Project Report Format

1. INTRODUCTION

Food, substance consisting essentially of protein, carbohydrate, fat, and other nutrients used in the body of an organism to sustain growth and vital processes and to furnish energy. The absorption and utilization of food by the body is fundamental to nutrition and is facilitated by digestion.

1.1 Project Overview

AI and its various subsets have been leveraged by these platforms to identify the calorie intake and also to make food recommendations for a healthy diet. In most cases, what we see is that these platforms act as a data repository where while providing real-time information to its users, it also makes available to numerous clients who work in this field for a determined rate. In this article, we take a look at the top AI-based online platforms which make use of AI and other deep learning technologies to provide a real-time updates about nutrition intake. 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.

1.2 Purpose

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.).

2. LITERATURE SURVEY

2.1 Existing problem

Poor nutrition can contribute to stress, tiredness and our capacity to work, and over time, it can contribute to the risk of developing some illnesses and other health problems such as: being overweight or obese. Tooth decay ,high blood pressure. There are now strong links between low intakes of particular nutrients and the risk of developing chronic disease including some cancers, heart disease, diabetes, osteoporosis and depression. During pregnancy, insufficient nutrient intake can have long-term health implications for the health of the child.

2.2 References

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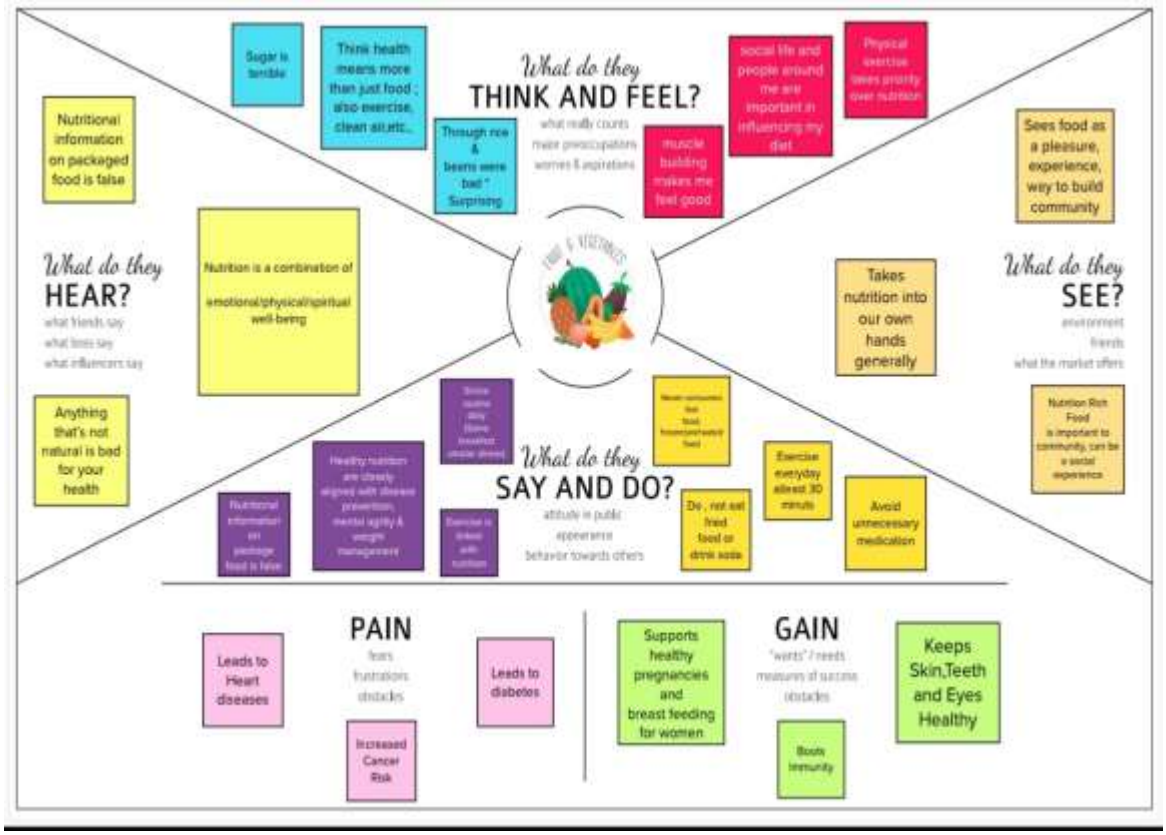
2.3 Problem Statement Definition

