

AI – POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

PROJECT REPORT

TEAM ID: PNT2022TMID42696

1. INTRODUCTION

1.1 Project Overview

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 thpe 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.).

1.2 Purpose

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.

2. LITERATURE SURVEY

2.1 Existing problem

Neutrino delivers nutrition-based data services and analytics to its users and wants to turn into a leading source of the nutrition-related platform. The platform employs NLP and mathematical models from the optimization theory as well as predictive analysis to enable individualized data compilation. The application relies on Artificial Intelligence to produce custom data related to smart calorie counter powered by AI. Their artificial intelligence learns an individual's tastes, preferences, and body type. All of this is packaged in a comprehensive nutrition and activity tracker

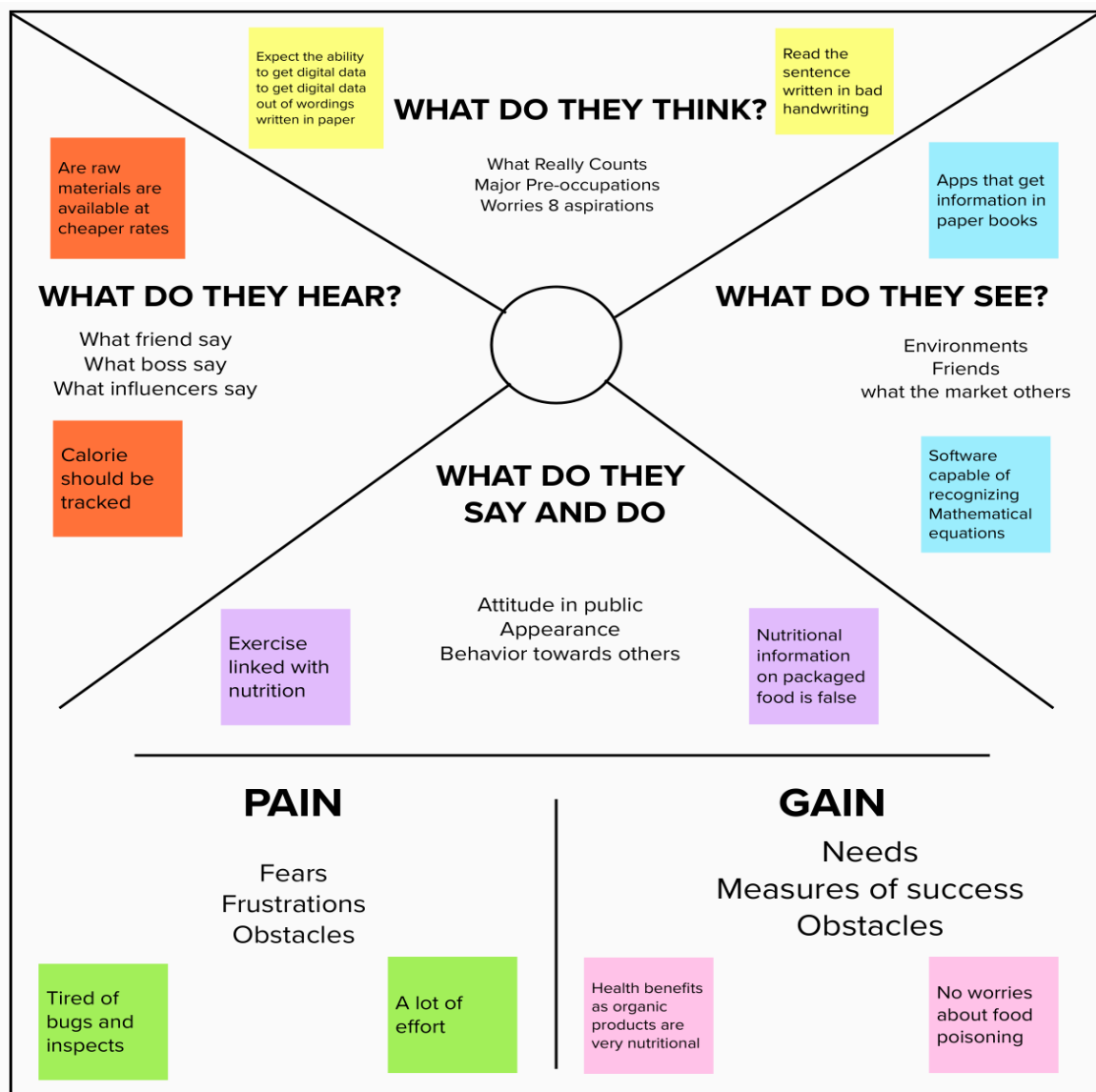
2.2 References

2.3 Problem Statement Definition

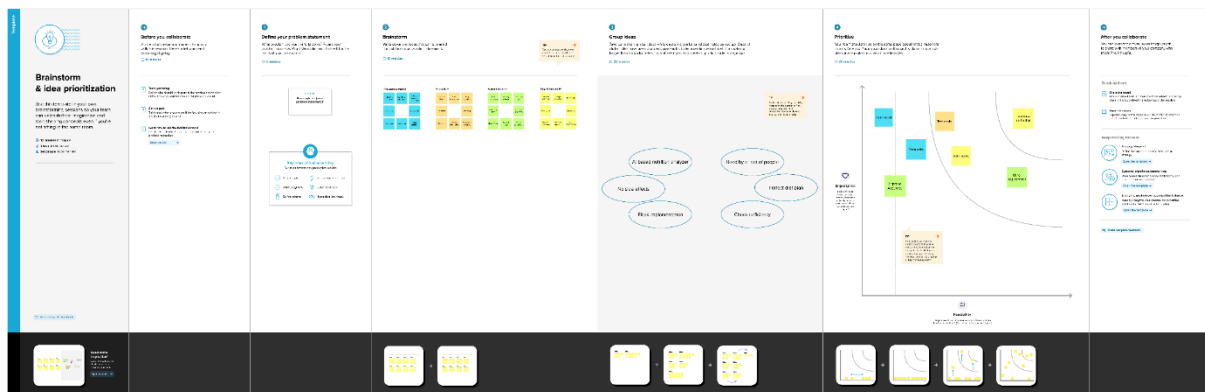
The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image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

