

# 1. INTRODUCTION

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.

## 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 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.).

## 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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doi: 10.1093/ajcp/aqw104. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

## 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 stroke and NCDs. Overtraining may wear down the immune system. It increases cardiovascular stress. Incorrect workouts may cause sprains, strains, fracture and other painful injury.

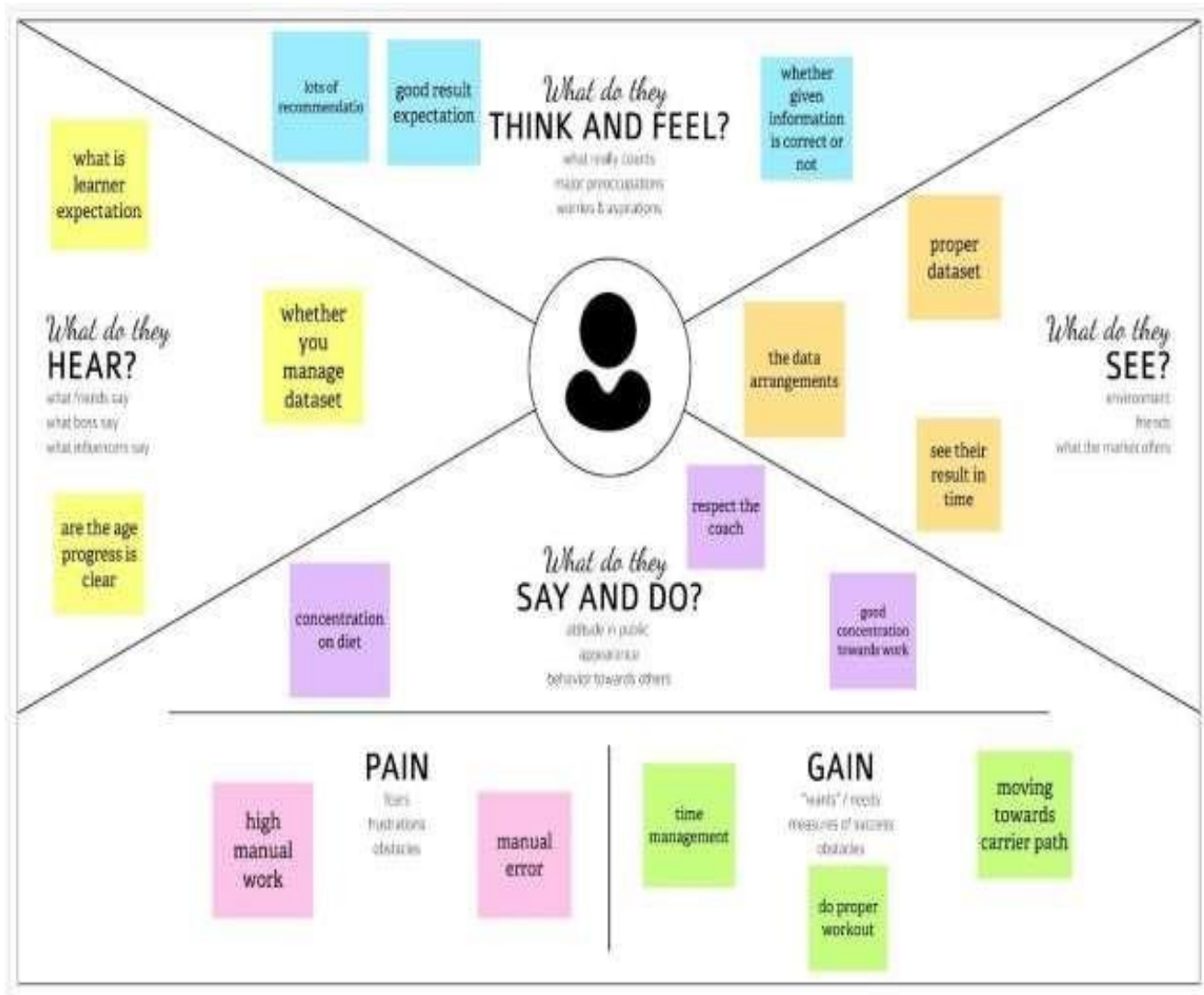
The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image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



<b>Problem Statement (PS)</b>	<b>I am (Customer)</b>	<b>I'm trying to</b>	<b>But</b>	<b>Because</b>	<b>Which makes me feel</b>
PS-1	Diabetics patients	Maintain health	They eat sweet	They can't control their food habit	Angry and Stressed
PS-2	Employee	Maintain health	Not able to maintain health	work pressure	Stressed about my health
PS-3	Fitness Enthusiasts	Build a Nutrition Analyzer	Analyzing Manually Can be difficult	Information about the chemical composition, processing, quality And contamination of food is a vital Part of analytical chemistry	To build AI-Powered Nutrition Analyzer For fitness Enthusiasts

## 3. IDEATION & PROPOSED SOLUTION

### 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming

3

### Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

⌚ 20 minutes

### Features & Extraction

Based on the nutrients available in the fruits classify them

To characterise the image, the texture patterns from each component are combined.

