AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

DOMAIN: ARTIFICIAL INTELLIGENCE
TEAM ID: PNT2022TMID04240

PROJECT REPORT
Submitted by

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1.   INTRODUCTION

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 maintaining 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.

The main aim of the project is to build a model which is used for classifying the fruit depending 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 analyzes the image and detects the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

Purpose

Nutrition Analyzer helps in the detailed and perfect determination of the component nutrients present in any food item. Food components have vast bio metabolic roles and could affect human health severely. Purpose of the AI powered Nutrition Analyzer is to help individuals who needs a proper nutrition assistant to achieve fitness, to cure diseases through foods or to lead a healthy lifestyle. With the help of Artificial Intelligence, it was possible to achieve a proper nutrition analyzer which is capable of showing the nutrition content of the food when we give the picture of it.

2.   LITERATURE SURVEY

Existing Problem

Controlled intake of nutrition is recommended as a condition for being a healthy individual. Knowing and monitoring how much food is consumed during the day, following the calorie and nutrition of these foods helps to control healthy nutrition. However, there is no proper assistance to achieve it. Nutritional intake is fundamental to human growth and health, and the intake of different types of nutrients and micronutrients can affect health. The content of the diet affects the occurrence of disease, with the incidence of many diseases increasing each year while the age group at which they occur is gradually decreasing. The consumption of a wide variety of food items is necessary in order for the human body to obtain the right amounts of nutrients. Failing to follow such a well- balanced diet, in combination with a generally unhealthy way of living, has been shown to increase the risk for cardiovascular disease, type II diabetes and some forms of cancer.

References

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[4]. Anchal Goyal, Ranpreet Kaur, ―Loan Prediction Using Ensemble Technique‖, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Issue 3, pp. 523 – 526, March 2016.

[5]. Aboobyda Jafar Hamid and Tarig Mohammed Ahmed, ―Developing Prediction Model of Loan Risk in Banks using Data Mining‖, Machine Learning andApplications: An International Journal (MLAIJ), Vol.3, No.1, pp. 1-9, March 2016.

[6]. Aditi Kacheria, Nidhi Shivakumar, Shreya Sawkar, Archana Gupta, Loan Sanctioning Prediction System, International Journal of Soft Computing and Engineering (IJSCE), vol. 6, no. 4, pp. 50-53, 2016.

Problem Statement Definition

Ideal situation:

Ideally, a Nutrition Analyzer is available which will help people in assisting the nutrition analysis and help them in maintaining good health.

Reality:

Currently there is no ideal nutrition analyzer available. Those which are available, fail to satisfy the needs of the people. Some are not personalized while some are very complicated to be accessed by everyone. Hence, there is no Nutrition analyzer to guide and assist people.

Consequences:

People tend to consume food without the knowledge of the nutrition content of the food.
This results in nutrition imbalance leading to nutrition deficiencies and diseases.

Proposal:

Our project of Nutrition Analyzer for Fitness Enthusiasts focuses on Developing a simple Nutrition Analyzer which is capable of analyzing the nutrition in the food by giving the picture of the food. This is achieved by Artificial Intelligence with Python, Deep learning, CNN etc...
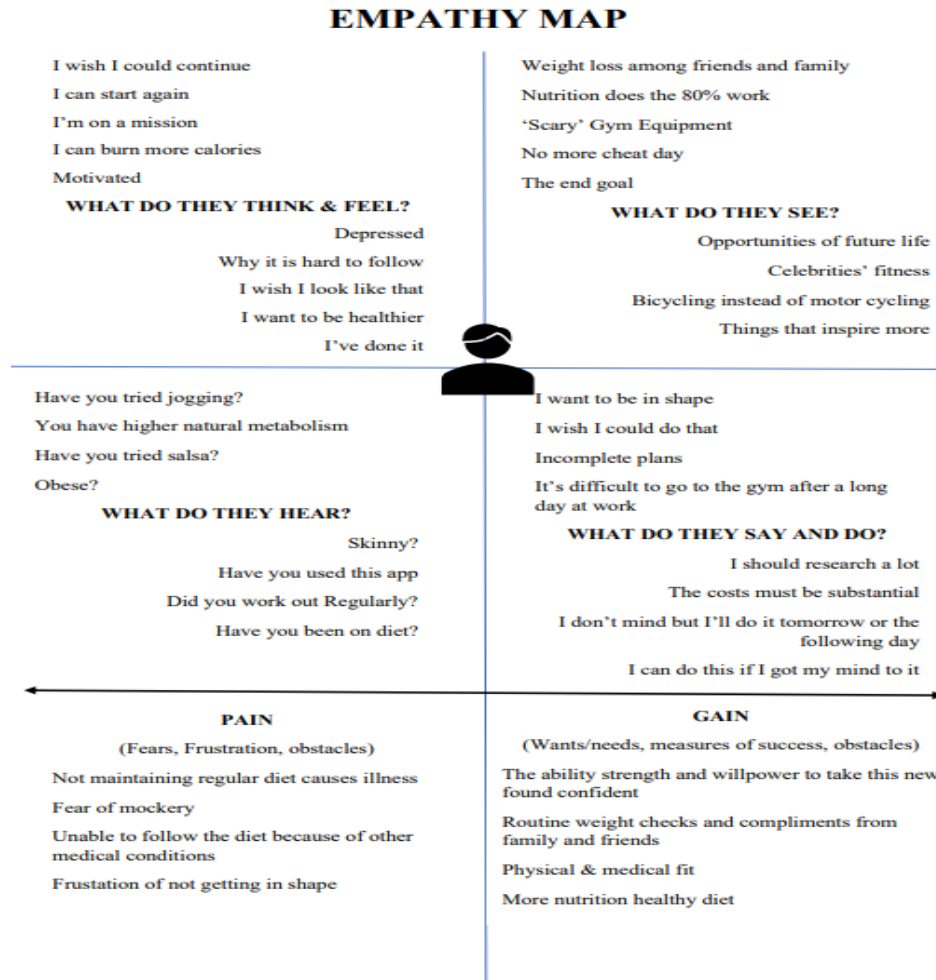
3.   IDEATION AND PROPOSED SOLUTIONS

