AI-powered Nutrition Analyzer for Fitness Enthusiasts

Team Id: PNT2022TMID23697

Project Report

1. INTODUCTION:

1.1 Project Overview

Food is fundamental for human existence and has been the worry of numerous medical services shows. These day new dietary evaluation and sustenance examination instruments empower more chances to assist individuals with understanding their everyday dietary patterns, investigating nourishment designs and keep a solid eating routine. Wholesome investigation is the method involved with deciding the nourishing substance of food. An imperative piece of scientific science gives data about the compound organization, handling, quality control and pollution of food.

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, Fibre, Protein, Calories, etc.).

2. LITERATURE SURVEY:

2.1 Existing Problem

Neutrino conveys nourishment based information administrations and examination to its clients and needs to transform into a
models from the advancement hypothesis as well as prescient examination to empower individualized information
accumulation.

The application depends on Man-made consciousness to
create custom information connected with brilliant calorie counter fueled by computer based intelligence. Their man-made consciousness learns a singular's

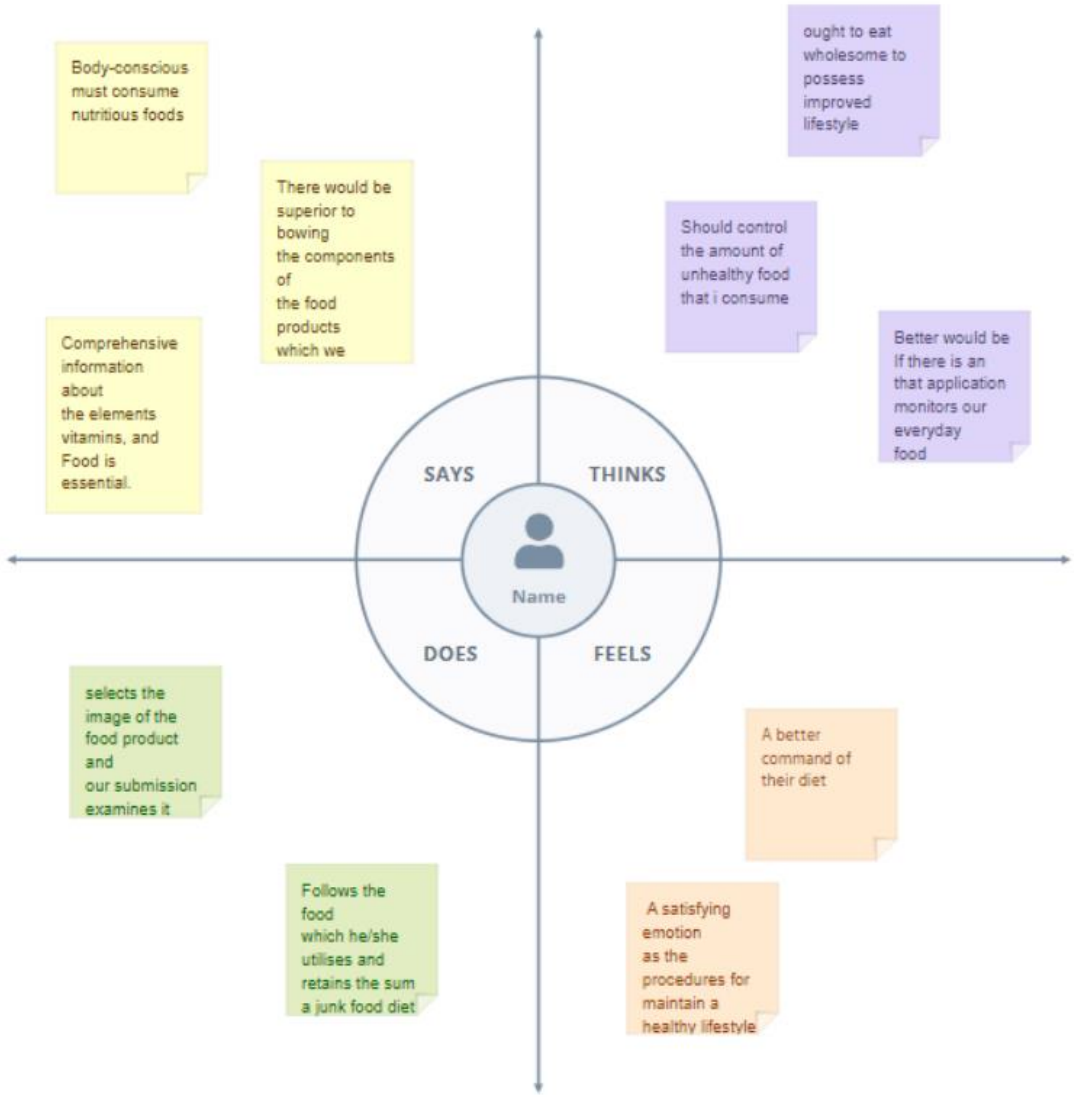
preferences, inclinations, and body type. This is all bundled in a far reaching nourishment and movement tracker driving wellspring of the nourishment related stage. The stage utilizes NLP and numerical.

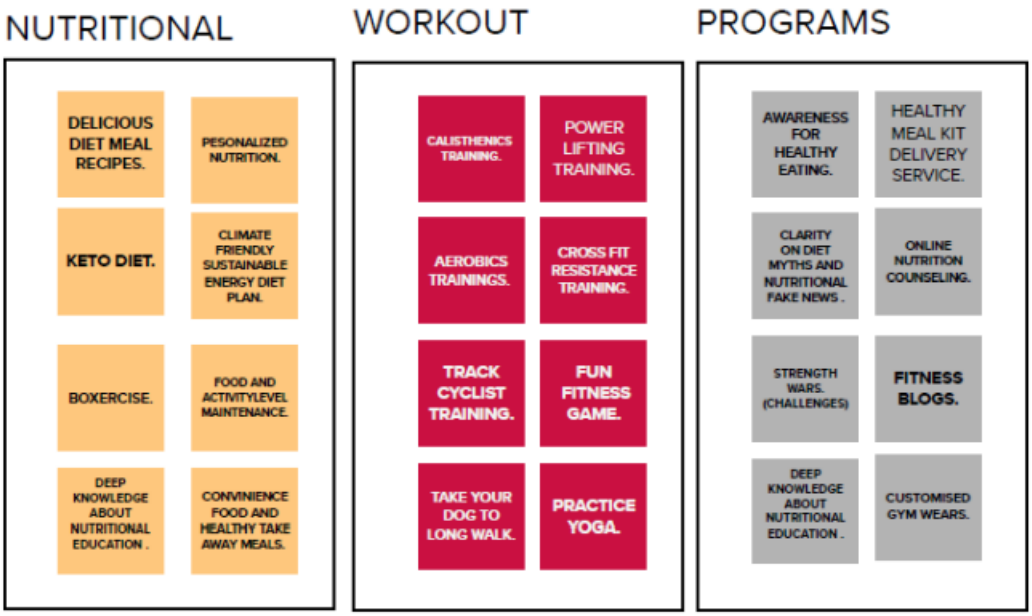
2.3 Problem Statement Definition

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.).

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas





3.2 Proposed Solution

S.No.	Parameter	Description
1.	ProblemStatement(Problemt obesolved)	The main goal of the project is tobuilding a model which is used for explaining the fruit depends on the different methods characteristics like colour,shape,texture etc.
2.	Idea/Solutiondescription	Brand-new fruit implementing method calledHPA-SLFN can be implemented for classifcation as it gives good results when compared too that echniques
3.	Novelty/Uniqueness	The type performance and accuracy for the analyses of image and detection rate of the nutrition based on the fruits is higher.
4.	SocialImpact/CustomerS atisfaction	Here the user can capture the images of different fruits and then the pictures 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.) .

