

# 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.).

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## 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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[www.deloitte.com/us/globalhospital-of-the future](http://www.deloitte.com/us/globalhospital-of-the-future) (accessed August 9,2019)
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motion sensors: A systematic review. *Nutrients*.

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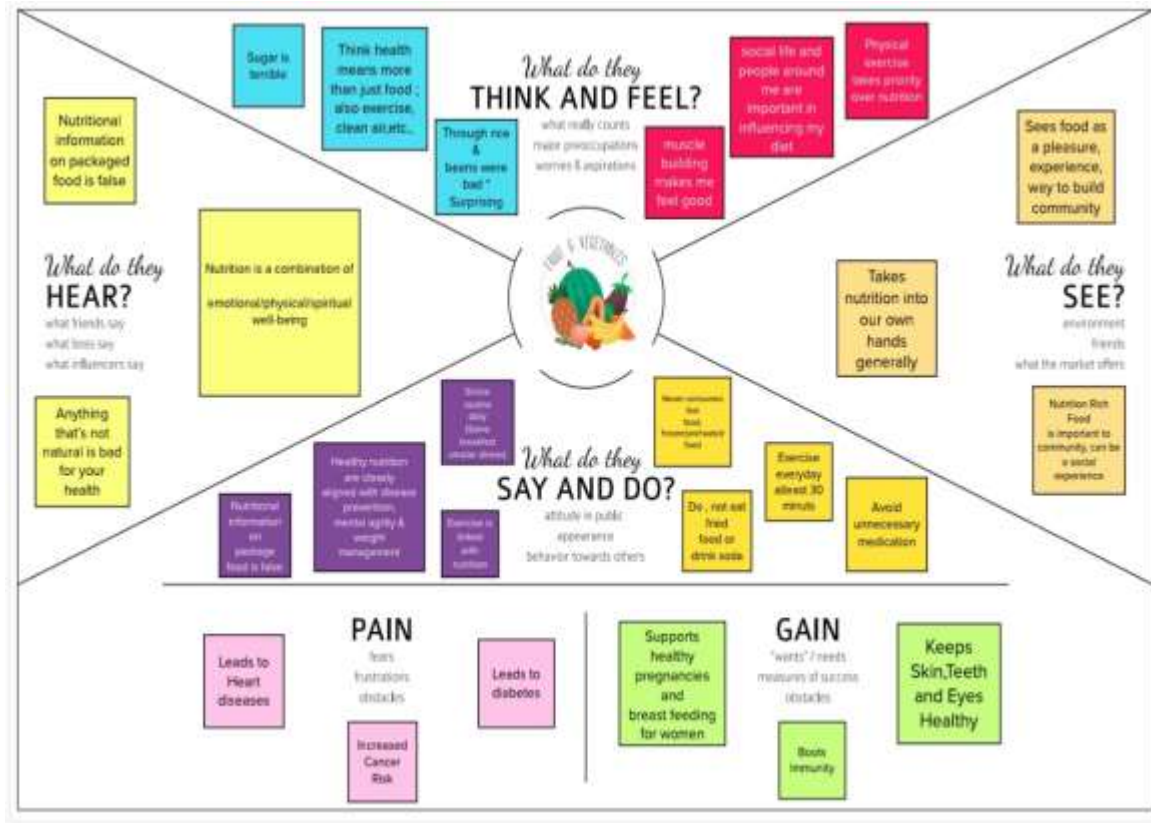
[[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