Three datasets with different sizes and levels of complexity can be used to test the model

The local texture descriptor, such as a Weber local descriptor (WLD) histogram or a local binary pattern (LBP), is then applied to each component in order to encode the texture pattern of the date.

### Model

To use various pretrained models provided in the PyTorch library's Torchvision package. And look into how well they can classify fine grained photos.

Three well-known classification models—Random Forest, K-Nearest Neighbors (KNN), and Support Vector Machine can be used to classify images to categorise fruits.

Brand-new fruit classification method called HPA-SLFN can be implemented for classification as it gives better results when compared to other techniques

Convolutional Neural Networks (ConNN)\* deep learning model for classification

### Classification

A Progressive Spinal Net, progressive computational network for FC layers of deep networks can be used

The accuracy and loss curves were created using various combinations of hidden layers.

Keras platform was used to construct the suggested model.

A chordate nervous system, which has a special way of connecting a lot of sensing data and making local decisions, is mimicked in the construction of SpinalNet.

### Approach

These approaches should combine NLP and other AI techniques with historical food research, food science, nutrition, and sustainability expertise.

Interdisciplinary approaches should be used to address food and recipe research in order to address health and sustainability issues.

A technique breaks down a visual image of a date into its component colours.

A computer vision-based approaches and algorithms for fruit recognition and classification.



### 3.3 Proposed Solution

S.N O	Parameter	Description
1.	Problem Statement (Problem to be solved )	To analyse the fitness of health
2.	Idea / Solution description	Try to eat more protein and fat
3.	Novelty / Uniqueness	Food is essential for human life and has been the concern of many healthcare conventions.
4.	Social Impact / Customer Satisfaction	Use of the health fitness, wellness.
5.	Business Model (Revenue Model)	Nature's Nutrition,Feed the Body,Nourishment Cafe,Nutritional Awareness,Nutritional Programs,Balanced, Nutri-Pure.
6.	Scalability of the Solution	The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fiber, Protein, Calories, etc.).



<p><b>Define CS, fit into CC</b></p>	
<p><b>1. CUSTOMER SEGMENT(S)</b></p> <p>Who is your customer? i.e. working parents of 0-5 y.o. kids</p> <p><b>CS</b></p>	<p><b>6. CUSTOMER CONSTRAINTS</b></p> <p>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</p> <p><b>CC</b></p>
<p><b>5. AVAILABLE SOLUTIONS</b></p> <p>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros &amp; cons do these solutions have? i.e. pen and paper is an alternative to digital note-taking</p> <p><b>AS</b></p>	<p><b>Explore AS, differentiate</b></p>

<p><b>Focus on J&amp;P, tap into BE, understand RC</b></p>	
<p><b>2. JOBS-TO-BE-DONE / PROBLEMS</b></p> <p>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</p> <p><b>J&amp;P</b></p>	<p><b>9. PROBLEM ROOT CAUSE</b></p> <p>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</p> <p><b>RC</b></p>
<p><b>7. BEHAVIOUR</b></p> <p>What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer; calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</p> <p><b>BE</b></p>	<p><b>Focus on J&amp;P, tap into BE, understand RC</b></p>

### 3.4 Problem Solution fit

## 4.REQUIREMENT ANALYSIS

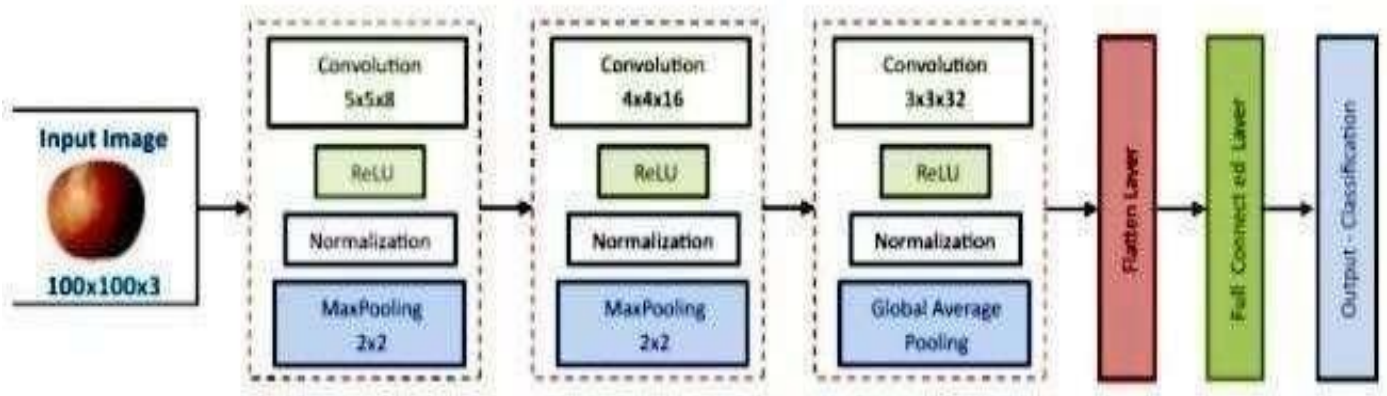
### 4.1 Functional requirement

- 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 convolution neural network.