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map



3.2 Brainstorming



3.3 Proposed Solution

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 thpe 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.).

3.4 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 behavioural 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 medium sand channels of behaviour.
- Sharpen your communication and marketing strategy with the right triggers and messaging.

- Increase touch-points with your company by finding the right problem behaviour fit and building trust by solving frequent annoyances, or urgent or costly problems.

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.

- Image classification, object detection, segmentation, faces 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, fibre, 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 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 analyses the image and detects the nutrition based on the fruits like (Sugar, Fibre, 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.

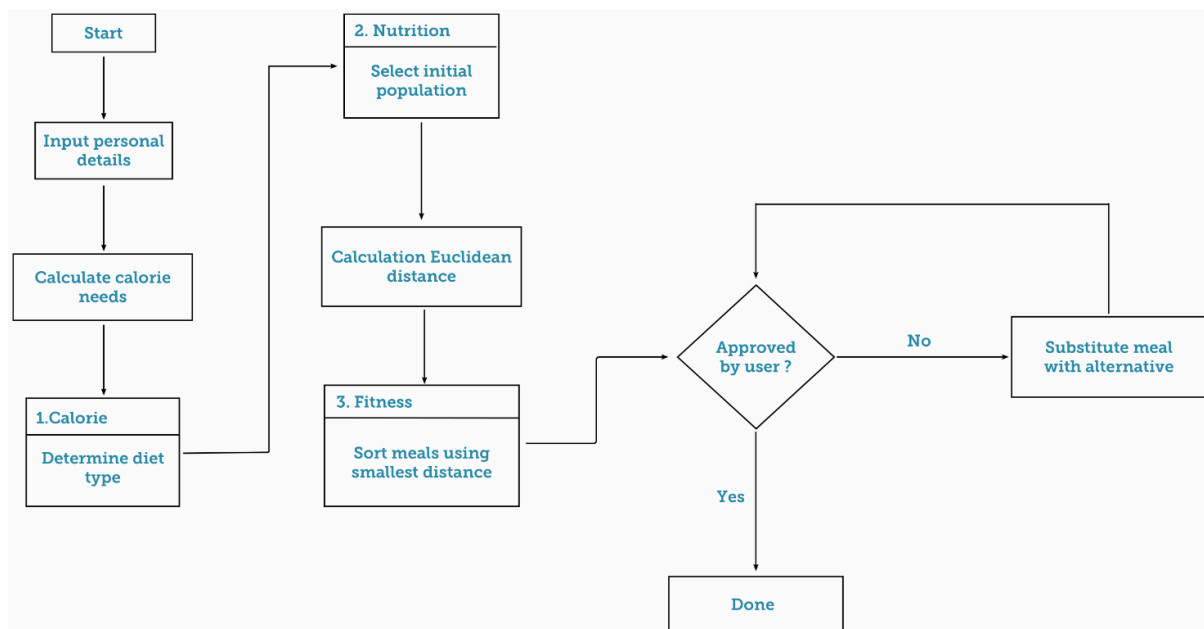
- This software collaborated with IBM's natural language capability to provide 24-hour assistance and dietary recommendations.