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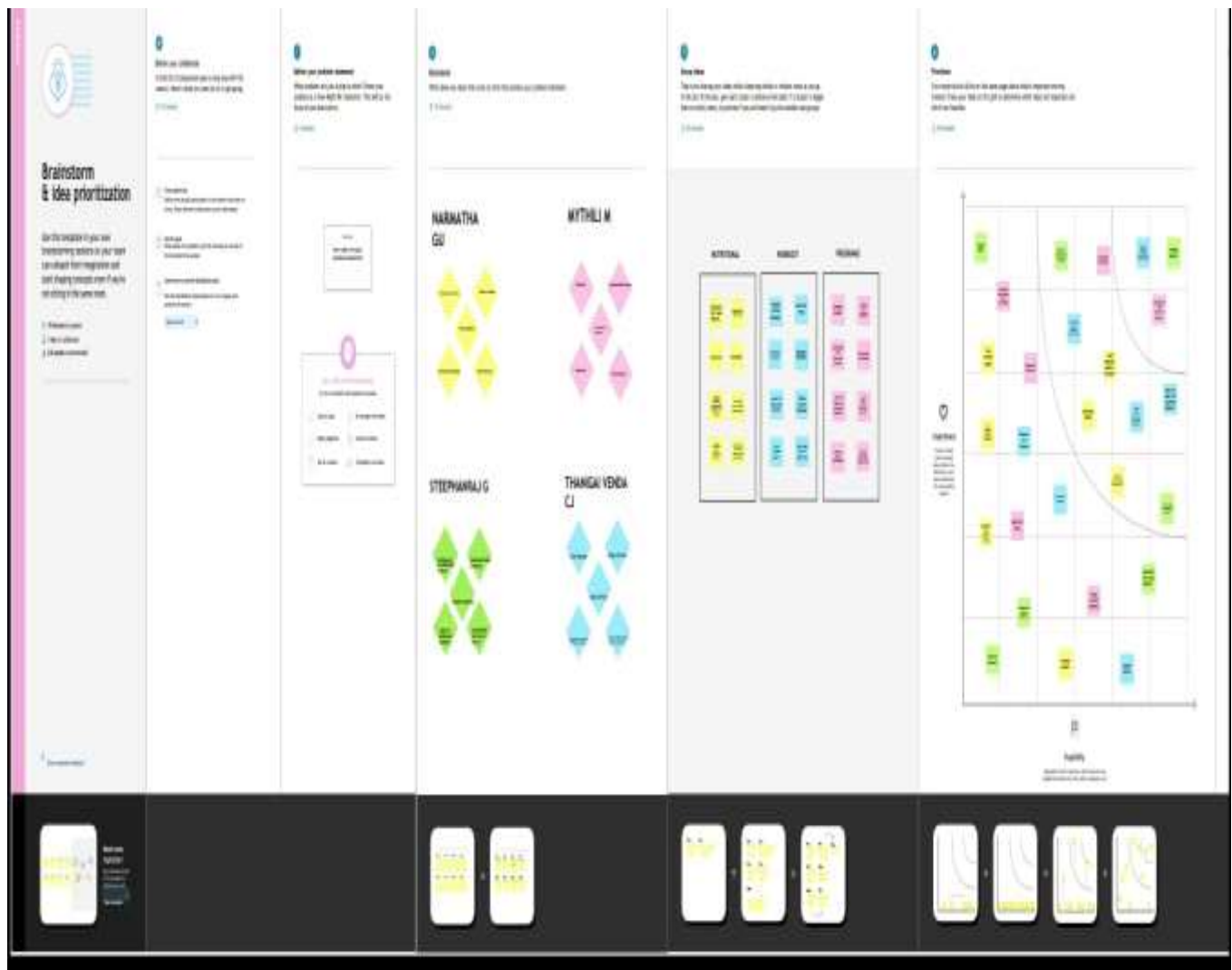
## 2.3 Problem Statement Definition

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 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.

### 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming



### 3.3 Proposed Solution

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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

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4	Social Impact/ Customer Satisfaction	Regular suggestion on fitness maintenance and healthy diet suggestion.
5	Business Model (Revenue Model)	<ul style="list-style-type: none"> <li>• Key Partners are supporting organization and fitness enthusiasts.</li> <li>• Key Activities are done as prediction, suggestion for calorie consumption and healthy life suggestion.</li> <li>• Showing advertisements and promoting certain brands by collaborating with Google Adsense.</li> <li>• Channels are email, mobile, helpline and health care.</li> <li>• Subscription based service to the user</li> </ul>
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



## 3.4 Problem Solution fit

Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Who is your customer? i.e. working parents of 3-5 y.o. kids <ul style="list-style-type: none"> <li>People who want to fit their body and maintain proper or balanced diet in a proper way</li> </ul>	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> 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) <ul style="list-style-type: none"> <li>constraints may contribute to the unhealthy food choices observed among low socioeconomic groups in industrialized countries.</li> </ul>	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> 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 & cons do these solutions have? (i.e. pen and paper is an alternative to digital notetaking) <ul style="list-style-type: none"> <li>Try to eat more protein and fat, and less simple sugars.</li> <li>Ask your doctor or dietitian about nutritional supplements.</li> <li>Avoid non-nutritious beverages</li> </ul>	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Which jobs to be done (or problems) do you address for your customers? There could be more than one, explore different sides. <ul style="list-style-type: none"> <li>Being a holistic wellness coach, registered dietitian, nutritionist, food scientist, nutrition educator are the job can successfully done in this field</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> 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 <ul style="list-style-type: none"> <li>Lack of appetite, or decreased hunger</li> <li>A sore mouth or throat can make eating difficult</li> <li>Unsettled plan in untimed eating</li> </ul>	<b>7. BEHAVIOUR</b> <span>BE</span> 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. Sweepplace) <ul style="list-style-type: none"> <li>the sum of all planned, spontaneous, or habitual actions of individuals or social groups to procure, prepare, and consume food as well as those actions related to storage and clearance.</li> </ul>	
Identify strong TR & EM	<b>3. TRIGGERS</b> <span>TR</span> What triggers customers to act? (i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news) <ul style="list-style-type: none"> <li>Antigens are substances that the body labels as foreign and harmful, which triggers immune cell activity.</li> </ul>	<b>10. YOUR SOLUTION</b> <span>SL</span> If you are working on an existing business, write down your current solution first, fit in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. <ul style="list-style-type: none"> <li>In our platform we provide a individual healthy chart for subscribers</li> <li>Normally Common health diet plan was allocated</li> <li>Seek your way on organic side and stay healthy</li> </ul>	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7 <ul style="list-style-type: none"> <li>Refer journal through online applications, attending some online session, following healthy remedies.</li> </ul> <b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. <ul style="list-style-type: none"> <li>Taking proteins, visit gym, doing aerobic exercise, consume huge water.</li> </ul>	Extract online & offline CH of BE
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure → confident, in control - use it in your communication strategy & design. Before: Initially they felt intensely confused by their own. And felt more negative thoughts and overestimated themselves. After: After the correct solution they had a great confidence among themselves And achieve their Healthy diet.			