- Computer-Assisted Nutritional Recognize Food Images – In order to solve this issue, a brand-new Convolution 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 calories.

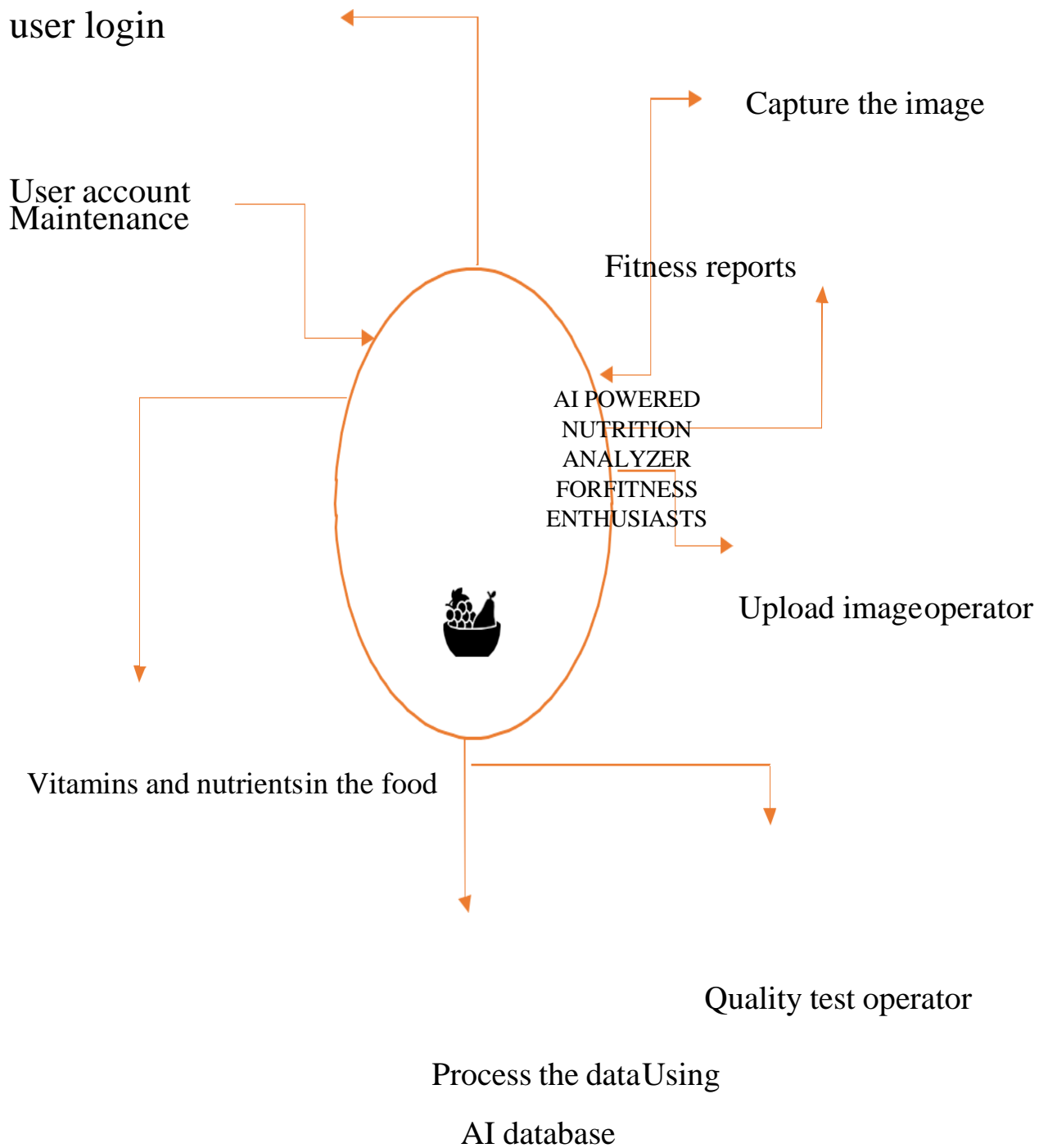
For Example:



- 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.

