TEAM ID : PNT2022TMID04889

PROJECT NAME : AI-Powered Nutrition Analyzer For Fitness Enthusiasts

Project Report Format

1. INTRODUCTION

1.1 Project Overview

Food is the basis of human life and is the subject of many health conventions. Today, new nutrition assessment and analysis tools are opening up more opportunities to help people understand their daily diet, explore nutritional patterns, and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional composition of foods. It is an important part of analytical chemistry that provides information on the chemical composition, processing, quality control and contamination of foods.

The main objective of the project is to create a model that is used for classifying fruits depending on various features like color, shape, texture, etc. Here, the user can capture images of different fruits and then the image will be sent to the trained Model. The model analyzes the image and determines the nutrition based on the fruit such as (sugar, fiber, protein, calories, etc.).

2. LITERATURE SURVEY

2.1 Existing problem

Neutrino provides nutrition-based data services and analytics to its users and aims to become the leading source of nutrition-related platform. The platform uses NLP and mathematical models from optimization theory as well as predictive analytics to enable individualized data compilation. The app relies on artificial intelligence to generate its own data related to the AI-powered smart calorie counter. Their artificial intelligence learns individual tastes, preferences and body type. It's all wrapped up in comprehensive nutrition and activity tracking.

2.2 References

https://www.nutrinohealth.com/

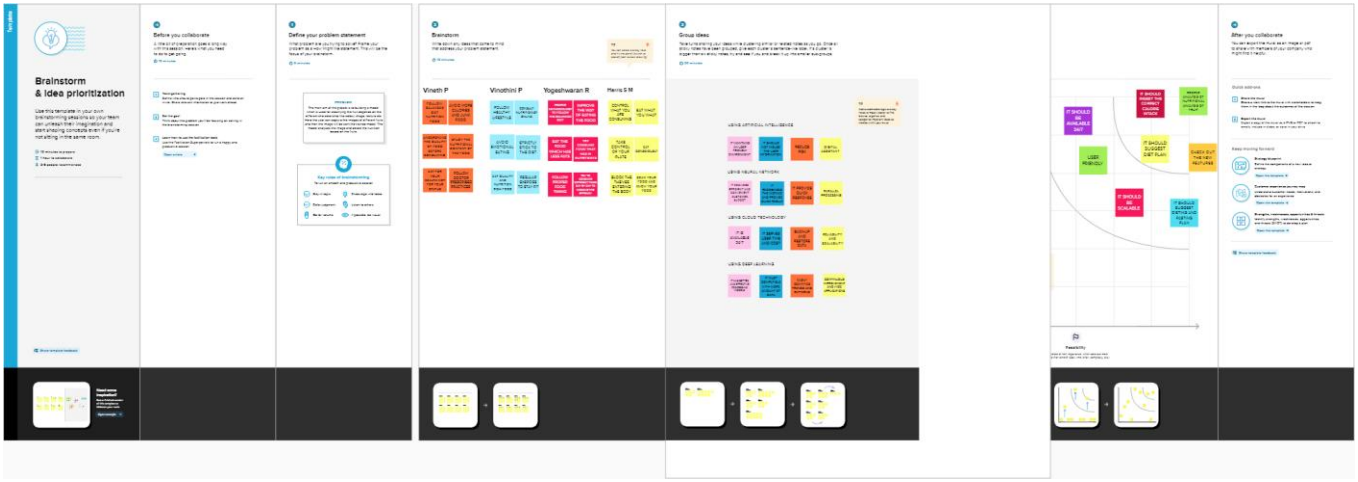
2.3 Problem Statement Definition

The main objective of the project is to create a model that is used for classifying fruits depending on various features like color, shape, texture, etc. Here, the user can capture images of different fruits and then the image will be sent to the trained Model. The model analyzes the image and determines the nutrition based on the fruit such as (sugar, fiber, protein, calories, etc.).

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation & Brainstorming



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.)
2.	Idea / Solution description	The idea of this application is that 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. This idea is achieved by using the Convolution Neural Network (CNN) .
3.	Novelty / Uniqueness	The application has the feature of analysing the entire nutritional content of fruits and vegetables by simply scanning them.
4.	Social Impact / Customer Satisfaction	It is used to schedule a diet plan by taking the image of a food item. We can get information about the nutrition present in the item like carbohydrates, fat, proteins, vitamins, minerals and sugar. This will help others to improve their health and fitness.
5.	Business Model (Revenue Model)	Social media is the best way to spread the world about our application and with the help of influencers we can attract normal people. Clustering and targeting the fitness people with the help of local gyms. Allowing third-party vendors (Nutritional Products) to sell their products through our app via advertisements is way to generate money. If the products sold through advertisements, then it is even better.

6.	Scalability of the Solution	Scalable AI pertains to how data models, infrastructures, and algorithms can increase or decrease their complexity, speed, or size at scale in order to best handle the requirements of the situation at hand. As improvements continue with data storage capacities as well as computing resources, AI models can be created with billions of parameters. Scaling up nutrition is a global push for action and investment to improve maternal, child nutrition and various health problems

3.4 Problem Solution fit

Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have implemented for them actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify patterns of behavior

Purpose:

• Solve complex problems in a way that fits your customers' situation.

• Achieve faster success and increase adoption of your solution by leveraging existing media and behavioral channels.

• Enhance your communication and marketing strategy with the right triggers and messages.

• Increase touch points with your company by finding the right fit for problem behaviors and building trust by addressing frequent annoyances or urgent or costly issues.

AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS PROBLEM SOLUTION FIT TEAM ID-PNT2022TMID04889

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

1. Common people
2. Fitness Enthusiasts
3. Sports persons

6. CUSTOMER CONSTRAINTS CC

1. By searching in online websites
2. By gathering the information from the peoples and come to understanding

5. AVAILABLE SOLUTIONS AS

When the user don't have the knowledge about particular thing this kind of situation

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

1. Giving the necessary information for particular thing which needs for a person
2. Solving a persons doubt on a particular item

9. PROBLEM ROOT CAUSE RC

1. Unaware of the object
2. Difficulty in identifying the object

7. BEHAVIOUR BE

When the user don't have the knowledge about a particular item this kind of situation occurs

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

To help people to get extra knowledge about the thing

4. EMOTIONS: BEFORE / AFTER EM

Before: unease about something with uncertain outcome
After: pleasure of blessedness and brightness in face

10. YOUR SOLUTION SL

This system is built by using Machine learning and CNN algorithm.By using this system,we can predict the nuritional value of the food item at any time any where

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

Online websites
Social media platforms

8.2 OFFLINE

Customer throw words

Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

• It will generate a diet plan and also track the user's health to classify the disease category and create a diet plan. It will also reduce the cost of consulting a nutritionist.