Problem-Solution fit canvas is licensed under a Creative Commons Attribution NonCommercial-NoDerivatives 4.0 license  
 Created by Daria Repelakina / Amaltama.com

## 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.

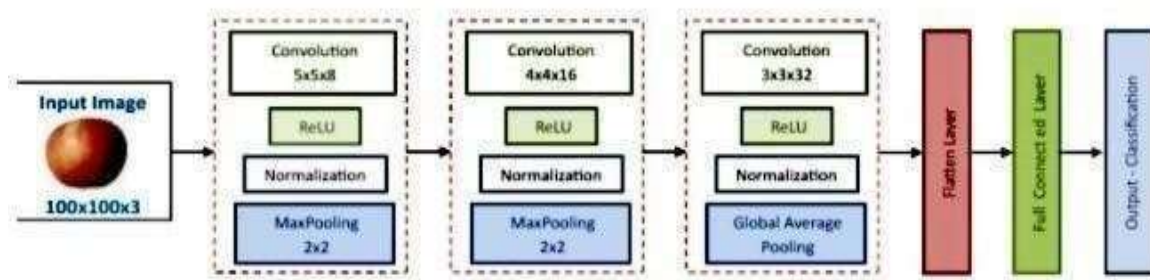
- Computer-Assisted Nutritional Recognize Food Images
  - In order to solve this issue, a brand-new Convolutional Neural Network (CNN)- based food picture identification system was created, as described in this study. We utilized our suggested strategy on two sets of actual food picture data.
- Here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

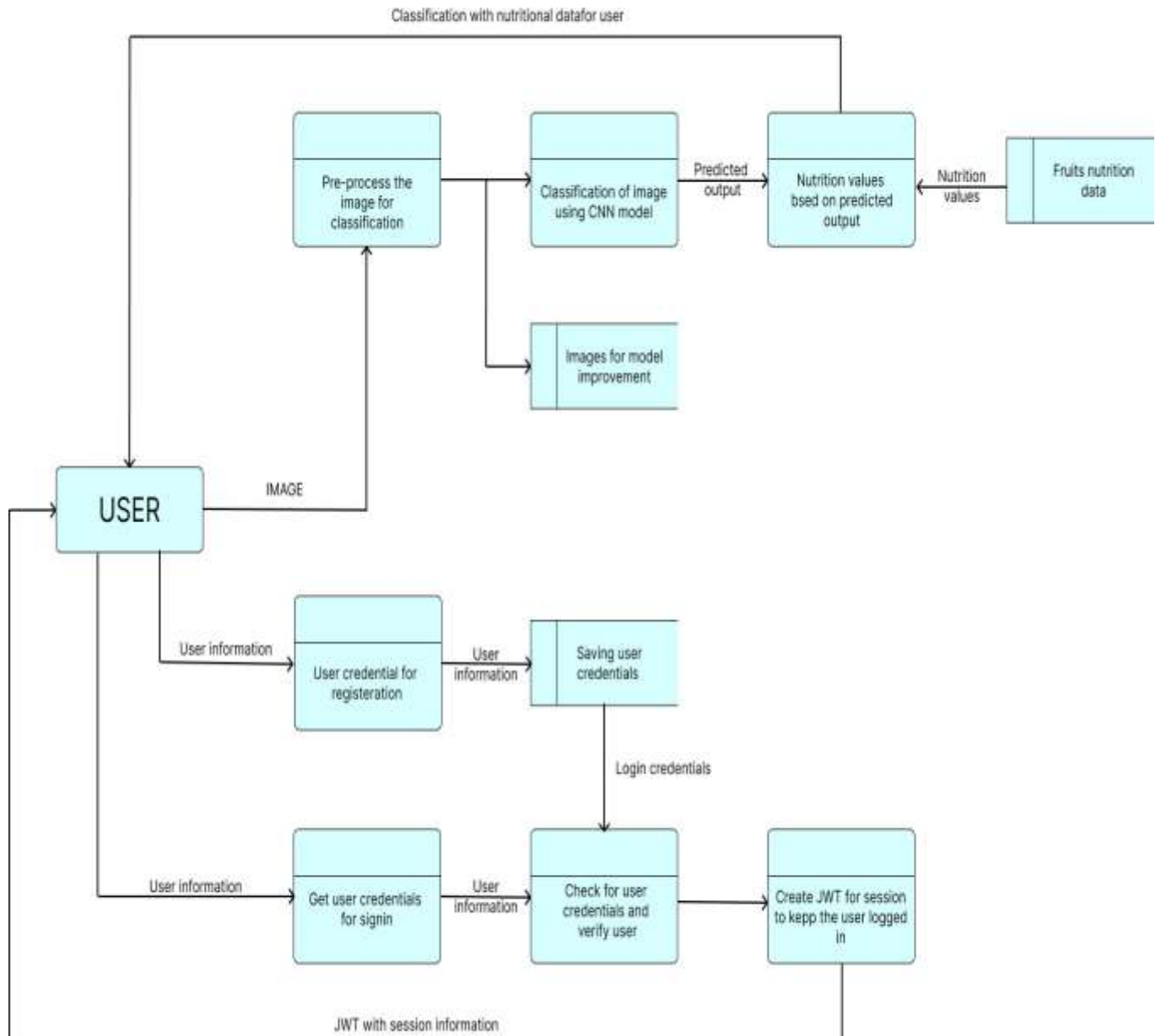
For Example:



