AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

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1.INTRODUCTION

A. 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.

B.Purpose

The main aim of the project is to building a model which is used for classifying the fruit depends onthe different characteristics like colour, shape, texture etc. Here the user can capture the images ofdifferent 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.).

2.LITERATURE SURVEY

A.Existing problem

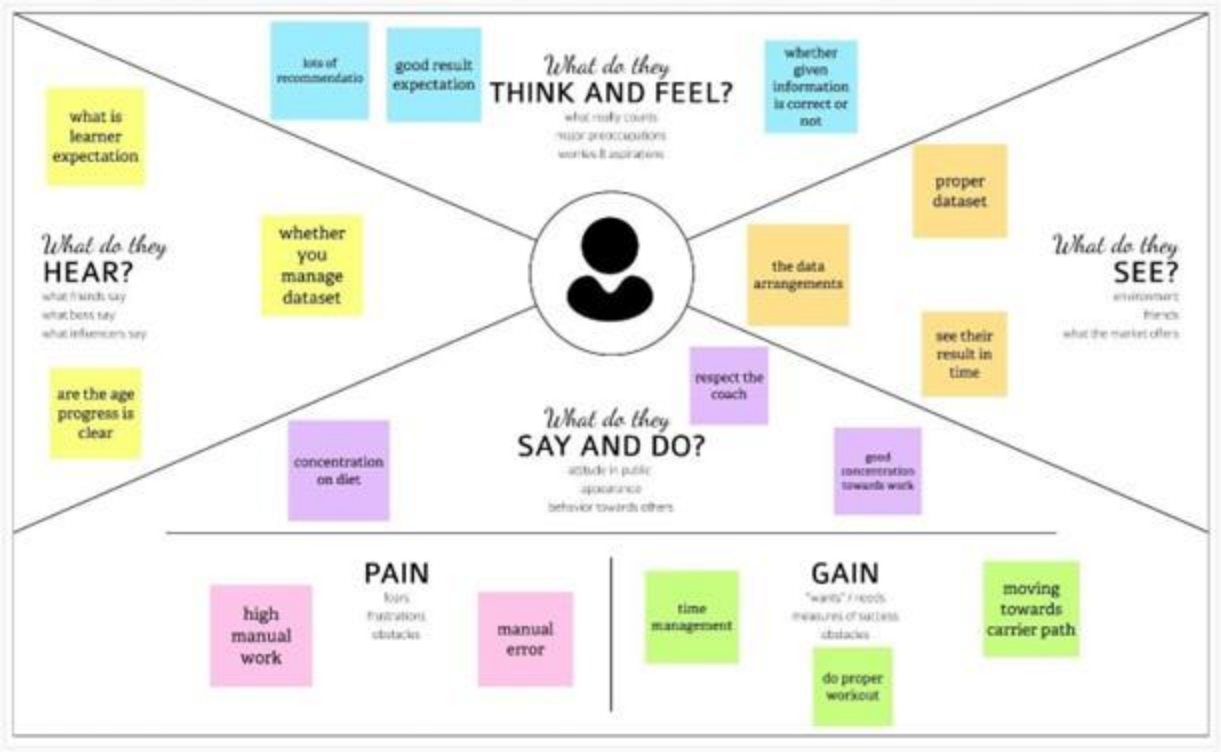
Neutrino delivers nutrition-based data services and analytics to its users and wants to turn into aleading source of the nutrition-related platform. The platform employs NLP and mathematical models from the optimization theory as well as predictive analysis to enable individualized data compilation.

The application relies on Artificial Intelligence to produce custom data related to smart calorie counter powered by AI. Their artificial intelligence learns an individual's tastes, preferences, andbody type. All of this is packaged in a comprehensive nutrition and activity tracker.

B. Problem Statement Definition

Food is crucial for human life and has been the subject of numerous healthcare conventions. Nowadays modern dietary assessment and nutrition analysis tools allow more options to help people understand their daily eating habits, investigate nutrition trends and maintain a healthy diet. Nutritional analysis is the method of determining the nutritional composition of food. It is a critical aspect of analytical chemistry that offers information about the chemical composition, processing, quality control and contamination of food. The major purpose of the project is to construct a model which is used for classifying the fruit depending on many features. The model examines the image and identifies the nutrition depending on the fruit's as (Sugar, Fibre, Calories, etc)

3. IDEATION & PROPOSED SOLUTION



B.PROPOSED SOLUTION

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

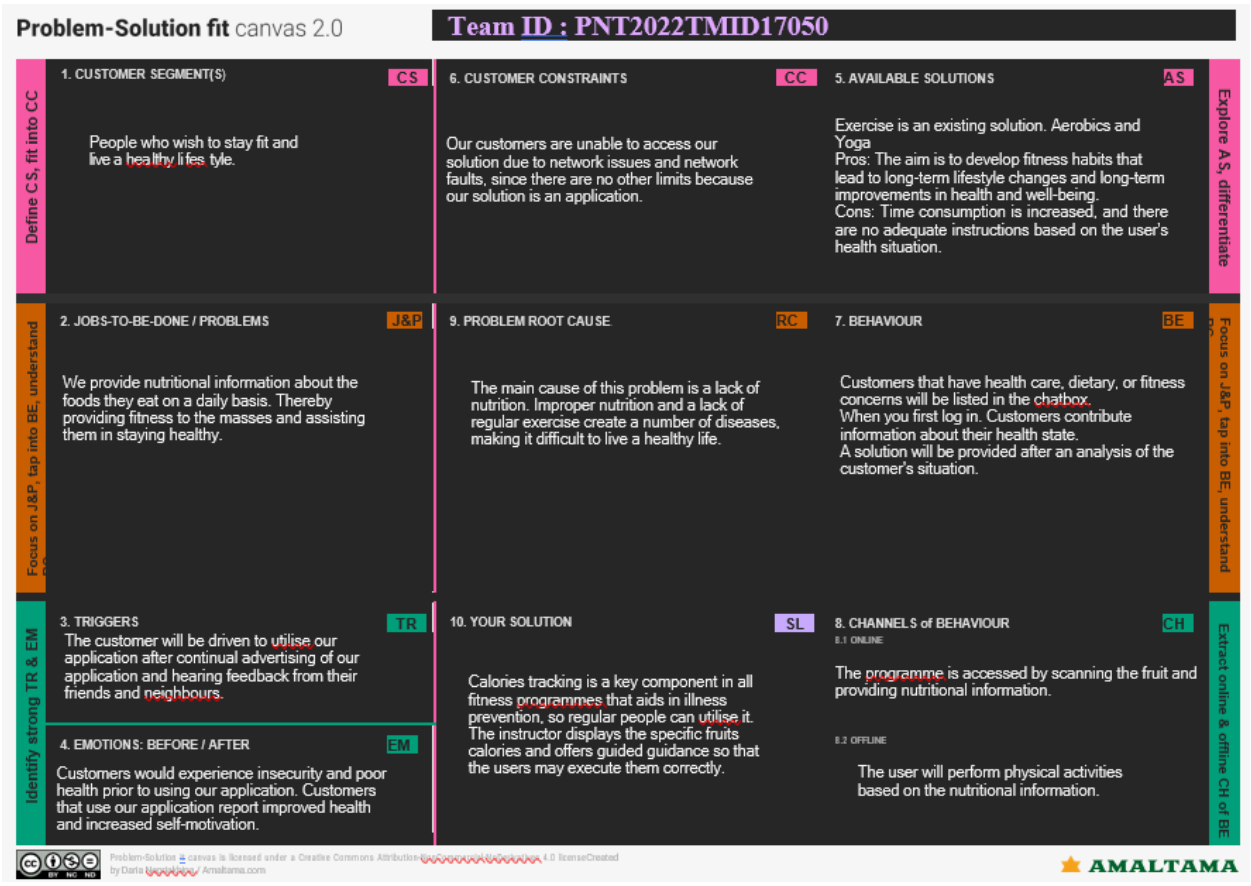
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	A regular person must use cutting-edge AI- based analyzing software to identify fruits and vegetables based on color, texture, form, and other characteristics. At the time of identification, the user must also be aware of the nutritional content of that specific edible.