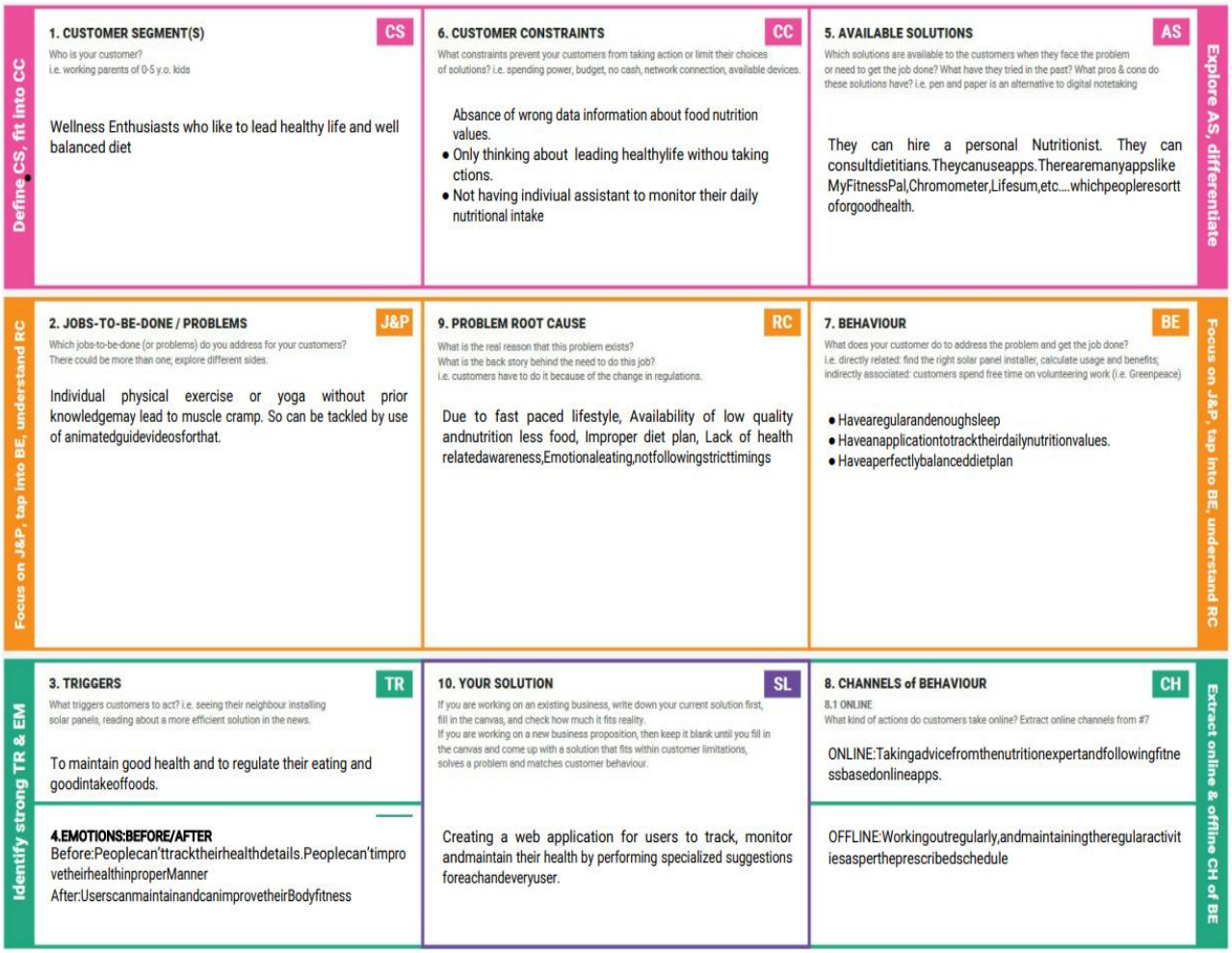
5.	BusinessModel(Revenue Model)	• Dataanalytics • Statistics methods • Future analysis
6.	ScalabilityoftheSolution	The model is scalable from the architecture and data set training perspective. We can train massive amounts of image data by converting them into .npy / .npz file formatwhich would facilitate easy storing,retrieving and processing.

3.4 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 identify behavioral patterns

Purpose:

- Solve complex problems in a way that fits the state of your customers.
- Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- Sharpen your communication and marketing strategy with the right triggers and messaging.
- Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.



4. REQUIREMENT ANALYSI

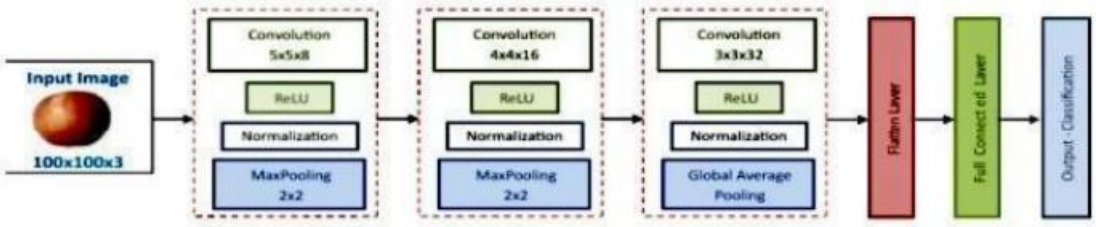
4.1 Functional requirement

The task of food detection/classification is not easy as it seems. All possible options related to the given Image.

- Image classification, object detection, segmentation , face recognition.
- Classification of crystal structure using a convolutional neural network
- Nutrition is vital to the growth of the human body. Nutritional analysis guarantees that the meal meets the appropriate vitamin and mineral requirements, and the examination of nutrition in food aids in understanding the fat proportion, carbohydrate dilution, proteins, fiber, sugar, and so on. Another thing to keep in mind is not to exceed our daily calorie requirements
- Computer-Assisted Nutritional Recognize Food Images – In order to solve this issue, a brandnew 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.

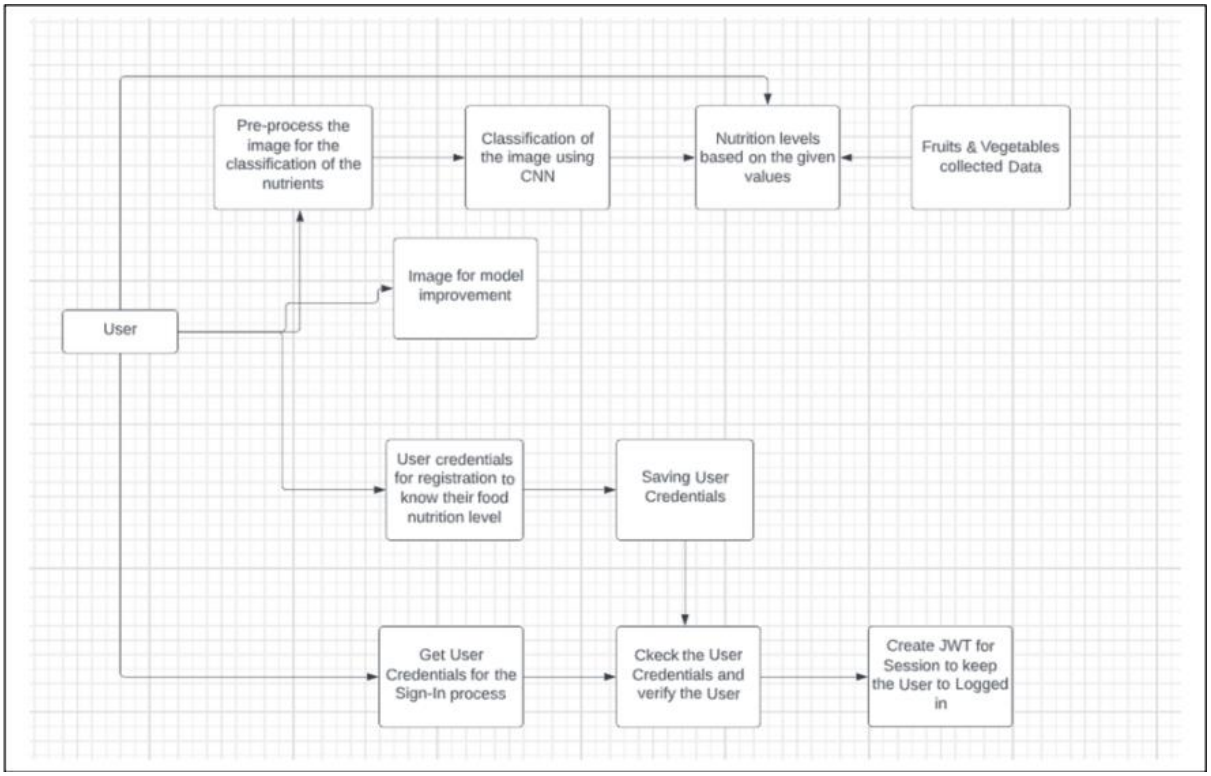
For Example:



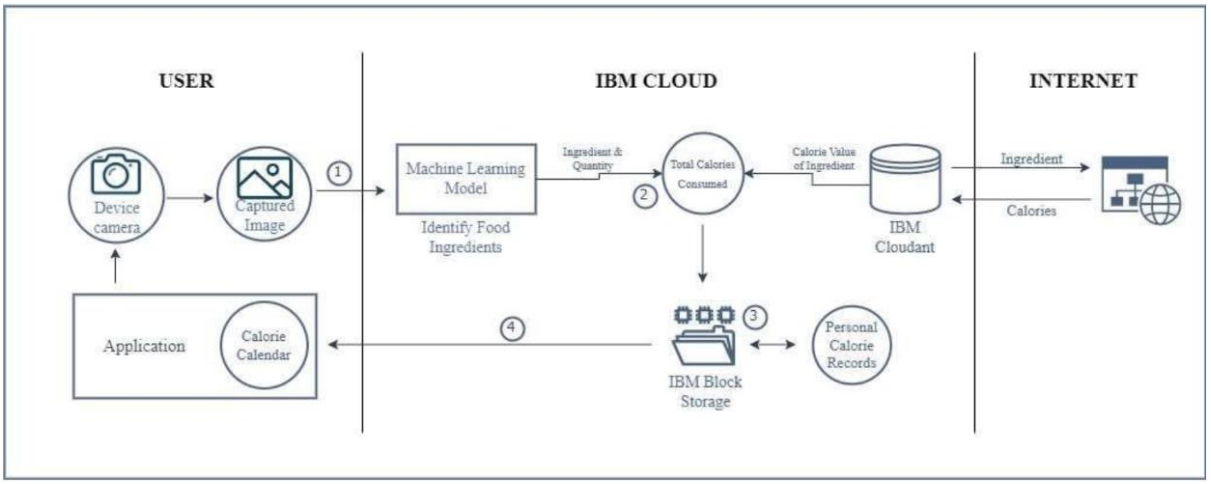
- The comparison of the proposed model with the conventional models shows that the results of this model are exceptionally good and promising to use in real-world applications.
- This sort of higher accuracy and precision will work to boost the machine's general efficiency in fruit recognition more appropriately.
- 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



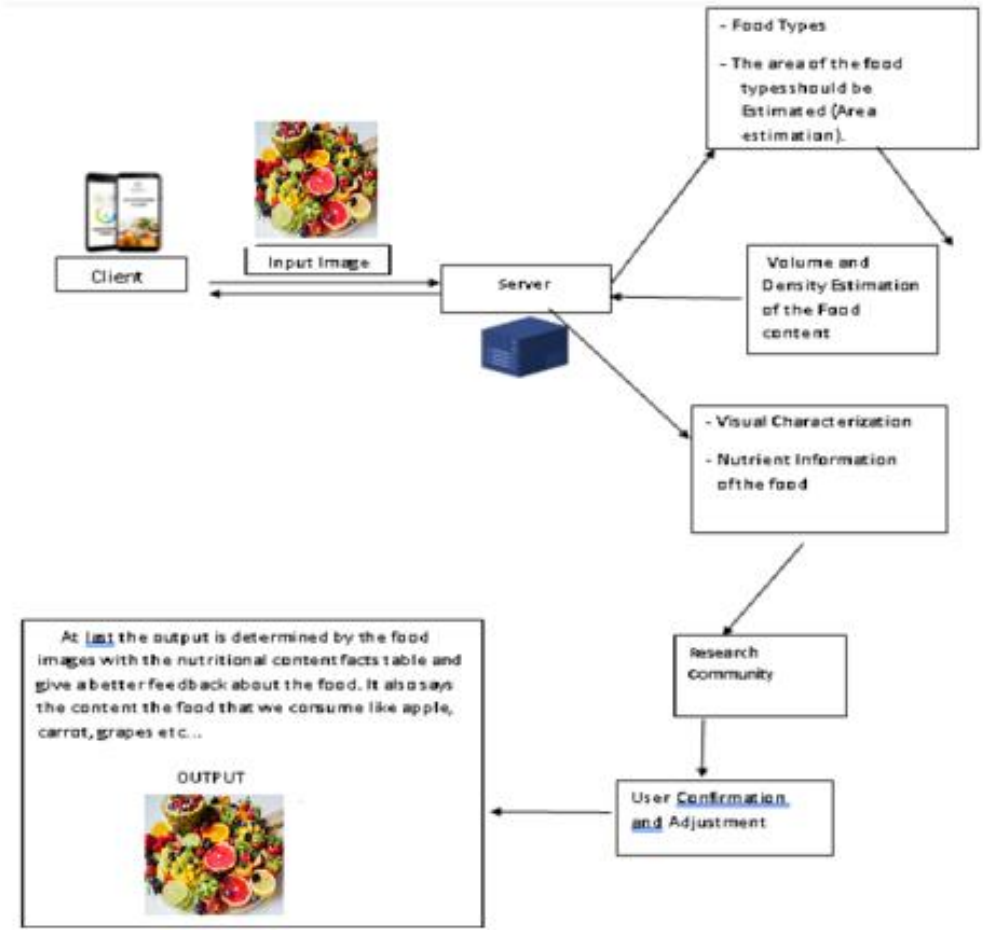
5.2 Solution & Technical Architecture



S.No	Component	Description	Technology
1.	App	User interacts with application for the prediction of Nutrition	Python, Java, HTML, SQLite, Android studio
2.	Database	Data Type, Configurations and data will be stored	MySQL, JS
3.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
4.	File Storage	File storage requirements	Cloud -- > drive
5.	Machine Learning Model	Purpose of Machine Learning Model	ANN, CNN, RNN
6.	Notification	Notification will be sent from the server	SendGrid

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 predications per second	IBM Load Balance


- Food Types
- The area of the food typesshould be Estimated (Area estimation).
Client
Input Image
Server
Volume and Density Estimation of the Food content
- Visual Characterization
- Nutrient Information ofthe food
Research Community
User Confirmation and Adjustment
At last the output is determined by the food images with the nutritional content facts table and give abetter feedback about the food. It also says the content the food that we consume like apple, carrot, grapes etc...
OUTPUT

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

6.1 Feature 1

Data Collection

Collect images of different food items organized into subdirectories based on their respective names as shown in the project structure.

Create folders of types of food items that need to be recognized.

In this project, we have collected images of 5 types of food items apples, 'banana', 'orange', 'pineapple' and 'watermelon', they are saved in the respective subdirectories with their respective names.
For more accurate results we can collect images of high resolution and feed the model with more images.
You can download the dataset used in this project using the link below.