- 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: 
$$\text{dietary requirement} = \frac{\text{metabolic demand}}{\text{efficiency of utilization}}.$$

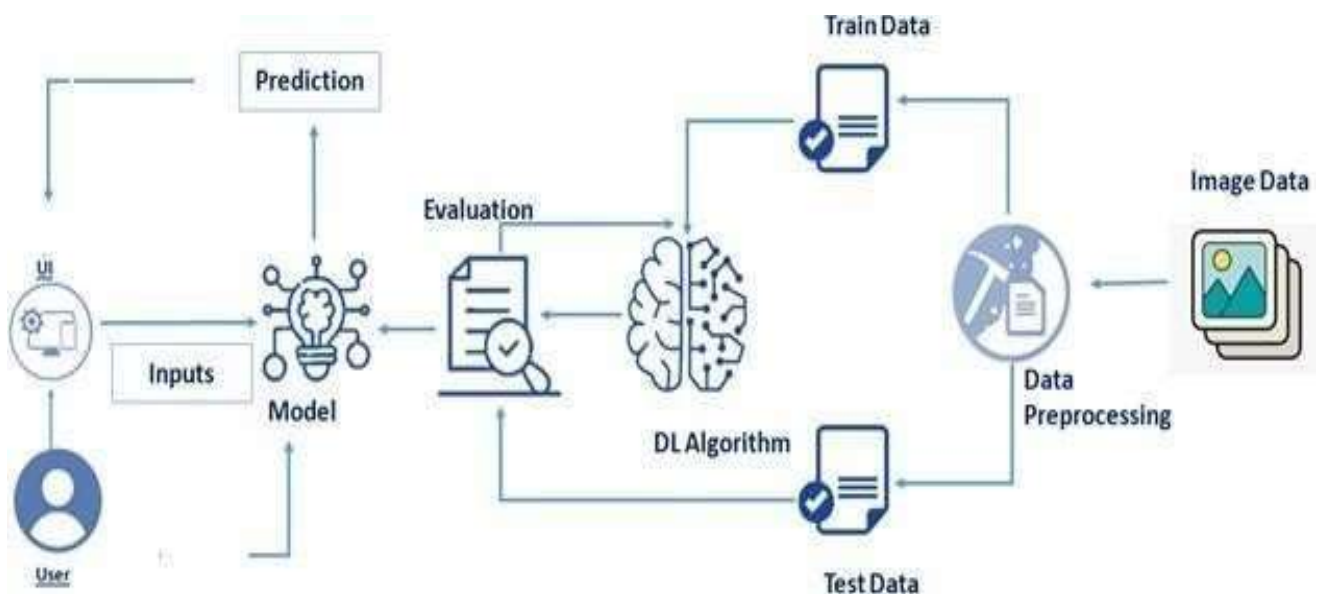
# 5.PROJECT DESIGN

## 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

<b>Sprint</b>	<b>Total Story Points</b>	<b>Duration</b>	<b>Sprint Start Date</b>	<b>Sprint End Date (Planned)</b>	<b>Story Points Completed (as on Planned End Date)</b>	<b>Sprint Release Date (Actual)</b>
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

<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
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	Thanigai vendhan
Sprint -1		USN-4	Feature Scaling	3	Low	Thanigai vendhan
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



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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

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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