For Example:

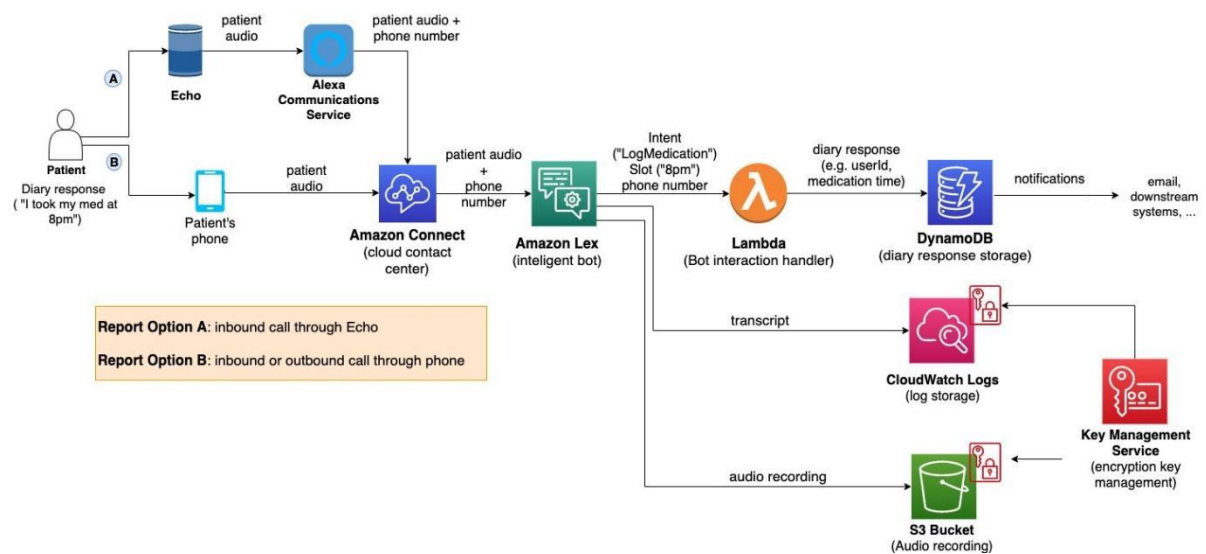
- The comparison of the proposed model with the conventional models shows that the results of this model are exceptionally good and promising to use in real-world applications.
- This sort of higher accuracy and precision will work to boost the machine's general efficiency in fruit recognition more appropriately.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



5.2 Solution & Technical Architecture



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Duration	Sprint Start Date	Sprint End Date (Planned)
Sprint-1	6 Days	24 Oct 2022	29 Oct 2022
Sprint-2	6 Days	31 Oct 2022	05 Nov 2022
Sprint-3	6 Days	07 Nov 2022	12 Nov 2022
Sprint-4	6 Days	14 Nov 2022	19 Nov 2022