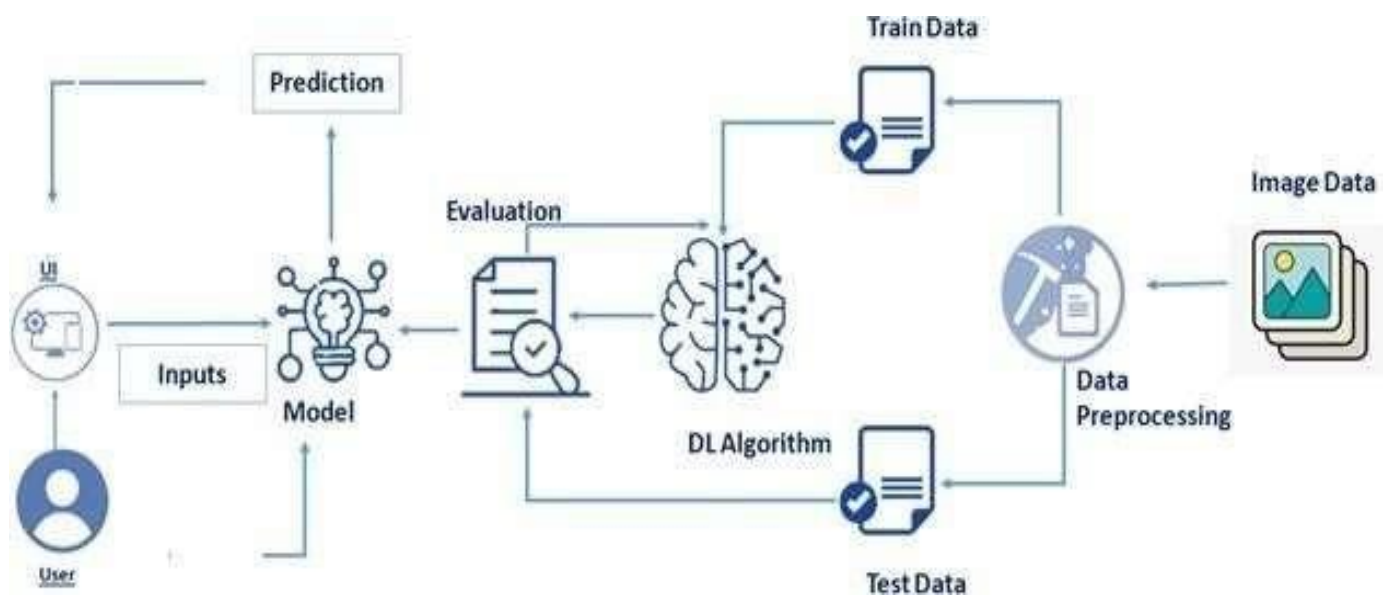
## 5.PROJECT DESIGN

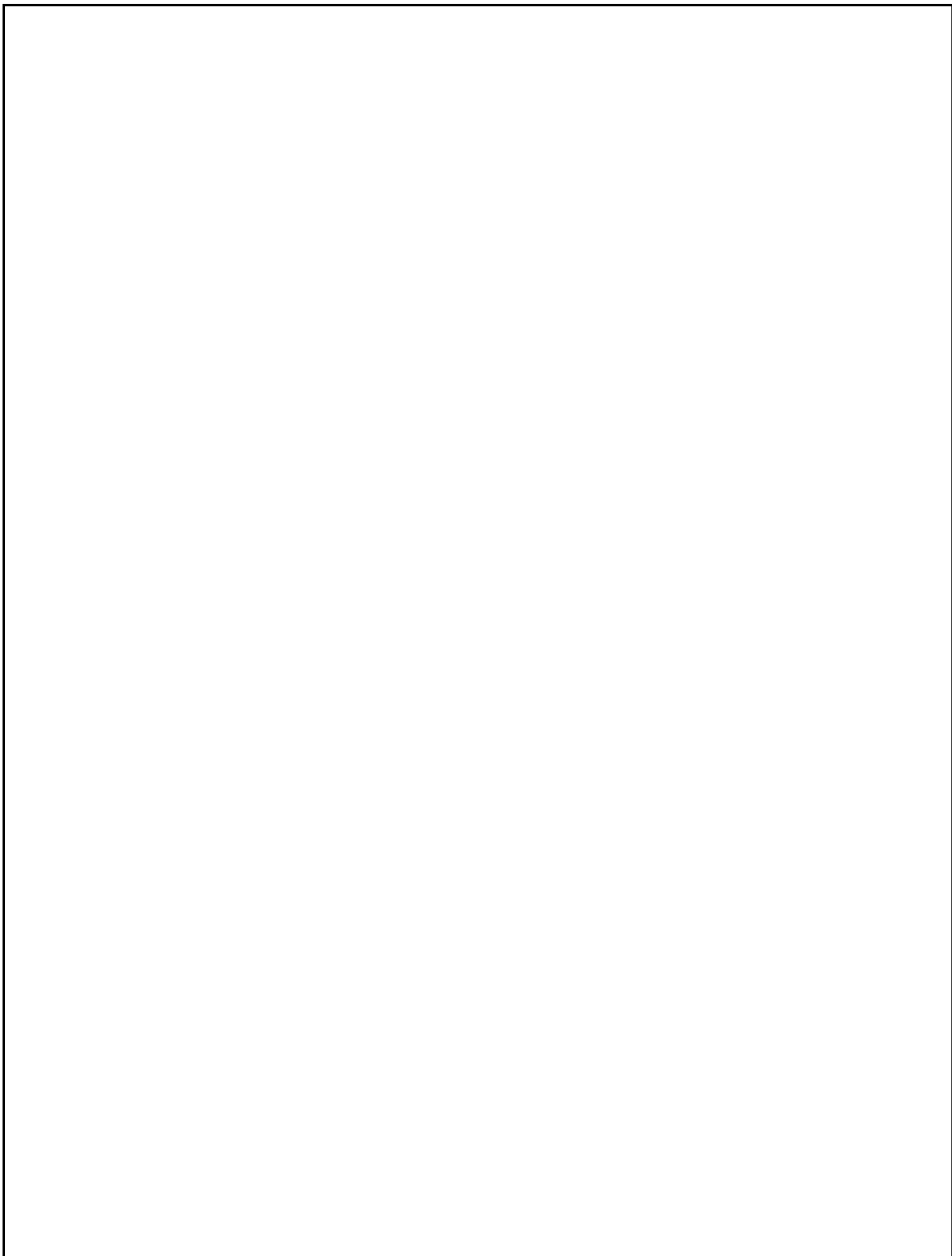
### 5.1 Data Flow Diagrams



## 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 color, 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.







## 6.PROJECT PLANNING & SCHEDUL

### 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 Nutrition Dataset	2	Medium	SILVIYA SHEEBA
Sprint-1	Data Preprocessing	USN-2	Importing The Dataset into Workspace	1	Low	SAI SIDDARTHAN
Sprint-1		USN-3	Handling Missing Data	3	Medium	SRI JAYARANI
Sprint-1		USN-4	Feature Scaling	3	Low	PRATHIBHA
Sprint-1		USN-5	Data Visualization	3	Medium	SAI SIDDARTHAN
Sprint-1		USN-6	Splitting Data into Train and Test	4	High	SILVIYA SHEEBA
Sprint-1		USN-7	Creating A Dataset with Sliding Windows	4	High	SAI SIDDARTHAN
Sprint-2	Model Building	USN-8	Importing The Model Building Libraries	1	Medium	SRI JAYARANI
Sprint-2		USN-9	Initializing The Model	1	Medium	PRATHIBHA