Data Set: **LINK**

Note: For better accuracy train on more images

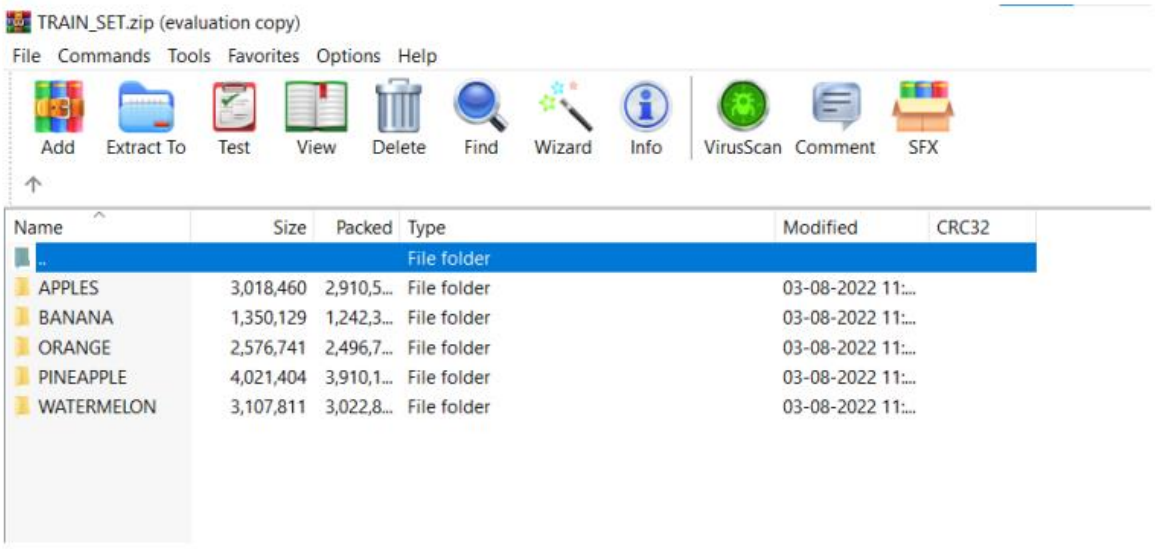
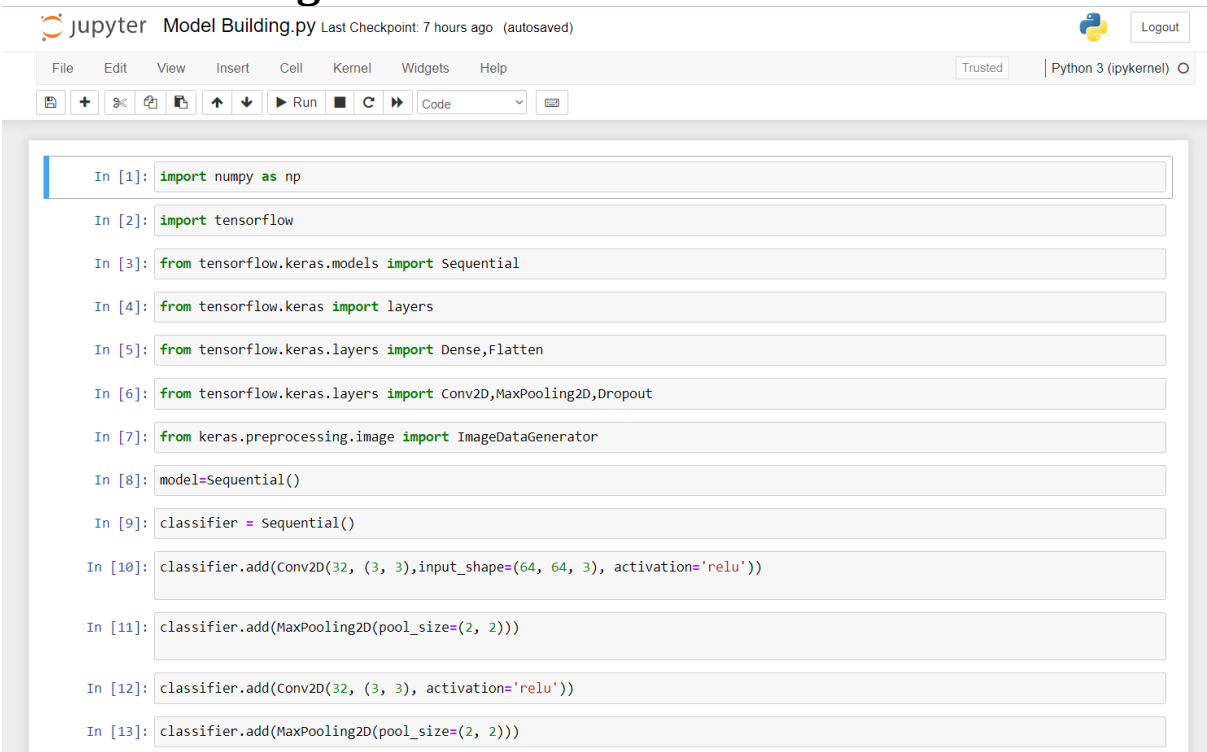


Image Preprocessing

```
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:\AI-powered Nutrition Analyzer for Fitness Enthusiasts',target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sp
        x_test = test_datagen.flow_from_directory(r'C:\AI-powered Nutrition Analyzer for Fitness Enthusiasts',target_size=(64, 64),batch_

        Found 4138 images belonging to 2 classes.
        Found 4138 images belonging to 2 classes.

In [4]: print(x_train.class_indices)
        {'APPLES': 0,'BANANA': 1,'ORANGE': 2,'PINEAPPLE': 3,'WATERMELON': 4}

        {'Rapid API Video': 0, 'TRAIN_SET-20221110T014135Z-001': 1}

Out[4]: {'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}

In [5]: print(x_test.class_indices)

        {'Rapid API Video': 0, 'TRAIN_SET-20221110T014135Z-001': 1}

In [6]: from collections import Counter as c
        c(x_train.labels)

Out[6]: Counter({1: 4138})

        {'Rapid API Video': 0, 'TRAIN_SET-20221110T014135Z-001': 1}

In [6]: from collections import Counter as c
        c(x_train.labels)

Out[6]: Counter({1: 4138})

In [8]: x_train = train_datagen.flow_from_directory(
            r'D:\IBM Assignment\Project Structure\Dataset\TRAIN_SET',target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='spars

        Found 4138 images belonging to 5 classes.
```

Model Building:



jupyter Model Building.py Last Checkpoint: 7 hours ago (autosaved)

Logout

File Edit View Insert Cell Kernel Widgets Help

Trusted | Python 3 (ipykernel)

Run Code

In [14]:
```
classifier.add(Flatten())
```

In [15]:
```
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=5, activation='softmax'))
```