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

• Image classification, object detection, segmentation, face recognition.

• Crystal structure classification using a convolutional neural network

• Nutrition is vital for the growth of the human body. Nutritional analysis ensures that the food meets the appropriate vitamin and mineral requirements, and the nutrition examination of the food helps to understand the proportion of fat, dilution of carbohydrates, protein, fiber, sugar, etc. Another thing to keep in mind is not to exceed our daily requirements for calorie

• Computer Aided Nutrition for Food Image Recognition – To solve this problem, a completely new Convolutional Neural Network (CNN) based food identification system was created. Created as described in this study. We applied our proposed strategy on two real food datasets.

• Here the user can capture images of different fruits and then the image will be sent to the trained model. The model analyzes the image and detects nutrition based on the fruit as (sugar, fiber, protein, calories, etc.)

Functional Requirements:

Following are the functional requirements of the proposed solution.

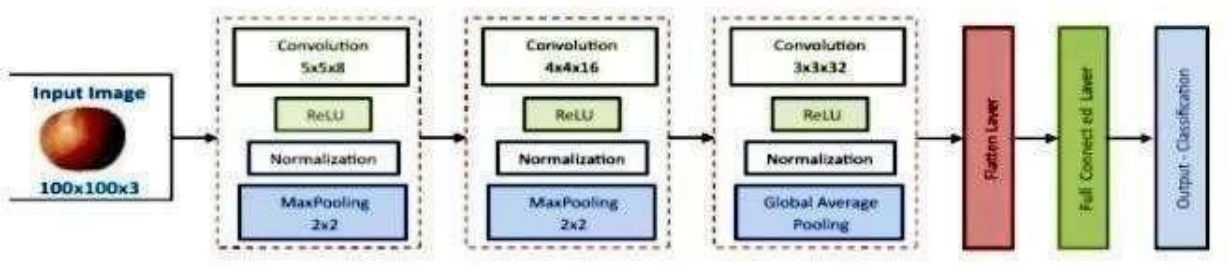
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	USER REGISTRATION	All the registered users will be verified with email For non-registered users, the user can visit the website free of cost and also can view the common practices for fitness.
FR-2	USER MANAGEMENT	The application gives the ability to ask questions about a problem.
FR-3	USER SATISFYING	The satisfaction of each user is a must, so UI/UX should be more than enough to engage the user in the platform and the performance of the application should be optimized in order to keep every user for a long time
FR-4	USER ENGAGEMENT	The user should be engaged in the application at least once a day to get notified about the latest and good practice on fitness.

• The best solution for working out at home This AI fitness software is designed with individual training regimens for each individual. It started out as "gym-only software" but has now refined its system to meet "home fitness" expectations.

• You take a picture, dial in information such as whether you're having breakfast or lunch, add a quick text label, and the app estimates the calorie content.

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

For Example:



• Comparison of the proposed model with conventional models shows that the results of this model are extremely good and promising for use in real applications.

• This kind of higher accuracy and precision will enhance the general effectiveness of the machine in recognizing fruits more adequately.

• The general model for the need for protein in the diet (as with any nutrient) defines the requirement in terms of the organism's needs,

• i.e. metabolic demands and the dietary amount that satisfies these needs, i.e. utilization efficiency, i.e.: dietary requirement = metabolic need/utilization efficiency.

4.2 Non Functional requirement

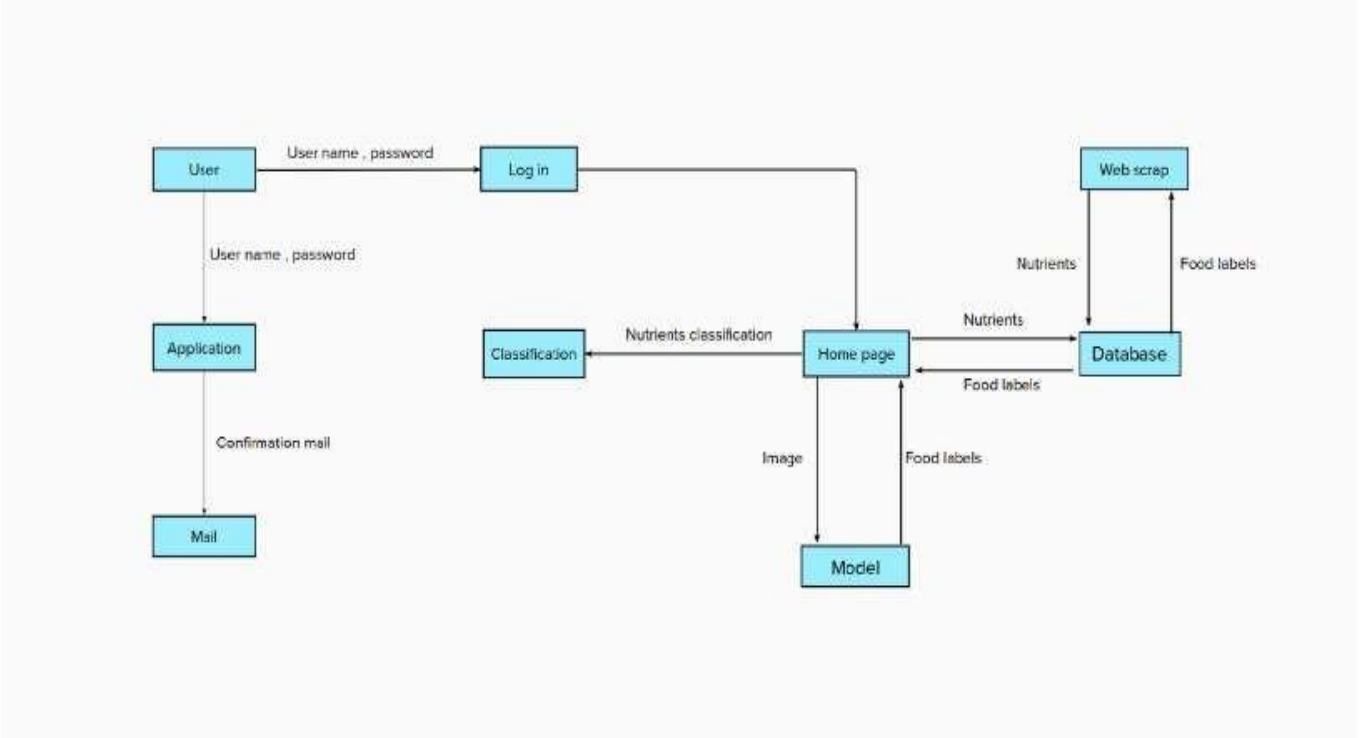
Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