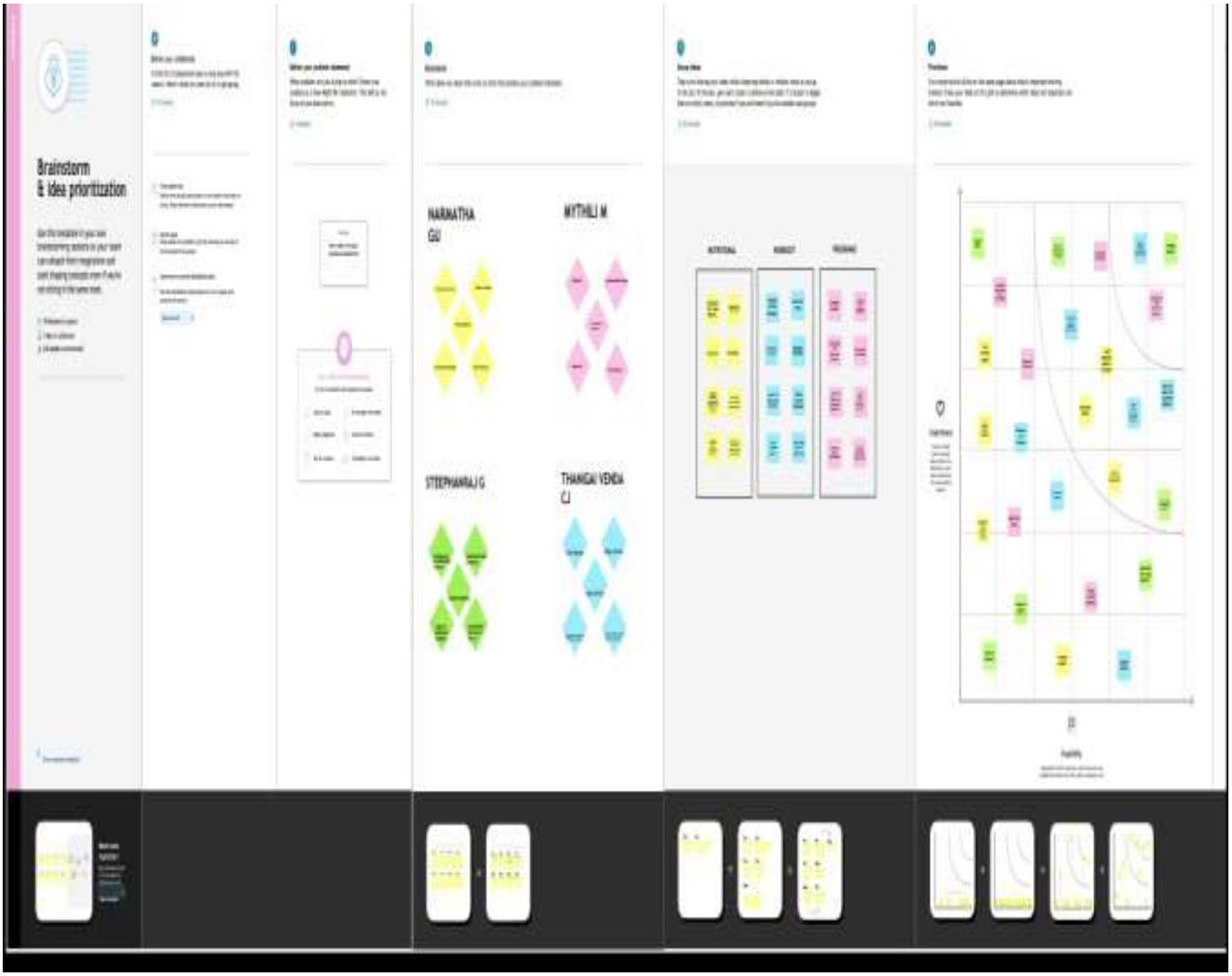
It's important to start within your abilities and listen to your body's cues in terms of pain and injury. Obesity is a common health issue that is defined by having a high percentage of body fat. Being overweight or obese increases your chances of dying from hypertension, coronary heart disease, sleep apnea, and endometrial, breast, prostate, and colon cancers. Junk foods are high in calorie but low in nutrition value and lead to an excess metabolic weight leading to obesity. An obese individual is prone to life-threatening diseases which are not only limited to cholesterol or diabetes but also can cause stoke and NCDs. Overtraining may wear down the immune system. It Increases cardiovascular stress. Incorrect workouts may cause sprains, strains, fracture and other painful injury.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

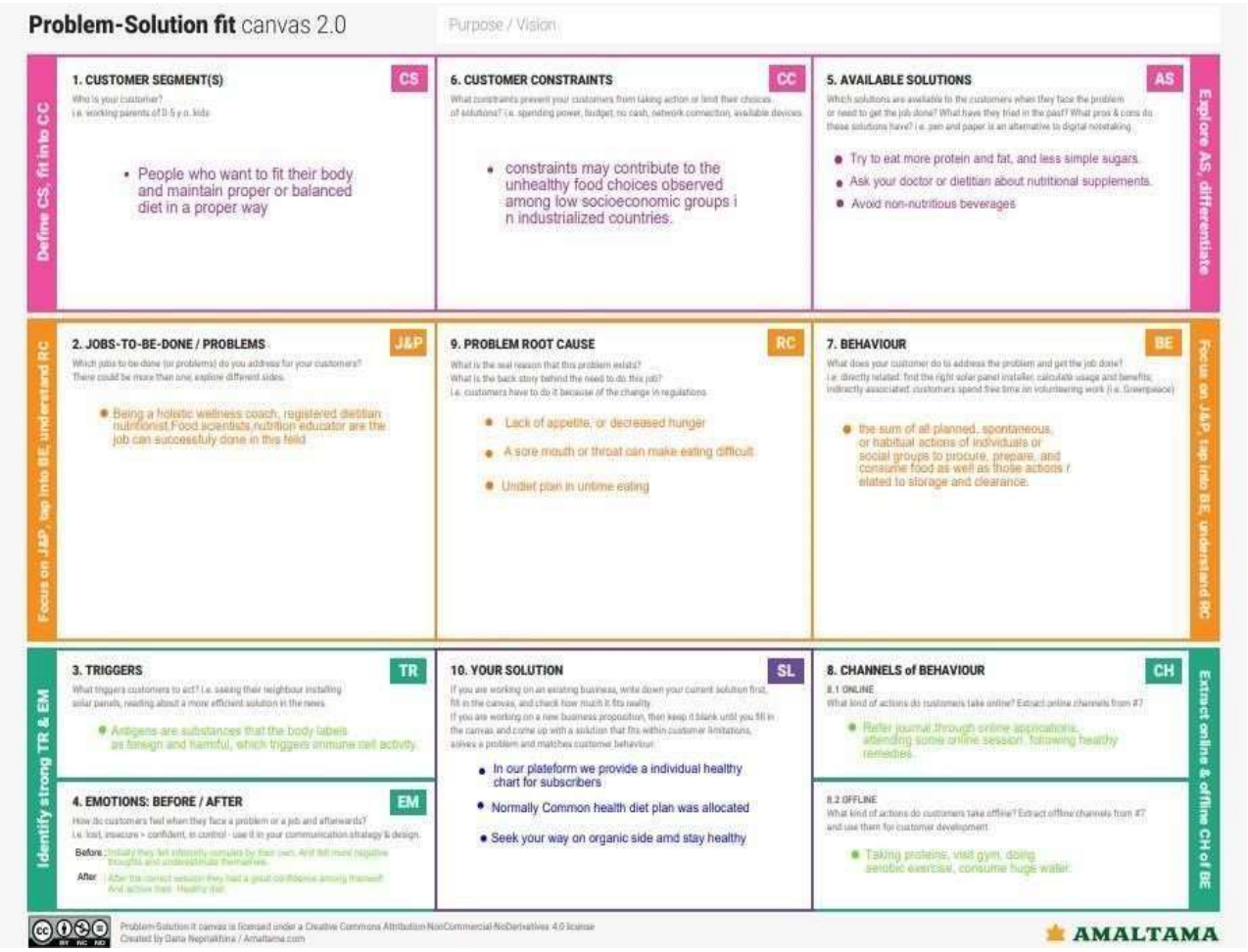


3.3 Proposed Solution

S.NO	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to be solved	The user needs information about the nutritional values of different types of food as accurately as possible to determine the necessary amount of calorie intake to maintain their health and also to manage their schedule.
2	Idea / Solution description	To determine the calorie consumption for the individual based on their health aspects. To provide them with regular remainder on nutrition requirement for the customer/individual. To provide the amount of consumption of food based on the calorie value predicted using the model.
3	Novelty / Uniqueness	Easier prediction of calorie utilization, preparing diet sheet based upon their calorie intake, improve customer satisfaction by providing information about the food items which are easily available in their locality