Sprint-2		USN-10	Adding LSTM Layers	2	High	SILVIYA SHEEBA
Sprint-2		USN-11	Adding Output Layers	3	Medium	SRI JAYARANI
Sprint-2		USN-12	Configure The Learning Process	4	High	SAI SIDDARTHAN
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2		USN-13	Train The Model	2	Medium	PRATHIBHA
Sprint-2		USN-14	Model Evaluation	1	Medium	SRI JAYARANI
Sprint-2		USN-15	Save The Model	2	Medium	SILVIYA SHEEBA
Sprint-2		USN-16	Test The Model	3	High	SAI SIDDARTHAN
Sprint-3	Application Building	USN-17	Create An HTML File	4	Medium	PARTHIBHA
Sprint-3		USN-18	Build Python Code	4	High	SRI JAYARANI
Sprint-3		USN-19	Run The App in Local Browser	4	Medium	SILVIYA SHEEBA
Sprint-3		USN-20	Showcasing Prediction On UI	4	High	SAI SIDDARTHAN
Sprint-4	Train The Model On IBM	USN-21	Register For IBM Cloud	4	Medium	PRATHIBHA
Sprint-4		USN-22	Train The ML Model On IBM	8	High	SRI JAYARANI
Sprint-4		USN-23	Integrate Flask with Scoring End Point	8	High	SILVIYA SHEEBA