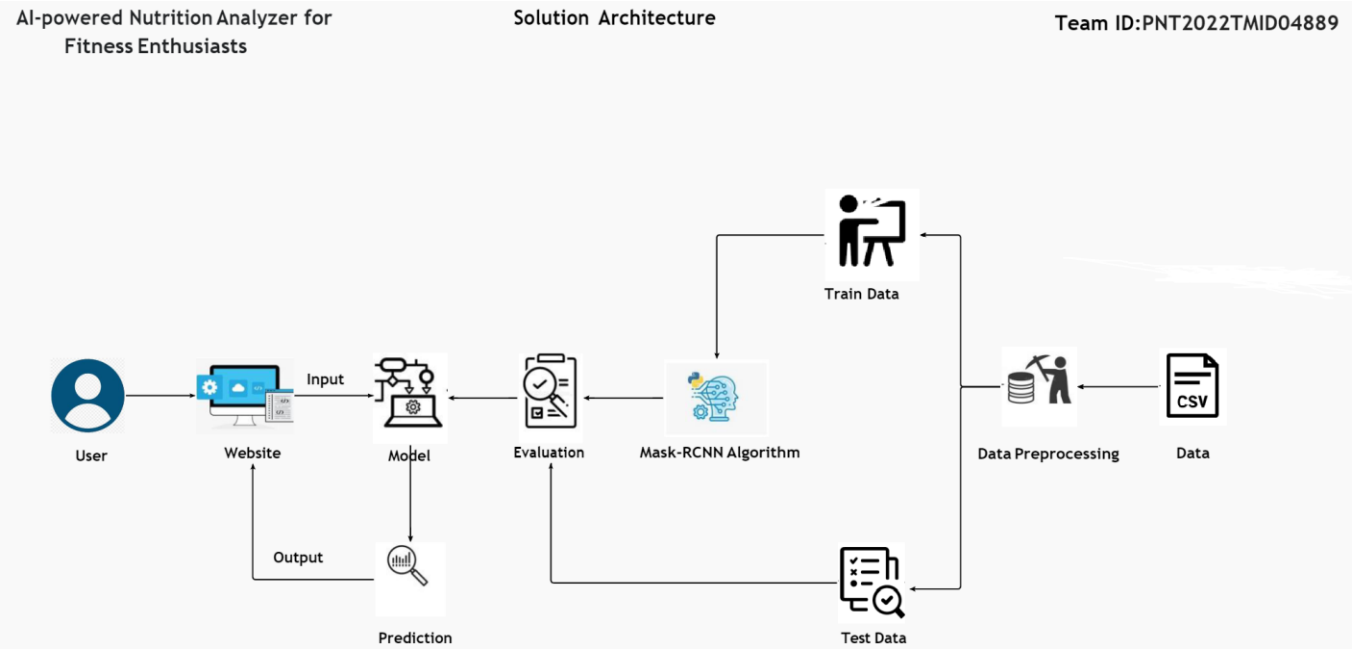
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It should be user friendly and comfortable The results should be self-explanatory so that it can be understood by common people
NFR-2	**Security**	With the help of the username and password it provides more security in which it can access more securable and the data are private.
NFR-3	**Reliability**	AI powered nutrition analyser for fitness should have proper data and information in which we can get a correct information about food items.
NFR-4	**Performance**	It should provide a greater number of users to consume the data at the same time.
NFR-5	**Availability**	Easy to access Data. Available 24/7. User Friendly.
NFR-6	**Scalability**	The application can be scalable. More number of food items and its related contents can be added.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