4	Social Impact/ Customer Satisfaction	Regular suggestion on fitness maintenance and healthy diet suggestion.
5	Business Model (Revenue Model)	• Key Partners are supporting organization and fitness enthusiasts. • Key Activities are done as prediction, suggestion for calorie consumption and healthy life suggestion. • Showing advertisements and promoting certain brands by collaborating with Google Adsense. • Channels are email, mobile, helpline and health care. • Subscription based service to the user
6	Scalability of the Solution	Every Customer must get Healthy Life and Proper Diet Maintenance based on the Healthy Measure and Calorie prediction. Also suggest the feedback to maximize the Application usage. Every user can easily access our product from their smartphones for free and easy to understand interface

3.4Problem Solution fit



4.REQUIREMENT ANALYSIS

4.1Functional requirement

- It will generate the diet plan as well as monitor the user's health to classify the category of the disease and to create the diet plan. It will also reduce the cost of consulting the person nutritionist.
- The task of food detection/classification is not easy as it seems. All possible options related to the given Image.

1. Image classification, object detection, segmentation, face recognition.
2. Classification of crystal structure using a convolutional neural network.

- Computer-Assisted Nutritional Recognize Food Images – In order to solve this issue, a brand-new Convolutional Neural Network (CNN)- based food picture identification system was created, as described in this study. We utilized our suggested strategy on two sets of actual food picture data.

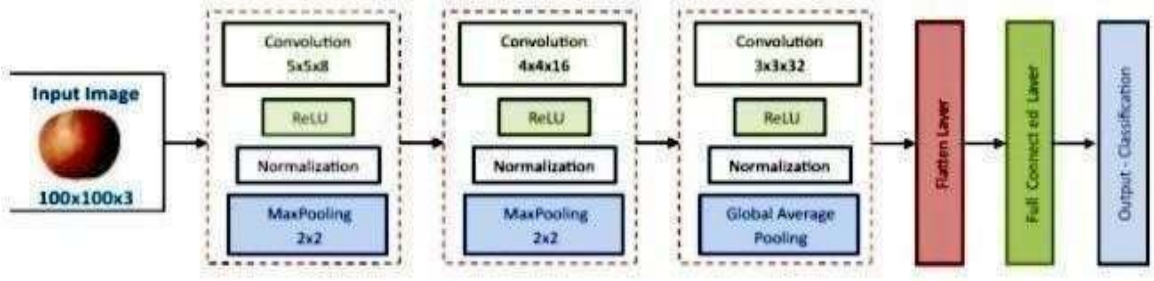
- Here the user can capture the images of different fruits and then the image will be sent to the trained model. The model analyzes the image and detects the nutrition

based on the fruits like (Sugar, Fiber, Protein, Calories, etc.)

- The Ultimate Workout at Home Solution This fitness AI software is designed with personalized training regimens for each individual. It began as “gym only software,” but has now improved its system to satisfy “at home fitness” expectations.
- You take a picture, dial in data such as whether you are eating breakfast or lunch and add a quick text label, and the app estimates the calorie content.

This software collaborated with IBM’s natural language capability to provide 24-hour assistance and dietary recommendations.

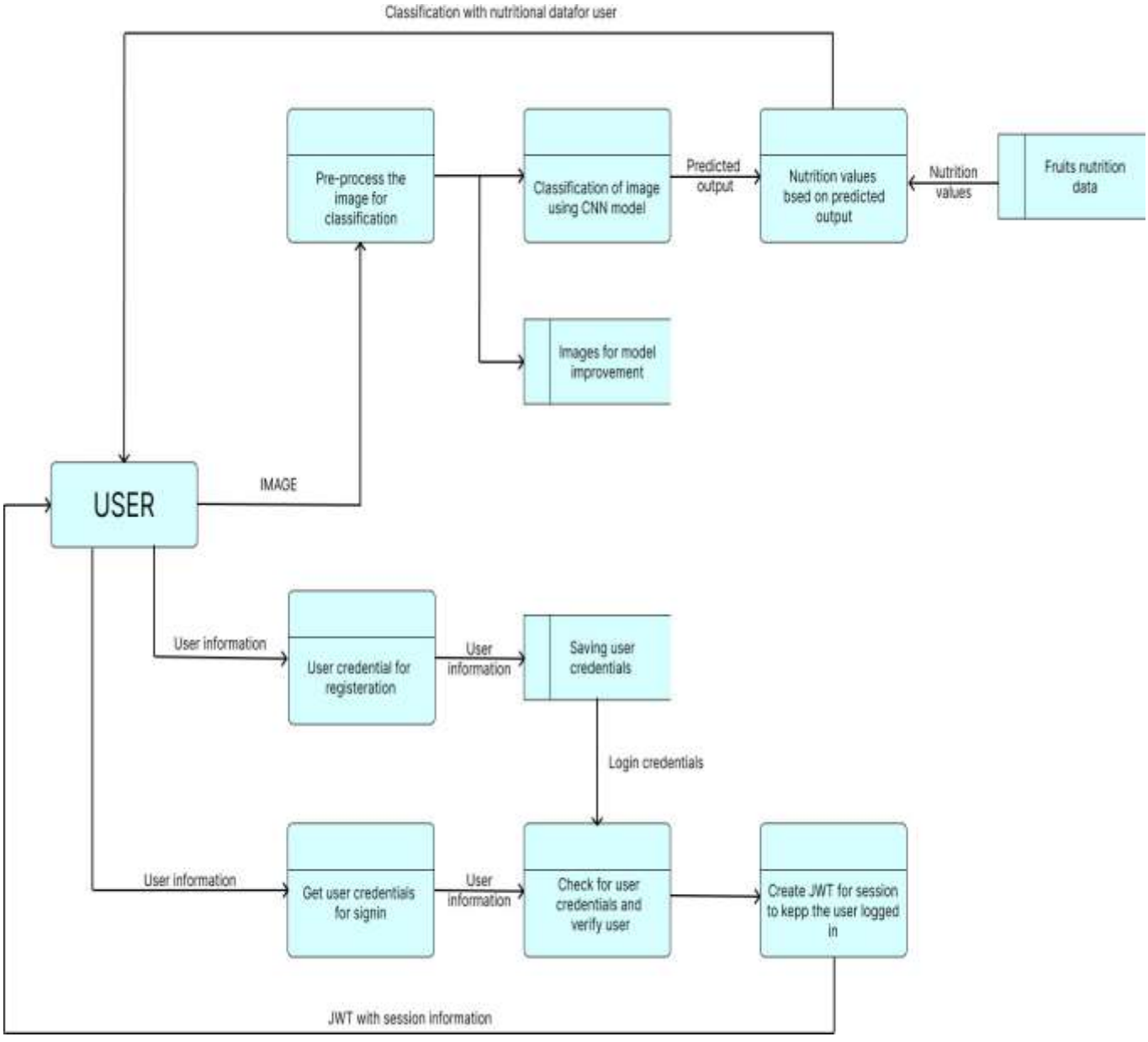
For Example:



- The comparison of the proposed model with the conventional models shows that the results of this model are exceptionally good and promising to use in real-world applications. This sort of higher accuracy and precision will work to boost the machine's general efficiency in fruit recognition more appropriately.
- A generic model for the dietary protein requirement (as with any nutrient) defines the requirement in terms of the needs of the organism,
- i.e. metabolic demands, and the dietary amount which will satisfy those needs, i.e. efficiency of utilization, thus: dietary requirement = metabolic demand/efficiency of utilization.

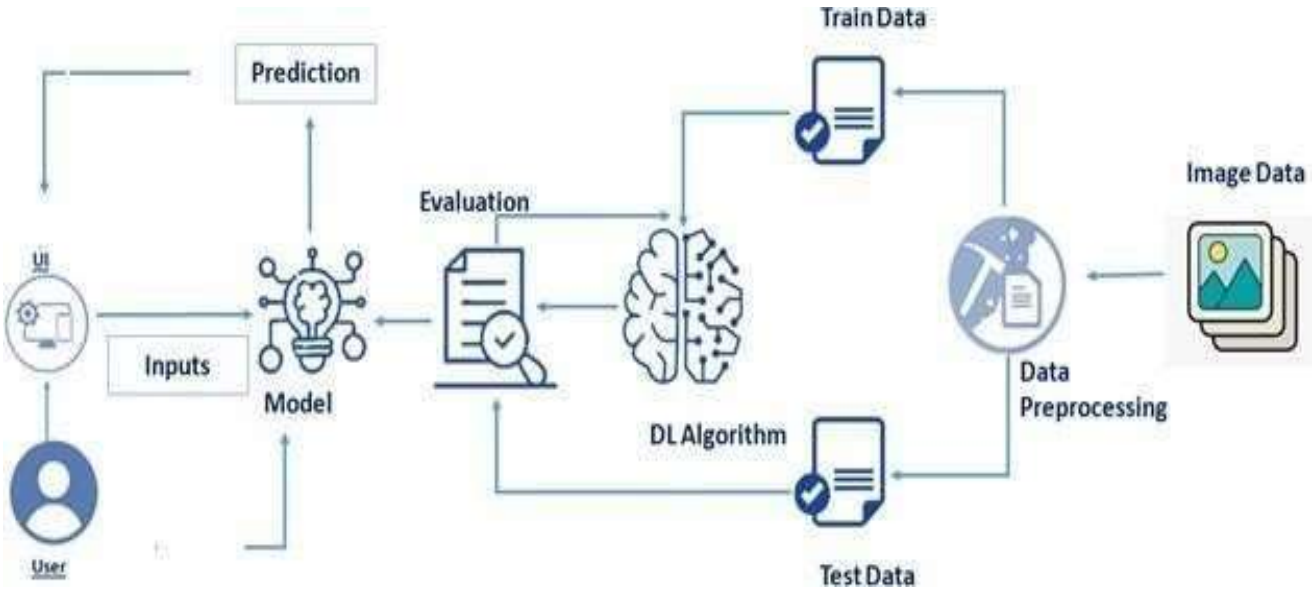
5.PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture

- 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.
- 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.
- Food is essential for human life and has been the concern of many healthcare conventions.
- It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	03 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

6.2 Sprint Delivery Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Download Food	2	Medium	Mythili

			Nutrition Dataset			
Sprint-1	Data Preprocessing	USN-2	Importing The Dataset into Workspace	1	Low	Steephenraj
Sprint-1		USN-3	Handling Missing Data	3	Medium	Thanigaivendhan
Sprint-1		USN-4	Feature Scaling	3	Low	Thanigaivendhan
Sprint-1		USN-5	Data Visualization	3	Medium	Mythili
Sprint-1		USN-6	Splitting Data into Train and Test	4	High	Narmatha
Sprint-1		USN-7	Creating A Dataset with Sliding Windows	4	High	Narmatha
Sprint-2	Model Building	USN-8	Importing The Model Building Libraries	1	Medium	Steephanraj
Sprint-2		USN-9	Initializing The Model	1	Medium	Steephenraj

Sprint-2		USN-10	Adding LSTM Layers	2	High	Mythili
Sprint-2		USN-11	Adding Output Layers	3	Medium	Narmatha
Sprint-2		USN-12	Configure The Learning Process	4	High	Thangai vendhan
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2		USN-13	Train The Model	2	Medium	Narmatha
Sprint-2		USN-14	Model Evaluation	1	Medium	Mythilki
Sprint-2		USN-15	Save The Model	2	Medium	Steephenraj
Sprint-2		USN-16	Test The Model	3	High	Thanigai vendhan
Sprint-3	Application Building	USN-17	Create An HTML File	4	Medium	Narmatha
Sprint-3		USN-18	Build Python Code	4	High	Mythili

Sprint-3		USN-19	Run The App in Local Browser	4	Medium	Narmatha
Sprint-3		USN-20	Showcasing Prediction On UI	4	High	Thanigai vendhan
Sprint-4	Train The Model On IBM	USN-21	Register For IBM Cloud	4	Medium	Narmatha
Sprint-4		USN-22	Train The ML Model On IBM	8	High	Mythili
Sprint-4		USN-23	Integrate Flask with Scoring End Point	8	High	Mythili

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

7.1 Feature 1

Data Collection

Download the dataset here

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

```
Mounted at /content/drive
```

```
[ ]  cd/content/drive/MyDrive/Colab Notebooks
```

```
/content/drive/MyDrive/Colab Notebooks
```

```
[ ]  # Unzipping the dataset
     !unzip 'Dataset.zip'
```