494/824 [=====] ..... - 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")
```

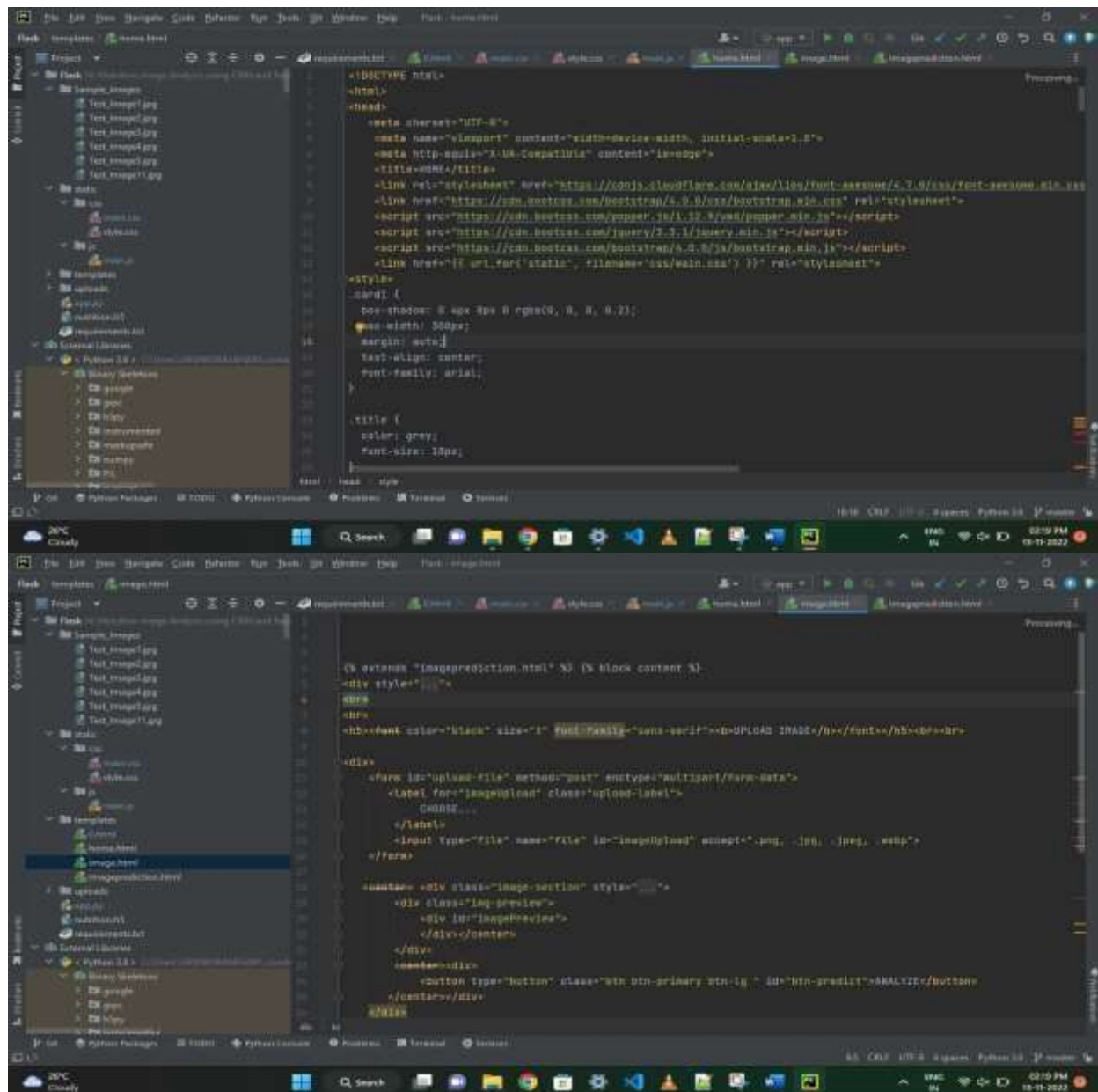


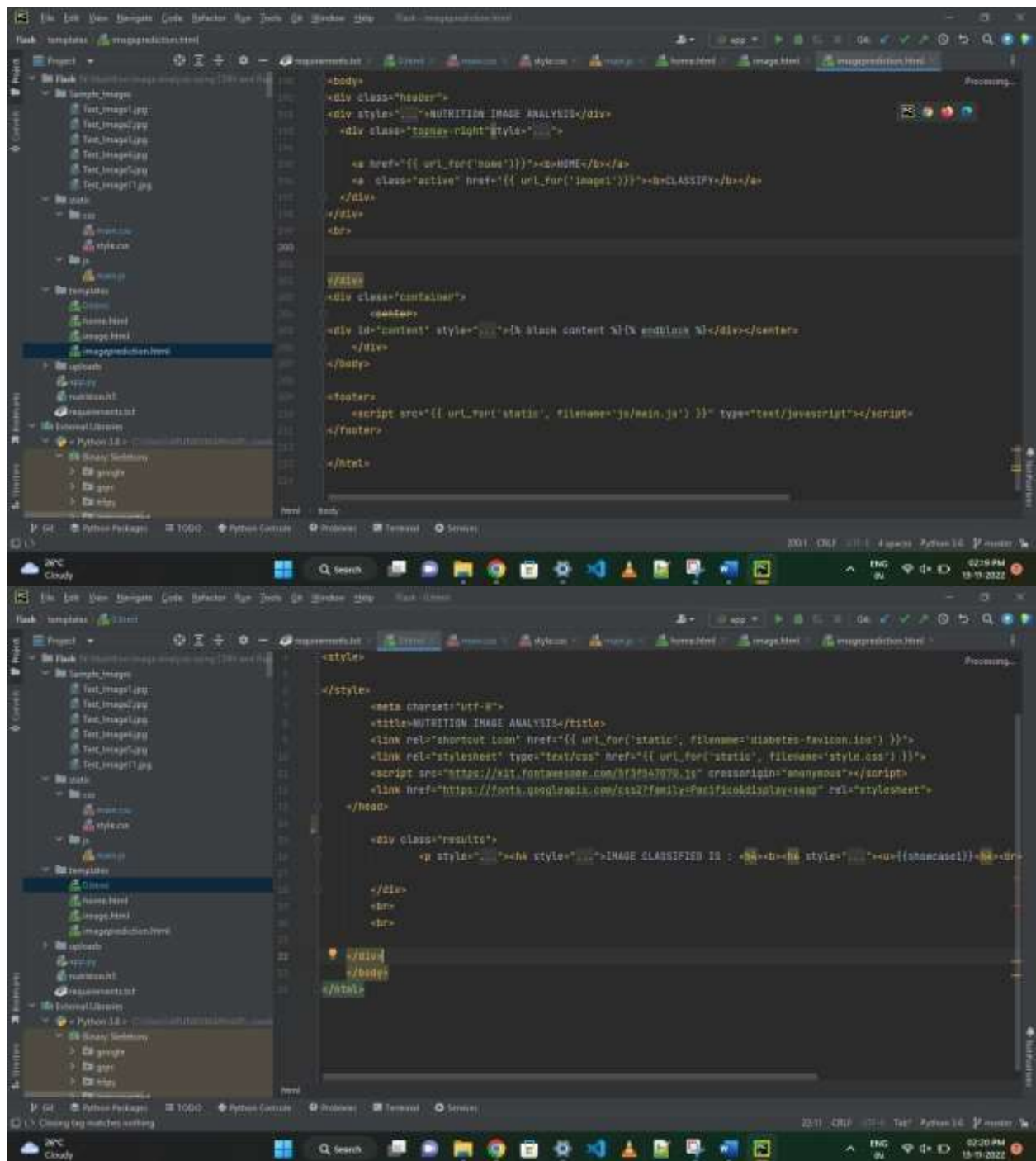
```
from tensorflow.keras.models import load_model  
from tensorflow.keras.preprocessing import image  
model = load_model("nutrition.h5")  