7. CODING AND SOLUTIONING

7.1 Feature

```

File Edit Selection View Go Run Terminal Help
Image_Preprocessing.ipynb - Visual Studio Code
Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn More

Image_Preprocessing.ipynb X
E: > jupyter notebook Image_Preprocessing.ipynb --Image Pre-processing
+ Code + Markdown + Run All Clear Outputs of All Cells Outline ... Python 3.9.6 64-bit

import os
import seaborn as sns
sns.set()
os.getcwd()

...
'/content'

import zipfile as zf
data = zf.ZipFile('Dataset.zip')
data.extractall('Dataset')
data.close()

Apply Image DataGenerator Functionality To Trainset And Testset

#performing data augmentation to train the data
x_train=train_datagen.flow_from_directory('Dataset/Dataset/Dataset/TRAIN_SET/TRAIN_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode
#performing data augmentation to test the data
x_test=test_datagen.flow_from_directory('Dataset/Dataset/Dataset/TEST_SET/TEST_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse')

```

```

import os
import seaborn as sns
sns.set()
os.getcwd()

... '/content'

import zipfile as zf
data = zf.ZipFile('Dataset.zip')
data.extractall('Dataset')
data.close()

#performing data augmentation to train the data
x_train=train_datagen.flow_from_directory("Dataset/Dataset/Dataset/TRAIN_SET/TRAIN_SET",target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='binary')
#performing data augmentation to test the data
x_test=test_datagen.flow_from_directory("Dataset/Dataset/Dataset/TEST_SET/",target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse')

```

```

model = models.Sequential()

Adding CNN Layers

model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.Flatten())
model.add(layers.Dense(64, activation='relu'))
model.add(layers.Dense(10))

Adding Dense Layer

```

7.2 Feature

```

<!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">
</head>
<body>
  <div class="background-image">
    background-image: url("https://www.livingproofnyc.com/wp-content/themes/livingproof/assets/img/hero-background.jpg");
    background-size: cover;
  </div>
  <div class="bar">
    <div>
      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;
    </div>
  </div>