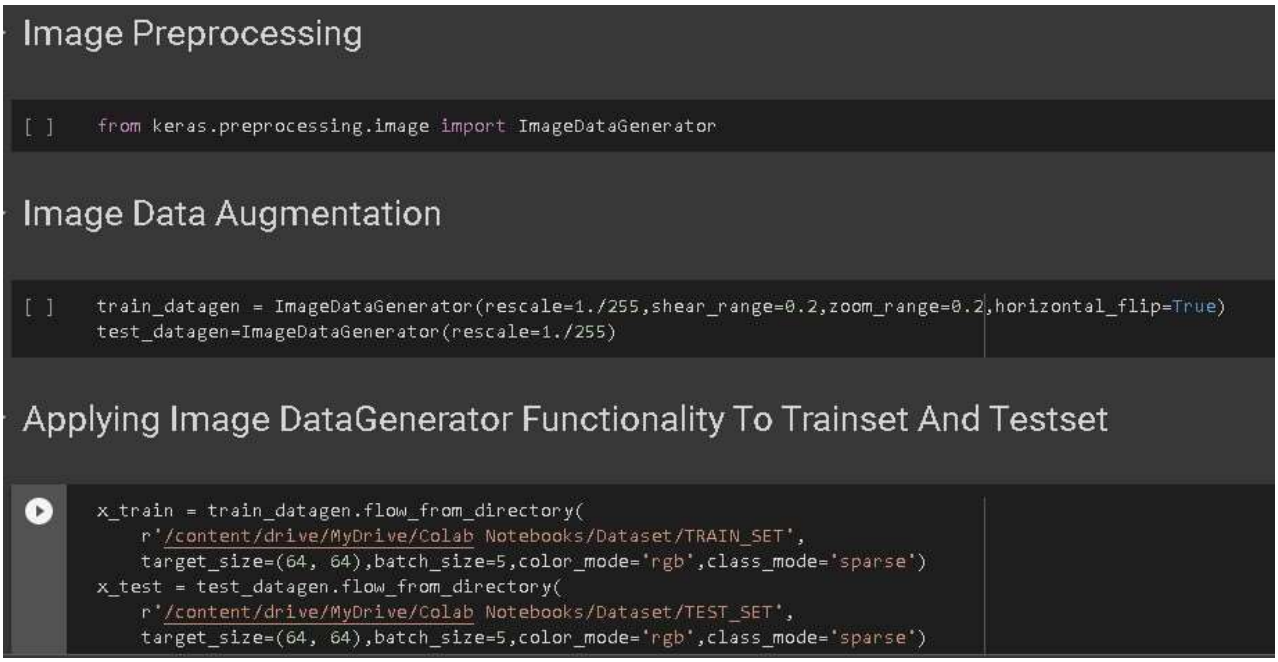


Image Preprocessing

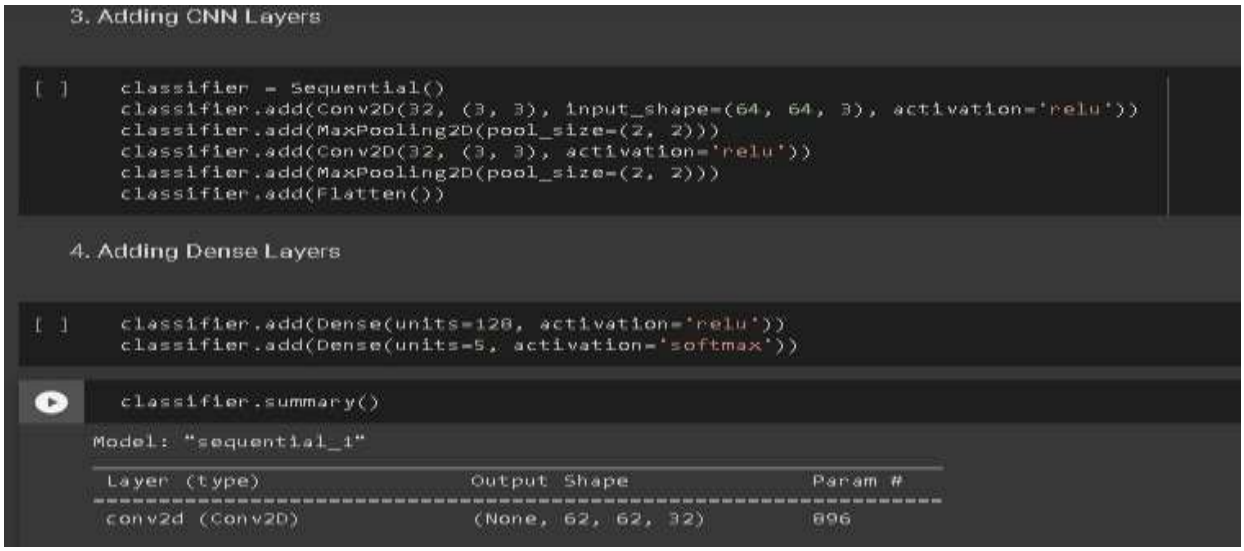
```
[ ]  from keras.preprocessing.image import ImageDataGenerator
```

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/drive/MyDrive/Colab Notebooks/Dataset/TRAIN_SET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')
x_test = test_datagen.flow_from_directory(
    r'/content/drive/MyDrive/Colab Notebooks/Dataset/TEST_SET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')
```



3. Adding CNN Layers

```
classifier = Sequential()
classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))
classifier.add(Conv2D(32, (3, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))
classifier.add(Flatten())
```

4. Adding Dense Layers

```
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=5, activation='softmax'))
```

```
classifier.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                 Output Shape              Param #
=================================================================
 conv2d (Conv2D)              (None, 62, 62, 32)        896
```

5. Configure The Learning Process