img = image.load_img(r'/content/drive/MyDrive/Colab Notebooks/Sample Images/Test_Image1.jpg', grayscale=False, target_size=(64,64))  
x = img_to_array(img)  
x = np.expand_dims(x, axis = 0)  
predict_x=model.predict(x)  
classes_x=np.argmax(predict_x,axis=-1)  
classes_x
```

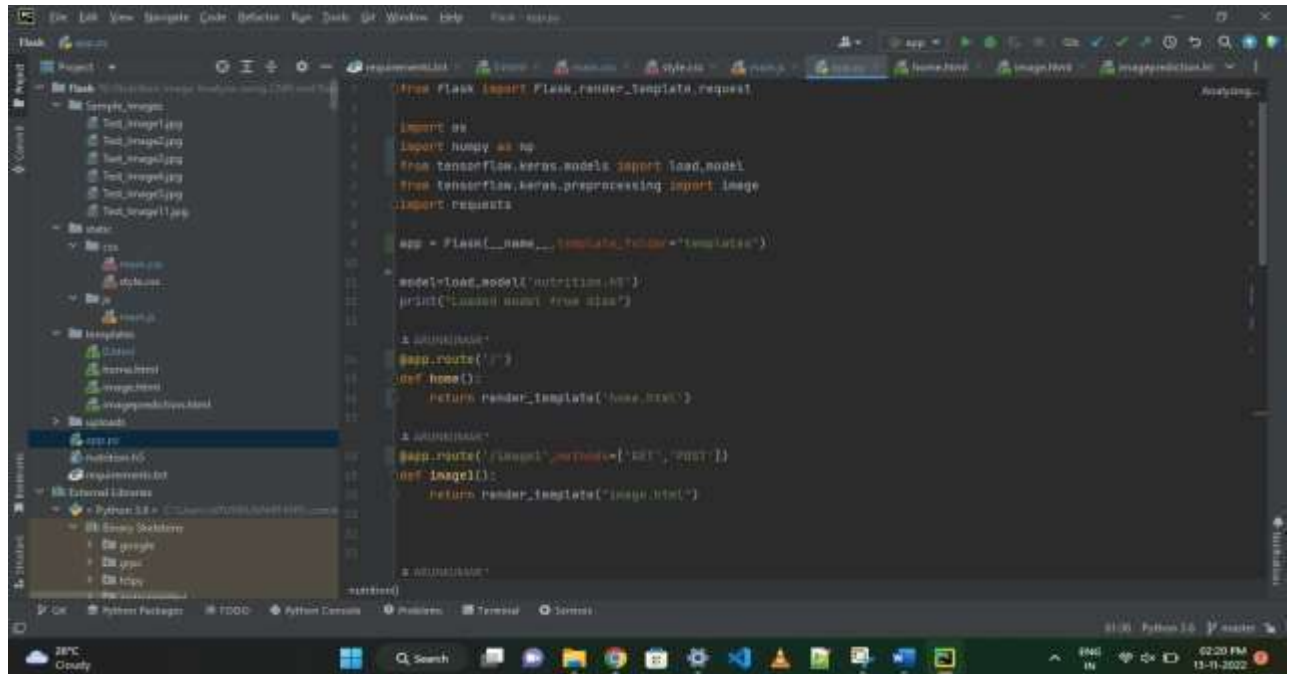
1/1 [=====] - 0s 62ms/step  