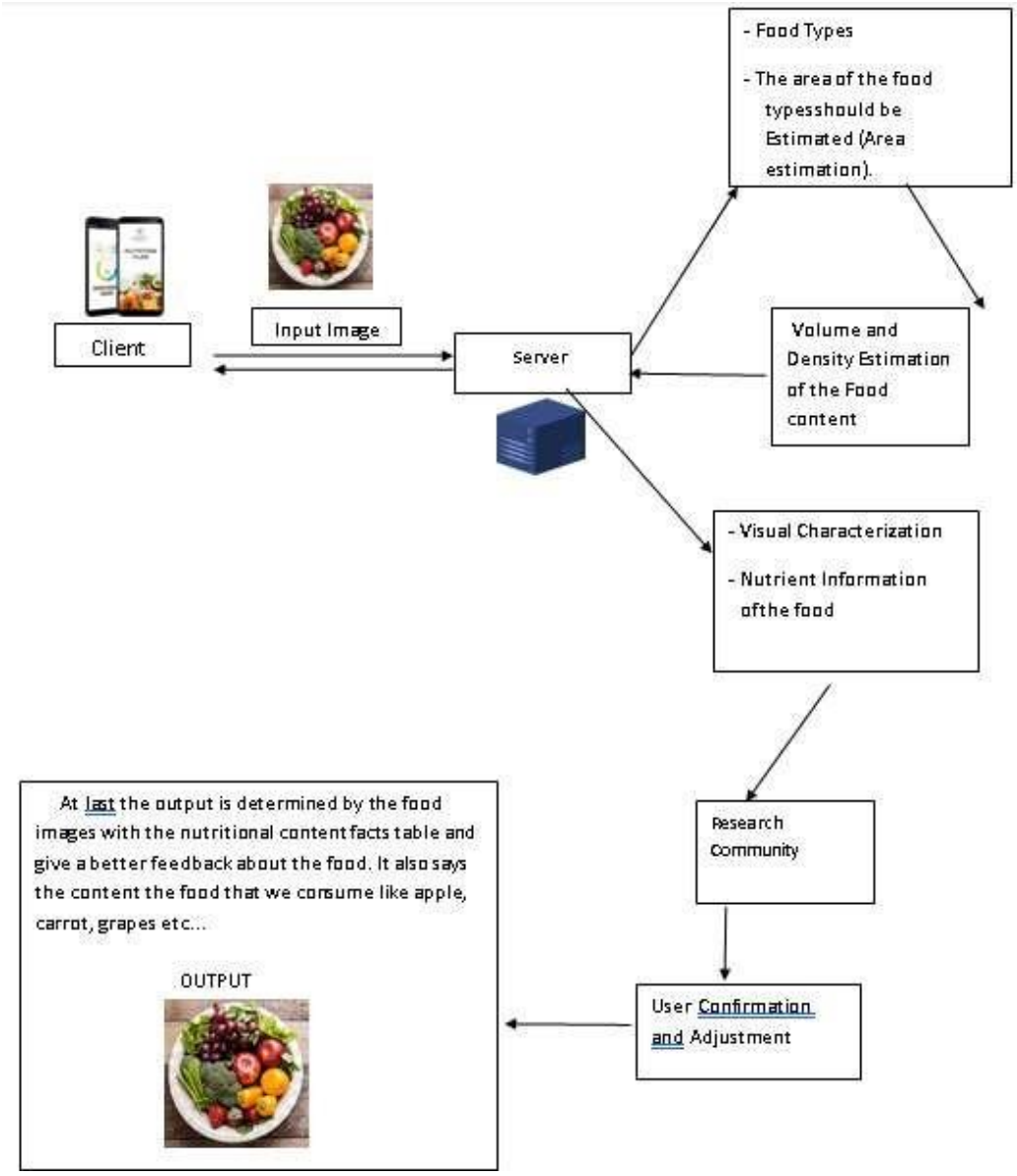
5.2 Solution & Technical Architecture



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 architectureconsists 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 a better feedback about the food. It also says the content the food that we consume like apple, carrot, grapes etc...
OUTPUT

5.3 User Stories

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-3	As a user I can login by entering the necessary credentials	I can log in and get access to the system	Medium	Sprint-2
	Input	USN-4	As a user I can capture the image of the food to get the details	I can capture the images of the food to get the details	High	Sprint-3
	Output	USN-5	As a user, I can view the information related to the food item	I can view the information related to the food item	High	Sprint-4
Administrator	Dashboard	USN-6	As a administrator, I take care all the activities related to the system	To avoid issues from the user	High	Sprint-4
Customer Care Executive	Feedbacks	USN-7	As a Customer Care Executive, I collect feedback from the customers.	Maintaining proper environment	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Dataset - Collecting images of food items apples, banana, orange, pineapple, watermelon for analysis	5	High	Vinothini P
Sprint-1	Image Preprocessing	USN-2	Image data augmentation - Increasing the amount of data by generating new data points from existing data	4	Medium	Vineth P
Sprint-1		USN-3	Image Data Generator Class - Used for getting the input of the original data	4	Medium	Harris S M
Sprint-1		USN-4	Applying image data generator functionality to train set and test set	4	Medium	Yogeswaran R
Sprint-2	Modeling Phase	USN-5	Defining the model architecture - Building the model using deep learning approach and adding CNN layers	4	High	Vinothini P
		USN -6	Training, saving, testing and predicting the model	5	High	Harris S M
Sprint-2		USN- 7	Database creation for the input classes	4	High	Yogeswaran R

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint- 2	Development phase	USN- 8	User database creation - It contains the details of users	3	Medium	Vineh P
Sprint-2		USN- 9	Home page creation - It shows options of the application	2	Low	Harris S M
Sprint-2		USN- 10	Login and registration page creation - User can register and login through gmail with Id and password	2	Low	Vinothini P
Sprint-3		USN- 11	Dashboard creation – Dashboard contains the information of user profile and features of the application	2	Low	Yogeswaran R
Sprint-3		USN- 12	User Input Page Creation - It is for the user to feed the input images	4	Medium	Vinothini P
Sprint-3		USN- 13	Analysis and prediction page creation - It shows the prediction of given user input	4	Medium	Harris S M
Sprint-3		USN- 14	Creation of about us , feedback and rating page – It shows application history and feedback page to users	4	Medium	Vineth P
Sprint-3	Application Phase	USN- 15	Building the python code and importing the flask module into the Project	6	High	Yogeswaran R
Sprint-4		USN- 16	Create the Flask application and loading the model	5	High	Vinothini P
Sprint-4		USN- 17	API integration - Connecting front end and back end and perform routing and run the application	5	High	Harris S M
Sprint-4	Deployment Phase	USN-18	Cloud deployment – Deployment of application by using IBM cloud	4	High	Vineth P

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Testing Phase	USN-19	Functional testing – Checking usability and accessibility	3	Medium	Yogeswaran R
		USN-20	Non-Functional testing – Checking scalability and performance of the application	3	Medium	Vineth P

Project Tracker, Velocity & Burn down Chart: (4 Marks)

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	08	5 Days	29 Oct 2022	02 Nov 2022	20	3 Nov 2022
Sprint-2	15	5 Days	03 Oct 2022	07 Nov 2022	20	8 Nov 2022
Sprint-3	15	5 Days	08 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	25	5 Days	13 Nov 2022	17 Nov 2022	20	16 Nov 2022

Velocity:

Average Velocity= 12/4 =3

6.2 Sprint Delivery Schedule

Milestone	Activity
Data Collection	Collecting images of food items apples,bananas, oranges, pineapples, watermelons for analysis.
Image Preprocessing	Increasing the amount of data by generating new data points from existing data. Applying image data generator functionality to train and test dataset.
Modeling Phase	Building the model using a deep learning approach and adding CNN layers. Training,saving,testing and predicting the model. Database creation for the input classes.
Development phase	Dashboard creation. Analysis and prediction page creation. Creating feedback and rating page.
Application Phase	Building the python code and importing the flask module into the project. Create the Flask application and load the model. Connecting front end and back end and performing routing and running the application.
Testing Phase	Checking usability and accessibility. Checking scalability and performance of the application.

6.3 Reports from JIRA

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

Team id :PNT2022TMID04889

AI Powered Nutrition Analyzer For Fitness Enthusiasts

Download dataset here dataset

Data Collection

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

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

```
[3] !unzip '/content/drive/MyDrive/IBM/Dataset.zip'
```

```
Archive:  /content/drive/MyDrive/IBM/Dataset.zip
  inflating: Dataset/TEST_SET/APPLES/r_28_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_112_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_19_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_124_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_23_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_16_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_29_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_27_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_117_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_25_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_26_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_120_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_31_100.jpg
  inflating: Dataset/TEST_SET/APPLES/r_118_100.jpg
```

Image Preprocessing

Import The ImageDataGenerator Library

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

Configure ImageDataGenerator Class

```
[5] train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
    test_datagen = ImageDataGenerator(rescale=1./255)
```