```
classifier.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
```

6. Train The Model

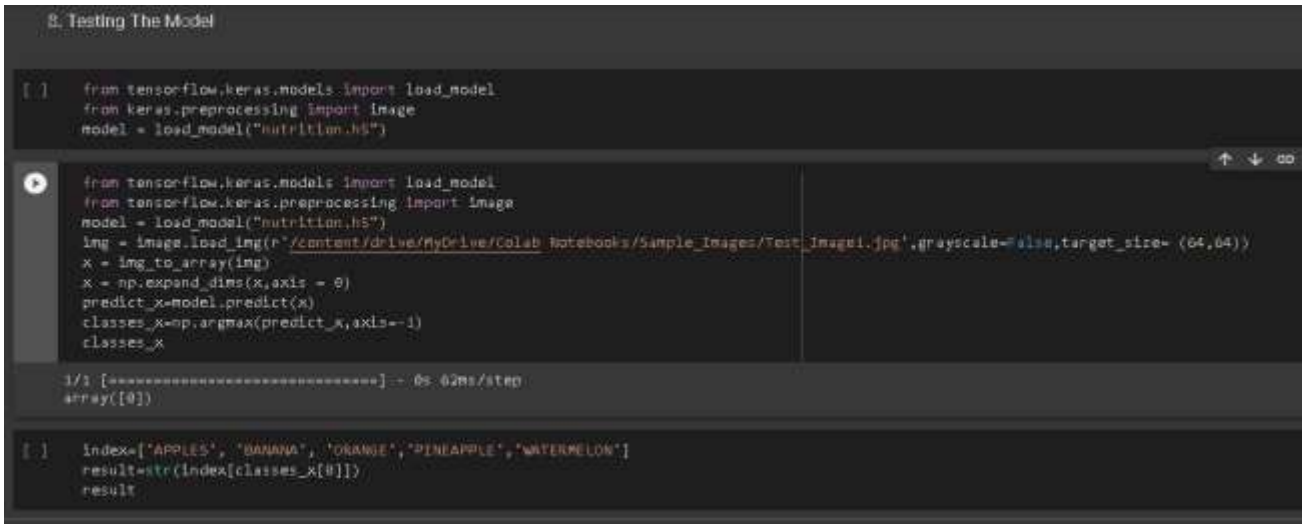
```
classifier.fit_generator(generator=x_train,steps_per_epoch = len(x_train),epochs=20, validation_data=x_test,validation_steps = len(x_test))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Pl

Epoch 1/20
494/826 [================>.............] - ETA: 6:52 - loss: 0.7194 - accuracy: 0.7174
```

7. Saving The Model

```
classifier.save('nutrition.h5')
```



8. Testing The Model

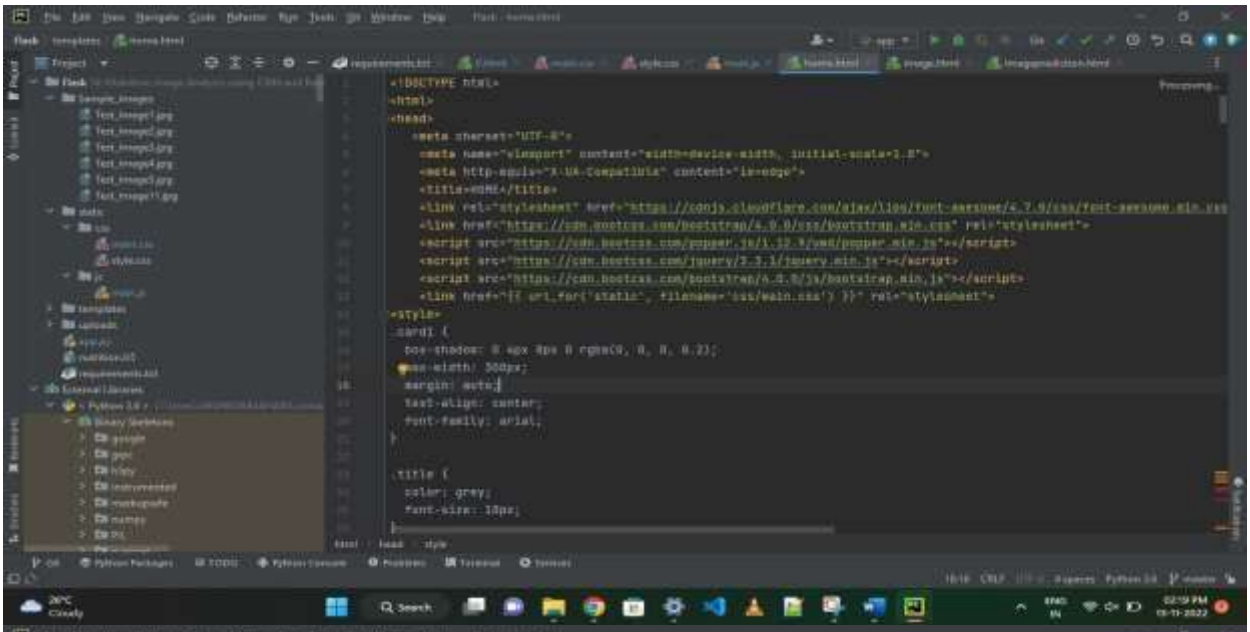
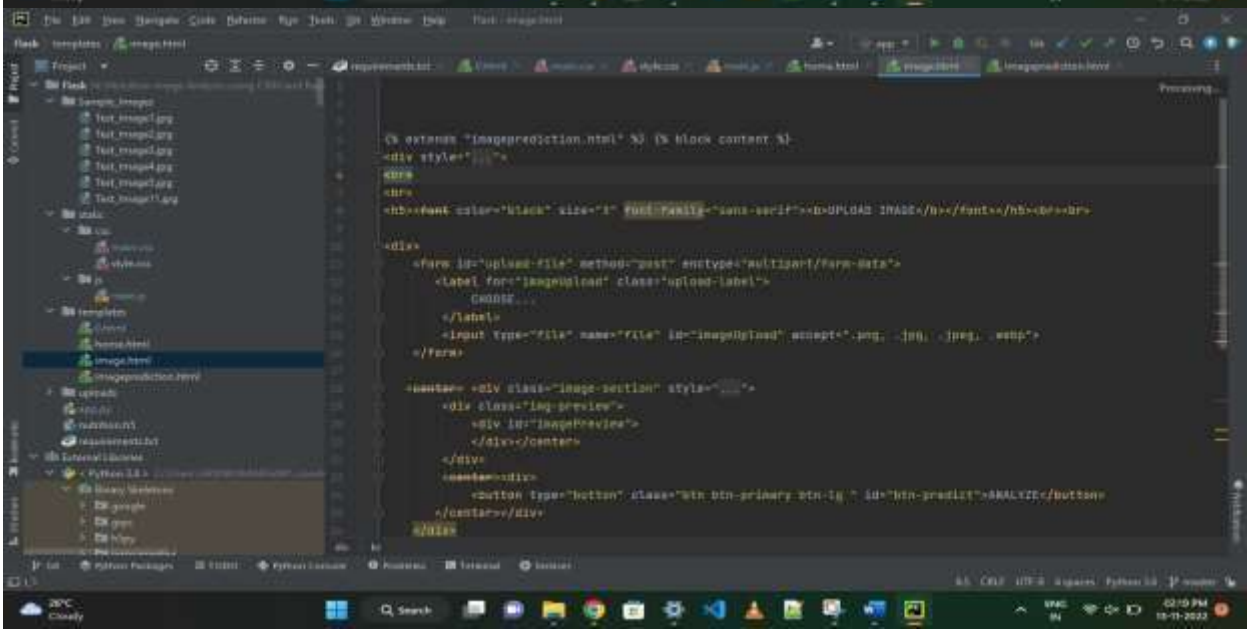
```
from tensorflow.keras.models import load_model
from keras.preprocessing import image
model = load_model("nutrition.h5")
```

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model = load_model("nutrition.h5")
img = image.load_img(r'/content/drive/MyDrive/Colab Notebooks/Sample_Images/Test_Image1.jpg',grayscale=False,target_size= (64,64))
x = img_to_array(img)
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 62ms/step
array([0])
```