```

```
EXPLORER  ...  Get Started  home.html X  image.html
IBM-PROJECT-28157-1660...  Final Deliverables > Final Code > Nutrition Analysis > templates > home.html > ...
  > Assignments
  > Final Deliverables
  > Dataset
  > Final Code \ Nutritio...
    > _pycache_
    > Sample_Images
    > static
    > templates
      home.html
      image.html
      imageprediction...
      output.html
    app.py
    nutrition.h5
  > Project Report
  > Project Design & Plan...
  > Project Development ...

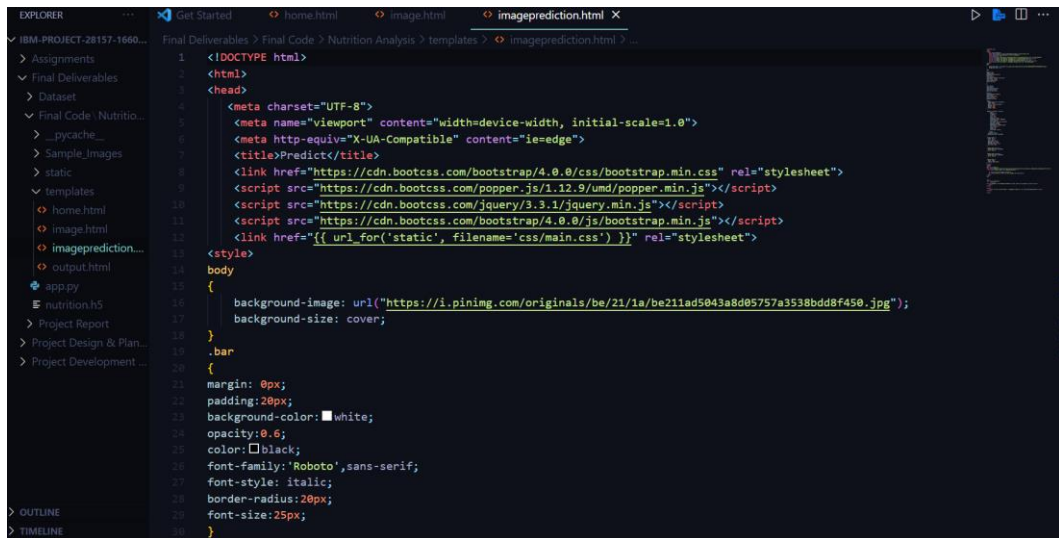
100  .topnav-right a {
101    float: left;
102    color: black;
103    text-align: center;
104    padding: 14px 16px;
105    text-decoration: none;
106    font-size: 22px;
107  }
108
109  .topnav-right a:hover {
110    background-color: #FF69B4;
111    color: black;
112  }
113
114  .topnav-right a.active {
115    background-color: #DA70D6;
116    color: black;
117  }
118
119  .topnav-right {
120    float: right;
121    padding-right: 100px;
122  }
123
124  </style>
125  </head>
126  <body>
127
128  <!-- Brian Tracy -->
129
```

```
EXPLORER  ...  Get Started  home.html X  image.html
IBM-PROJECT-28157-1660...  Final Deliverables > Final Code > Nutrition Analysis > templates > home.html > ...
  > Assignments
  > Final Deliverables
  > Dataset
  > Final Code \ Nutritio...
    > _pycache_
    > Sample_Images
    > static
    > templates
      home.html
      image.html
      imageprediction...
      output.html
    app.py
    nutrition.h5
  > Project Report
  > Project Design & Plan...
  > Project Development ...

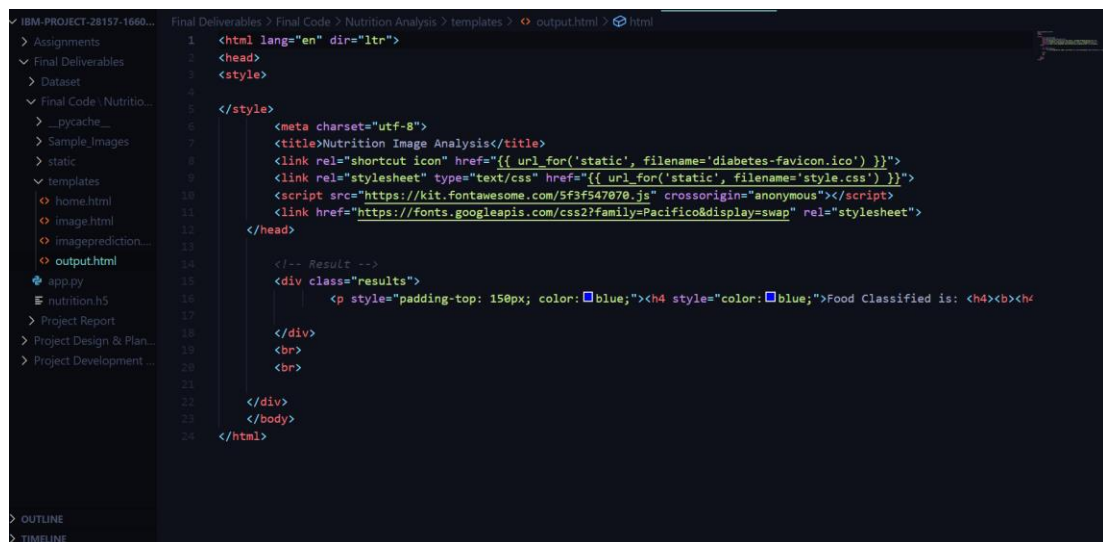
122  <div class="topnav-right" style="padding-top: 0.5%;>
123
124    <a class="active" href="{{ url_for('home') }}">Home</a>
125    <a href="{{ url_for('image1') }}">Classify</a>
126  </div>
127
128  </div>
129
130  <br>
131  <br>
132  <br>
133  <br>
134  <br>
135  <br>
136  <br>
137  <h1>
138
139  <center>
140
141
142  <h3>Food is essential for human life and has been the concern of
143  many healthcare conventions. Nowadays new dietary assessment
144  and nutrition analysis tools enable more opportunities to help
145  people understand their daily eating habits, exploring nutrition
146  patterns and maintain a healthy diet. Nutritional analysis is the
147  process of determining the nutritional content of food. It is a
148  vital part of analytical chemistry that provides information about
149  the chemical composition, processing, quality control and contamination
150  of food. It ensures compliance with trade and food laws.</h3>
151
```

```
EXPLORER  ...  Get Started  home.html X  image.html
IBM-PROJECT-28157-1660...  Final Deliverables > Final Code > Nutrition Analysis > templates > image.html > ...
  > Assignments
  > Final Deliverables
  > Dataset
  > Final Code \ Nutritio...
    > _pycache_
    > Sample_Images
    > static
    > templates
      home.html
      image.html
      imageprediction...
      output.html
    app.py
    nutrition.h5
  > Project Report
  > Project Design & Plan...
  > Project Development ...

1  {% extends "imageprediction.html" %} {% block content %}
2  <div style="float:left">
3  <br>
4  <br>
5  <h5><font color="black" size="3" font-family="sans-serif"><b>Upload image to classify</b></font></h5><br><br>
6
7  <div>
8
9    <form id="upload-file" method="post" enctype="multipart/form-data">
10      <label for="imageUpload" class="upload-label">
11        Choose...
12      </label>
13      <input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
14    </form>
15
16    <center> <div class="image-section" style="display:none;">
17      <div class="img-preview">
18        <div id="imagePreview">
19        </div></center>
20      </div>
21      <center><div>
22        <button type="button" class="btn btn-primary btn-lg" id="btn-predict">Classify</button>
23      </center></div>
24
25      <div class="loader" style="display:none;margin-left: 450px;"></div>
26
27      <h3 id="result">
28
29      <span><p style="padding-top: 25px;"><h4>Food Classified is : <h4><b>{{showcase}}</b></p> </span>
30    </h3>
```

```
1 <!DOCTYPE html>
2 <html>
3 <head>
4   <meta charset="UTF-8">
5   <meta name="viewport" content="width=device-width, initial-scale=1.0">
6   <meta http-equiv="X-UA-Compatible" content="ie=edge">
7   <title>Predict</title>
8   <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
9   <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
10  <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
11  <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
12  <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
13 </head>
14 <body>
15   {
16     background-image: url("https://i.pinimg.com/originals/be/21/1a/be21ad5043a8d05757a3538bdd8f450.jpg");
17     background-size: cover;
18   }
19   .bar
20   {
21     margin: 0px;
22     padding: 20px;
23     background-color: white;
24     opacity: 0.6;
25     color: black;
26     font-family: 'Roboto', sans-serif;
27     font-style: italic;
28     border-radius: 20px;
29     font-size: 25px;
30   }
```



