

## AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

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### INTRODUCTION

#### A. Project Overview

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.

#### B. Purpose

The main aim of the project is to building a model which is used for classifying the fruit depends onthe different characteristics like colour, shape, texture etc. Here the user can capture the images ofdifferent 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

#### A. 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.

## **B. 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 to the trained model. The model analyses the image and detects the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

## **LITERATURE SURVEY**

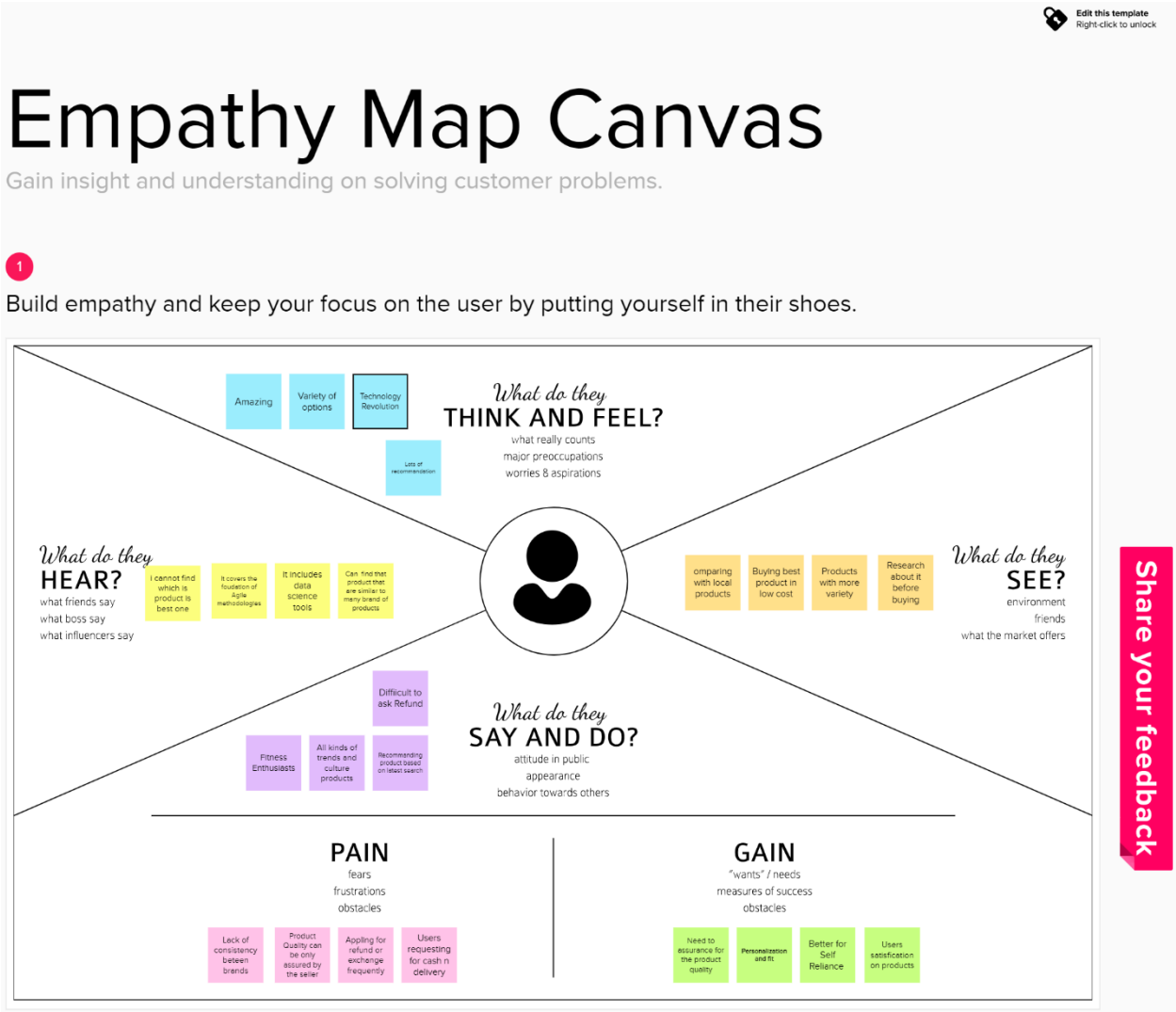
<b>S.no</b>	<b>Title of the project</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Technology used</b>
1	Recommender System with Artificial Intelligence for Fitness Assistance System	It has an ability to learn, analyze, predict, and make a suggestion as well as communicate to human through AI.	It predicts and train data to give the suggestion for the fitness workout it was not more accurate and appreciable in risk cases.	The Artificial Neural Network with Logistic Regression implements the prediction of workout parameters with the accuracy.
2	IntelliDoctor – AI based Medical Assistant	This application tracks the user physical activities like periodic step count and their calories intake and calculate BMI.	Though it has a lot of facilities it can lag due to internet connection and it doesn't track the user performance activity.	The system was trained with real-world cases with several thousands of clinical records, discharge summaries, prescriptions, etc through information extraction using Natural Language Processing (NLP).

3	Efficient Fitness action Analysis based on Spatio-Temporal feature Encoding	It recognizes fitness actions from image sequences and propose an action evaluation method, which can be applied in artificial intelligence (AI) fitness system.	Recognition accuracy of complex dynamic movements are direction less.	A geometrical registration metric is constructed to analyze the fit ness actions along with dataset for recognition and evaluation.
4	Endurance based Personalized Fitness Planner	It provides a device to predict future endurance of a test subject for particular exercise regime.	It doesn't capture the subtle effect of various other personal and environmental factors. It focuses on only few parameters.	It is a statistical technique to model endurance with the help of serial dependence of observations.
5	Personalized Nutrition Solution based on Nutrigenomics	This application provides nutrition recommendation by findings of nutrigenomics at the population sub-groups and even individual level.	It has an able to Provide with more precise and Personalized nutritional advice to individuals but supplement for various parameters were missing.	By using intelligent algorithms, they able to analyze people's DNA, personal and lifestyle data, and provide with more exact and personalized nutritional recommendations to individuals.
6	Information Technology in the Mobile Application of Analysis and Correction of the Diet of Individual Health Nutrition	It is socially important and relevant for ensuring public health.	minimal deviation from the norms of healthy nutrition with possible interchangeability and compatibility of food products.	General algorithm and mathematical formulation of the task of compiling and optimizing a healthy diet.