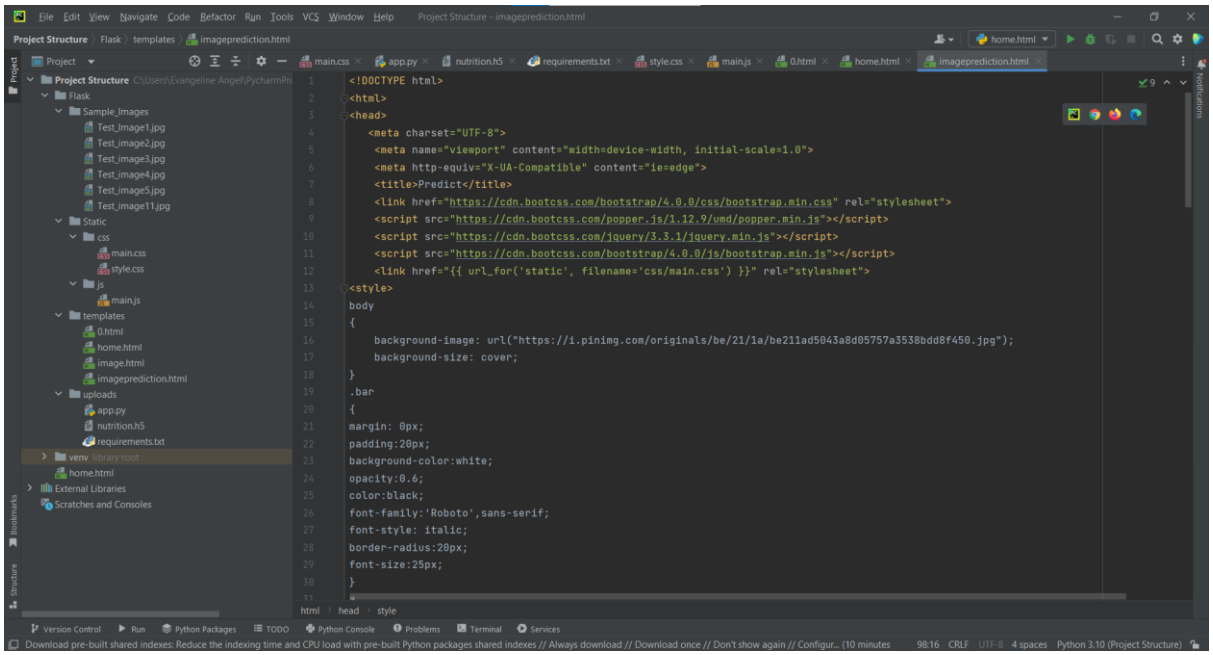
In [16]:
```
classifier.summary()
```

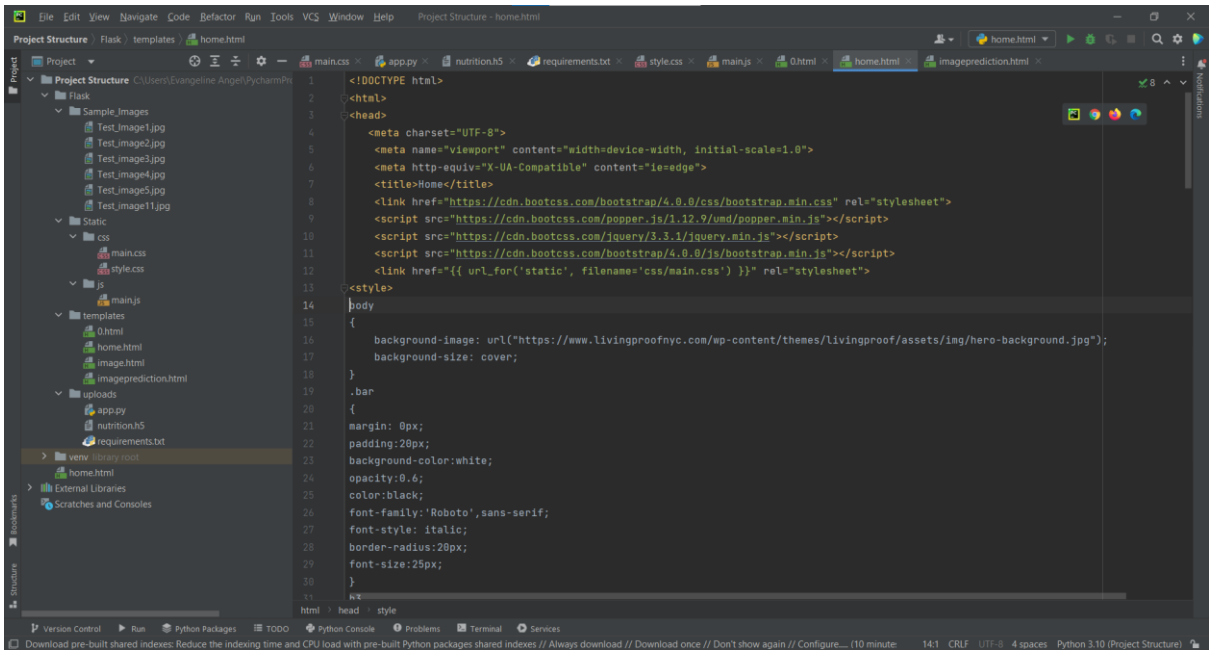
```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 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
_________________________________________________________________
```

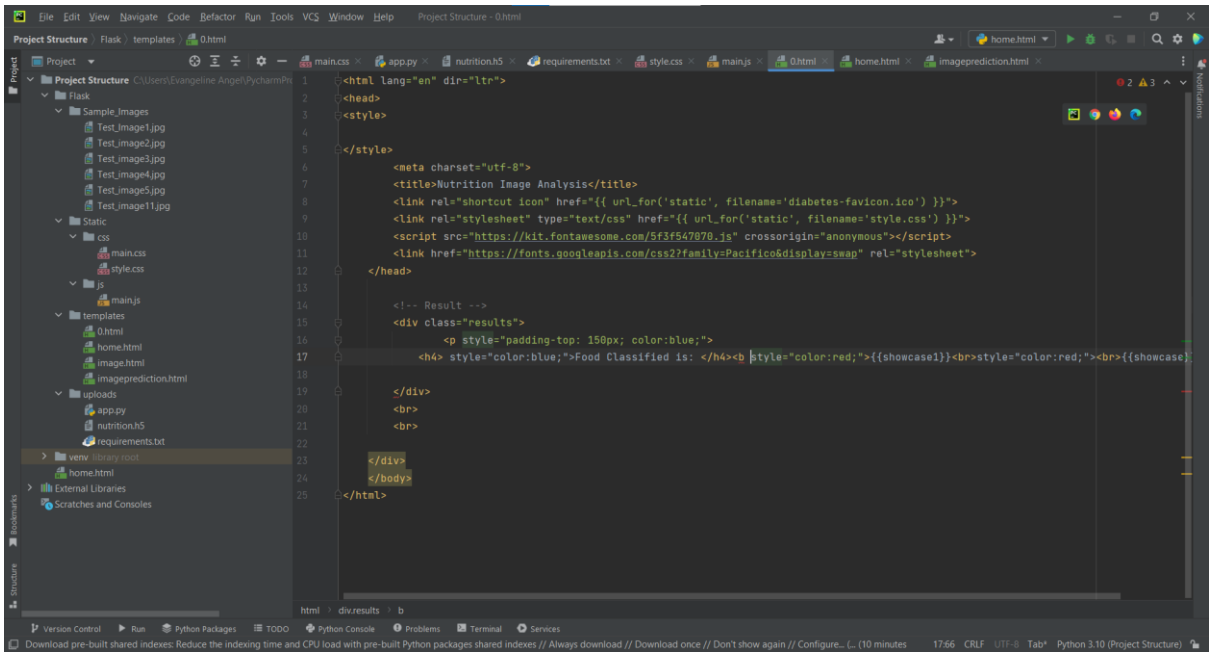
In [17]:
```
classifier.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
```