Apply Image DataGenerator Functionality To Trainset And Testset

```
[6] x_train = train_datagen.flow_from_directory(
        '/content/drive/MyDrive/IBM/Dataset/TRAIN_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse')
```

```
Found 2626 images belonging to 5 classes.
```

```
[7] x_test = train_datagen.flow_from_directory(
        '/content/drive/MyDrive/IBM/Dataset/TEST_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse')
```

```
Found 1055 images belonging to 5 classes.
```

```
[8] print(x_train.class_indices)
```

```
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
```

```
[9] print(x_test.class_indices)
```

```
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
```

```
[10] from collections import Counter as c
     c(x_train .labels)
```

```
Counter({0: 606, 1: 445, 2: 479, 3: 621, 4: 475})
```

Model Building

Importing The Model Building Libraries

```
[11] import numpy as np
     import tensorflow as tf
     from tensorflow.keras.models import Sequential
     from tensorflow.keras import layers
     from tensorflow.keras.layers import Dense,Flatten
     from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout
```

Initializing The Model

```
[12] model = Sequential()
```

Adding CNN Layers

```
[13] # Initializing the CNN
     classifier = Sequential()

     # First convolution layer and pooling
     classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
     classifier.add(MaxPooling2D(pool_size=(2, 2)))

     # Second convolution layer and pooling
     classifier.add(Conv2D(32, (3, 3), activation='relu'))

     # input_shape is going to be the pooled feature maps from the previous convolution layer
     classifier.add(MaxPooling2D(pool_size=(2, 2)))

     # Flattening the layers
     classifier.add(Flatten())
```

Adding Dense Layers

[14]
```
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=5, activation='softmax'))
```

[15]
```
#summary of our model
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
```

Configure The Learning Process

```
[16] # Compiling the CNN
     # categorical_crossentropy for more than 2
     classifier.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
```

Train The Model

```
[17] #Fitting 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. Please use `Model.fit`, which

Epoch 1/20
526/526 [==============================] - 1167s 2s/step - loss: 0.1533 - accuracy: 0.9497 - val_loss: 0.0437 - val_accuracy: 0.9754
Epoch 2/20
526/526 [==============================] - 24s 46ms/step - loss: 6.9583e-04 - accuracy: 1.0000 - val_loss: 0.0343 - val_accuracy: 0.9820
Epoch 3/20
526/526 [==============================] - 24s 46ms/step - loss: 2.6882e-04 - accuracy: 1.0000 - val_loss: 0.0332 - val_accuracy: 0.9801
Epoch 4/20
526/526 [==============================] - 24s 46ms/step - loss: 1.6657e-04 - accuracy: 1.0000 - val_loss: 0.0293 - val_accuracy: 0.9877
Epoch 5/20
526/526 [==============================] - 26s 49ms/step - loss: 1.4821e-04 - accuracy: 1.0000 - val_loss: 0.0306 - val_accuracy: 0.9839
Epoch 6/20
526/526 [==============================] - 24s 46ms/step - loss: 1.3521e-05 - accuracy: 1.0000 - val_loss: 0.0277 - val_accuracy: 0.9867
Epoch 7/20
526/526 [==============================] - 26s 49ms/step - loss: 1.0695e-05 - accuracy: 1.0000 - val_loss: 0.0272 - val_accuracy: 0.9905
Epoch 8/20
526/526 [==============================] - 24s 46ms/step - loss: 8.2007e-06 - accuracy: 1.0000 - val_loss: 0.0265 - val_accuracy: 0.9896
```

```
[17] Epoch 9/20
526/526 [==============================] - 23s 44ms/step - loss: 6.8941e-06 - accuracy: 1.0000 - val_loss: 0.0227 - val_accuracy: 0.9934
Epoch 10/20
526/526 [==============================] - 23s 44ms/step - loss: 1.7932e-05 - accuracy: 1.0000 - val_loss: 0.0248 - val_accuracy: 0.9896
Epoch 11/20
526/526 [==============================] - 23s 43ms/step - loss: 2.2071e-05 - accuracy: 1.0000 - val_loss: 0.0388 - val_accuracy: 0.9839
Epoch 12/20
526/526 [==============================] - 23s 44ms/step - loss: 3.3409e-06 - accuracy: 1.0000 - val_loss: 0.0240 - val_accuracy: 0.9877
Epoch 13/20
526/526 [==============================] - 23s 43ms/step - loss: 2.9074e-06 - accuracy: 1.0000 - val_loss: 0.0294 - val_accuracy: 0.9896
Epoch 14/20
526/526 [==============================] - 23s 44ms/step - loss: 1.3048e-06 - accuracy: 1.0000 - val_loss: 0.0347 - val_accuracy: 0.9829
Epoch 15/20
526/526 [==============================] - 23s 44ms/step - loss: 9.9826e-07 - accuracy: 1.0000 - val_loss: 0.0476 - val_accuracy: 0.9848
Epoch 16/20
526/526 [==============================] - 23s 43ms/step - loss: 0.0969 - accuracy: 0.9711 - val_loss: 0.0319 - val_accuracy: 0.9886
Epoch 17/20
526/526 [==============================] - 23s 43ms/step - loss: 8.1193e-04 - accuracy: 1.0000 - val_loss: 0.0779 - val_accuracy: 0.9839
Epoch 18/20
526/526 [==============================] - 23s 44ms/step - loss: 0.0010 - accuracy: 0.9996 - val_loss: 0.0096 - val_accuracy: 0.9953
Epoch 19/20
526/526 [==============================] - 23s 44ms/step - loss: 0.1353 - accuracy: 0.9665 - val_loss: 0.3276 - val_accuracy: 0.9033
Epoch 20/20
526/526 [==============================] - 26s 49ms/step - loss: 0.0281 - accuracy: 0.9912 - val_loss: 0.2720 - val_accuracy: 0.9469
<keras.callbacks.History at 0x7f94b8a19c10>
```

Save The Model

```
[18] classifier.save('/content/drive/MyDrive/IBM/Flask/uploads/nutrition.h5')
```