7	Computer Optimization of Food Nutrition Formula Based on the Consideration of Adaptive Genetic Algorithm	A kind of computer optimization method for the food nutrition formula based on the consideration of the adaptive genetic algorithm	The algorithm was difficult to Understand but pro good accuracy.	The computer Optimization (COFNF algorithm) of the food nutrition formula is generated by the matrix decomposition based on the consideration of the heterogeneous data.
8	Intelligent computer Service system for public fitness based on Fusion of Entropy weight Matter element extension model	The Intelligent Computer service System for public Fitness operates and applies the entropy weight matter element extension model.	It is used for Theoretical references but it is not as much accurate.	The entropy weight matter element extension model was constructed in combination with Degree Resolution Principle.
9	The iFit: An Integrated Physical Fitness Testing System to Evaluate the Degree of Physical Fitness of the Elderly	It represents an integrated physical fitness testing system (iFit) that evaluates the physical fitness of older adults.	A standard deviation for balance time is needed to instruct elderly users to retest in the case of unexpected accidents.	The iFit encompasses a member management module, an acquisition device, a wireless transmission (AWT) module, a Game-based Evaluation (GBE) module, a Personal Health Management (PHM) module.
10	Fitness Tracking and Advisory Application	This application enables a user to track his/her fitness and also get advices and fitness related information in the form of a report at the end and it will	It doesn't matter in high risk situation and need to consult doctors.	It uses Image processing GPS.

		enable the users to calculate their heart blood pressure, and other health related parameters.		
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3. IDEATION & PROPOSED SOLUTION

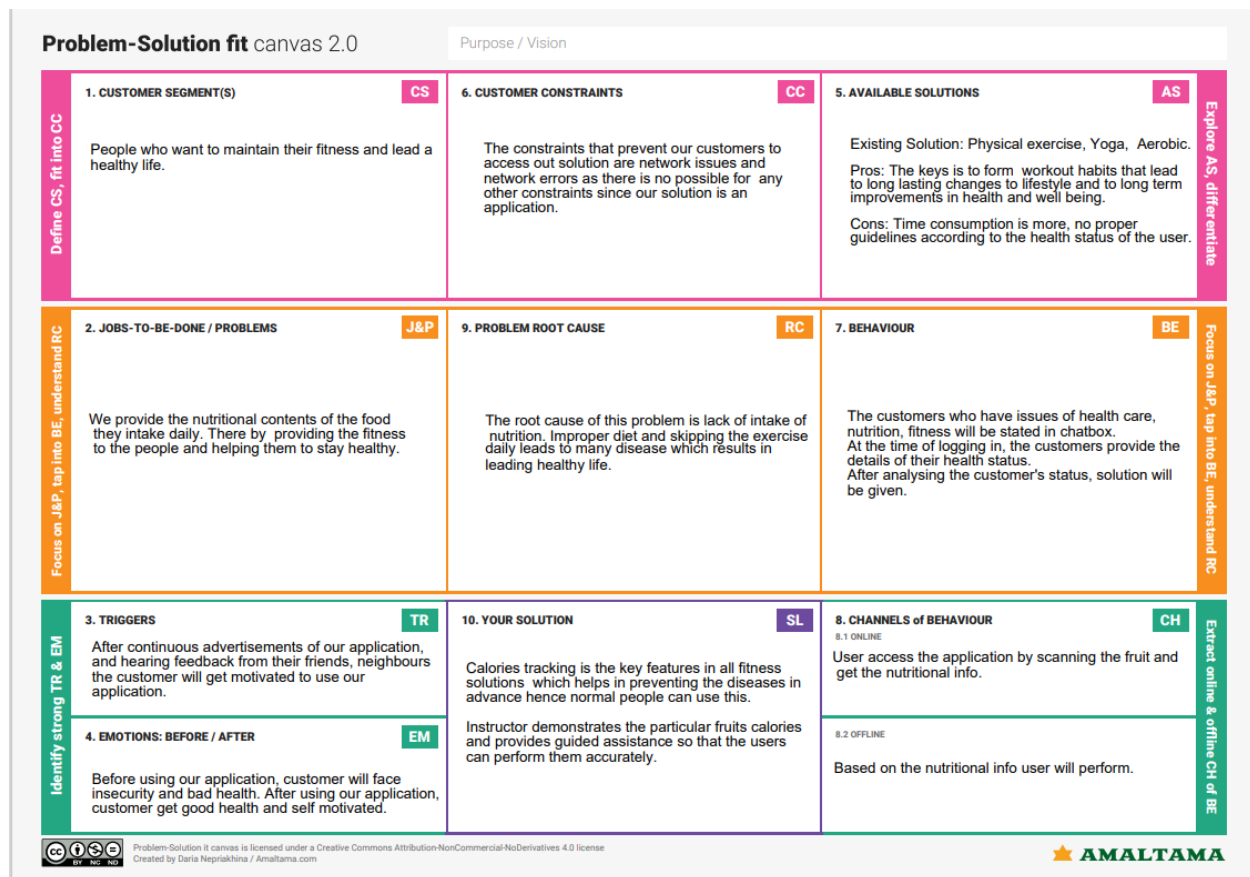


## B. PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Due to lack of a complete tracking system, there is a constant struggle to properly know the necessary amount of nutrition needed and the amount we intake, then the total estimation till the end of a certain period.
2.	Idea / Solution description	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.
3.	Novelty / Uniqueness	In our Project we give more important for patient document and provide mass storage.
4.	Social Impact / Customer Satisfaction	By solving this issue, these people can properly decide on their diet plan to achieve the desired result of staying fit.
5.	Business Model (Revenue Model)	The proposed system will help the people to maintain a proper diet and make them heathier and motivate the people to buy more medical devices. This will help the medical manufacturing company.
6.	Scalability of the Solution	It is highly scalable because people can properly decide on their diet plan to achieve the desired result of staying fit