In [18]:
```
classifier.save('nutrition.h5')
```

6.2 Feature 2

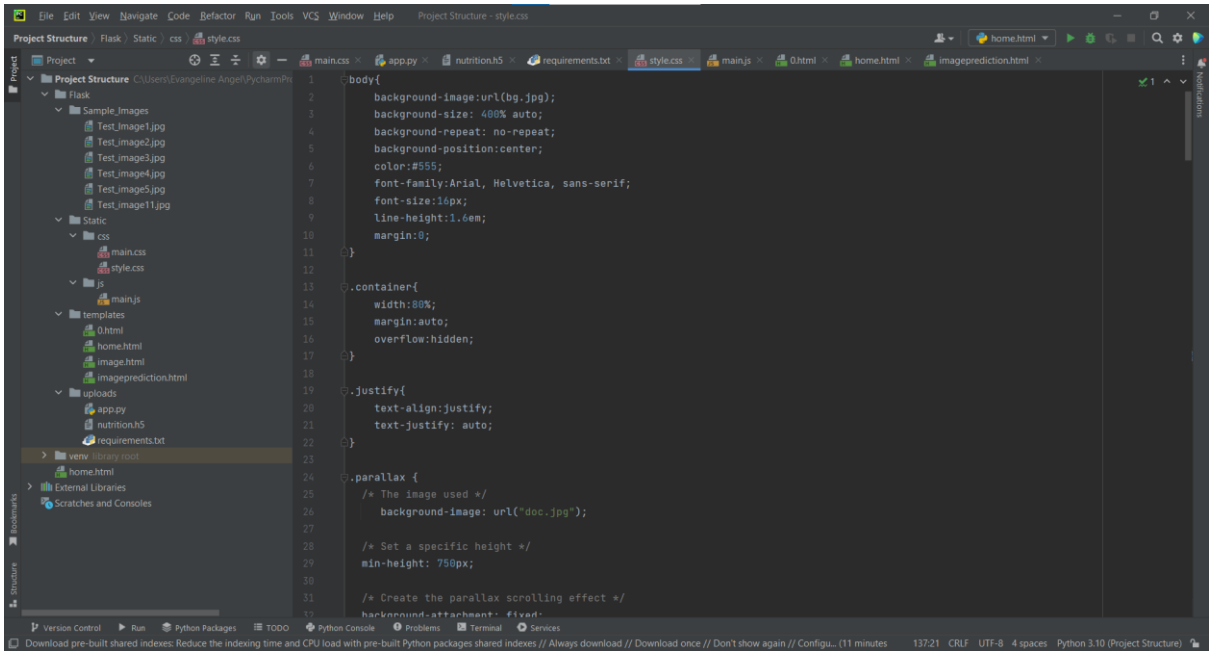



File Edit View Navigate Code Refactor Run Tools VCS Window Help
Project Structure - home.html
Project Structure Flask templates home.html
main.css app.py nutrition.h5 requirements.txt style.css main.js 0.html home.html imageprediction.html
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="X-UA-Compatible" content="ie=edge">
<title>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;
}
html head style
Version Control Run Python Packages TODO Python Console Problems Terminal Services
Download pre-built shared indexes: Reduce the indexing time and CPU load with pre-built Python packages shared indexes // Always download // Download once // Don't show again // Configure... (10 minute
14:1 CRLF UTF-8 4 spaces Python 3.10 (Project Structure)

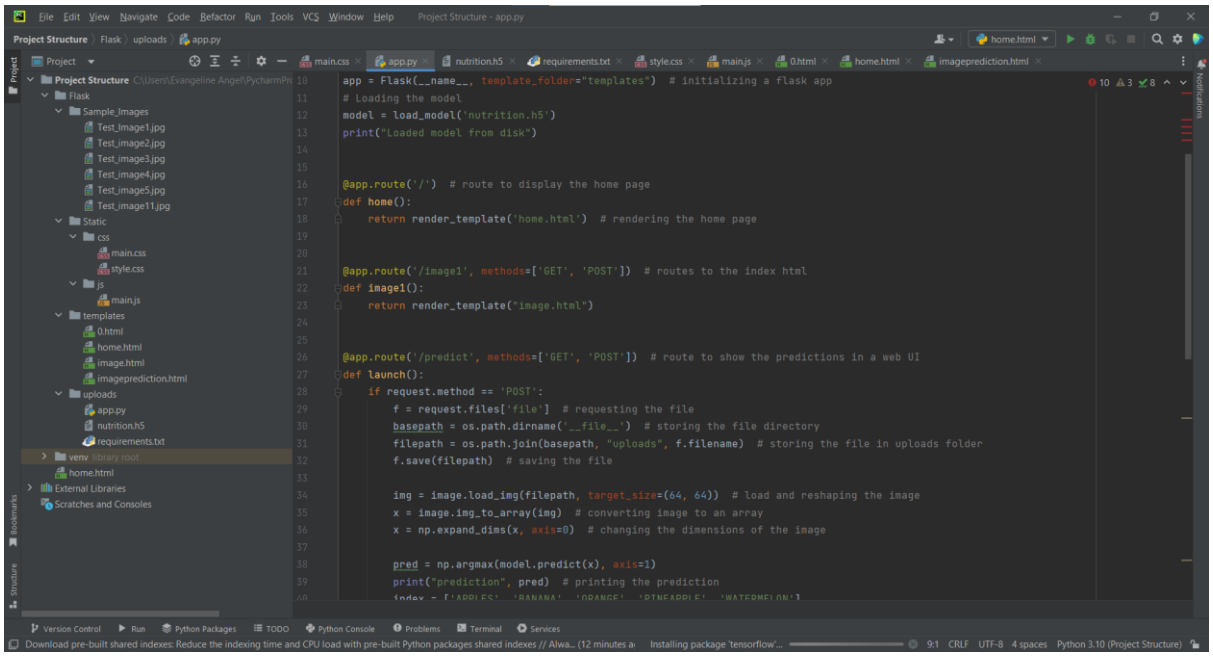

File Edit View Navigate Code Refactor Run Tools VCS Window Help
Project Structure - 0.html
Project Structure Flask templates 0.html
main.css app.py nutrition.h5 requirements.txt style.css main.js 0.html home.html imageprediction.html
<html lang="en" dir="ltr">
<head>
<style>
</style>
<meta charset="utf-8">
<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 -->

<p style="padding-top: 150px; color:blue;">
<h4> style="color:blue;">Food Classified is: </h4><b style="color:red;">{{showcase1}}
style="color:red;">
{{showcase}}

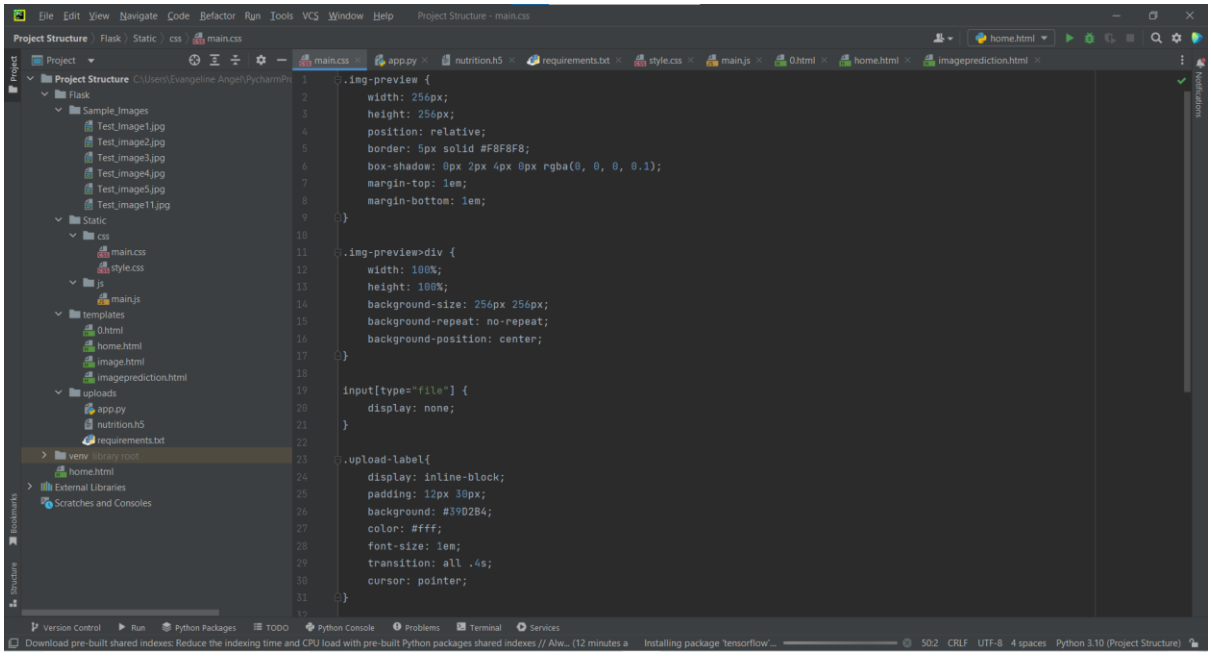
</body>
</html>
html div.results b
Version Control Run Python Packages TODO Python Console Problems Terminal Services
Download pre-built shared indexes: Reduce the indexing time and CPU load with pre-built Python packages shared indexes // Always download // Download once // Don't show again // Configure... (... (10 minutes
17:66 CRLF UTF-8 Tab* Python 3.10 (Project Structure)



```
body{
    background-image:url(bg.jpg);
    background-size: 400% auto;
    background-repeat: no-repeat;
    background-position:center;
    color:#555;
    font-family:Arial, Helvetica, sans-serif;
    font-size:16px;
    line-height:1.6em;
    margin:0;
}

.container{
    width:80%;
    margin:auto;
    overflow:hidden;
}

.justify{
    text-align:justify;
    text-justify: auto;
}

.parallax {
  /* The image used */
     background-image: url("doc.jpg");

  /* Set a specific height */
  min-height: 750px;

  /* Create the parallax scrolling effect */
```