Test The Model

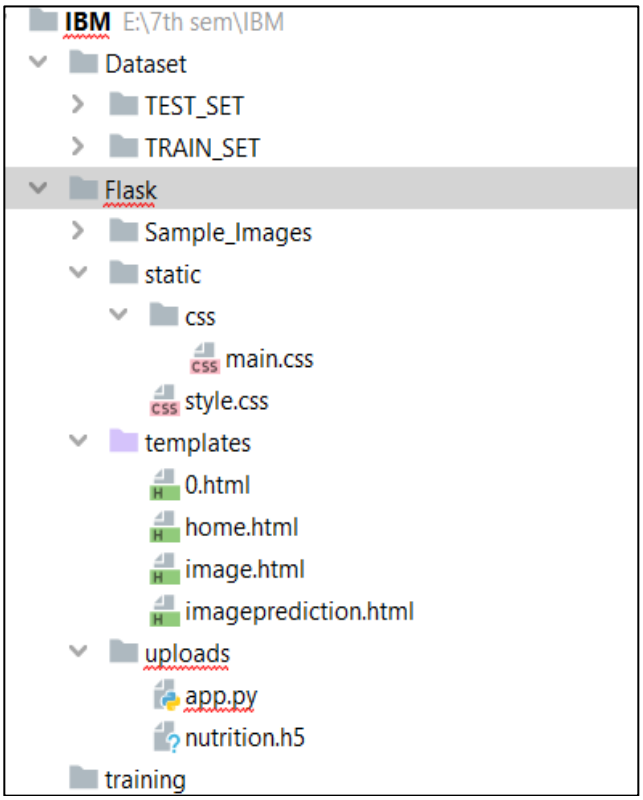
```
[19] #Predict the results
     from tensorflow.keras.models import load_model
     from keras.preprocessing import image
     model = load_model("/content/drive/MyDrive/IBM/Flask/uploads/nutrition.h5")
```

```
[20] from tensorflow.keras.utils import img_to_array
     from tensorflow.keras.utils import load_img
     #loading of the image
     img = load_img(r'/content/drive/MyDrive/IBM/Flask/Sample_Images/watermelon1.png',grayscale=False,target_size= (64,64))
     #image to array
     x = img_to_array(img)
     #changing the shape
     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 87ms/step
array([4])
```

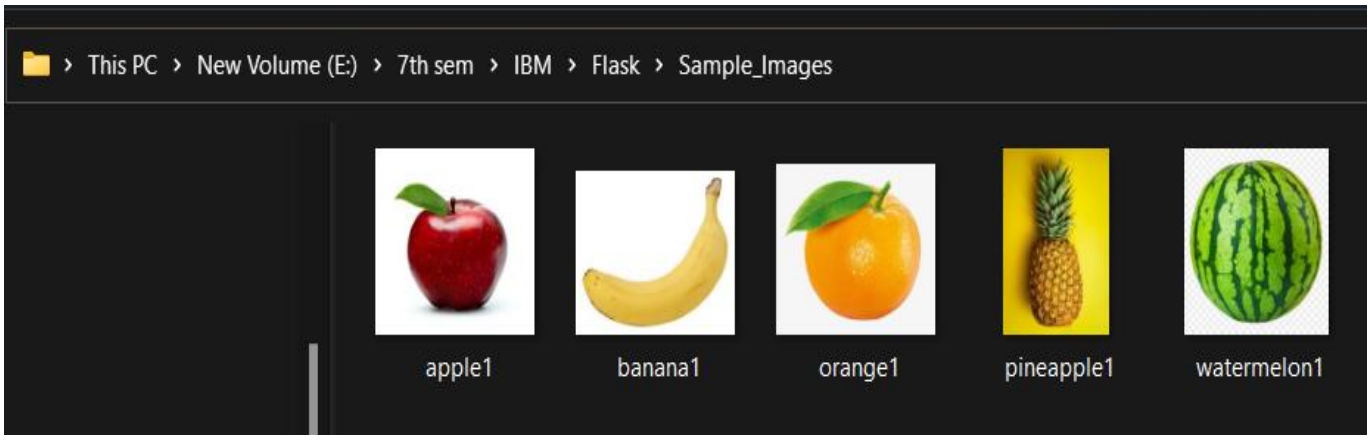
```
[21] index=['APPLES', 'BANANA', 'ORANGE','PINEAPPLE','WATERMELON']
     result=str(index[classes_x[0]])
     result
```

```
'WATERMELON'
```