## C. 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.



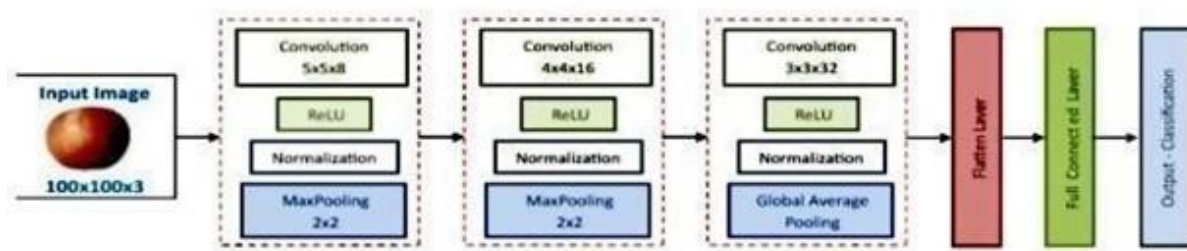
## 4. REQUIREMENT ANALYSIS

### A. 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, face recognition.
- Classification of crystal structure using a convolutional neural network.
- Nutrition is vital to the growth of the human body.
- Nutritional analysis grants 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 brand? New Convolutional Neural Network (CNN)- based food picture 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



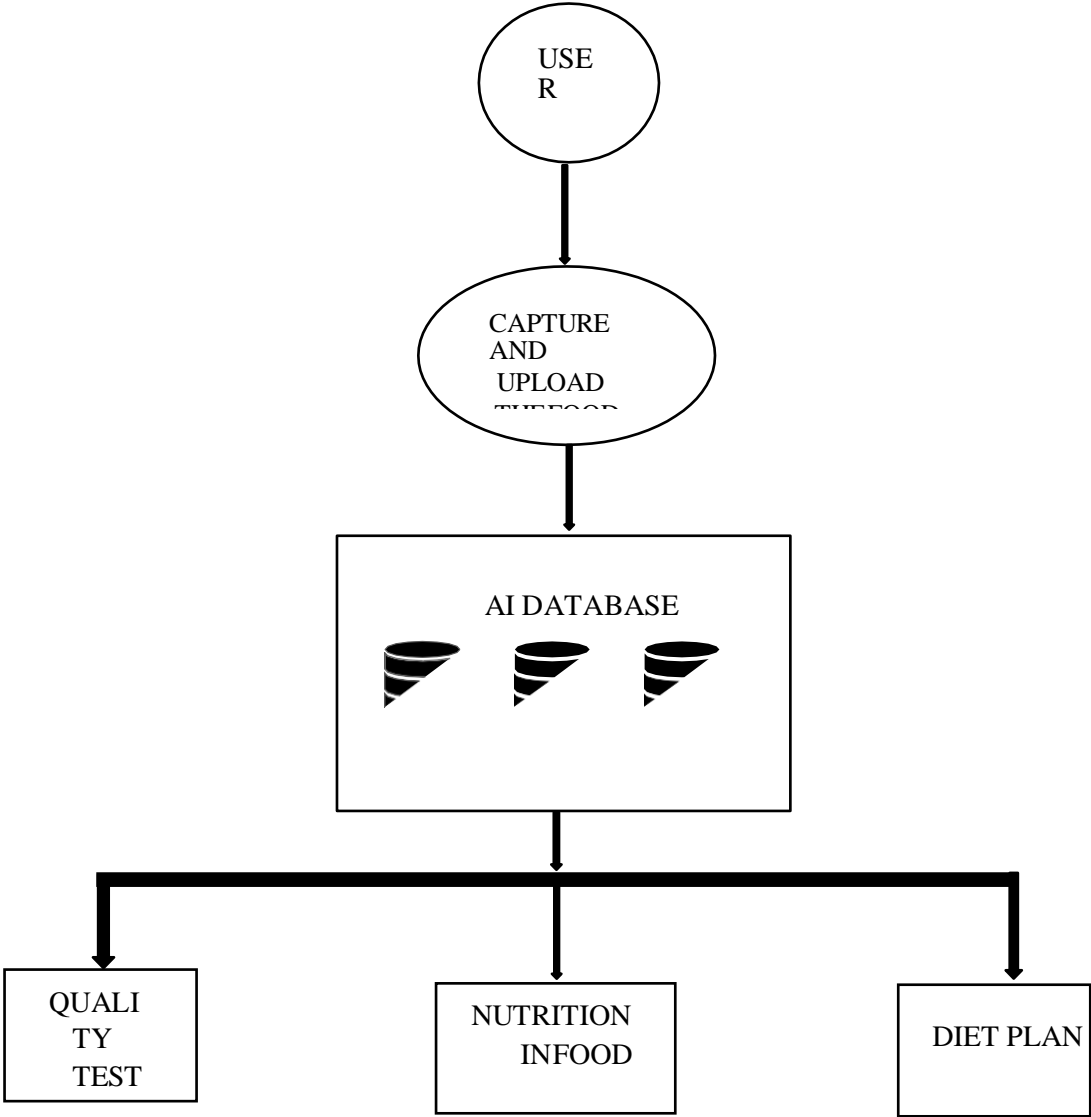
- The comparison of the proposed model with the conventional models shows that the results of this model are exceptionally good and promising to use in real-world applications.
- This sort of higher accuracy and precision will work to boost the machine’s general efficiency in fruit recognition more appropriately.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