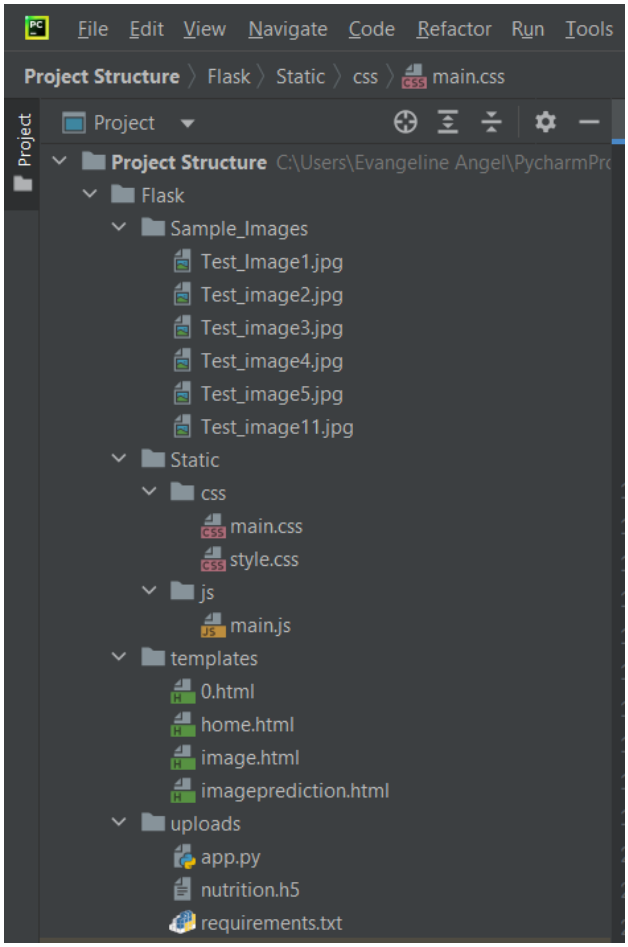


```
app = Flask(__name__, template_folder="templates")  # initializing a flask app
# Loading the model
model = load_model('nutrition.h5')
print("Loaded model from disk")


@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
```