PROBLEM STATEMENT

Empathy Map Canvas

Empathy mapping is a simple yet effective workshop that can be conducted with a variety of different users in mind, anywhere from stakeholders, individual use cases, or entire teams of people. It can be conducted by many different teams such as design teams, sales, product development or customer service. Essentially, it is an exercise that seeks to get inside the head of the customer as they interact with your product/service. Nutrition Analyzer does the process of determining the nutritional content of the food that provides information about chemical composition, processing, quality control and contamination of food
The following empathy map helped us to understand the customer needs and their expectations and to develop our Nutrition Analyzer.
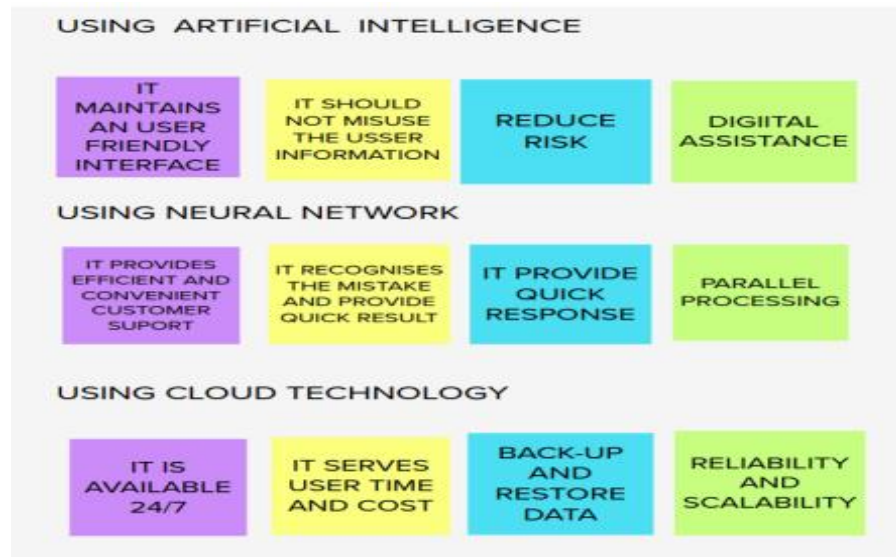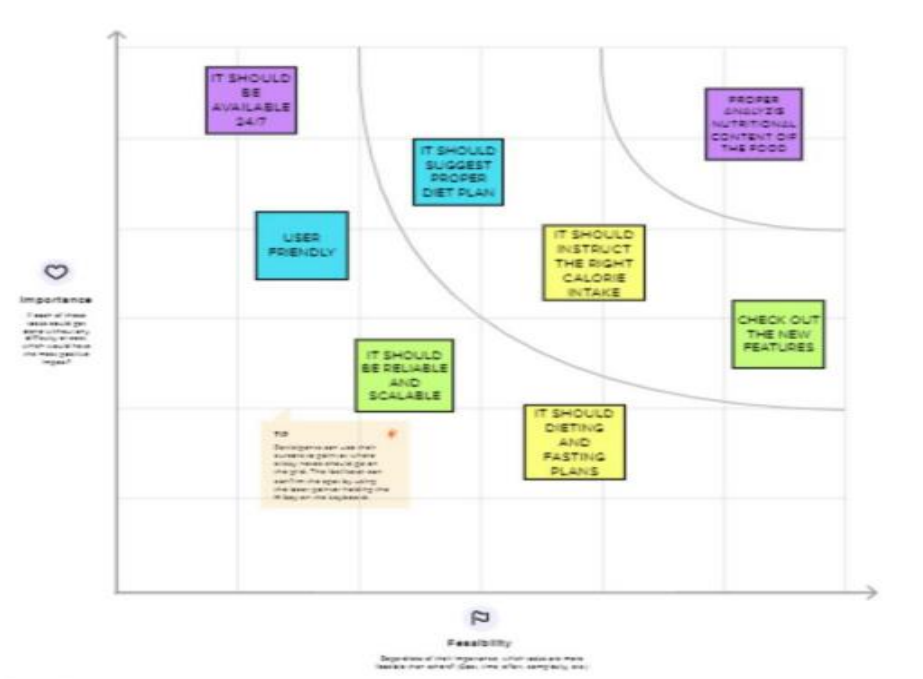
EMPATHY MAP

EMPATHY MAP

I wish I could continue

I can start again

I'm on a mission

I can burn more calories

Motivated

WHAT DO THEY THINK & FEEL?

Depressed

Why it is hard to follow

I wish I look like that

I want to be healthier

I've done it

Have you tried jogging?

You have higher natural metabolism

Have you tried salsa?

Obese?

WHAT DO THEY HEAR?

Skinny?

Have you used this app

Did you work out Regularly?

Have you been on diet?

Weight loss among friends and family

Nutrition does the 80% work

'Scary' Gym Equipment

No more cheat day

The end goal

WHAT DO THEY SEE?

Opportunities of future life

Celebrities' fitness

Bicycling instead of motor cycling

Things that inspire more

I want to be in shape

I wish I could do that

Incomplete plans

It's difficult to go to the gym after a long day at work

WHAT DO THEY SAY AND DO?