2.	Idea / Solution description	**Main Solution**: ● Clear and proper identification of the given input data. ● Provide nutritional facts based on the obtained data. ● Fitness analysis and maintenance as per the user's body conditions **Additional benefits**: ● Analysis of daily dietary requirements ● Daily tracking of dietary consumption thoroughly.
3.	Novelty / Uniqueness	● The availability of fitness plans with addon bonuses ● Suggestion of home remedies and simple solutions for basic problems. ● An individualized food plan based on health condition and deficiency. ● Allowing for diet flexibility helps promote a healthy and effective eating pattern
4.	Social Impact / Customer Satisfaction	● Healthy lifestyle development ● Constant calorie management monitoring results in a fitness mindset.
5.	Business Model (Revenue Model)	● Consultation with nearest trainers and nutritionist for personalized plans.
		● Adopt a specialized diet plan under the direction of an expert. ● Advertise and offer nutritional supplements and fitness gear. ● Promotion for fitness centers and hospitals.

6.	Scalability of the Solution	• Improving accuracy by expanding the data collection using user input data • Storage requirements of a specific food. • User friendly UI for everyone to use and get benefit from it.

C. Problem Solution fit

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators.



4. REQUIREMENT ANALYSIS

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	Login through Google Login through Email
FR-4	Choose package	Selection of desired package
FR-5	Generate the daily plan	Daily plans will be generated by dietician
FR-6	Manage progress report	Gathering information from database and generating report
FR-7	Query	The user can ask for changes in plan

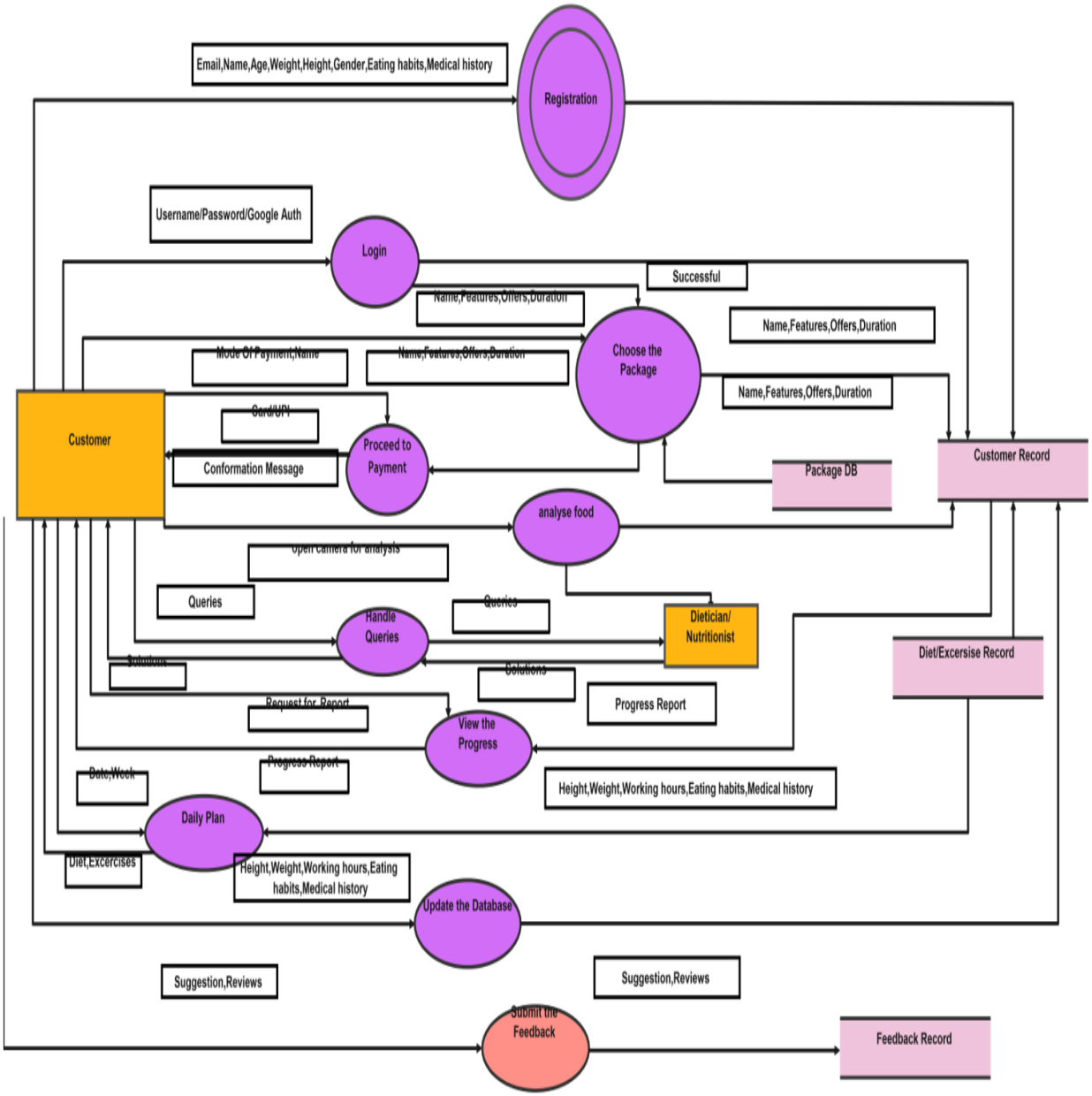
Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