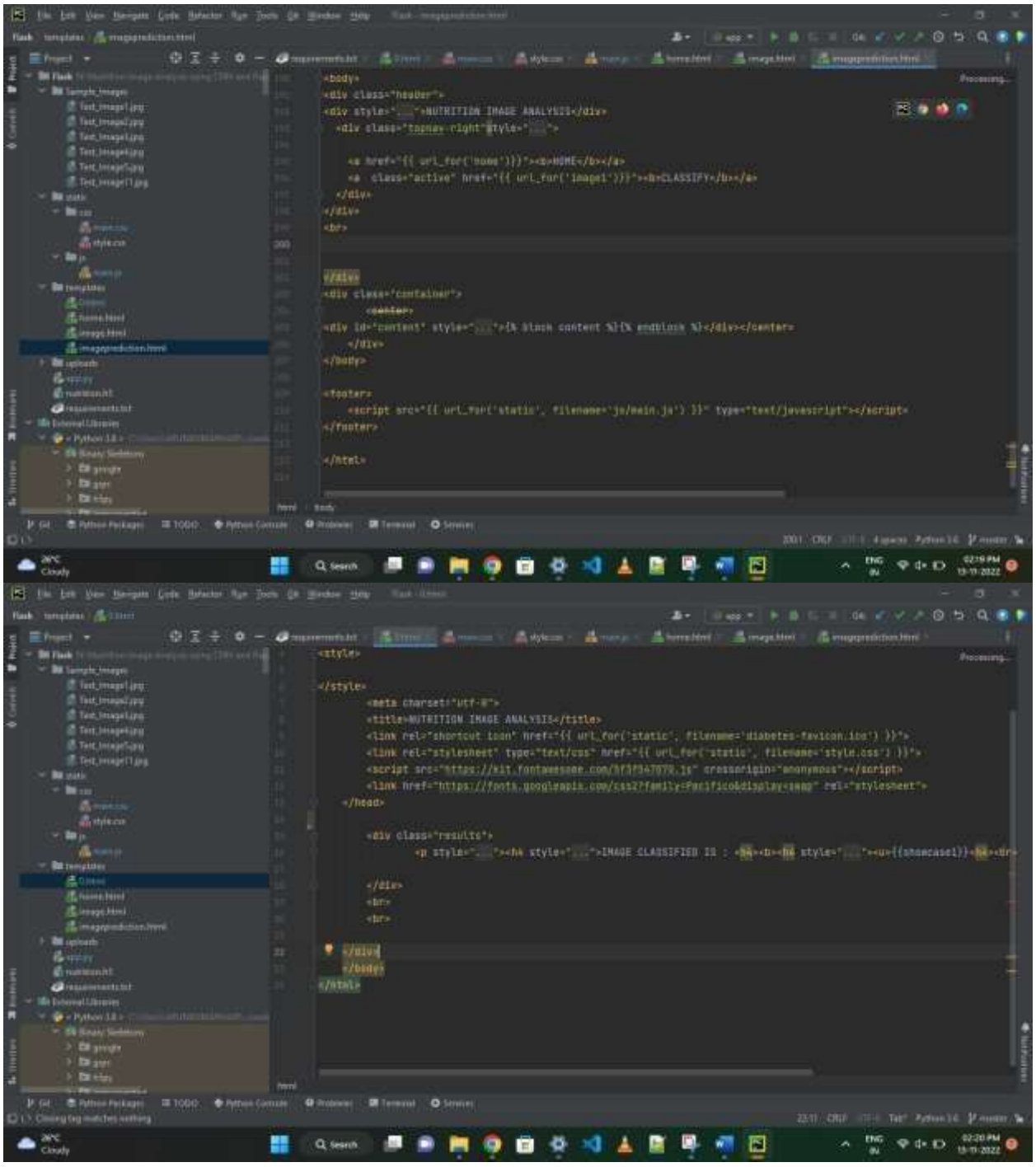
```
index=['APPLES', 'BANANA', 'ORANGE','PINEAPPLE','WATERMELON']
result=str(index[classes_x[0]])
result
```