I should research a lot

The costs must be substantial

I don't mind but I'll do it tomorrow or the following day

I can do this if I got my mind to it

PAIN

(Fears, Frustration, obstacles)

Not maintaining regular diet causes illness

Fear of mockery

Unable to follow the diet because of other medical conditions

Frustation of not getting in shape

GAIN

(Wants/needs, measures of success, obstacles)

The ability strength and willpower to take this new found confident

Routine weight checks and compliments from family and friends

Physical & medical fit

More nutrition healthy diet

IDEATION & BRAINSTORMING:

Brainstorming

Group Ideas

USING ARTIFICIAL INTELLIGENCE

| IT MAINTAINS AN USER FRIENDLY INTERFACE | IT SHOULD NOT MISUSE THE USSER INFORMATION | REDUCE RISK | DIGIITAL ASSISTANCE |

USING NEURAL NETWORK

| IT PROVIDES EFFICIENT AND CONVENIENT CUSTOMER SUPORT | IT RECOGNISES THE MISTAKE AND PROVIDE QUICK RESULT | IT PROVIDE QUICK RESPONSE | PARALLEL PROCESSING |

USING CLOUD TECHNOLOGY

| IT IS AVAILABLE 24/7 | IT SERVES USER TIME AND COST | BACK-UP AND RESTORE DATA | RELIABILITY AND SCALABILITY |

Priorities

3.3 Proposed Solution

1. Problem Statement

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays it has become even more difficult for people to understand their daily eating habits, exploring nutrition patterns and maintaining a healthy diet.

2. Solution Description

In order to guide people to follow healthier eating habits, a nutrition analyzer has to be introduced. Nutritional analyzer does 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.

3. Novelty/Uniqueness

Consult Online Doctor/ Nutritionist, Research on some websites based on nutrition and Chat- bots in which we are able to answer all our queries based on Calories, Nutritional Food content, Diet plans, Balanced food-based charts etc... This also gives the correct solution and answer for the Nutrition to get fit in our life.

4. Social Impact/ Customer Satisfaction

Being Healthy is very important and our project will help those who are trying to maintain their health. There are different foods available and there are many undesirable contents in the food. Many people consume them unconsciously. Our project paves way for conscious eating and to control what we eat. This will help many people who are trying to eat according to their body needs like people with health conditions or some people who like to consume healthy content. This can create a great awareness among the people and help them in many ways.

5. Business Model

The person using a nutrition analyzer may avoid spending time and money for a nutrition analyst instead by paying the less premium amount to communicate with nutritional specialists and get benefited.

6. Scalability of Solution

AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food to maintain a healthy diet. According to their tracking system for the person, nutrient intake can be increased or decreased.

3.4 Problem-Solution Fit

1. **Customer Segments:**
   Consults on Nutrition

2. **Jobs-to-be-done:**
   - Healthy diet plan
   - Quality control of food
   - Nutrition rich food recommendations
   - Different nutrition pattern exploration
   - Classification of food based on its nutrients

3. **Triggers**
   To maintain good health and to regulate their eating. Good intake of foods

4. **Emotion Before/After**
   Before: Depressed, Exhausted, Confused, Tense on body shape
   After: Confidence, Delightful, Encouraged, Motivated, Customer became mentally and physically fit

5. **Available Solutions**

   ➤ They can hire a personal nutritionist.
   ➤ They can consult dietitians
   ➤ They can use apps such as My Fitness Pal, Chronometer, Life Sum, etc...

6. **Customer**

   Lack of knowledge on understanding everything and go beyond on calorie counting, scared of getting help from the resources on analyzer, whether the premium amount for the premium is acceptable for the customers.

7. **Behavior**

   Consulting doctors or nutritionists, enquiries about the food to be consumed, refer articles such as magazines, newspapers, watching exercises and yoga, searching it in websites ,etc......

8. **Channels of Behavior**

   Referring Articles, checking websites related to nutrition, Consulting nutritionists online, etc....

9. Problem Root cause

- □ Fast paced lifestyle
- □ Availability of low-quality food
- □ Nutrition less food
- □ Improper diet plan
- □ Lack of health-related awareness
- □ Emotional Eating
- □ Improper food timings

10. Solution

Food has the power to influence metabolism and health directly. If food is the reason nutrition is the result, Hence we should give high importance to proper nutrition. Our project "AI Powered Nutrition Analyzer" helps people to get to know the nutrition content in their food and improve body health.

4. REQUIREMENT ANALYSIS

4.1 **Functional Requirements**

Following are the functional requirements for the proposed solution.

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**	**PERSONAL DETAILS FOOD DETAILS** <table><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 if any</td><td></td></tr><tr><td>Allergies if any</td><td></td></tr></table>
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

4.2 **Non-Functional Requirements**

Following are the functional requirements for the proposed solution.