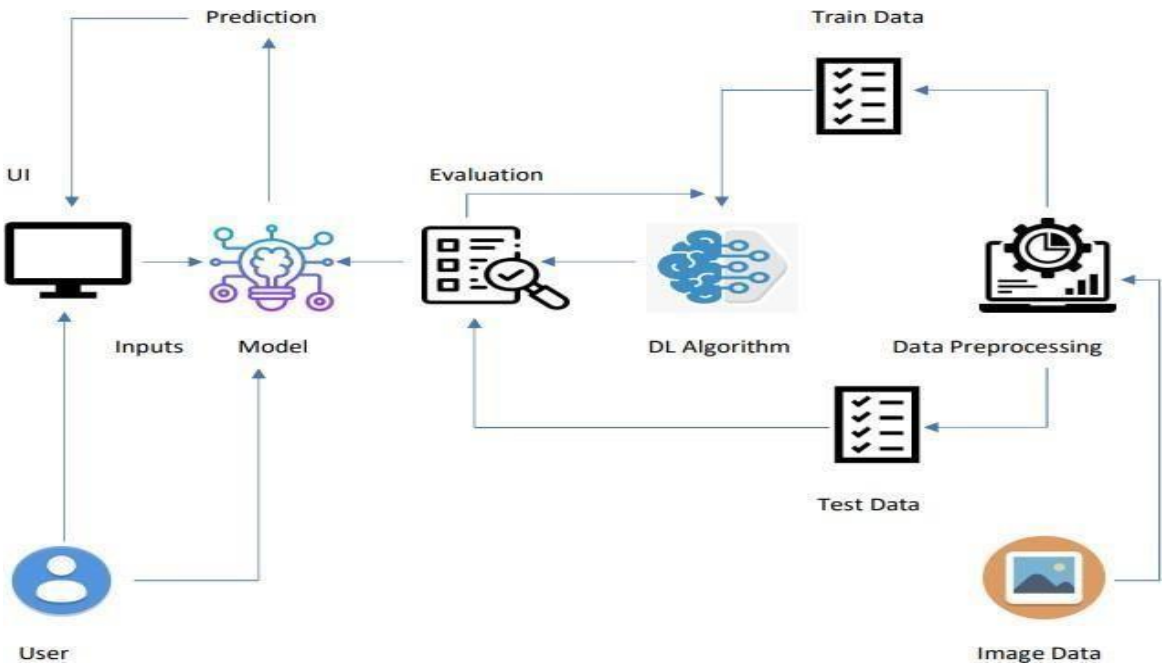
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Easy to use with interactive User Interface
NFR-2	**Security**	User can access only their personal information and not that of other users.
NFR-3	**Reliability**	The average time of failure shall be 7 days.
NFR-4	**Performance**	The results has to be shown within 10 sec
NFR-5	**Availability**	The dietician shall be available to users 24 hours a day, 7 days a week.
NFR-6	**Scalability**	Supports various food items

5. PROJECT DESIGN

A. Data Flow Diagram



5.1 Solution & Technical Architecture



Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	open-source frameworks used	SendGrid, Python, jQuery
2.	Security Implementations	Request authentication using encryption	Encryptions, SSL certs
3.	Scalable Architecture	The scalability of architecture consists of 3 tiers	Web Server – HTML, CSS, JavaScript Application Server – Python Flask Database Server – IBM Cloud

4.	Availability	Availability is increased by loads balancers in cloud VPS	IBM Cloud hosting
5.	Performance	The application is expected to handle up to 4000 predictions per second	IBM Load Balance

6.PROJECT PLANNING AND SCHEDULING

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

The below template shows the product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -1	Upload Images	USN-1	Dataset - Collecting images of food items apples , banana, orange, pineapple, watermelon for analysis	2	High	1. Harni srie L 2. Hemanth M 3. Gokulakrishnan P 4. Vigneshwaran K
Sprint -1	Image Preprocessing	USN-2	Image data augmentation - Increasing the amount of data by generating new data	3	High	1.Harni srie L 2.Hemanth M 3.Gokulakrishnan P 4.Vigneshwaran K

			points from existing data.			

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -1	Image Preprocessing	USN-3	Image Data Generator Class - Used for getting the input of the original data	2	Low	1.Harni srie L 2.Hemanth M 3.Gokulakrishnan P 4.Vigneshwaran K
Sprint -1	Image Preprocessing	USN-4	Applying image data generator functionality to train set and test set	2	High	1.Harni srie L 2.Hemanth M 3.Gokulakrishnan P 4.Vigneshwaran K
Sprint -2	Model Building	USN-5	Defining the model architecture - Building the model using deep learning approach and adding CNN layers	2	High	1. Harni srie L 2. Hemanth M 3. Gokulakrishnan P 4. Vigneshwaran K

Sprint -2	Model Building	USN-6	Training , saving, testing and predicting the model	3	High	1. Harni srie L 2. Hemanth M 3. Gokulakrishnan P 4. Vigneshwaran K
Sprint -3	Application Building	USN-7	Home page creation - It shows options of the application Login and registration page creation - User can register and	2	Medium	1. Harni srie L 2. Hemanth M 3. Gokulakrishnan P 4. Vigneshwaran K

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022

Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

Velocity:

For example, 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)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

eration unit (story points per day)

AV = Sprint Duration = 20 = 3.3 (approx.)
Velocity 6

In our project, we have a 6-days sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per