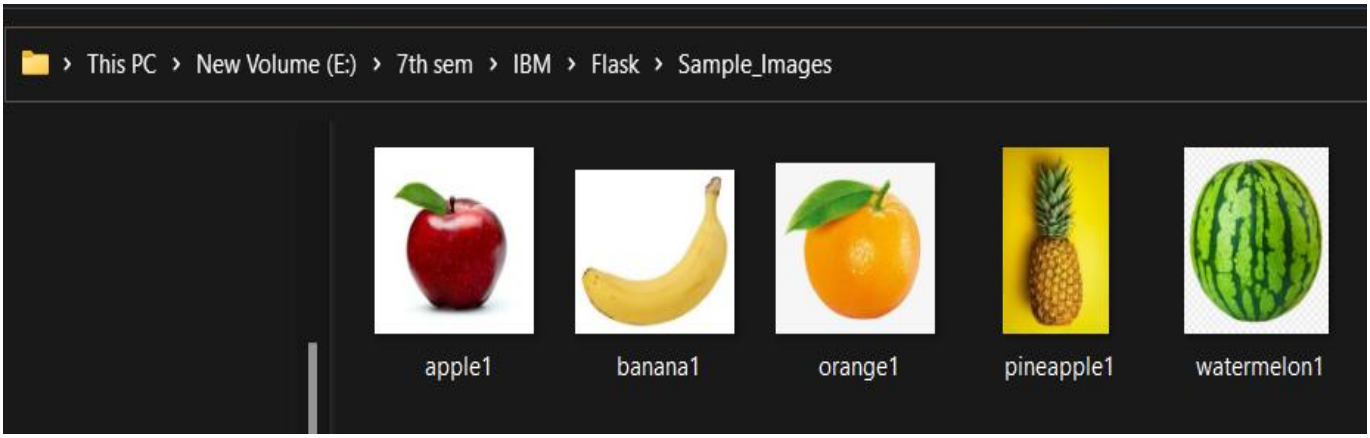


8. TESTING

8.1 Test Cases



1.1 User Acceptance Testing

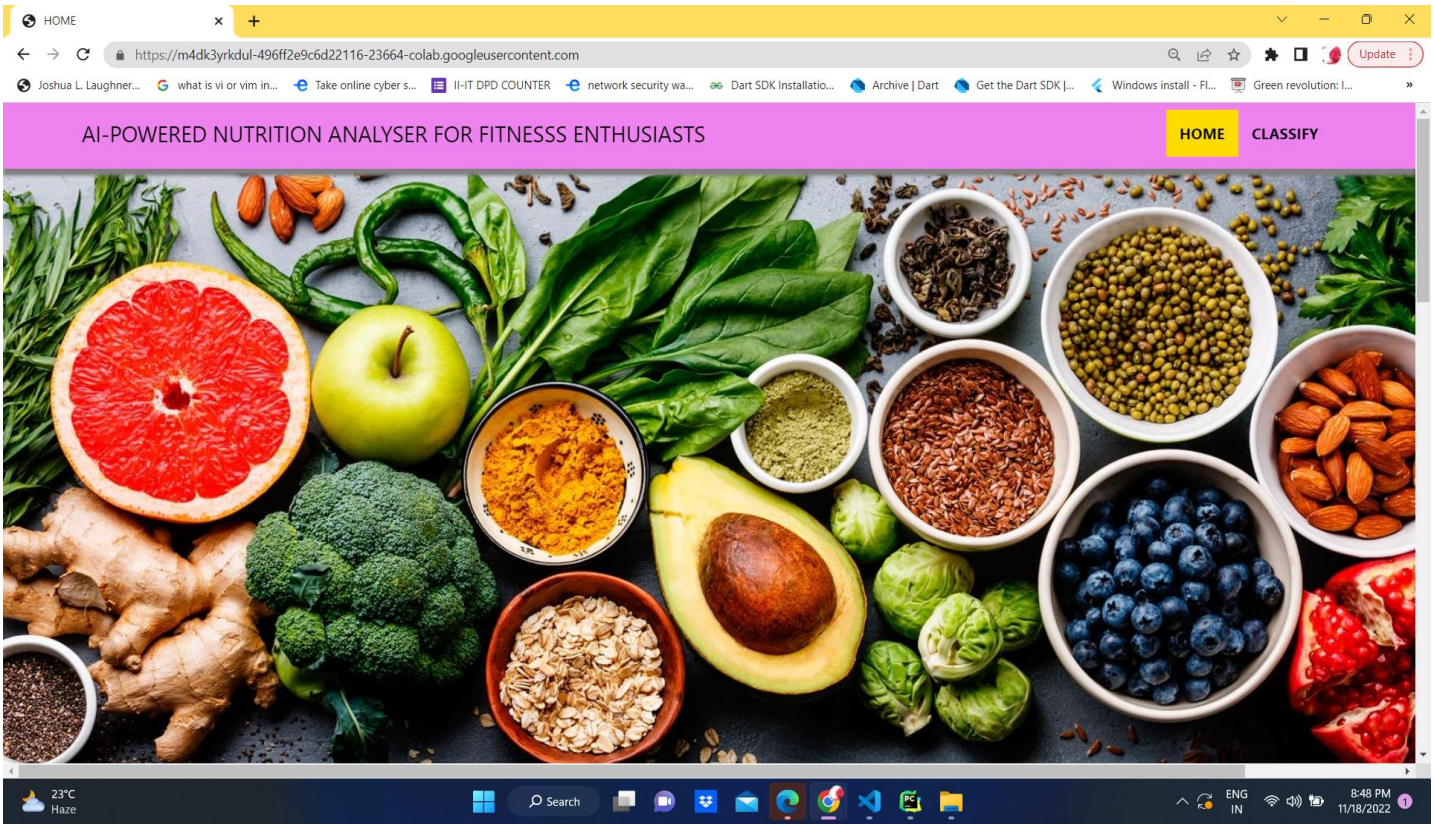


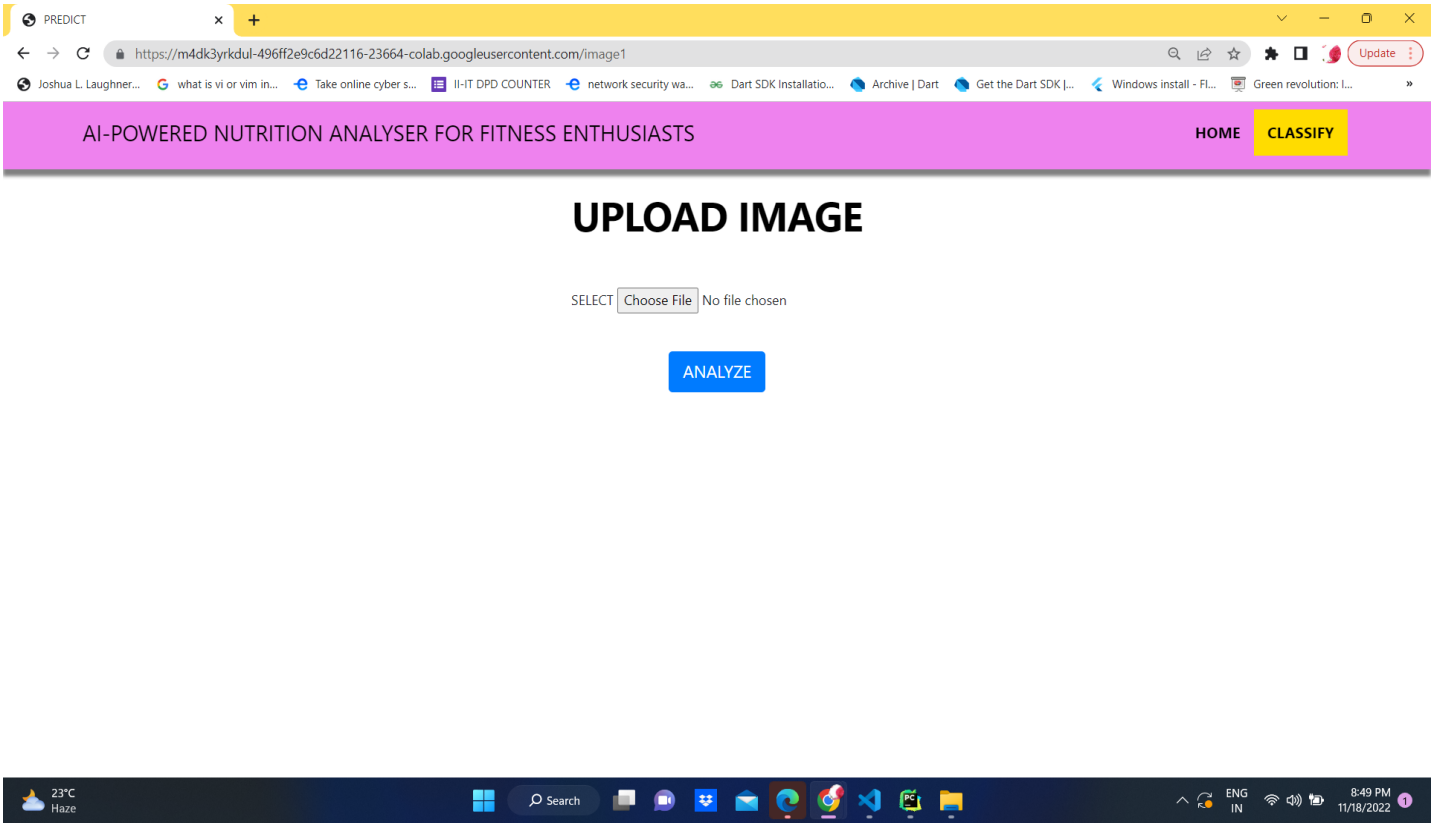
2. RESULTS

2.1 Performance Metrics

```
Loaded model from disk
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: gevent in /usr/local/lib/python3.7/dist-packages (22.10.2)
Requirement already satisfied: zope.interface in /usr/local/lib/python3.7/dist-packages (from gevent) (5.5.2)
Requirement already satisfied: greenlet>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from gevent) (2.0.1)
Requirement already satisfied: zope.event in /usr/local/lib/python3.7/dist-packages (from gevent) (4.5.0)
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-packages (from gevent) (57.4.0)
https://localhost:16126/
127.0.0.1 - - [2022-11-19 09:20:51] "GET / HTTP/1.1" 200 24072 0.010535
127.0.0.1 - - [2022-11-19 09:20:52] "GET /static/css/main.css HTTP/1.1" 404 356 0.000818
127.0.0.1 - - [2022-11-19 09:20:57] "GET /image1 HTTP/1.1" 200 4933 0.013754
127.0.0.1 - - [2022-11-19 09:20:58] "GET /static/css/main.css HTTP/1.1" 404 356 0.001020
127.0.0.1 - - [2022-11-19 09:20:58] "GET /static/js/main.js HTTP/1.1" 404 356 0.000804
127.0.0.1 - - [2022-11-19 09:20:59] "GET /favicon.ico HTTP/1.1" 404 356 0.001001
1/1 [==============================] - 0s 71ms/step
prediction [4]
WATERMELON
{"items": [{"sugar_g": 10.2, "fiber_g": 2.0, "serving_size_g": 100.0, "sodium_mg": 1, "name": "fruits", "potassium_mg": 21, "fat_saturated_g": 0.0, "fat_total_g": 0.3, "calories": 60.2, "cholesterol_mg": 0, "protein_g": 0.8, "carbohydrates_total_g": 15.4}]}
[{'sugar_g': 10.2, 'fiber_g': 2.0, 'serving_size_g': 100.0, 'sodium_mg': 1, 'name': 'fruits', 'potassium_mg': 21, 'fat_saturated_g': 0.0, 'fat_total_g': 0.3, 'calories': 60.2, 'cholesterol_mg': 0, 'protein_g': 0.8, 'carbohydrates_total_g': 15.4}]
127.0.0.1 - - [2022-11-19 09:22:02] "POST /predict HTTP/1.1" 200 2647 1.071676
127.0.0.1 - - [2022-11-19 09:22:03] "GET /static/style.css HTTP/1.1" 404 356 0.001023
127.0.0.1 - - [2022-11-19 09:22:04] "GET /static/diabetes-favicon.ico HTTP/1.1" 404 356 0.000785
```

2.2 Output


HOME
https://m4dk3yrkdul-496ff2e9c6d22116-23664-colab.googleusercontent.com
Update
AI-POWERED NUTRITION ANALYSER FOR FITNESSS ENTHUSIASTS
HOME
CLASSIFY
23°C
Haze
Search
ENG
IN
8:48 PM
11/18/2022


PREDICT
https://m4dk3yrkdul-496ff2e9c6d22116-23664-colab.googleusercontent.com/image1
Update
AI-POWERED NUTRITION ANALYSER FOR FITNESS ENTHUSIASTS
HOME
CLASSIFY
UPLOAD IMAGE
SELECT
Choose File
No file chosen
ANALYZE
23°C
Haze
Search
ENG
IN
8:49 PM
11/18/2022

PREDICT

https://m4dk3yrkdul-496ff2e9c6d22116-23664-colab.googleusercontent.com/image1

Update