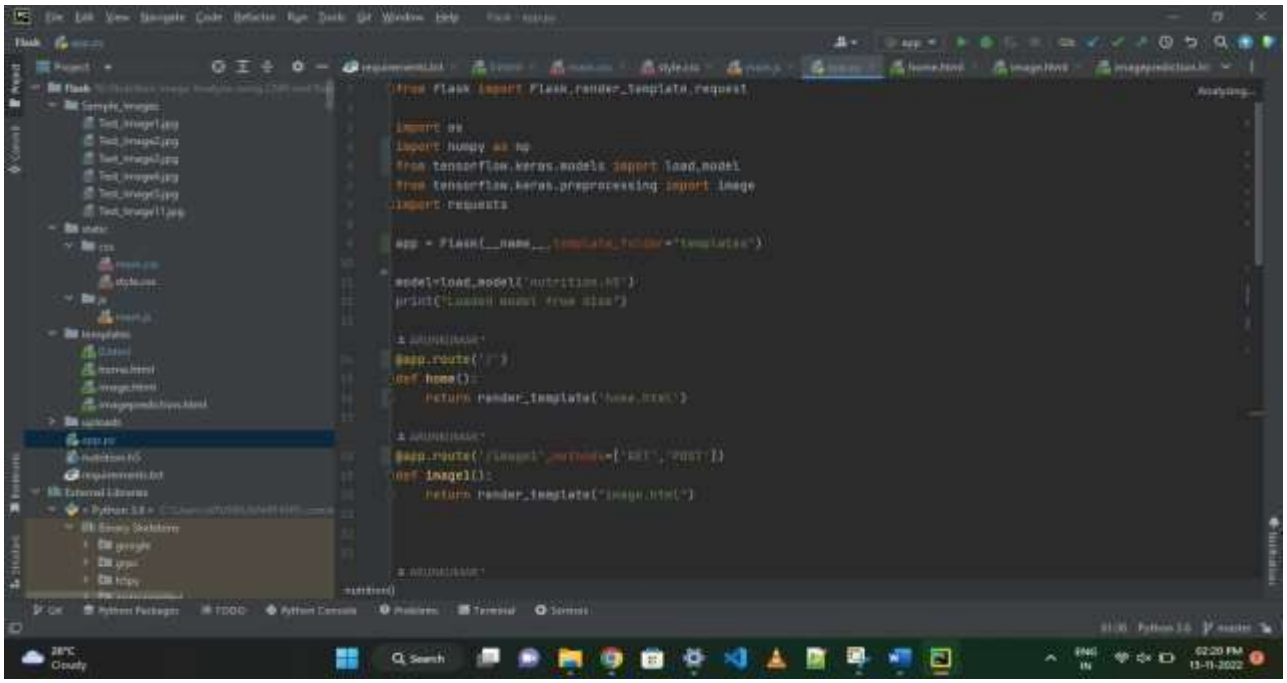
7.2Feature 2


<!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 rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css"
<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>
.card{ {
box-shadow: 0 4px 8px 0 rgba(0, 0, 0, 0.2);
max-width: 300px;
margin: auto;
text-align: center;
font-family: arial;
}
.title {
color: grey;
font-size: 18px;
}

{% extends "imageprediction.html" %} {% block content %}

<h1>UPLOAD IMAGE</h1>

<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, .webp">
</form>
<center> <div class="image-section" style="
<div class="img-preview">
<div id="imagePreview">
</div></center>
</div>
<center><div>
<button type="button" class="btn btn-primary btn-lg " id="btn-predict">ANALYZE</button>
</center></div>
</div>

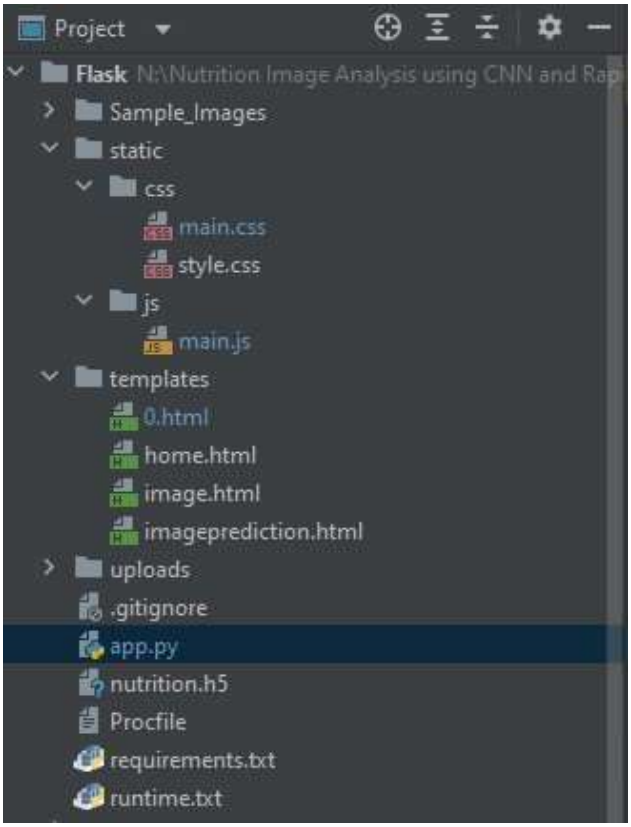




Database Schema (if Applicable)

8.TESTING

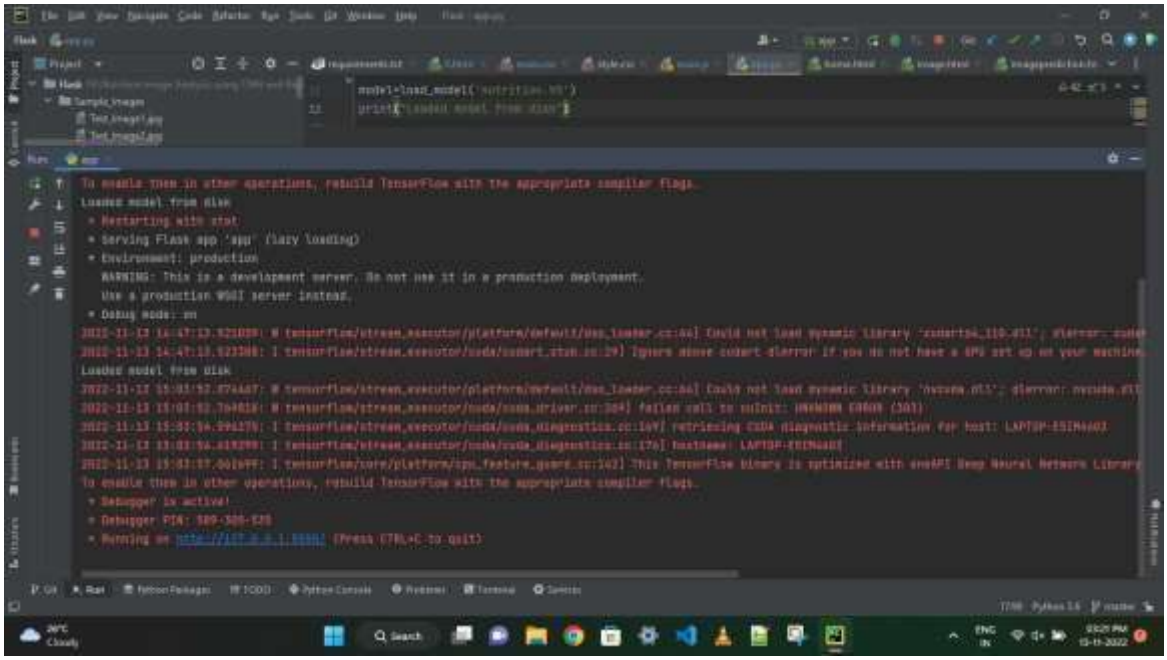
8.1 Test Cases



8.2User Acceptance Testing

9.RESULTS

9.1 Performance Metrics



10.ADVANTAGES

- Advantages-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.

11.CONCLUSION

- Thus powered nutrition analyzer for fitness enthusiasts good nutrition promotes not only better physical healthy 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 food.
- A balance diet and appropriate meal timings are important for healthy body and mind.
- Most countries nowadays implement health education program in schools which include feeding to students, vitamin and mineral supplementation.

12.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.

13.APPENDIX

GitHub & Project Demo Link

IBM-EPBL/IBM-Project-32330-1660209268