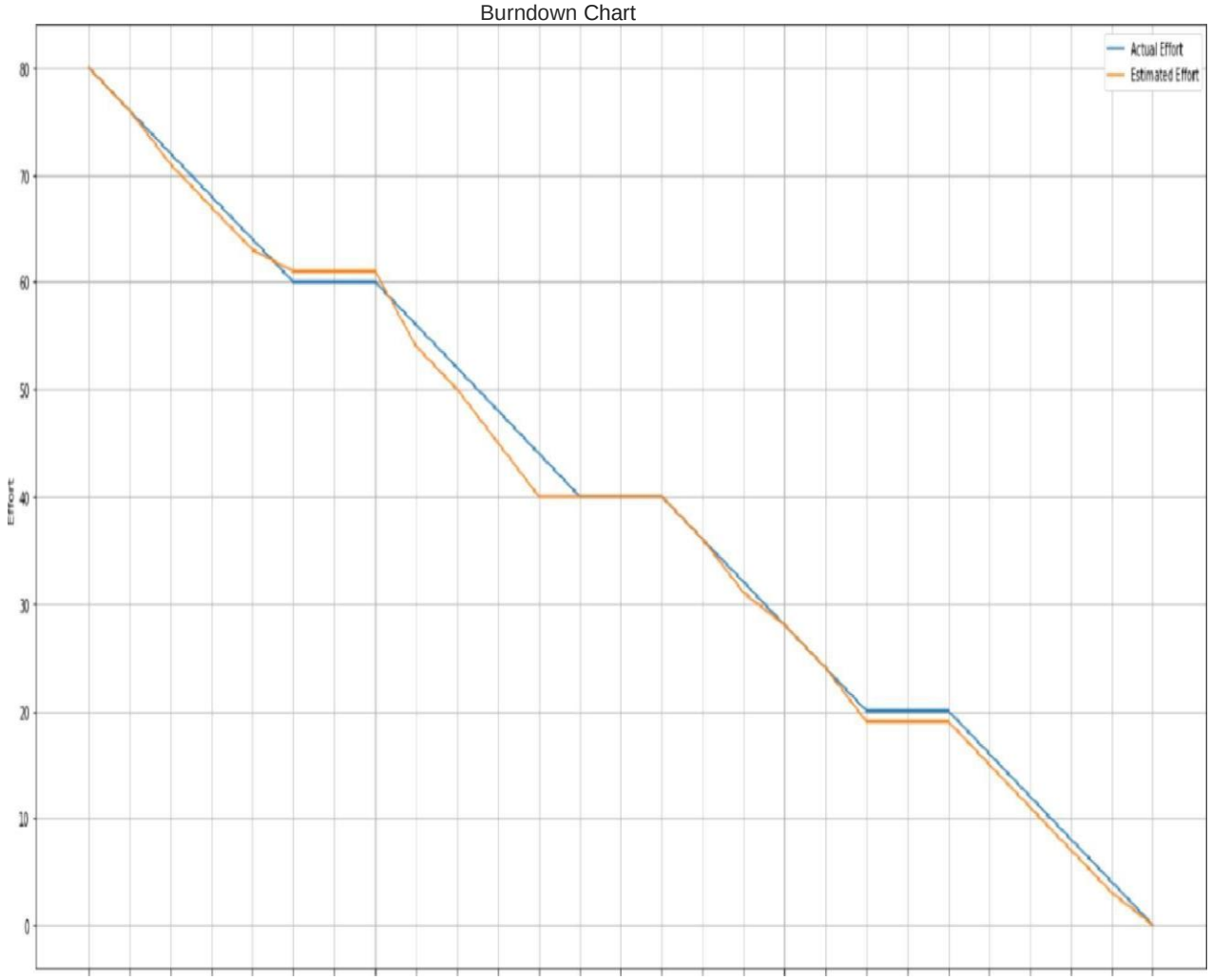
Burndown Chart:

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.

A burndown chart is almost a “must” have tool for a Scrum Team for the following main reasons:

- monitoring the project scope creep
- Keeping the team running on schedule
- Comparing the planned work against the team progression