7. TESTING

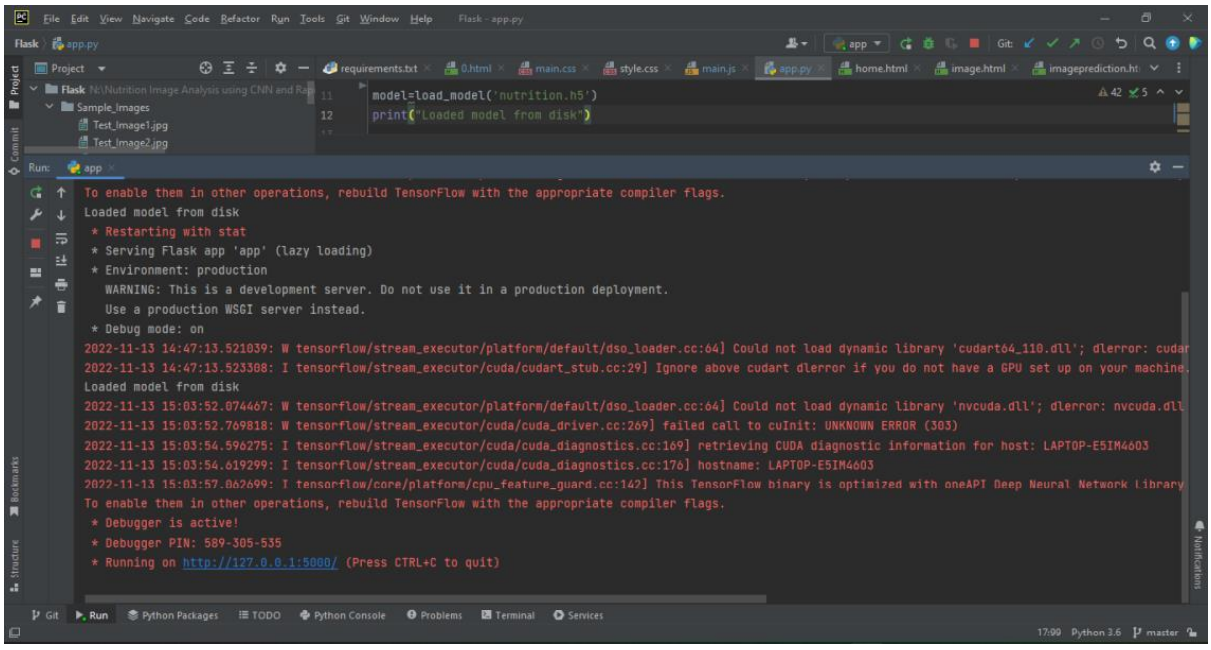
7.1 Test Cases



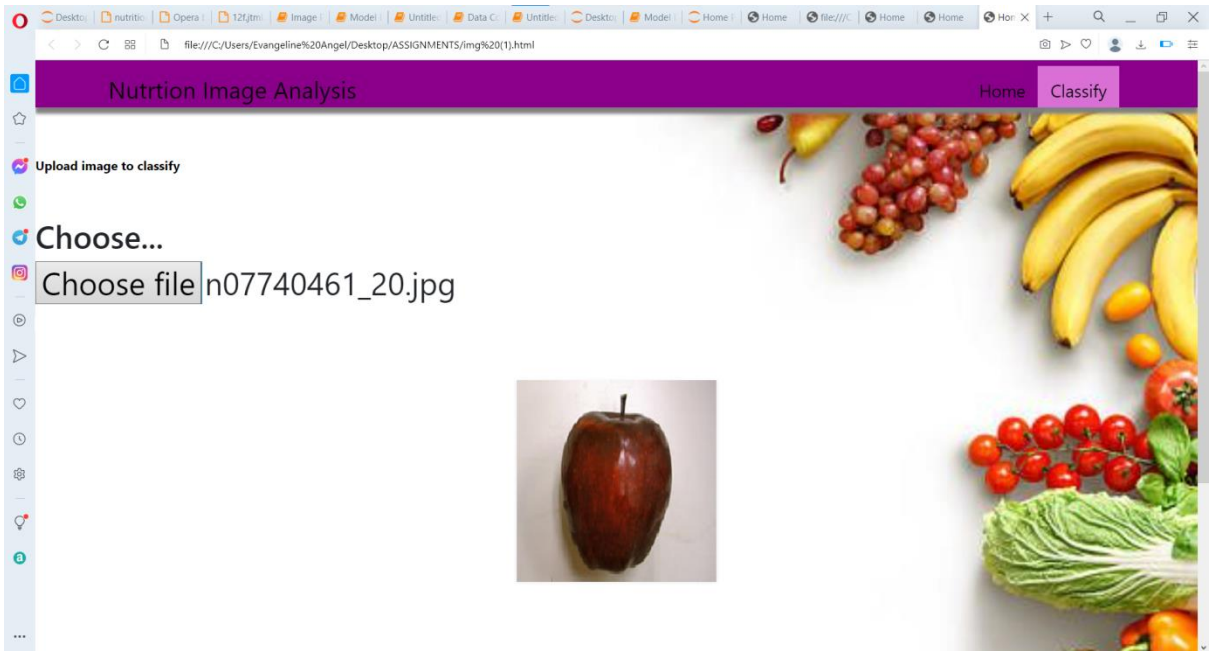
7.2 User Acceptance Testing

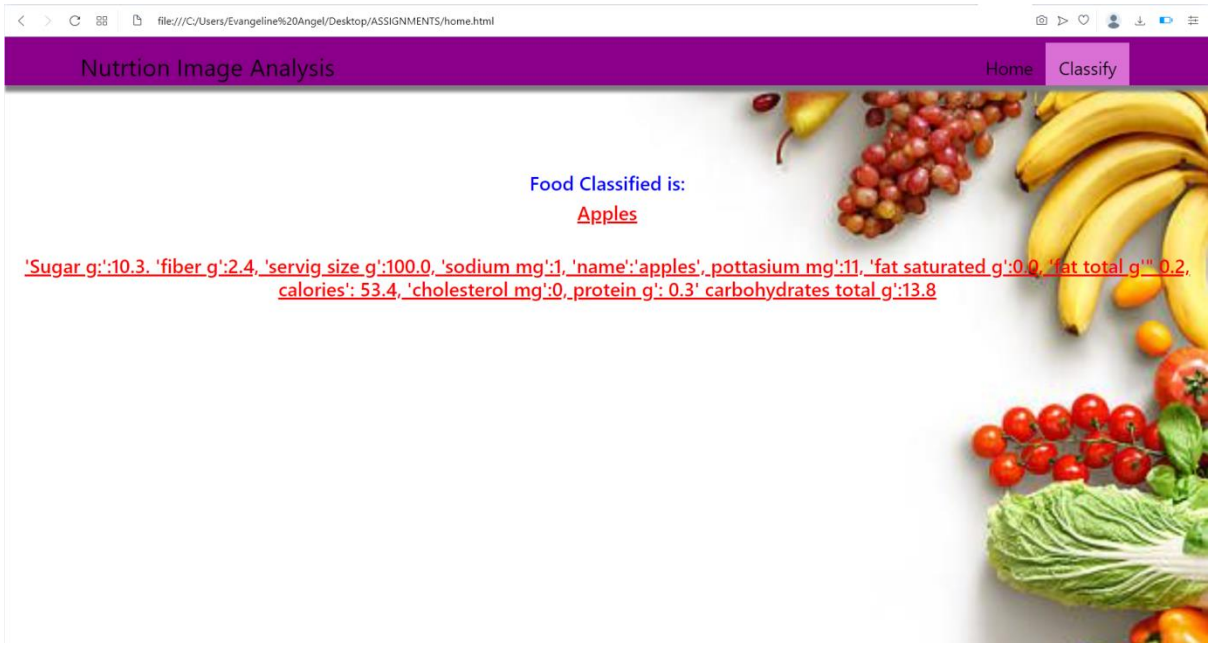
8. RESULTS

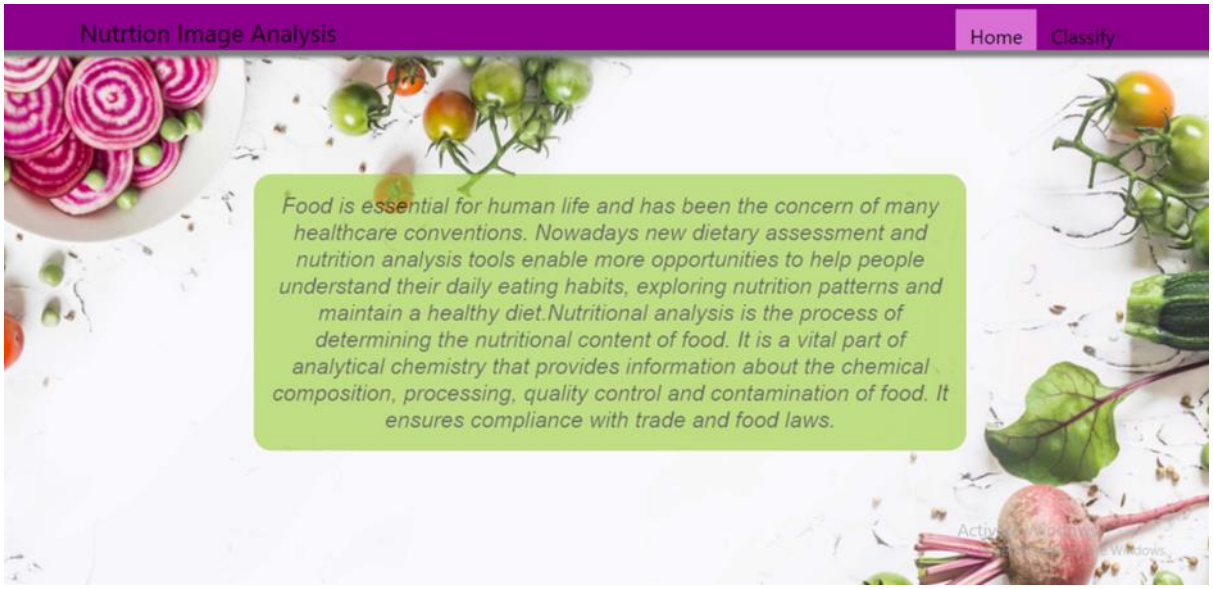
8.1 Performance Metrics



8.2 Output


file:///C:/Users/Evangeline%20Angel/Desktop/ASSIGNMENTS/img%20(1).html
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Choose file
n07740461_20.jpg


file:///C:/Users/Evangeline%20Angel/Desktop/ASSIGNMENTS/home.html
Nutrtion Image Analysis
Home
Classify
Food Classified is:
Apples
'Sugar g:':10.3. 'fiber g':2.4, 'servig size g':100.0, 'sodium mg':1, 'name':'apples', pottasium mg':11, 'fat saturated g':0.0, 'fat total g'" 0.2,
calories': 53.4, 'cholesterol mg':0, protein g': 0.3' carbohydrates total g':13.8



9. CONCLUSION

- By the end of this project we will know fundamental concepts and techniques of Convolutional Neural Network.
- Gain abroad understanding of image data know how to build a web application using the Flask framework.
- Know how to pre-process data and know how to clean the data using different data preprocessing techniques.

10. FUTURE SCOPE

- Simulated intelligence is upsetting the wellbeing business.
- It is significantly utilized in further developing promoting and deals choices, man-made intelligence is currently likewise being utilized to Reshape individual propensities.
- In later we would rather not go to exercise center and do any eating regimens. By utilizing this nourishment wellness analyzer
- we can keep up with our eating regimen plans with practically no assistance from others and we can lead a cheerful and
- Solid existence with great riches.
- Simulated intelligence can undoubtedly follow wellbeing ways of behaving and dull activity examples and utilize the information to direct
- You towards your wellness process and diet plans .