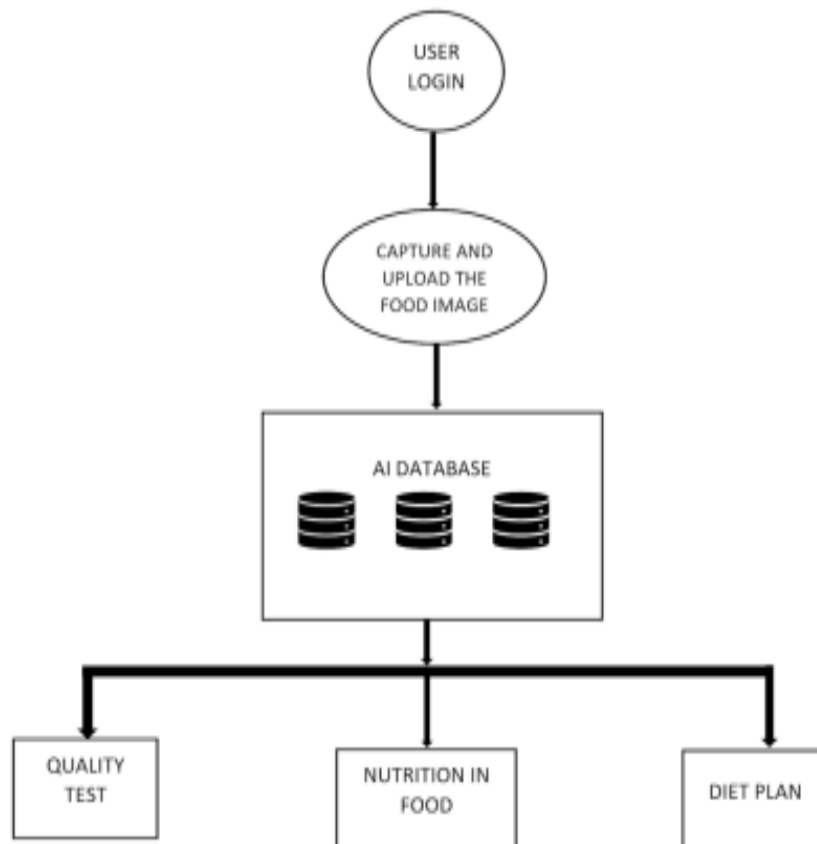| FR.NO	NON-FUNCTIONAL REQUIREMENTS	DESCRIPTION
NFR-1	**USABILITY**	➤ No training is required to access the Nutrition Analyzer. ➤ The results should be loaded within 30 seconds. ➤ It should be user friendly and comfortable. ➤ It should be simple and easy to use. ➤ The results should be self-explanatory so that it can be understood by common people.
NFR-2	**SECURITY**	➤ AI powered nutrition analyzer for fitness should contain more security in which our data which entered or maintained should be more security. ➤ With the help of the username and password it provides more security in which it can access more securable and the data is private. ➤ It should be social-economic which should have access to sufficient and safe use.
NFR-3	**RELIABILITY**	➤ It is Important that the AI powered nutrition analyzer for fitness should be reliable. ➤ How can a person find it is reliable? It is easy to find that if he/she can compare the nutrition based food with other nutrition related applications, it can easily rectify whether it is reliable or not. ➤ But it takes too much time, to avoid this a reliable application should be made in which it itself produces whether we can get the correct solution or not. So, it is necessary that the AI powered nutrition analyzer for fitness should have proper data and information so we can get the correct information about it and also get proper guidance about it. ➤ With the proper guidance and proper information in which we can get nutrition properly and we can have a proper fitness plan.

		➤ It should also provide the information on nutrition and health which it should prevent from health information on diseases, health risks and prevention guidelines. It should also provides an extension of a research based online learning network with several resource areas, so it provides more reliability in that area. For more reliability it can also contain the calorie information, balanced diet plans, what type food can be consumed at what time etc. So, by this way it can be reliable.
NFR-4	PERFORMANCE	➤ It should provide a greater number of users to consume at any time and at any place. ➤ It should provide Reliability, Scalability, Security and Usability. ➤ It should contain minimum data while over-paging the websites or application and it is necessary that it should not exceed more than 20mb. ➤ While consuming the page it should provide the response as much as possible without any delay or time traffic. ➤ The connection should be properly maintained so that it can be used while travelling or in remote places. ➤ The nutritious food to meet their dietary needs and the food preferences for an active and healthy life. ➤ There should be consistent access, availability and affordability of foods and beverages that promote well-being and prevent diseases. ➤ It should be suitable in all situations that exist to all people, at all times.
NFR-5	AVAILABILITY	➤ Easy to access Data. ➤ Avoids Data redundancy and inconsistency. ➤ Fast and Efficient. ➤ User Friendly.
NFR-6	SCALABILITY	➤ The architecture for AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of