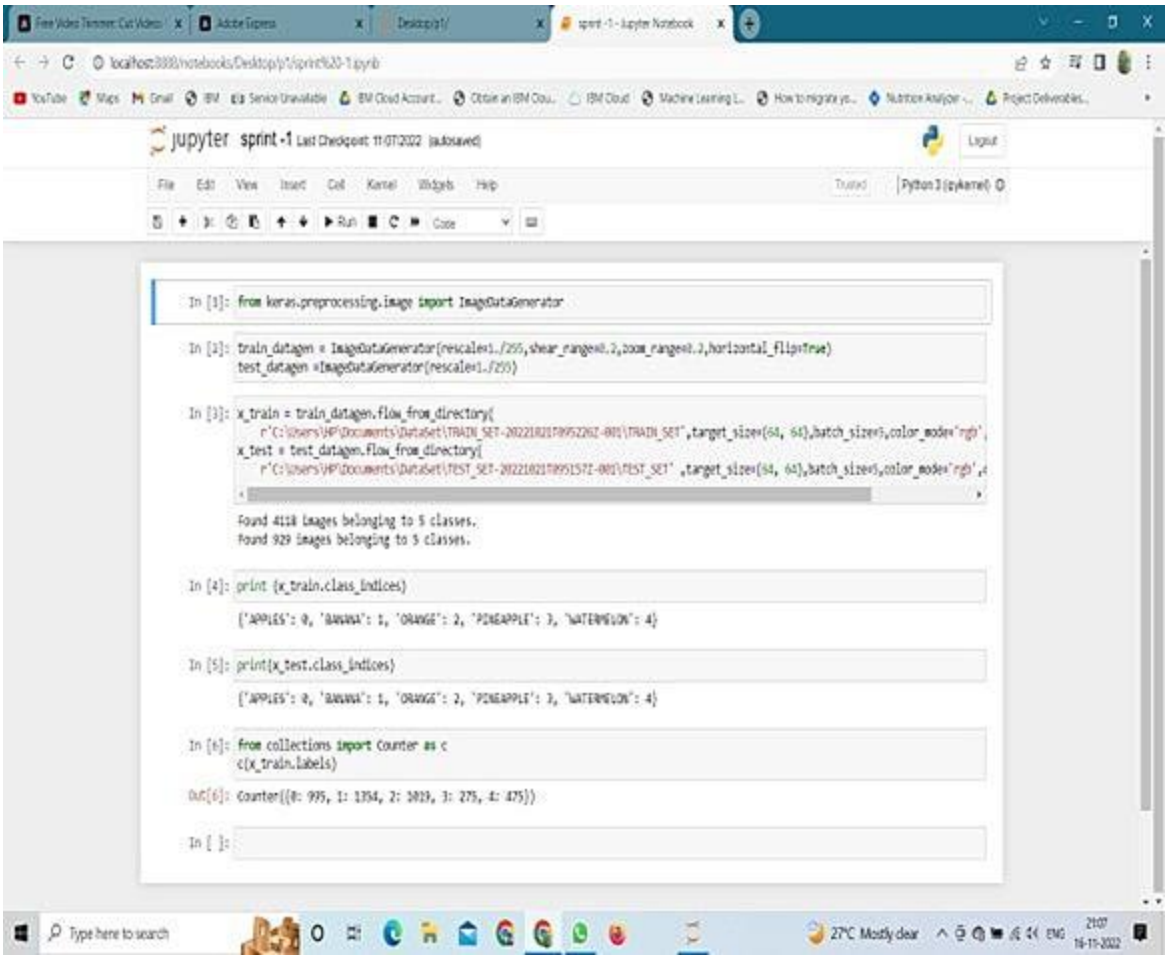
Burndown Chart

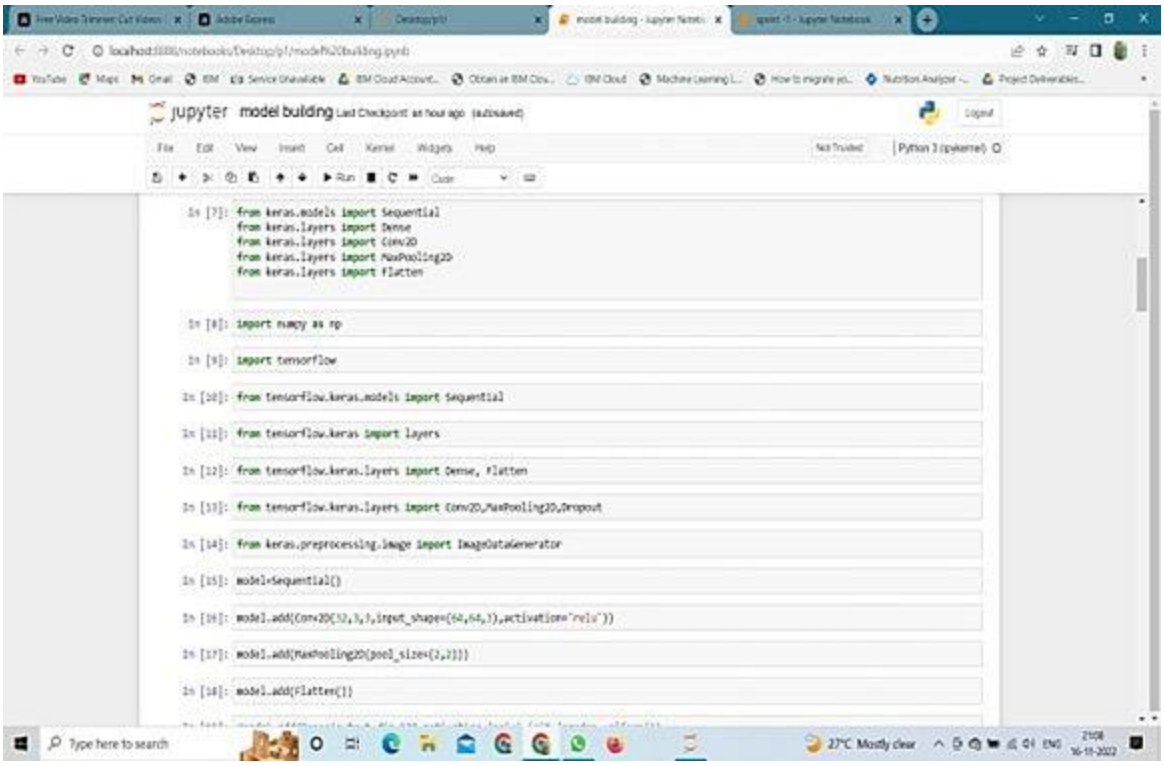


N0‹+ A0<T Y0‹i l7l ¥0£t N0‹i Y0‹+ 3T0l No Mwz fi fi 5V Vo‹ 7+o Bo 1%Nv UN T2t 3V CN 5N:‹ GV NN‹ EV lV

6. CODING & SOLUTIONING (Explain the features added in the project along with code)

6.1 Feature 1


jupyter sprint -1 Last Checkpoint: 11 07 2022 (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3 (ipykernel)
Run
Code
In [1]: from keras.preprocessing.image import ImageDataGenerator
In [2]: train_datagen = ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
test_datagen =ImageDataGenerator(rescale=1./255)
In [3]: x_train = train_datagen.flow_from_directory(
r'C:\Users\HP\Documents\Dataset\TRAIN_SET-20221021T095226Z-001\TRAIN_SET',target_size=(64, 64),batch_size=5,color_mode='rgb',
x_test = test_datagen.flow_from_directory(
r'C:\Users\HP\Documents\Dataset\TEST_SET-20221021T095157Z-001\TEST_SET' ,target_size=(64, 64),batch_size=5,color_mode='rgb',
Found 4118 images belonging to 5 classes.
Found 929 images belonging to 5 classes.
In [4]: print (x_train.class_indices)
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