Joshua L. Laughner... | what is vi or vim in... | Take online cyber s... | II-IT DPD COUNTER | network security wa... | Dart SDK Installatio... | Archive | Dart | Get the Dart SDK |... | Windows install - Fl... | Green revolution: I...

AI-POWERED NUTRITION ANALYSER FOR FITNESS ENTHUSIASTS

HOME CLASSIFY

UPLOAD IMAGE

SELECT Choose File orange1.jpg

ANALYZE

23°C Haze | Search | ENG IN | 8:49 PM 11/18/2022

NUTRITION IMAGE ANALYSIS

https://m4dk3yrkdul-496ff2e9c6d22116-23664-colab.googleusercontent.com/predict

Update

Joshua L. Laughner... | what is vi or vim in... | Take online cyber s... | II-IT DPD COUNTER | network security wa... | Dart SDK Installatio... | Archive | Dart | Get the Dart SDK |... | Windows install - Fl... | Green revolution: I...

AI-POWERED NUTRITION ANALYSER FOR FITNESS ENTHUSIASTS

HOME CLASSIFY

IMAGE CLASSIFIED IS :

ORANGE

[{'sugar_g': 10.2, 'fiber_g': 2.0, 'serving_size_g': 100.0, 'sodium_mg': 1, 'name': 'fruits', 'potassium_mg': 21, 'fat_saturated_g': 0.0, 'fat_total_g': 0.3, 'calories': 60.2, 'cholesterol_mg': 0, 'protein_g': 0.8, 'carbohydrates_total_g': 15.4}]

23°C Haze | Search | ENG IN | 8:50 PM 11/18/2022

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES

New dietary assessment and nutrition analysis tools provide more opportunities to help people understand their daily eating habits

It helps in exploring nutritional patterns in their daily routines and this is very helpful for people to maintain a balanced healthy diet.

Nutritional analysis is used to determine the nutritional content of foods.

This app eliminates travel costs when visiting a nutritionist.

Using this app greatly reduces the time required to get the best diet plan

DISADVANTAGES

Android mobile user will not be able to insert or view details if the server is down.

So the disadvantage is single point failure.

11. CONCLUSION

We will be by the end of this project

- know the basic concepts and techniques of a convolutional neural network.
- gain a broad understanding of image data
- know how to create a web application using the Flask framework.
- know how to preprocess data and
- know how to clean data using various data pre-processing techniques.

13.

12.FUTURE SCOPE

- Artificial intelligence is revolutionizing healthcare.
- Mainly used to improve marketing and sales decisions, AI is now also being used to reshape individual habits.
- We don't want to go to the gym and follow any diets in the future. With this nutrition analyzer we can maintain our diet plans without the help of others and 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 on your fitness journey and diet plans.

13. APPENDIX

Source Code => Link

GitHub => Link

Demo link => Link