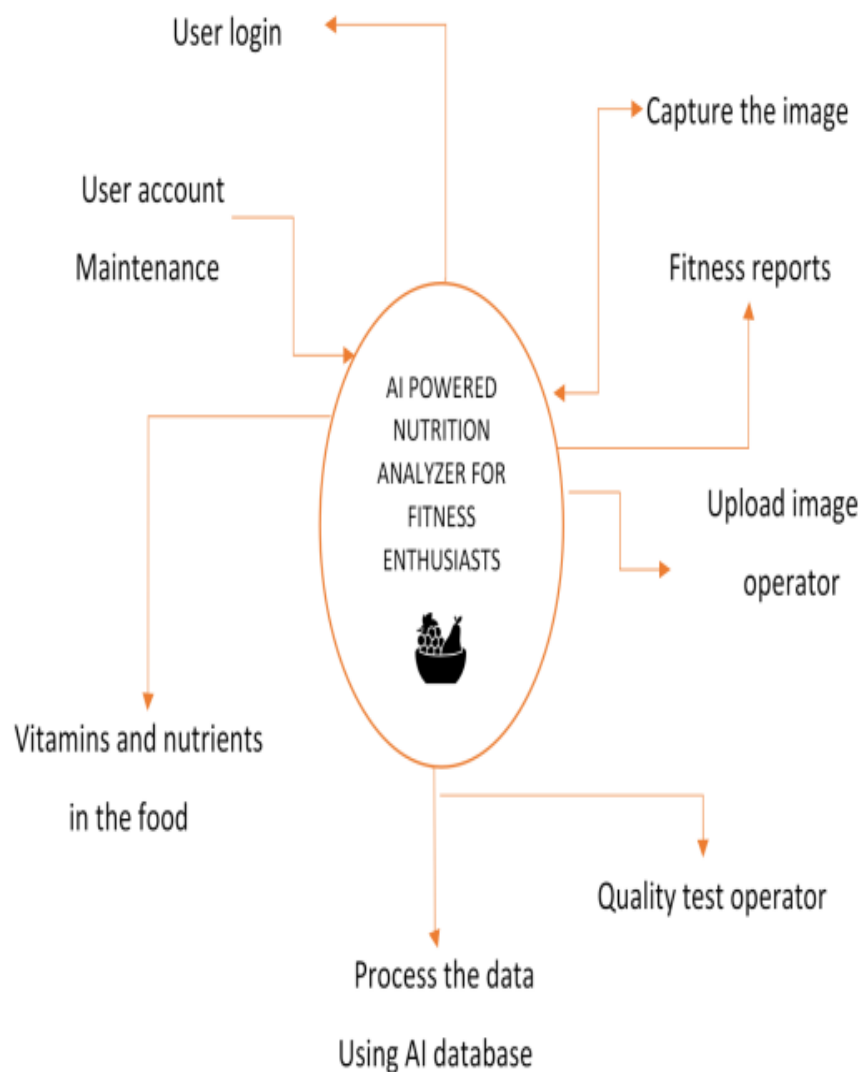|		food and helps the user to maintain a healthy diet. ➤ According to their tracking system implemented in architecture provide the proper mechanism to the every individual of their nutrients intake which can be increased or decreased. The premium amount for analyzer is very much optimum.

5. PROJECT DESIGN

Data flow diagrams

Simplified Data flow:

USER LOGIN

CAPTURE AND UPLOAD THE FOOD IMAGE

AI DATABASE

QUALITY TEST

NUTRITION IN FOOD

DIET PLAN

1.   The application starts from the user login. the user must enter their mail id and the password to use the nutrition analyzer
2.   The next step is that the user should capture the food and upload the food in the specified capture image icon.
3.   The third step is to click the "Analyze Food" and wait for some time. The AI database processes the image.
4.   The tool figuring out images and pages automatically gives the information about food such as the quality of the food, Nutrition, then issues the diet and fitness plan for the user.

DATA FLOW DIAGRAM LEVEL 0

User login

Capture the image

User account

Maintenance

Fitness reports

AI POWERED
NUTRITION
ANALYZER FOR
FITNESS
ENTHUSIASTS

Upload image

operator

Vitamins and nutrients

in the food

Quality test operator

Process the data

Using AI database

5.2 Technical and Solution Architecture

Technical Architecture:

ABSTRACT:

➤ The main aim of the project is to build a model which is used for classifying the fruit, vegetables, spinach, fish, meat, Green leafy vegetables etc..… depends on the different characteristics like colour, shape, texture etc.

➤ Here the user can capture the images of different fruits, vegetables, spinach, Green leafy vegetables, fish, meat, etc... 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, Fibre, Protein, Calories, etc.).

➤ 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 maintaining 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.

➤ This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.

➤ The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.

OBJECTIVES:

➤ Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments.

➤ What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health.

➤ The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life.

➤ It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods.

➤ Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenishing malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result.

➤ Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and biochemical composition of foods is important to the health, well-being, and safety of the consumers.

➤ We consume food so that we can obtain proper nutrition. Hence it is very important for us to know the composition of nutrients in our food.

➤ Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding nutrients required for our body and excluding which is not good for health.

TECHNOLOGY ARCHITECTURE
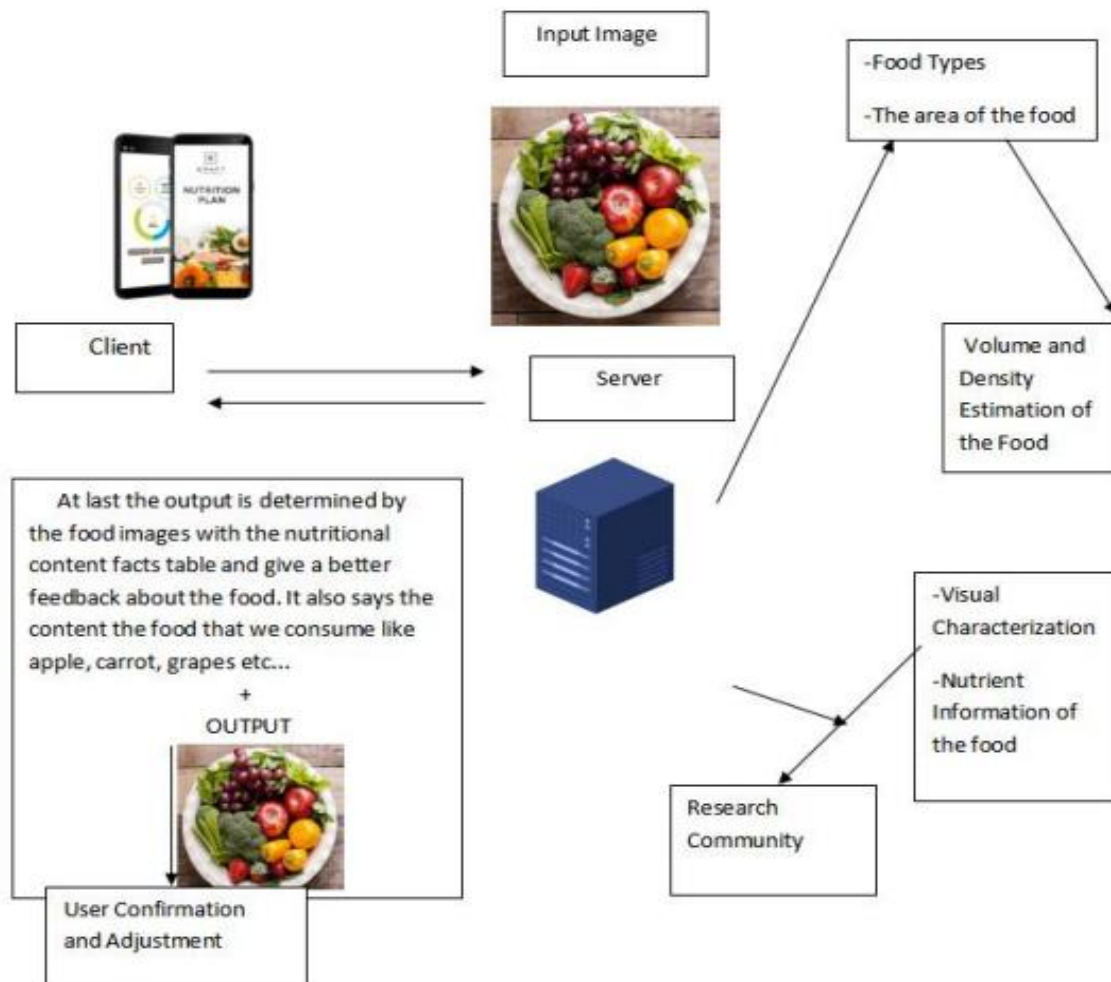
Solution Architecture:

Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments. What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health. The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life. It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods. Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenishing malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result. Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and Biochemical composition of foods is important to the health, well-being, and safety of the consumers. We consume food so that we can obtain proper nutrition.

Hence it is very important for us to know the composition of nutrients in our food. Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding nutrients required for our body and excluding which is not good for health.

➤ This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.
➤ The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.
➤ First, the user captures the images of the food and uploads it.
➤ Next, the image will be sent to the trained model.
➤ The model will classify the food based on the different characteristics like colour
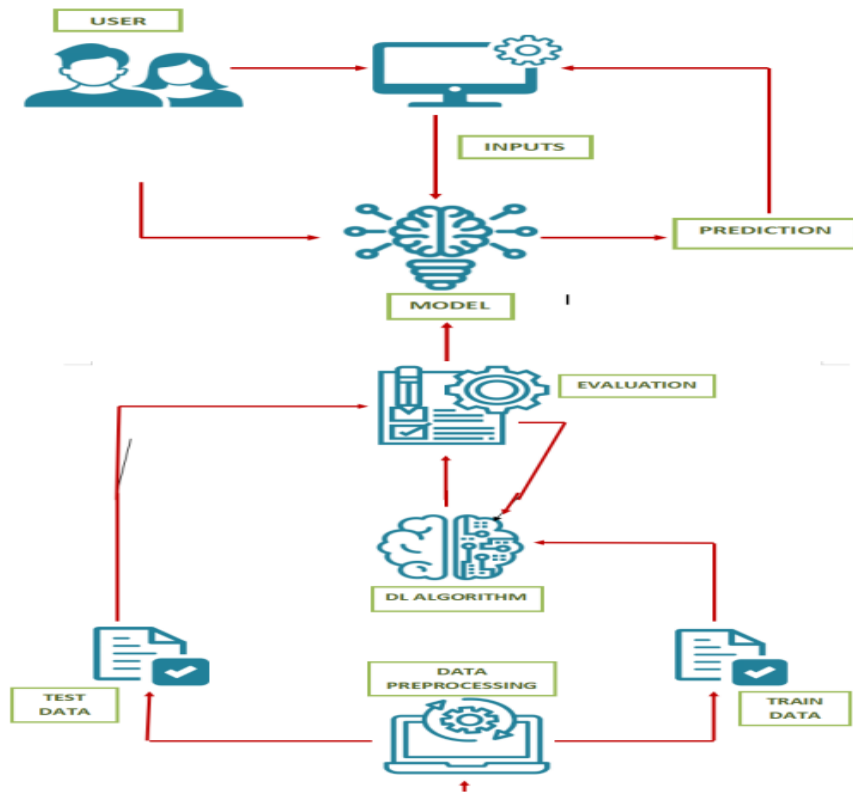
RELIABILITY:

□ It is Important that the AI powered nutrition analyzer for fitness should be reliable.

□ How can a person find it is reliable? It is easy to find that if he/she can compare the nutrition-based food with other nutrition related applications, it can easily determine whether it is reliable or not.

□ But it takes too much time, to avoid this a reliable application should be made in which it itself produces whether we can get the correct solution or not. So, it is necessary that the AI powered nutrition analyzer for fitness should have proper data and information in which we can get correct information about it and also get proper guidance about it.

□ With the proper guidance and proper information in which we can get nutrition properly and we can have a proper fitness plan.

□ It should also provide the information on nutrition and health which it should prevent from health information on diseases, health risks and prevention guidelines. It should also provide an extension of a research based online learning network with several resource areas, so it provides more reliability in that area. For more reliability it can also contain the calorie information, balanced diet plans, what type food can be consumed at what time etc. So, by this way it can be reliable.

SCALABILITY:

☐　　　The architecture for AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food and helps the user to maintain a healthy diet.

☐　　　According to their tracking system implemented in architecture, they provide the proper mechanism to every individual of their nutrient intake which can be increased or decreased.

☐　　　The premium amount for analyzer is very much optimum.

PERFORMANCE:

☐　　　It should provide more users to consume at any time and at any place.