In [5]: print(x_test.class_indices)
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
In [6]: from collections import Counter as c
c(x_train.labels)
Out[6]: Counter({0: 995, 1: 1354, 2: 1019, 3: 275, 4: 475})
In [ ]:
Type here to search
27°C Mostly clear
ENG
21:07
16-11-2022


jupyter model building Last Checkpoint an hour ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [7]:
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Conv2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
In [8]:
import numpy as np
In [9]:
import tensorflow
In [10]:
from tensorflow.keras.models import Sequential
In [11]:
from tensorflow.keras import layers
In [12]:
from tensorflow.keras.layers import Dense, Flatten
In [13]:
from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout
In [14]:
from keras.preprocessing.image import ImageDataGenerator
In [15]:
model=Sequential()
In [16]:
model.add(Conv2D(32,3,3,input_shape=(64,64,3),activation='relu'))
In [17]:
model.add(MaxPooling2D(pool_size=(2,2)))
In [18]:
model.add(Flatten())
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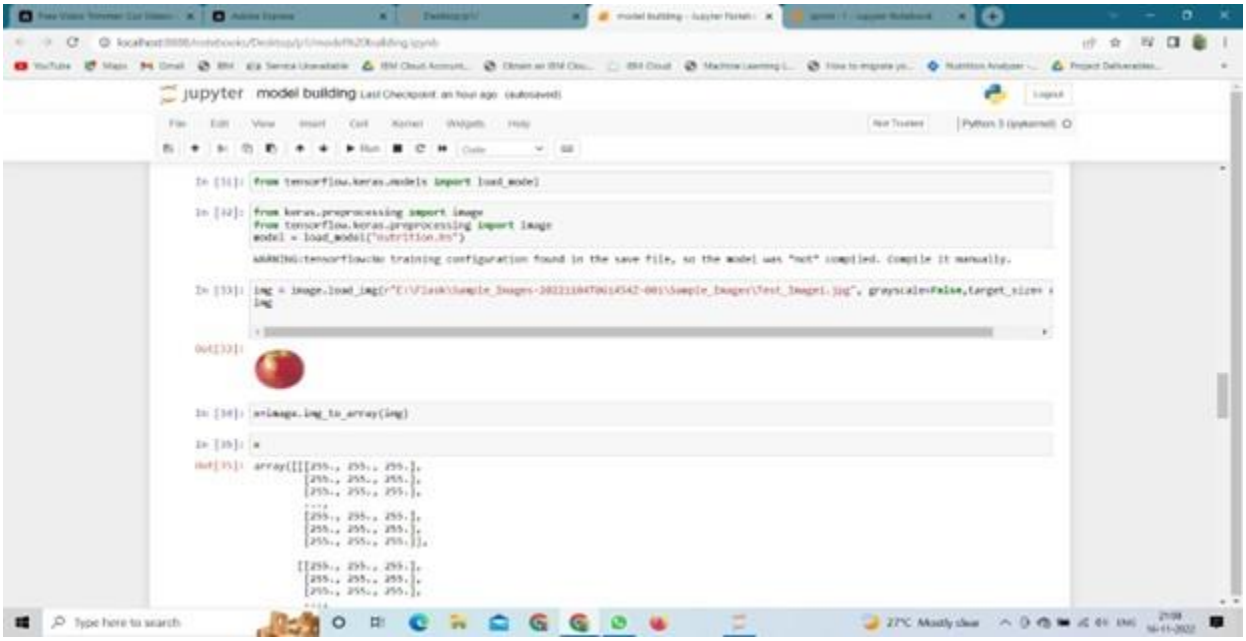
ENG
21:08
16-11-2022