array([0])

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

## 7.2 Feature 2



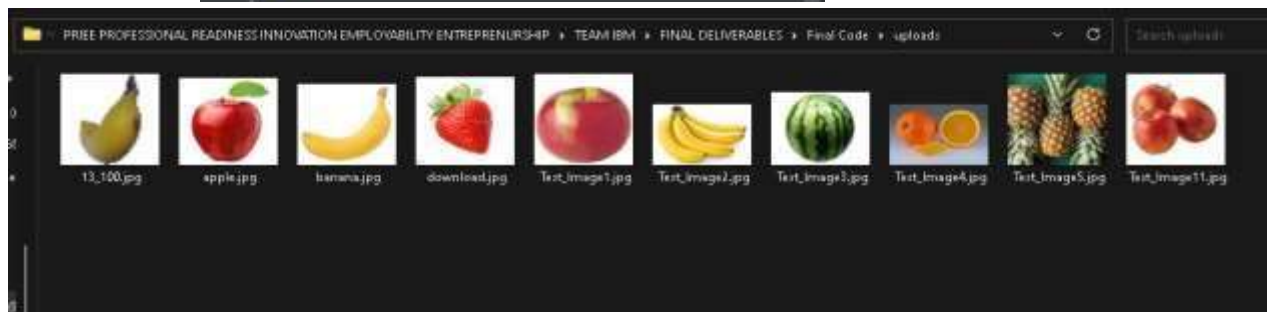
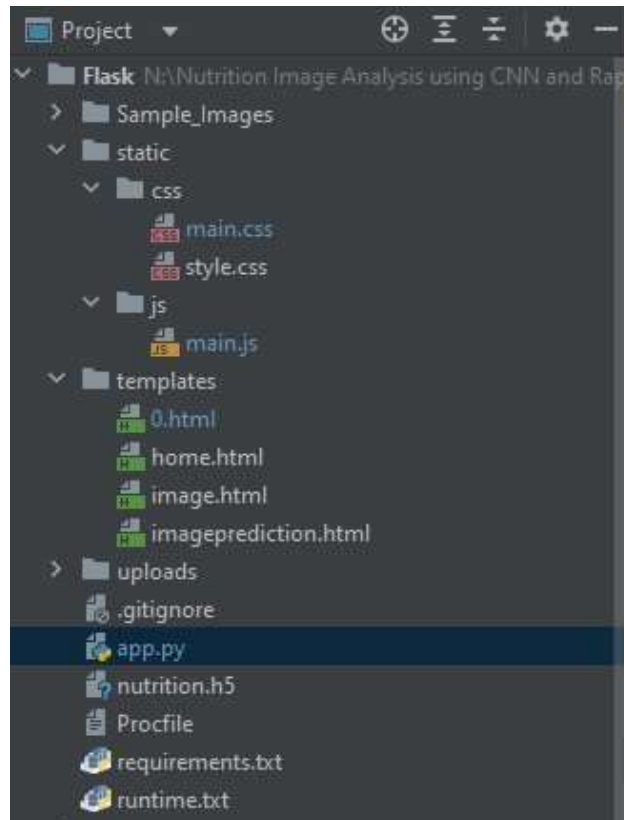




Database Schema (if Applicable)

## 8.TESTING

### 8.1 Test Cases



### 8.2 User Acceptance Testing





## 9.RESULTS

### 9.1 Performance Metrics