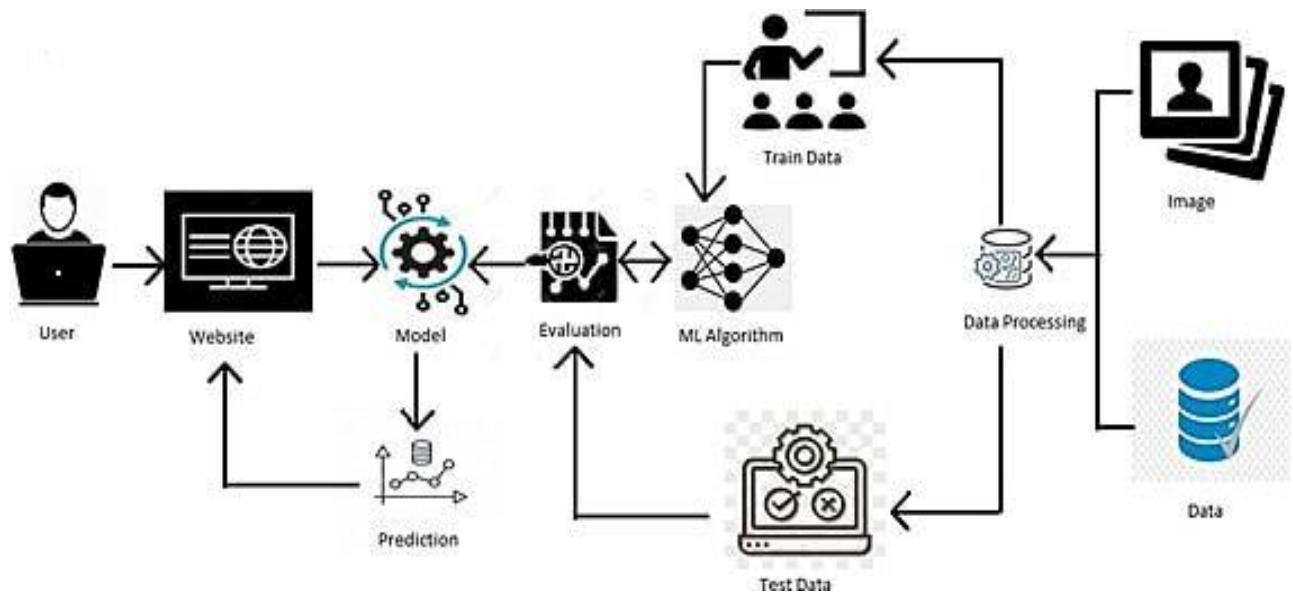
FR NO.	FUNCTIONAL REQUIREMENTS(EPIC)	SUB REQUIREMENT(STORY/SUBTASK)														
FR-1	USER REGISTRATION	-Registration through Gmail -Registration through Mobile Number -Registration through Face-book														
FR-2	USER CONFIRMATION	Confirmation via Email Confirmation via OTP														
FR-3	USER DETAILS	<table><tr><td colspan="2">PERSONAL DETAILS FOOD DETAILS</td></tr><tr><td>Age</td><td>Food</td></tr><tr><td>Height</td><td>Recipe</td></tr><tr><td>Weight</td><td>Added ingredients</td></tr><tr><td>Diseases if any</td><td>Age</td></tr><tr><td>Conditions is any</td><td></td></tr><tr><td>Allergies is any</td><td></td></tr></table>	PERSONAL DETAILS FOOD DETAILS		Age	Food	Height	Recipe	Weight	Added ingredients	Diseases if any	Age	Conditions is any		Allergies is any	
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Age	Food															
Height	Recipe															
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Diseases if any	Age															
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FR-4	USER REQUIREMENTS	-The user simply inputs your recipe ingredients and amounts. The software will instantly produce an accurate readout of your dish in terms of nutritional analysis in a readable format that consumers are familiar with. -With already given details the system can alert the consumer if any content of their allergies, it can alert the consumer														