☐　　　It should provide Reliability, Scalability, Security and Usability.

☐　　　It should contain minimum data while over-paging the websites or application and it is necessary that it should not exceed more than 20mb.

☐　　　While consuming the page it should provide the response as much as possible without any delay or time traffic.

☐　　　The connection should be properly maintained so that it can use while travelling or in remote places.

☐　　　The nutritious food to meet their dietary needs and the food preferences for an active and healthy life.

☐　　　There should be consistent access, availability and affordability of foods and beverages that promote well-being and prevent diseases.

☐　　　It should be suitable in all situations that exist to all people, at all times.

SECURITY:

☐　　　AI powered nutrition analyzer for fitness should contain more security in which our data which entered or maintained should be more 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.

☐　　　It should be social-economic which should have access to sufficient and safe use.

USABILITY:

☐　　　No training is required to access the Nutrition Analyzer.

☐　　　The results should be loaded within 30 seconds.

☐　　　It should be user friendly and comfortable.

☐　　　It should be simple and easy to use.

☐　　　The results should be self-explanatory so that it can be understood by common people.

User Stories Functional Requirement (Epic)   User Story Number   User Story / Task

Data Collection & Image Processing

USN-1   As a user, First I must register for IBM cloud
USN-2   As a user, I must collect and download the datasets
USN-3   After collecting the datasets, Image Preprocessing must be done.
USN-4   After image preprocessing, user has to build the model

Model Building & Testing

USN-5   As a user, I have to develop a code for this model   building and I have to build a model
USN-6   After model building, I have to create an application for the end users
USN-7   As a user, I have to Create a folder which
contains all the necessary html, CSS, js and python coding files

Application building

USN-8   Create HTML pages to design the front-end part of the web page
USN-9   Create the flask application and loading the model file
USN-10   Link the flask file with html files

Cloud integration

USN-11   Train the model on Cloud

6.   PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

**Sprint   Functional Requirement (Epic)
User Story Number   User Story / Task   Story Points   Priority
Team Members**

Sprint-1   Registration

USN-1   As a user, First I must register for IBM cloud   3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-1   Collecting the datasets

USN-2   As a user, I must collect and download the datasets   3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-1   Image Preprocessing

USN-3   After collecting the datasets, Image Preprocessing must be done.   2   Medium
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-1

USN-4   After image preprocessing, user has to build the model   2   Medium
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-2   Model Building & testing

USN-5   As a user, I have to develop a code for this model building and I have to build a model
     3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-2

USN-6   After model building, I have to create an application for the end users
3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-2

USN-7   As a user, I have to Create a folder which contains all the necessary html, css,js and python
coding files   2   Medium
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-3   Application building

Sprint-3

USN-8   Create HTML pages to design the front-end part of the web page 3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-3

USN-9   Create the flask application and loading the model file   3   High

Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-3
USN-10   Link the flask file with html files   3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

Sprint-4   **Cloud integration**

Sprint-4
USN-11   Train the model on Cloud   3   High
Niranjan Kumar S, Mrudhula M S, Ragavi M, Sandeep R

6.2 **Sprint Delivery Schedule**

Sprint	Total Story Points	Duration	Sprint Start Date (Planned)	Sprint End Date	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	**20**	**6 Days**	24 Oct 2022	29 Oct 2022	**20**	**29 Oct 2022**
Sprint-2	**20**	**6 Days**	31 Oct 2022	05 Nov 2022	**20**	05 Nov 2022
Sprint-3	**20**	**6 Days**	07 Nov 2022	12 Nov 2022	**20**	12 Nov 2022
Sprint-4	**20**	**6 Days**	14 Nov 2022	19 Nov 2022	**20**	19 Nov 2022

6.3 Reports from JIRA
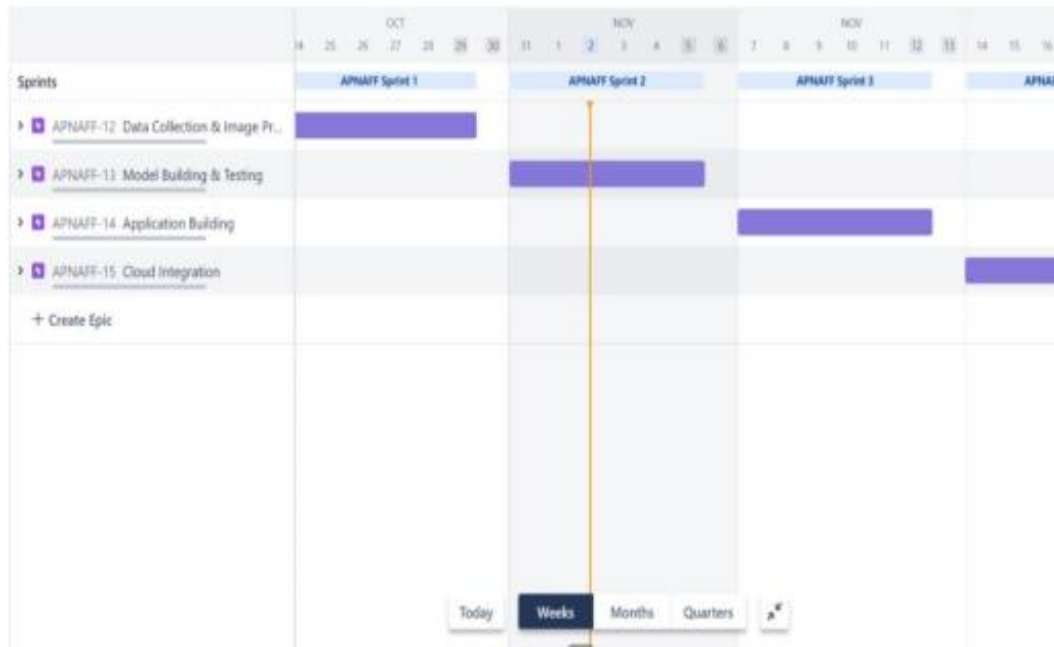
7. CODING & SOLUTIONING

7.1. **Feature 1**

●   AI-powered Nutrition Analyzer for Fitness Enthusiasts
●   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 analyzes the image and detects the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