## 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=28, 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 1/28

494/826 [=====] - ETA: 6:52 - loss: 0.7194 - accuracy: 0.7174

### 7. Saving The Model

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

### 8. Testing The Model

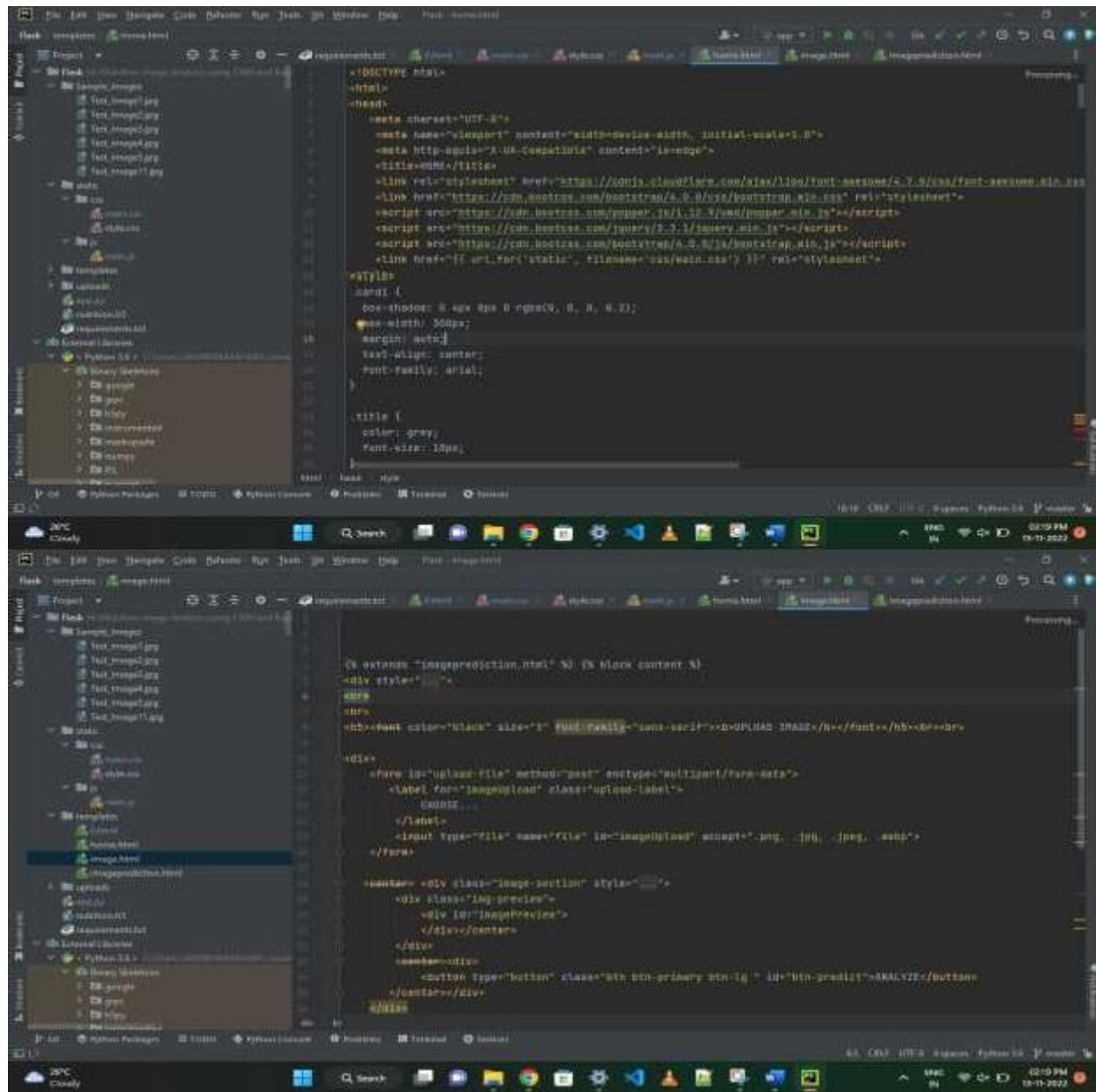
```
[ ] from tensorflow.keras.models import load_model
from keras.preprocessing import image
model = load_model("nutrition.h5")
```

 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\_Images1.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