jupyter model building Last Checkpoint an hour ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [31]:
from tensorflow.keras.models import load_model
In [32]:
from keras.preprocessing import image
from tensorflow.keras.preprocessing import image
model = load_model("nutrition.h5")
WARNING:tensorflow:No training configuration found in the save file, so the model was *not* compiled. Compile it manually.
In [33]:
img = image.load_img(r"C:\Flask\Sample_Images-20221104T061434Z-001\Sample_Images\Test_Image1.jpg", grayscale=False,target_size=
img
Out[33]:
In [34]:
x=image.img_to_array(img)
In [35]:
x
Out[35]:
array([[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],
[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
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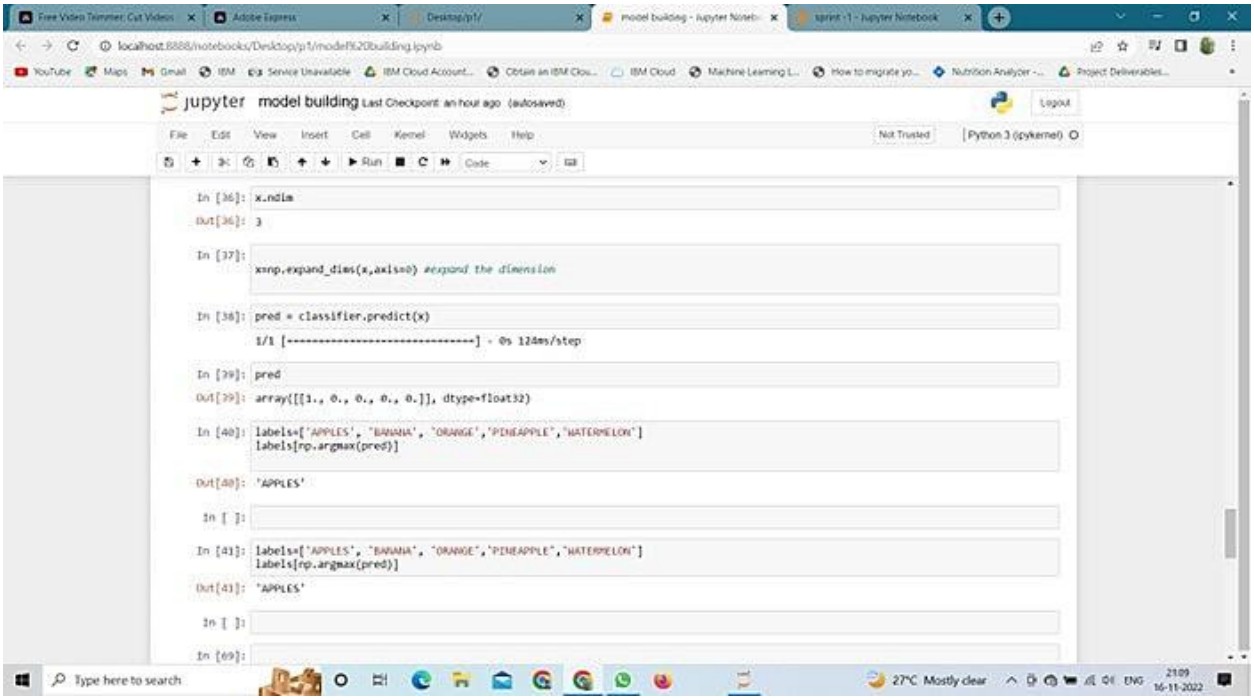
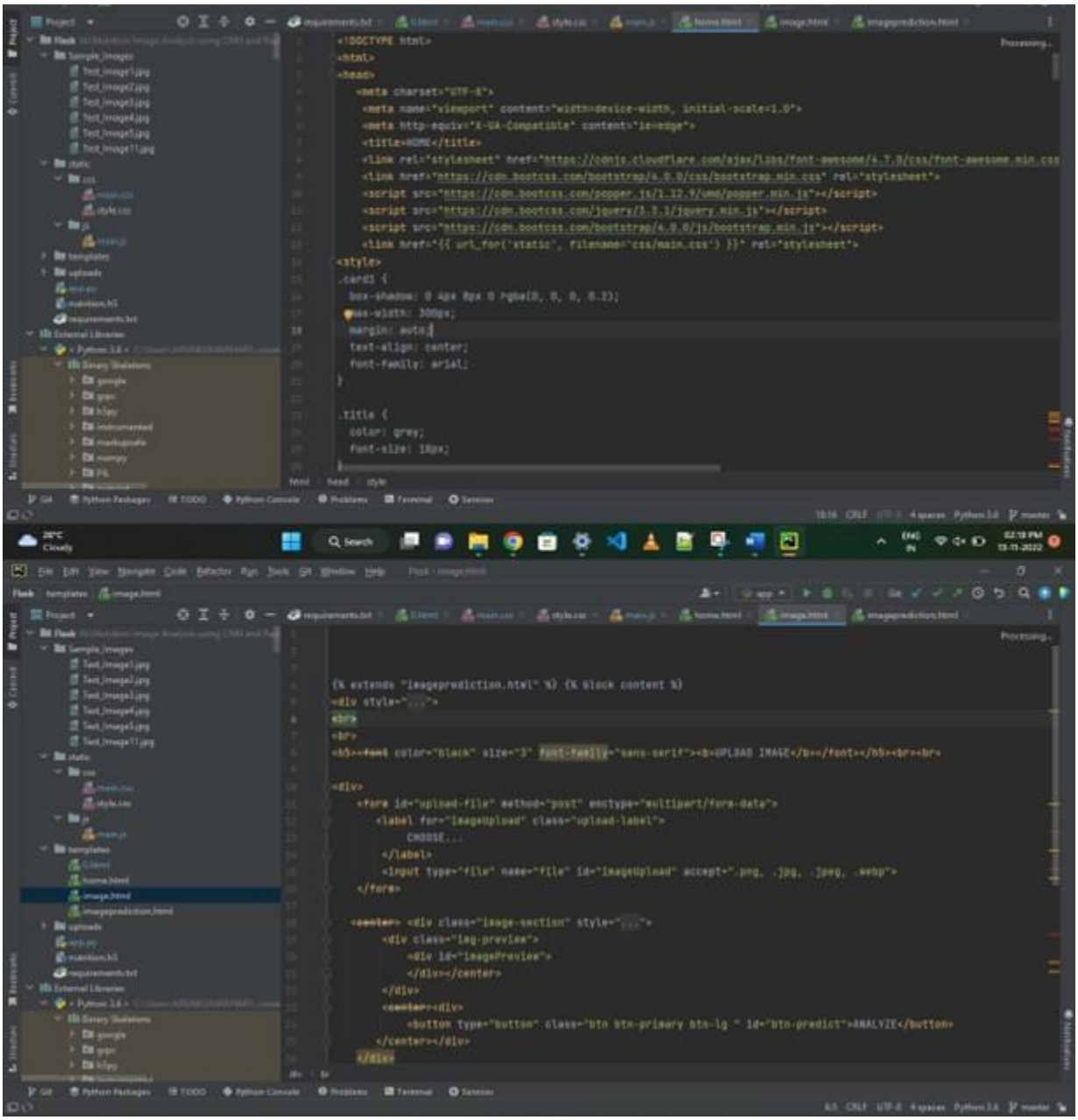
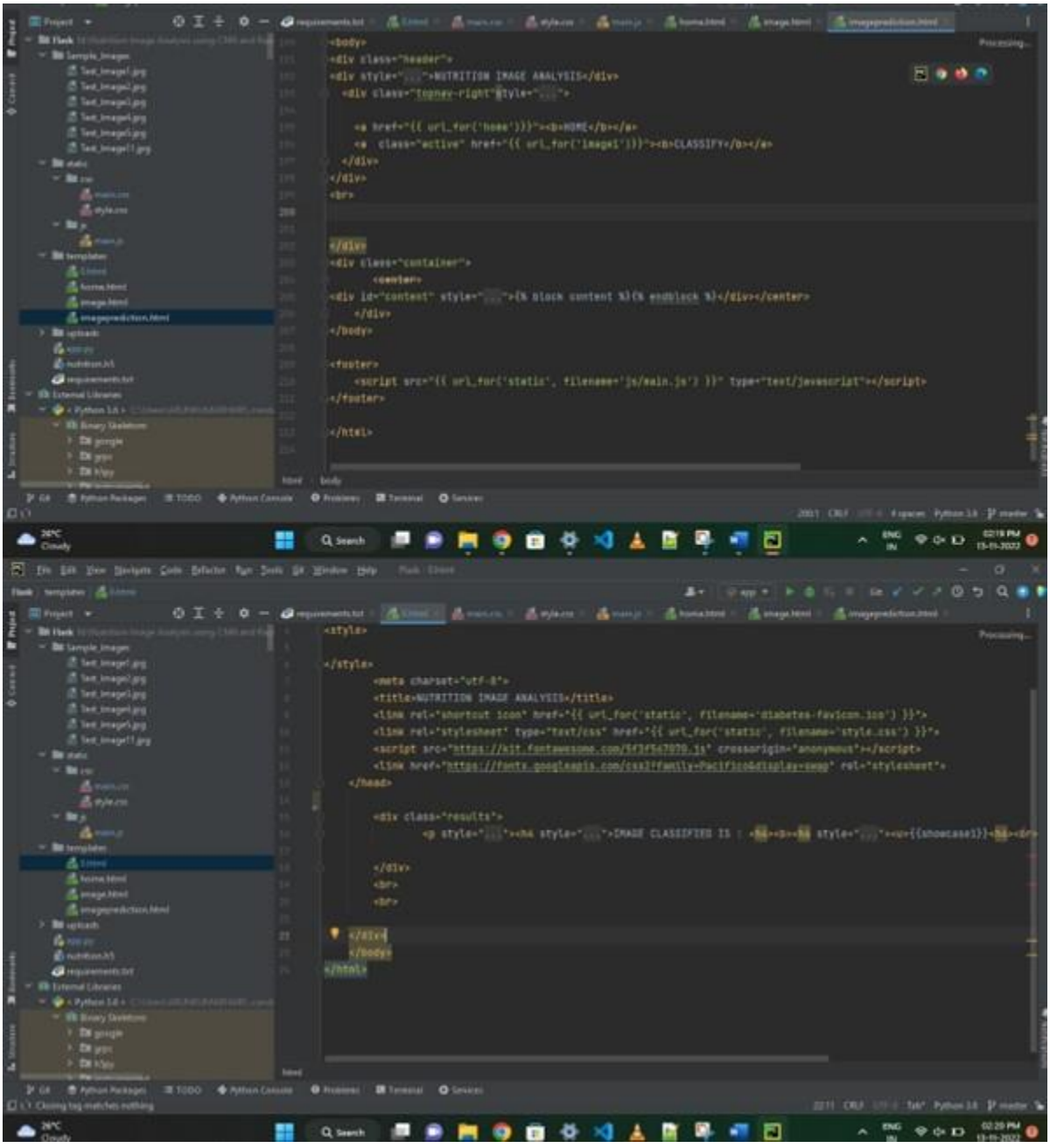
27°C Mostly clear
ENG