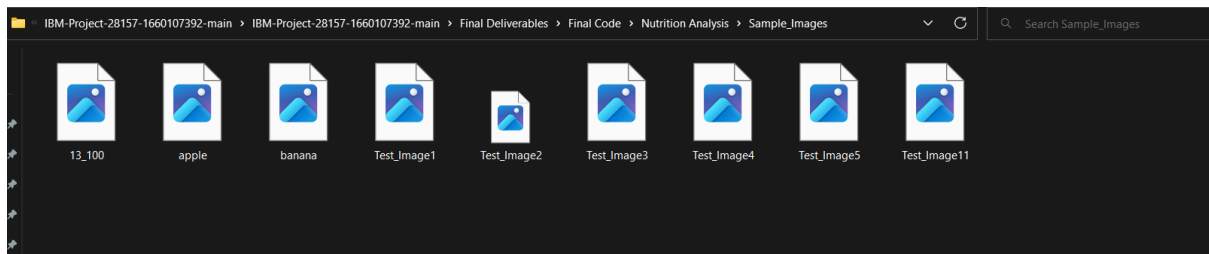
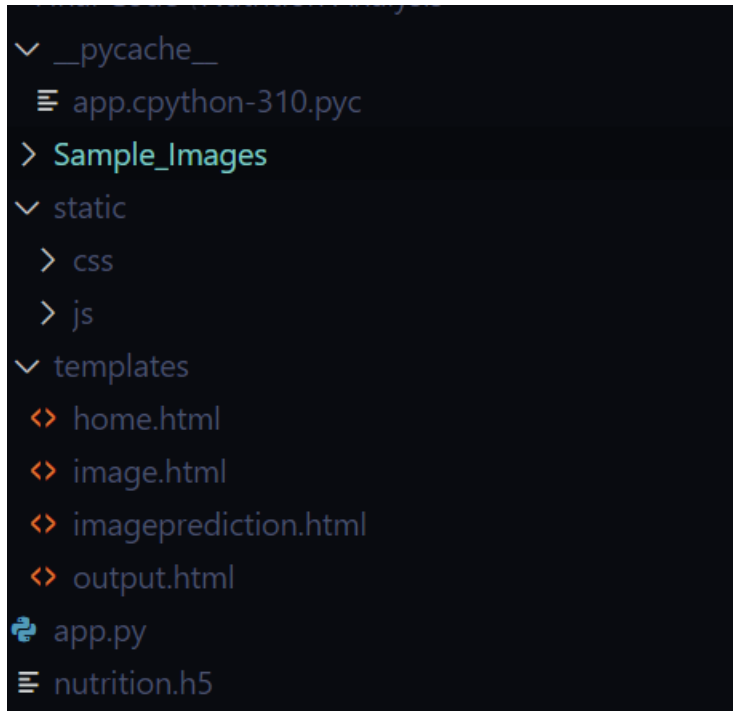
```
1 <html lang="en" dir="ltr">
2 <head>
3   <style>
4
5   </style>
6   <meta charset="utf-8">
7   <title>Nutrition Image Analysis</title>
8   <link rel="shortcut icon" href="{{ url_for('static', filename='diabetes-favicon.ico') }}">
9   <link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.css') }}">
10  <script src="https://kit.fontawesome.com/5f3f547070.js" crossorigin="anonymous"></script>
11  <link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap" rel="stylesheet">
12 </head>
13
14 <!-- Result -->
15 <div class="results">
16   <p style="padding-top: 150px; color: blue;"><h4 style="color: blue;">Food Classified is: <h4><b><h4>
17
18 </div>
19 <br>
20 <br>
21
22 </div>
23 </body>
24 </html>
```