5. PROJECT DESIGN

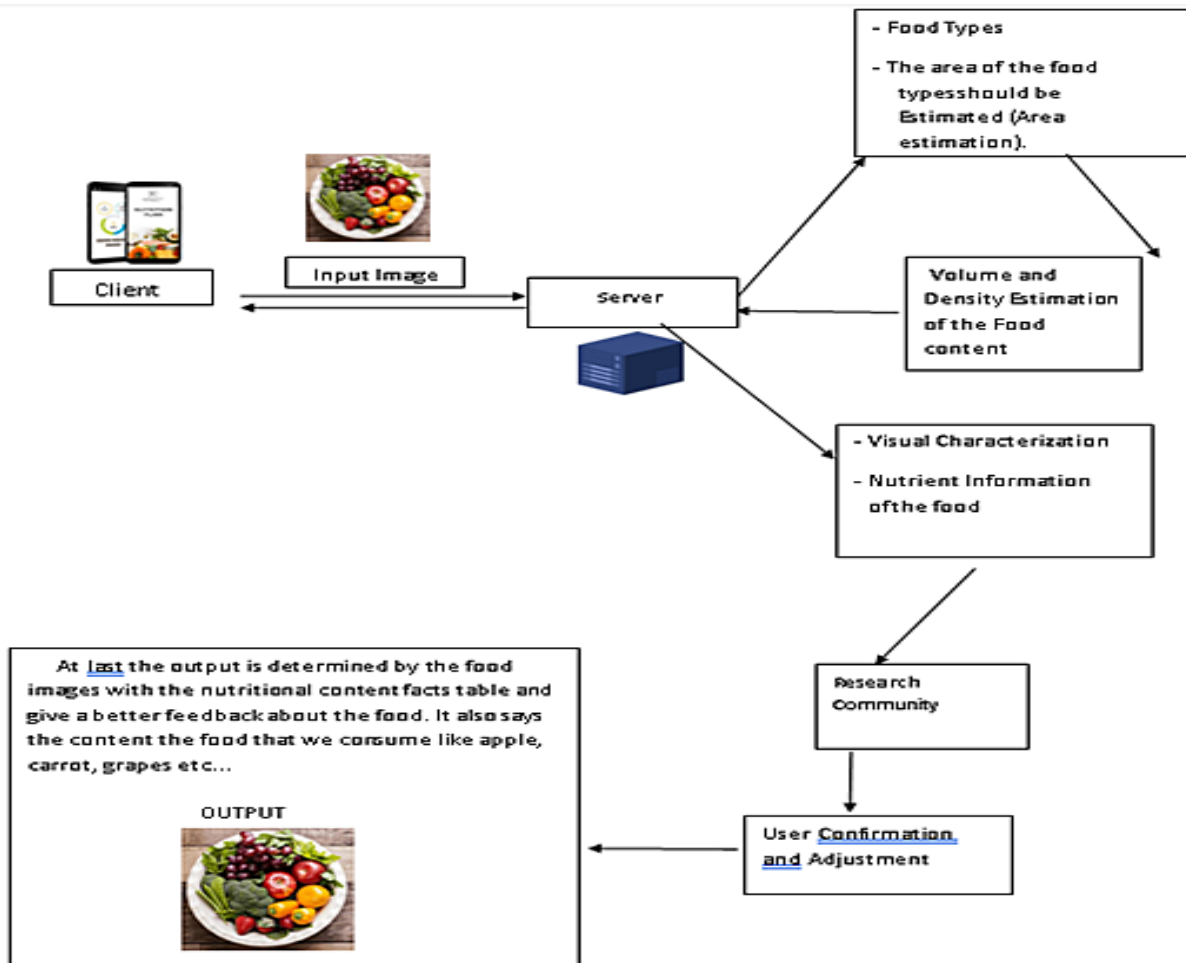
A. Data Flow Diagrams



## 5.1 Solution & Technical Architecture

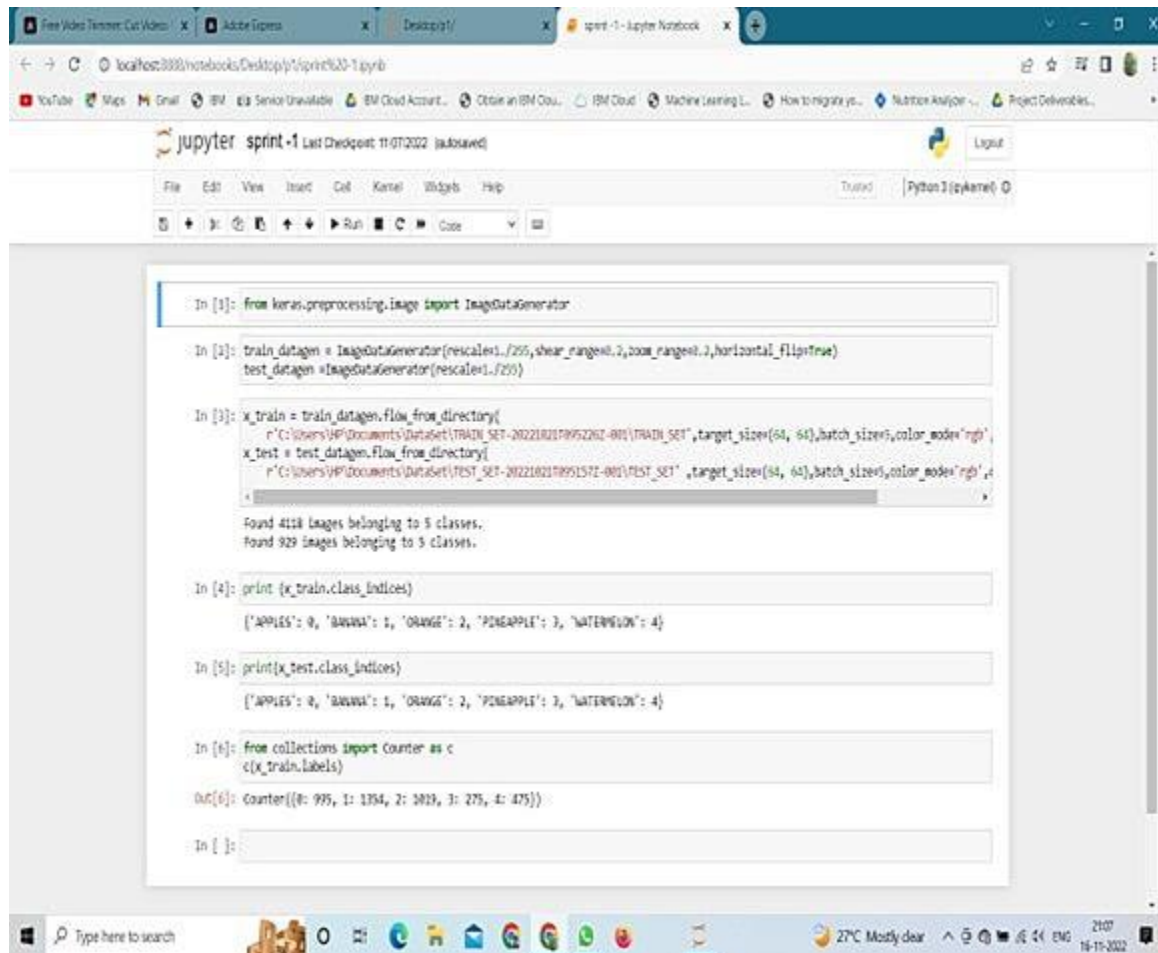


## Application Characteristics:



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

### 6.1 Feature 1



The screenshot shows a Jupyter Notebook titled 'sprint-1 - Jupyter Notebook' running on a local host. The notebook contains the following code and output:

```
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:\Users\VP\Documents\Dataset\TRAIN_SET-2022182178952262-001\TRAIN_SET", target_size=(64, 64), batch_size=5, color_mode='rgb',
    x_test = test_datagen.flow_from_directory(