```
model=load_model('nutrition.h5')
print('Loaded model from disk')
```

```
2022-11-13 14:47:13.821038: W tensorflow/stream_executor/platform/default/dso_loader.cc:44] Could not load dynamic library 'cudart64_110.dll': dlopen: could
2022-11-13 14:47:13.823388: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Ignore above cudart dlerror if you do not have a GPU set up on your machine.
Loaded model from disk
2022-11-13 15:01:52.874487: W tensorflow/stream_executor/platform/default/dso_loader.cc:44] Could not load dynamic library 'nvidia.dll': dlopen: nvidia.dll
2022-11-13 15:01:52.764618: W tensorflow/stream_executor/cuda/cuda_driver.cc:304] failed call to cuInit: INVALID_HANDLE (503)
2022-11-13 15:01:54.294178: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:149] retrieving CUDA diagnostic information for host: LAPTOP-ES1N4601
2022-11-13 15:01:54.418298: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:176] hostName: LAPTOP-ES1N4601
2022-11-13 15:01:57.041697: I tensorflow/core/platform/cpu_feature_guard.cc:142] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library
to enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
> Debugger is active!
> Debugger PID: 189-386-526
> Running on http://127.0.0.1:8080/ (Press CTRL+C to quit)
```

## 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.

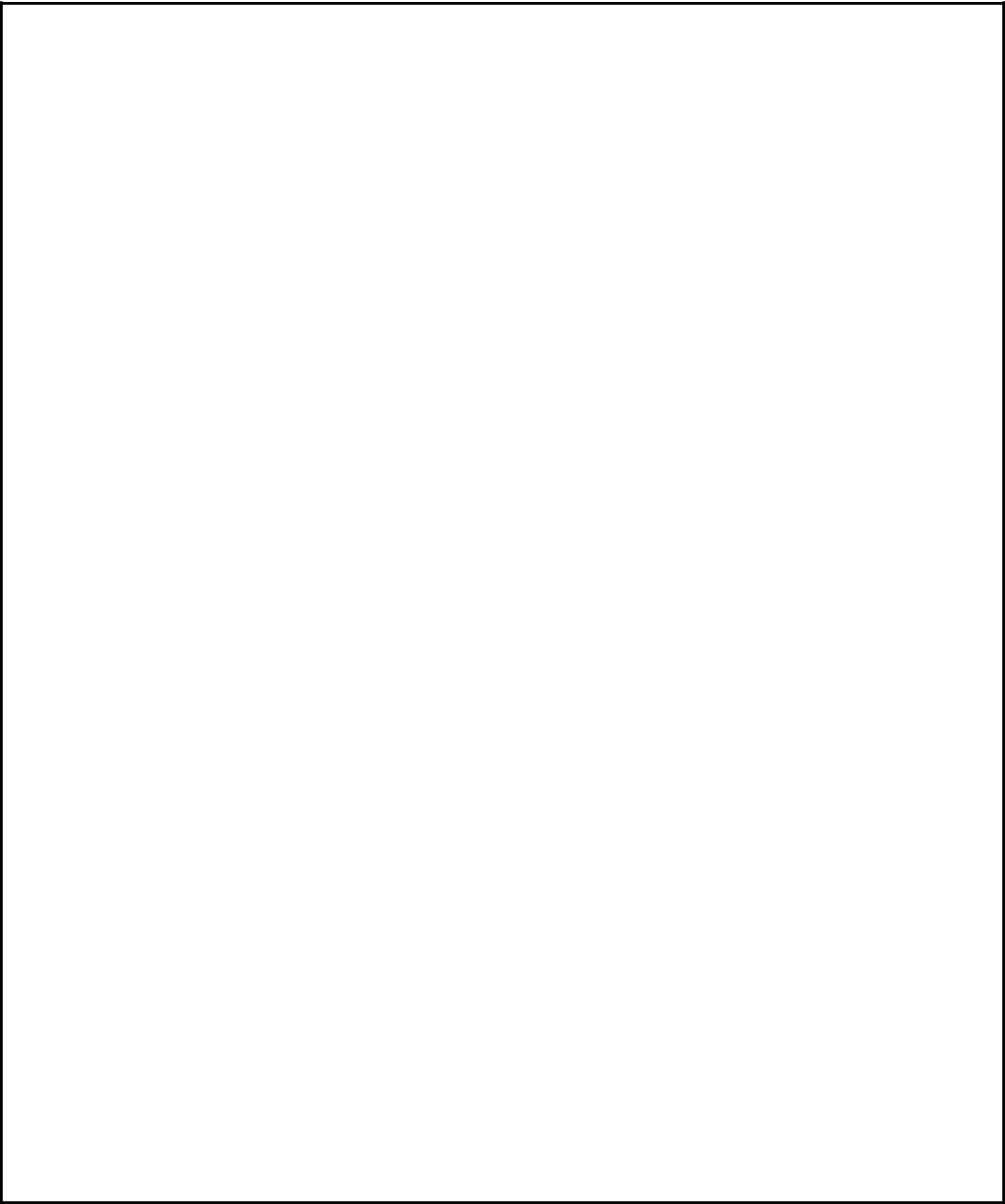
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## 12.FUTURE SCOPE

- 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](#)