7.3 Dataset

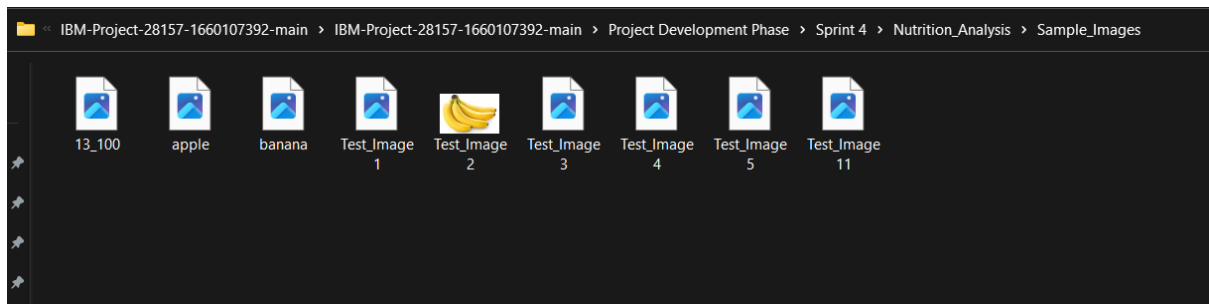
- ▼ DATASET
 - ▼ TEST_SET
 - > APPLES
 - > BANANA
 - > ORANGE
 - > PINEAPPLE
 - > WATERMELON
 - ▼ TRAIN_SET
 - > APPLES
 - > BANANA
 - > ORANGE
 - > PINEAPPLE
 - > WATERMELON
 - Dataset.zip