    r"C:\Users\VP\Documents\Dataset\TEST_SET-2022182178952262-001\TEST_SET", target_size=(64, 64), batch_size=5, color_mode='rgb')

Found 4118 images belonging to 5 classes.
Found 929 images belonging to 5 classes.

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

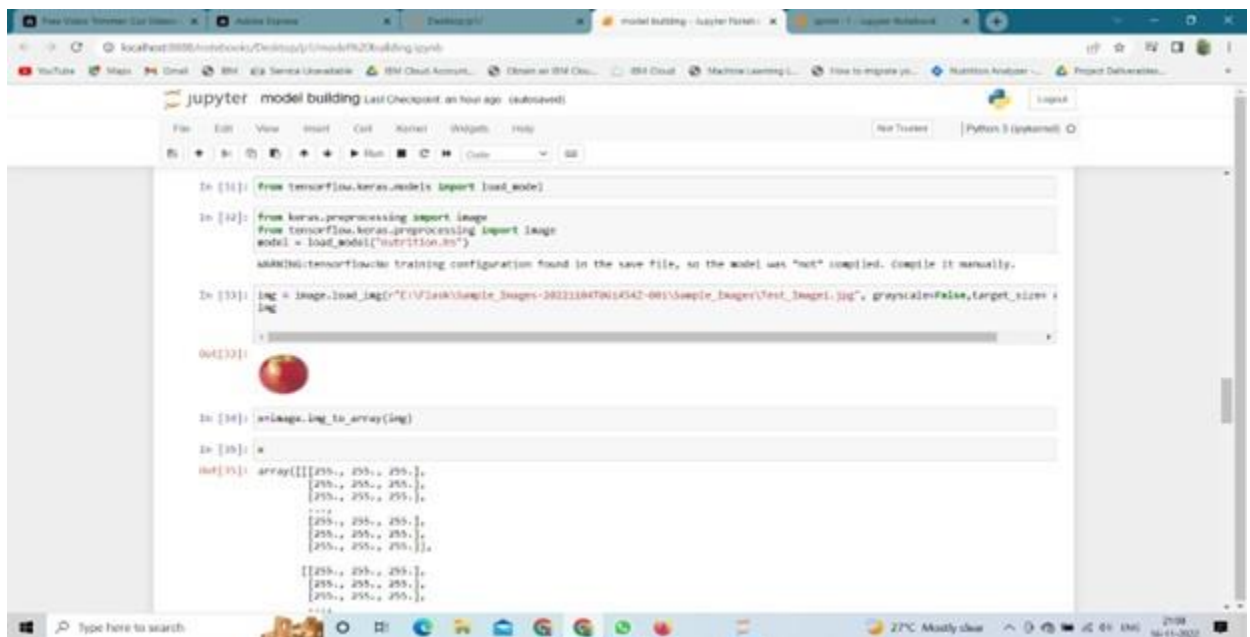
In [5]: print(x_test.class_indices)
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}

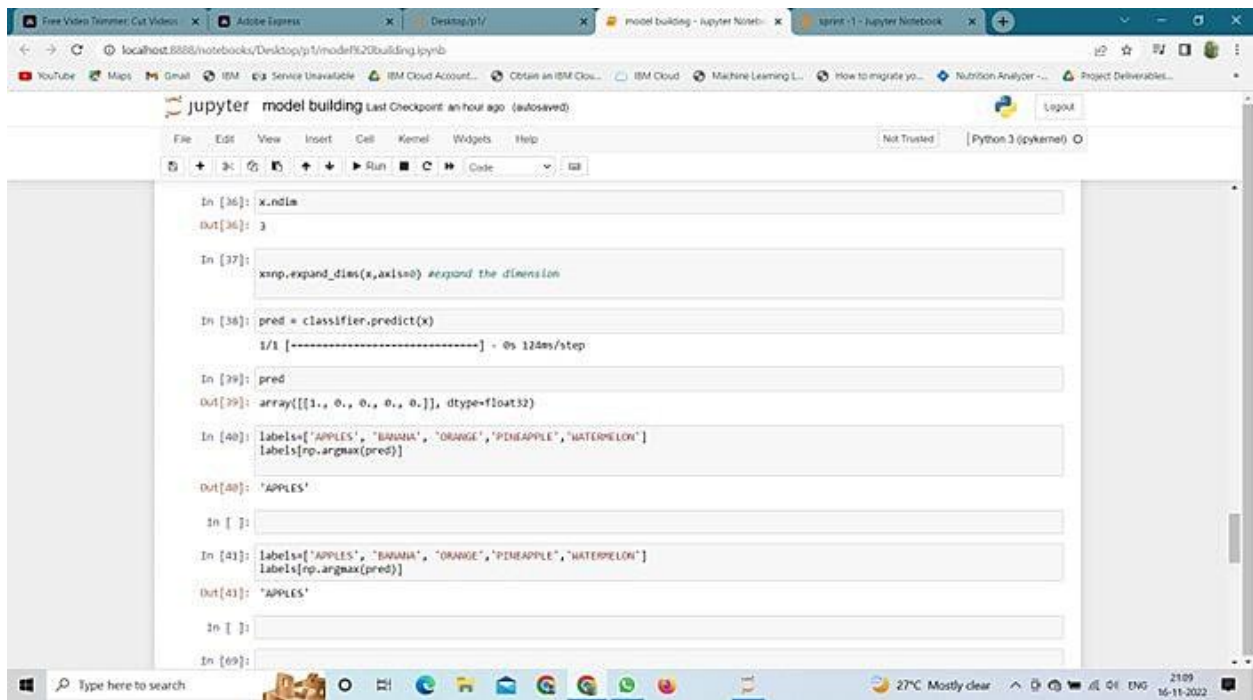
In [6]: from collections import Counter as c
c(x_train.labels)

Out[6]: Counter({0: 995, 1: 1354, 2: 3819, 3: 275, 4: 475})

In [ ]:
```

The output of the code shows the class indices for both training and testing datasets, and the count of images for each class in the training dataset.





