risk of heart disease, type 2 diabetes, and some cancers.
- Supports healthy pregnancies and breastfeeding.

10.2 DISADVANTAGES

- These unhealthy eating habits can affect our nutrient intake, including energy (or kilojoules) protein, carbohydrates, essential fatty acids, vitamins and minerals as well as fibre and fluid.
- Being overweight
- Tooth decay
- High blood pressure
- High cholesterol
- Heart disease and stroke
- Type-2 diabetes

11. CONCLUSION

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. Left to their own devices, children will not automatically select healthy foods.

12. FUTURE SCOPE

1. Mindful Eating and Food as Medicine:

   The distinction between food and supplements blur as functionalities, such as immune support or gut health, become a priority for consumers.

2. Plant-Based Eating and Alternative Proteins:

   Plant-based products accelerated this past year due to demand for healthy food options during the pandemic

3. From Farm to Fork: Food Tech, Origins and Security:

   Demand for sourcing transparency combined with unprecedented investment in tech is advancing the ability to trace food from production to consumption

13. APPENDIX

13.1 SOURCE CODE

App.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('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

    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://nutritionanalyzer.p.rapidapi.com/v1/nutrition"

querystring = {"query":index}

headers = {
    'x-rapidapi-key': "5jsnf47bfa9a8ee4e668f26d797ab107mshffd34bd044e64p1",
    'x-rapidapi-host': "nutritionanalyzer.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)
```

0.html

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

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

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

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

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

Home.html

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <title>Home</title>
    <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
    <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
    <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
    <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
    <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
<style>
body
{
    background-image: url("https://www.livingproofnyc.com/wp-
content/themes/livingproof/assets/img/hero-background.jpg");
    background-size: cover;
}
.bar
{
```

```
margin: 0px;
padding:20px;
background-color:white;
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
h3
{
margin: 0px;
padding:20px;
background-color:#9ACD32;
width: 800px;
opacity:0.6;
color:#000000;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
```

```
background-color:black;
color:white;
border-radius:15px;
font-size:30px;
padding-left:10px;
}
.div1{
  background-color: lightgrey;
  width: 500px;
  border: 10px solid peach;
  padding: 20px;
  margin: 20px;
  height: 500px;
}



.header { position: relative;
      top:0;
      margin:0px;
      z-index: 1;
      left: 0px;
      right: 0px;
      position: fixed;
      background-color: #8B008B ;
      color: white;
      box-shadow: 0px 8px 4px grey;
      overflow: hidden;
      padding-left:20px;
      font-family: 'Josefin Sans';
      font-size: 2vw;
```

```
      width: 100%;
      height:8%;
      text-align: center;
    }
    .topnav {
  overflow: hidden;
  background-color: #FCAD98;
}

.topnav-right a {
  float: left;
  color: black;
  text-align: center;
  padding: 14px 16px;
  text-decoration: none;
  font-size: 22px;
}

.topnav-right a:hover {
  background-color: #FF69B4;
  color: black;
}

.topnav-right a.active {
  background-color: #DA70D6;
  color: black;
}

.topnav-right {
  float: right;
  padding-right:100px;
}
```

```
</style>
</head>
<body>

<!--Brian Tracy-->

<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black; padding-top:1%;padding-left:5%;">Nutrtion Image Analysis</div>
  <div class="topnav-right"style="padding-top:0.5%;">

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

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

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://i.pinimg.com/originals/be/21/1a/be211ad5043a8d05757a3538bdd8f450.jpg");
   background-size: cover;
}
.bar
{
margin: 0px;
padding:20px;
background-color:white;
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;
border-radius:15px;
font-size:30px;
padding-left:10px;
}
```

```
.div1{
  background-color: lightgrey;
  width: 500px;
  border: 10px solid peach;
  padding: 20px;
  margin: 20px;
  height: 500px;
}




.header { position: relative;
      top:0;
      margin:0px;
      z-index: 1;
      left: 0px;
      right: 0px;
      position: fixed;
      background-color: #8B008B ;
      color: white;
      box-shadow: 0px 8px 4px grey;
      overflow: hidden;
      padding-left:20px;
      font-family: 'Josefin Sans';
      font-size: 2vw;
      width: 100%;
      height:8%;
      text-align: center;
    }
    .topnav {
  overflow: hidden;
```

```
  background-color: #FCAD98;
}

.topnav-right a {
  float: left;
  color: black;
  text-align: center;
  padding: 14px 16px;
  text-decoration: none;
  font-size: 18px;
}

.topnav-right a:hover {
  background-color: #FF69B4;
  color: black;
}

.topnav-right a.active {
  background-color: #DA70D6;
  color: black;
}

.topnav-right {
  float: right;
  padding-right:100px;
}
</style>
</head>
<body>
<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black; padding-
top:1%;padding-left:5%;">Nutrtion Image Analysis</div>
```

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

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

</div>
<div class="container">
      <center>
<div id="content" style="margin-top:2em">{% block content %}{% endblock
%}</div></center>
   </div>
</body>

<footer>
   <script src="{{ url_for('static', filename='js/main.js') }}"
type="text/javascript"></script>
</footer>

</html>
```

Main.js

```
$(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();
        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,
            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!');
            },
        });
    });

});
```

13.2GITHUB

https://github.com/IBM-EPBL/IBM-Project-29867-1660132081

13.3PROJECT DEMO LINK

https://drive.google.com/drive/folders/1pXhr6U_7ONi2H-8gzpC3k3K2aq7zz00O?usp=sharing