8. TESTING

8.1 Test cases

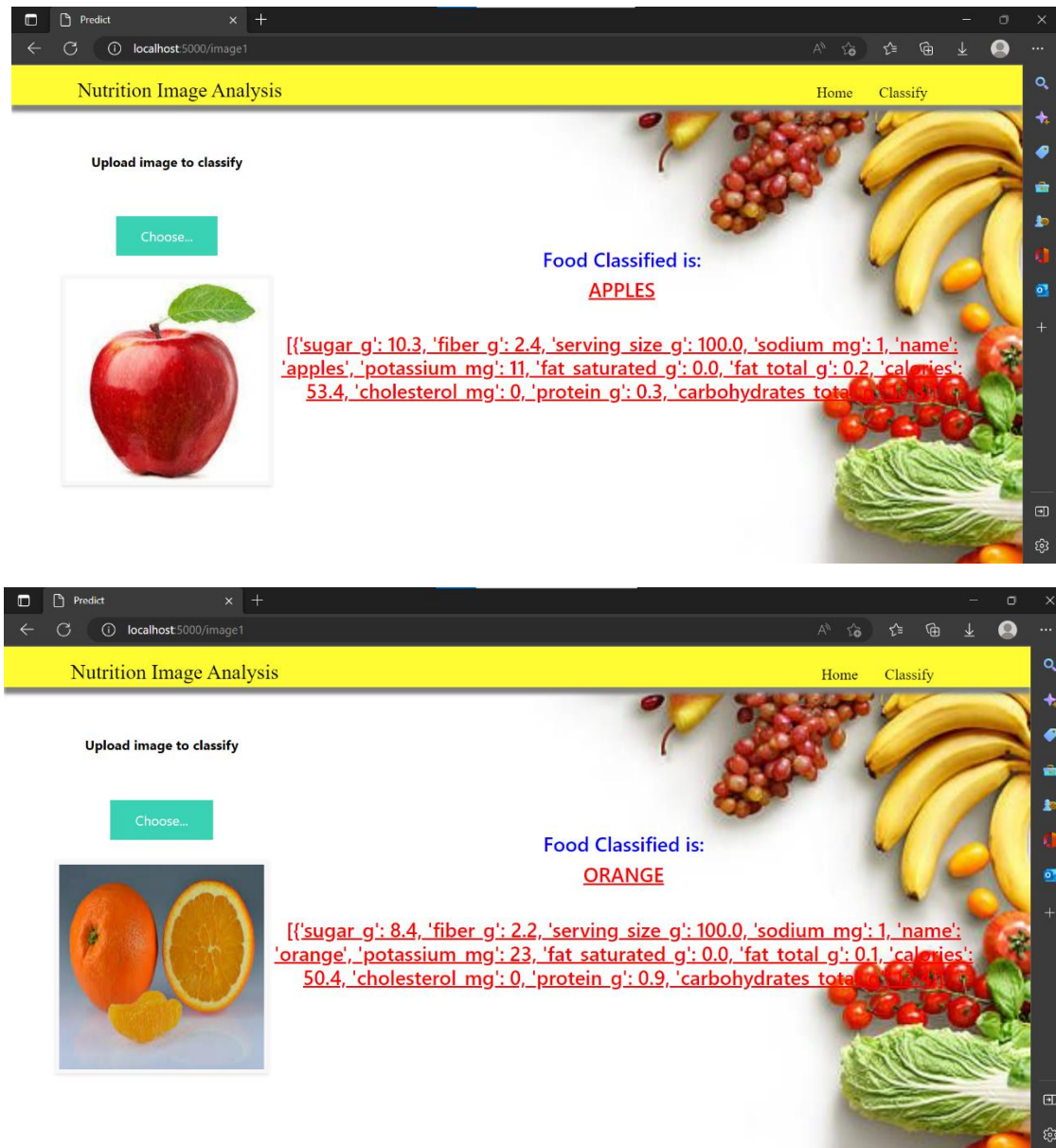


8.2 User Acceptance Testing



9. RESULTS

Sample Output Images



10.ADVANTAGES

- Food pattern is an important factor to prevent diseases and improve lifestyle. Studies show that changes in diet affect the evolution of chronic non-communicable diseases (CNCD) like cardiovascular diseases, obesity, and depression. It is highly recommended to change eating habits to prevent non-communicable diseases. Artificial Intelligence in nutrition is becoming popular for prevention and treatment.

- Analysis of personal health metrics has become possible because of advances in Artificial Intelligence.
- While artificial intelligence is increasing its part in our daily lives, AI-based diet planning could be created where it will be dependent on user's data and machine learning to create a comprehensive meal plan for every user based on their actual metabolic need.

DISADVANTAGES

- If the dataset has not been properly uploaded ,then the detection of images can be difficult.
- If the images are not clear, the nutrition analysis can be difficult.
- The user's health condition are not described.

11. CONCLUSION

By the end of this project we will

- Know fundamental concepts and techniques of Convolutional NeuralNetwork.
- Gain a broad 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 pre-processing techniques.

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 analyser 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 behaviours and repetitive exercise patterns and use the data to guide you towards your fitness journey and diet plans.

13.APPENDIX

Github Link :

<https://github.com/IBM-EPBL/IBM-Project-28157-1660107392>

Demonstration Video Link :

https://drive.google.com/file/d/1N99EhCsMYhvBEnp8_66fUE9HDNg5Ggfy/view?usp=share_link