jupyter model building Last Checkpoint: an hour ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [36]: x.ndim
Out[36]: 3
In [37]: xnp.expand_dims(x,axis=0) #expand the dimension
In [38]: pred = classifier.predict(x)
1/1 [==============================] - 0s 124ms/step
In [39]: pred
Out[39]: array([[1., 0., 0., 0., 0.]], dtype=float32)
In [40]: labels=['APPLES', 'BANANA', 'ORANGE','PINEAPPLE','WATERMELON']
labels[np.argmax(pred)]
Out[40]: 'APPLES'
In [ ]:
In [41]: labels=['APPLES', 'BANANA', 'ORANGE','PINEAPPLE','WATERMELON']
labels[np.argmax(pred)]
Out[41]: 'APPLES'
In [ ]:
In [69]:
Type here to search
27°C Mostly clear
ENG
21:09
16-11-2022

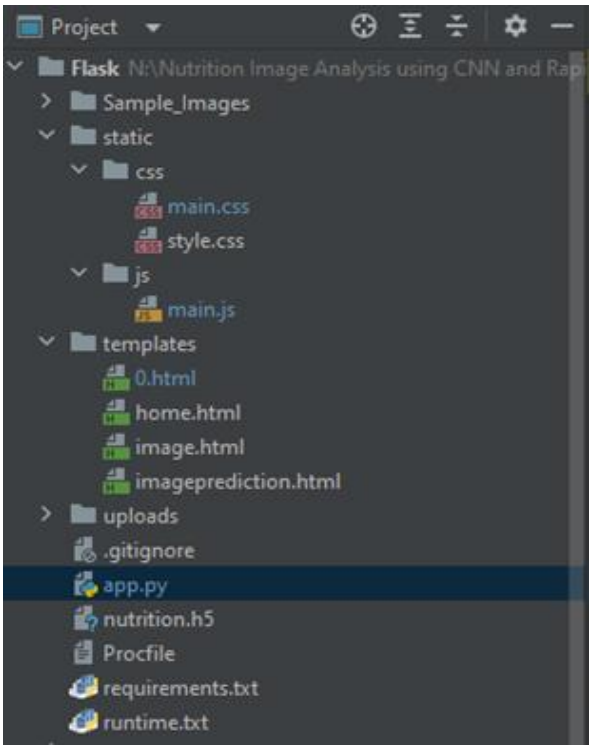
6.1Feature 2





7. TESTING

7.1 Test Cases



7.2 User Acceptance Testing

8.User Stories

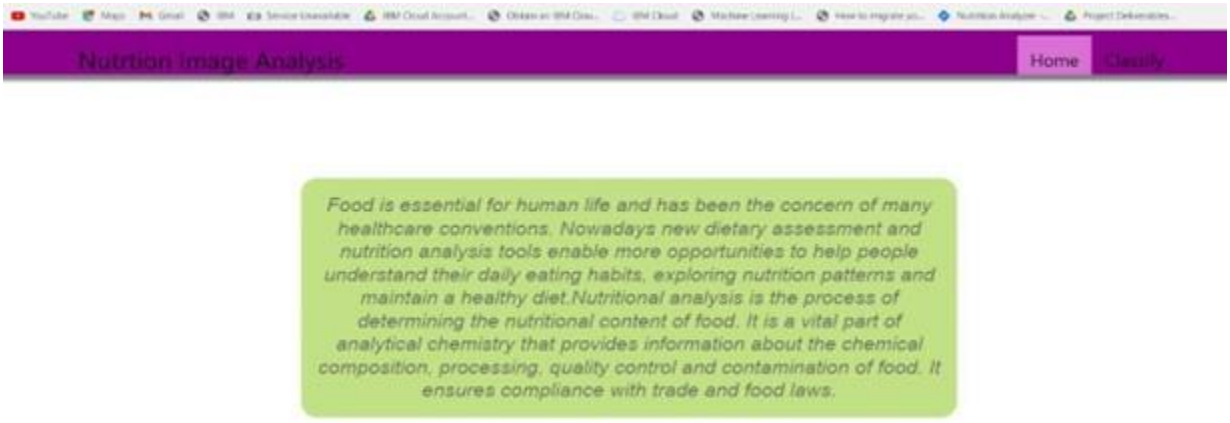
Use the below template to list all the user stories for the product.

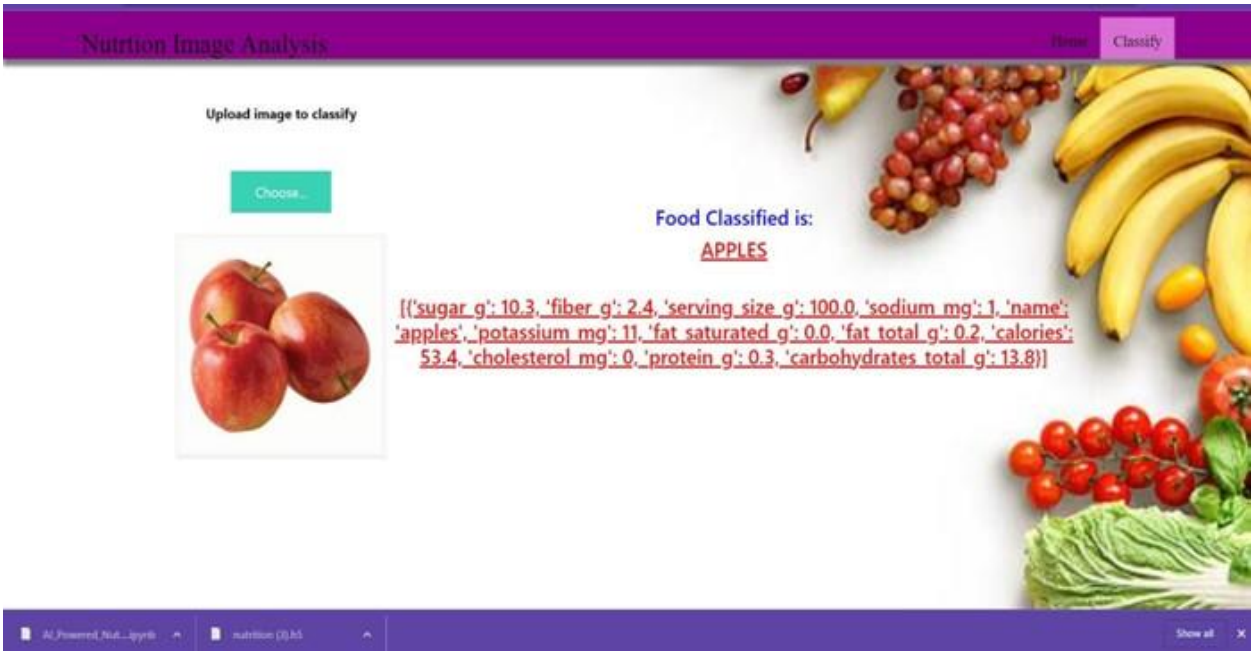
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Google	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Microsoft	I can access the Dashboard with Microsoft.	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login the Application by entering password	High	Sprint-1
	Main Interface	USN-6	As a user I can view my calorie intake by clicking photo of the food I eat	Access the proper information about the nutrition and the calorie intake	High	Sprint-2
	Package DB, Dashboard	USN-7	As a user I can choose variety of packages based on my requirement	Selecting an appropriate package	Medium	Sprint-2

Customer Care Executive	Feedbacks DB , Tollfree number, chat bot	USN-8	As a customer care executive, I collect feedbacks from customers	Maintaining proper environment for the customers	High	Sprint-2
Dietitian	Customer Record	USN-9	As a dietitian I provide daily plans for the betterment of the user	Positive results from user	High	Sprint-2
Administrator	Dashboard	USN-10	As an administrator I take care of all the operations which takes place in the app	Zero issues from the user	High	Sprint-2

9. RESULTS

Output:





10. CONCLUSION

By the end of this project we will ,

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

11. FUTURE SCOPE

- AI is revolutionizing the health industry.
- It is majorly used in improving marketing and sales decisions, AI is now also being used to reshape individual habits.
- In future we don't want to go to gym and do any diets. By using this nutrition fitness analyzer we can maintain our diet plans without any help from others and we can lead a happy and healthy life with good wealth.
- AI can easily track health behaviors and repetitive exercise patterns and use the data to guide you towards your fitness journey and diet plans.