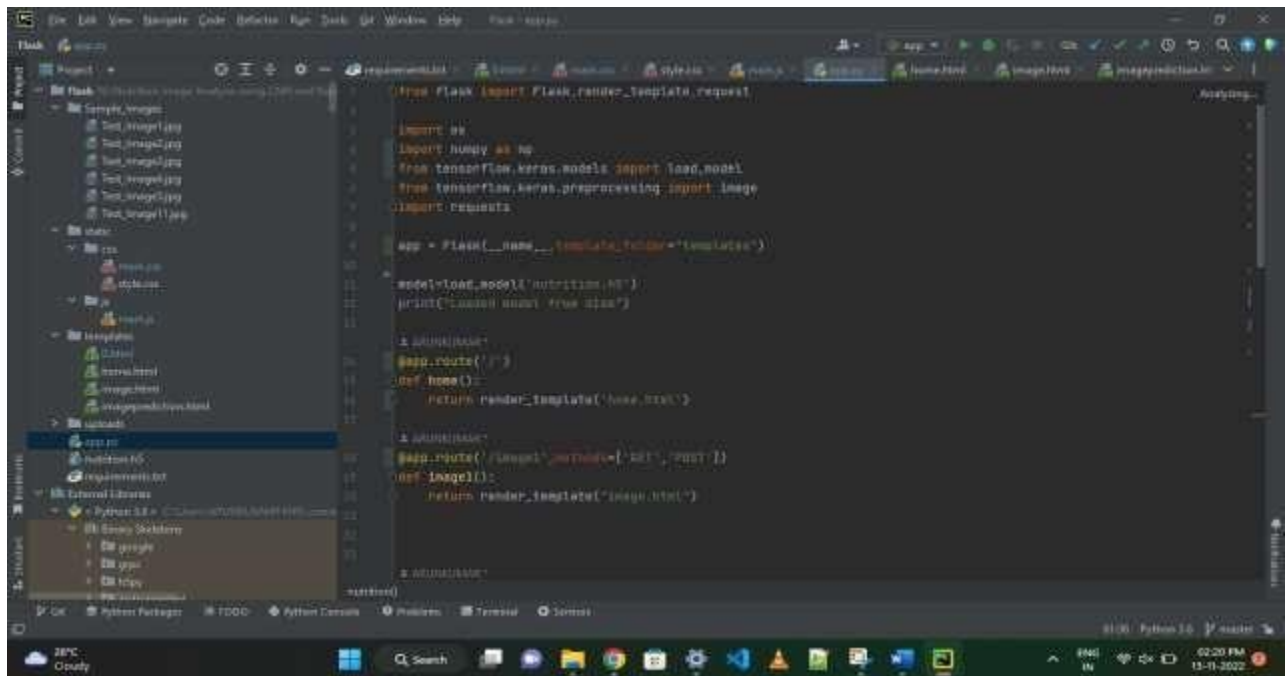
1/1 [=====] -> 0s. 62ms/step  
array([0])

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

## 7.2 Feature 2





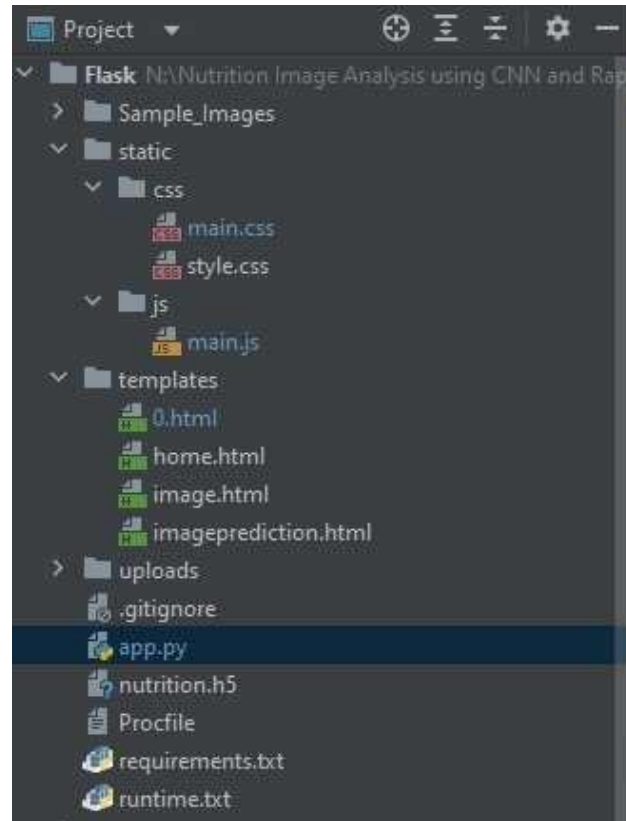


Database Schema (if Applicable)