The screenshot shows a Jupyter Notebook titled "model building" running on a local server. The notebook contains several code cells. The first cell shows the dimension of a variable 'x'. The second cell shows the expansion of a dimension. The third cell shows the prediction of a classifier. The fourth cell shows the predicted array. The fifth cell shows the labels for the predicted array. The sixth cell shows the labels for the predicted array. The seventh cell shows the labels for the predicted array. The eighth cell shows the labels for the predicted array. The ninth cell shows the labels for the predicted array. The tenth cell shows the labels for the predicted array. The eleventh cell shows the labels for the predicted array. The twelfth cell shows the labels for the predicted array. The thirteenth cell shows the labels for the predicted array. The fourteenth cell shows the labels for the predicted array. The fifteenth cell shows the labels for the predicted array. 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```
In [36]: x.ndim
Out[36]: 3

In [37]: xnp.expand_dims(x,axis=0) #expand the dimension

In [38]: pred = classifier.predict(x)
1/1 [-----] - 0s 128ms/step

In [39]: pred
Out[39]: array([[1., 0., 0., 0., 0.], dtype=float32)

In [40]: labels=['APPLES', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
labels[np.argmax(pred)]
Out[40]: 'APPLES'

In [ ]:

In [41]: labels=['APPLES', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
labels[np.argmax(pred)]
Out[41]: 'APPLES'

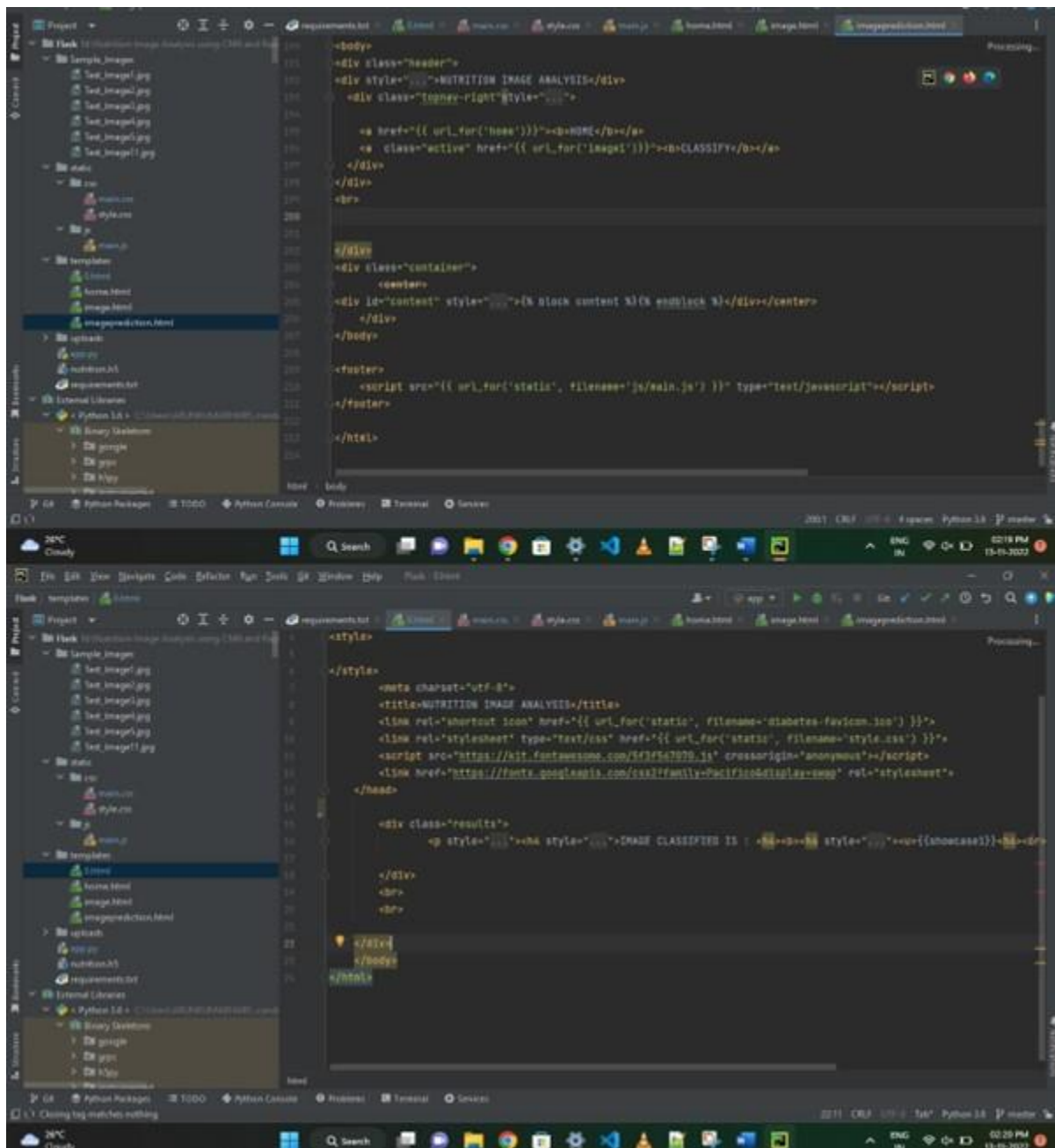
In [ ]:

In [69]:
```

## 6.1Feature 2

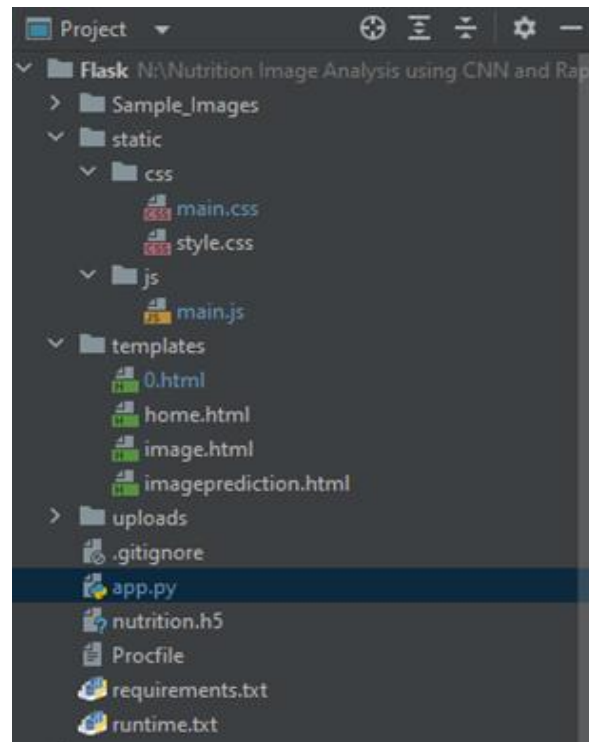






## 7. TESTING

### 7.1 Testcases

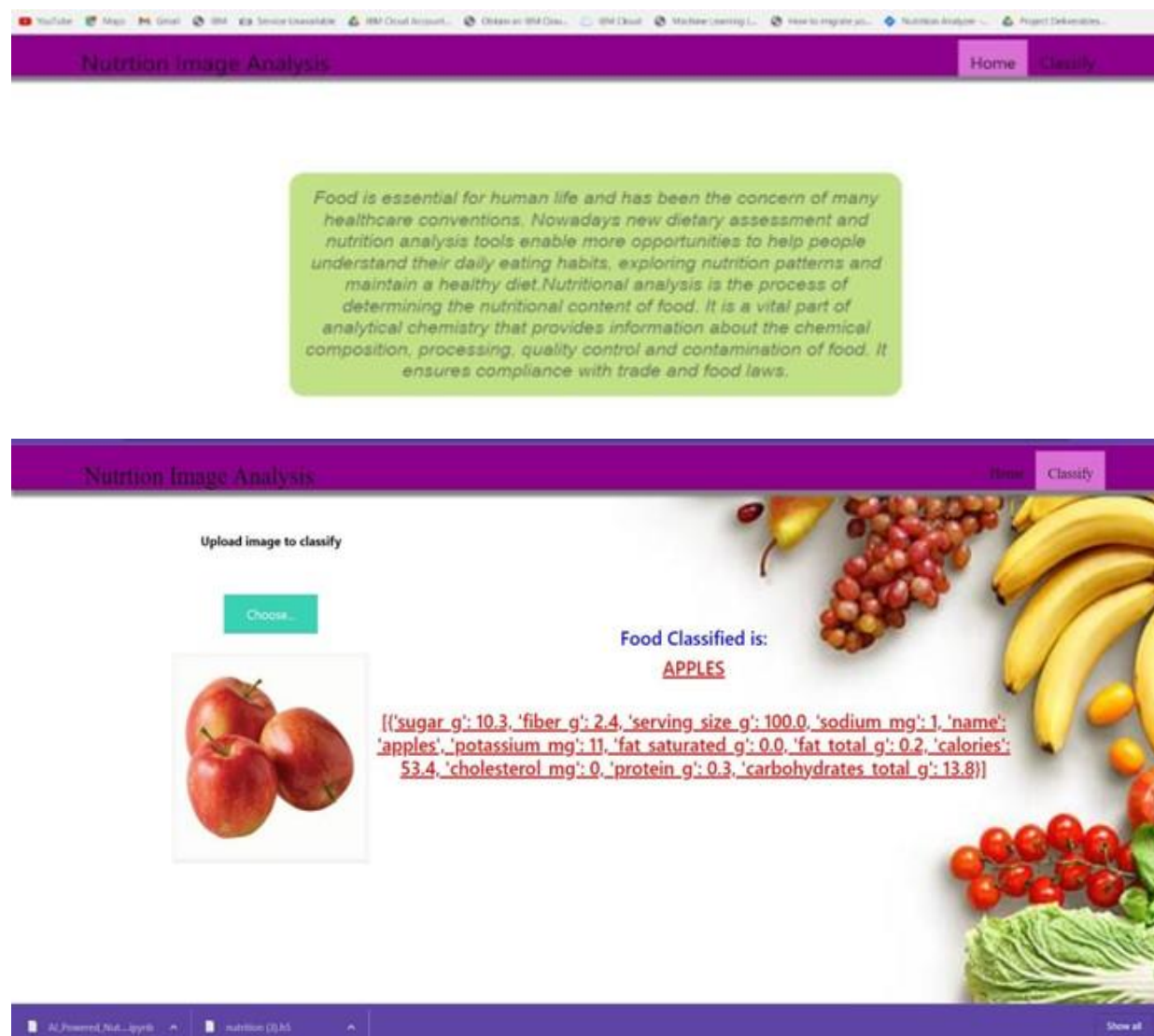


## 7.2 User Acceptance Testing



## 8. RESULTS

Output:



## **9. CONCLUSION**

By the end of this project, we will,

- Know fundamental concepts and techniques of Convolutional Neural Network.
- Gain a broad understanding of image data.
- Know how to build a web application using the Flask framework.
- Know how to pre-process data.
- Know how to clean the data using different data preprocessing techniques.

## **10. 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.