## 8.TESTING

### 8.1 Test Cases



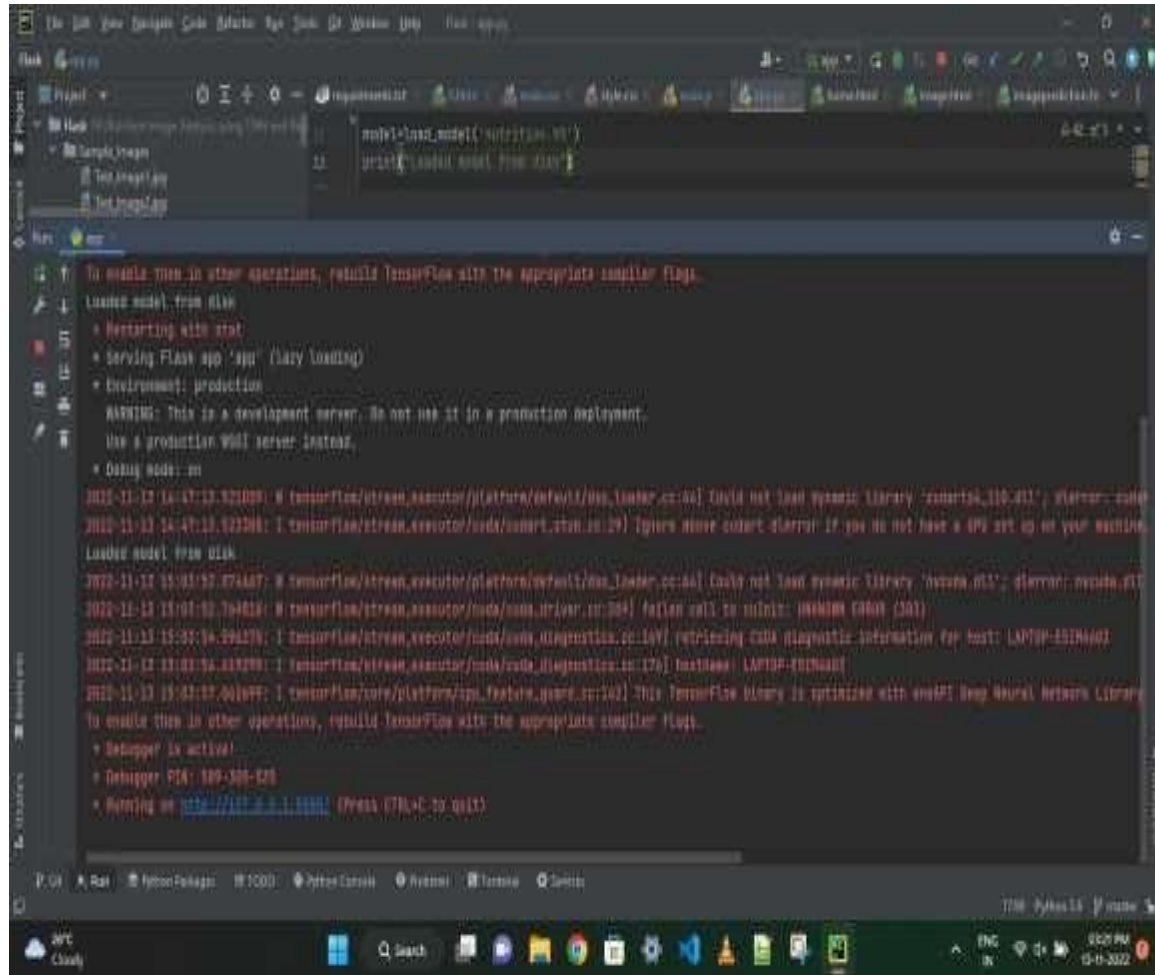
### User Acceptance Testing

## 8.2 User Acceptance Testing



## 9.RESULTS

### 9.1 Performance Metrics



The screenshot shows an IDE with a Python script in the editor and its execution output in the terminal. The script defines a function `model_load_model` that takes a filename as input and prints the loaded model from disk. The terminal output shows the execution of the script, including warnings about the development server and errors related to loading dynamic libraries.

```
def model_load_model(filename):  
    print('Loaded Model From Disk')
```

To enable these in other operations, rebuild TensorFlow with the appropriate compiler flags.

- Restarting with statd
- Serving Flask app 'app' (lazy loading)
- Environment: production
- WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
- Debug mode: on

2022-11-13 14:47:13.322039: W tensorflow/stream\_executor/platform/default/dso\_loader.cc:54] Could not load dynamic library 'cudart64\_110.dll'; error-code: 121

2022-11-13 14:47:13.322086: I tensorflow/stream\_executor/cuda/cuda\_init.cc:129] Ignored CUDA error: 121 (You do not have a GPU set up on your machine. Loaded model from disk)

2022-11-13 15:01:52.674467: W tensorflow/stream\_executor/platform/default/dso\_loader.cc:54] Could not load dynamic library 'nvidia.dll'; error-code: 121

2022-11-13 15:01:52.704616: W tensorflow/stream\_executor/cuda/cuda\_driver.cc:354] failed call to cuInit: UNKNOWN ERROR (303)

2022-11-13 15:01:54.294279: I tensorflow/stream\_executor/cuda/cuda\_diagnostics.cc:147] retrieving CUDA diagnostic information for host: LAPTOP-ES1NA601

2022-11-13 15:01:54.413299: I tensorflow/stream\_executor/cuda/cuda\_diagnostics.cc:176] hostName: LAPTOP-ES1NA601

2022-11-13 15:02:17.001697: I tensorflow/core/platform/cpu\_feature\_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library. To enable these in other operations, rebuild TensorFlow with the appropriate compiler flags.

- Debugger is active!
- Debugger PID: 329-329-329
- Running on <http://127.0.0.1:5000/> (Press CTRL+C to quit)

## **10.ADVANTAGES**

- Advantages-Nowadays new dietary assessment and nutritionanalysis tools enable more opportunities
- To help people understand their daily eating habits, exploringnutrition patterns and maintain a healthy diet.
- Nutritional analysis is the process of determining the nutritionalcontent 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.

# APPENDIX

GitHub & Project Demo Link

[IBM-EPBL/IBM-Project-17044-1659627246](#)