●   Languages   :   Python
●   Tools/IDE   :   Google collaboratory, Spyder
●   Libraries   :   Recommendation

```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our application. #request-for accessing
file which was uploaded by the user on our application. import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import load_model#to load our trained model from
tensorflow.keras.preprocessing import image
import requests
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') @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
launches():
if request.methods=='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
index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']
result=str (index[pred [0]]) x=result
print(x) result=nutrition(result) print(result)
return render_template("0.html", showcase=(result)) import http.client
conn = http.client.HTTPSConnection("calorieninjas.p.rapidapi.com") headers = {
'X-RapidAPI-Key': "e5805fbf62mshf8d7308c0600c2dp197087jsn93407e3cce35",
'X-RapidAPI-Host': "calorieninjas.p.rapidapi.com"
```

```
}
conn.request("GET", "/v1/nutrition?query=Pineapple", headers=headers) res = conn.getresponse()
data = res.read() print(data.decode("utf-8")) import requests
url = "https://calorieninjas.p.rapidapi.com/v1/nutrition" querystring = {"query":"Pineapple"}
headers = {
"X-RapidAPI-Key": "e5805fbf62mshf8d7308c0600c2dp197087jsn93407e3cce35", "X-RapidAPI-Host":
"calorieninjas.p.rapidapi.com"
}
response = requests.request("GET", url, headers=headers, params=querystring print(response.text)
if   name        == "   main    ": # running the app
app.run(debug=False)
```

7.1. Feature 2

home.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://img.freepik.com/free-photo/top-view-healthy-balanced-vegetarian-
food_1150-370 background-size: cover;
background-repeat: no-repeat; background-attachment: fixed; background-size: 100% 100% ;
}
.bar
{
margin: 0px; padding:5px;
background-color: #c0df84; color:black;
font-family:'Roboto',sans-serif; font-style: italic;
border-radius:20px; font-size:25px;
text-align:center; width: 400px;
```

```css
}
h3
{
margin: 0px; padding:5px;
background-color:#c0df84; width: 400px; color:#00000;
font-family:'Roboto',sans-serif; font-style: italic;
border-radius:20px; font-size:15px;
}
a
{
color:#c0df84; float:center;
text-decoration:none; font-style:normal; padding-right:20px;
}
a:hover{
background-color:black; color:white;
border-radius:15px;0
font-size:30px; padding-left:10px;
}
.div1{
background-color: lightgrey; width: 500px;
border: 10px solid peach; padding: 20px;
margin: 20px; height: 500px;
}
.header {position: relative;
}
.topnav { overflow: hidden;
top:0; margin:0px; z-index: 1; left: 0px; right: 0px;
position: fixed;
background-color: #8B008B ; color: white;
box-shadow: 0px 8px 4px grey; overflow: hidden;
padding-left:20px;
font-family: 'Josefin Sans' font-size: 2px;
width: 100%; height:8%;
text-align: center;
background-color: #FCAD98;
}

.topnav-right a { float: left; color: black;
text-align: center;
padding: 14px 16px; text-decoration: none; font-size: 10px;
}

.topnav-right a:hover { background-color: #FF69B4; color: black;
}
```

```
.topnav-right a.active { background-color: #DA70D6; color: black;
}

.topnav-right { float: right;
padding-right:100px;
}
</style>
</head>
<body>

<! --Brian Tracy-->

<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black;  padding-top:1%;  padding-
left:5%;"> Nutrition Image Analysis</div>
<div class="topnav-right"style="padding-top:0.5%;">

<a class="active" href="{{ url_for('home')}}">Home</a>
<a href="{{ url_for('image1')}}">Classify</a>
</div>
</div>
</div>
<br>
<h1>
<center>
<h3>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. It ensures compliance
with trade and food laws.</h3>

</center>
</h1>
</body>
</html>
```

image.html

```html
<div style="float:left">

<h5><font color="black" size="3" font-family="sans-serif">
<b>Upload image to classify</b></font></h5><br><br>

<div>
<form id="upload-file" method="post" enctype="multipart/form-data">
<label for="imageUpload" class="upload-label"> Choose...
</label>
<input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
</form>

<center> <div class="image-section" style="display:none;">
<div class="img-preview">
<div id="imagePreview">
</div></center>
</div>
<center><div>
<button type="button" class="btn btn-primary btn-lg " id="btn-predict">Classify</button>
</center></div>
</div>

<div class="loader" style="display:none;margin-left: 450px;"></div>

<h3 id="result">

<span><p style="padding-top: 25px;"><h4>Food Classified is : <h4><b><u>{{showcase}}
</h3>
</div>
</div>
```

ImagePrediction.html

```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>Predict</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">
```

```html
</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://i.pinimg.com/originals/be/21/1a
/be211ad5043a8d05757a3538bdd8f450.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:15px;
}
a
{
color:grey; float:right;
text-decoration:none; font-style:normal; padding-right:20px;
}
a:hover{
background-color:black; color:white;
border-radius:15px;0 font-size:30px; padding-left:10px;
}
.div1{
background-color: lightgrey; width: 500px;
border: 10px solid peach; padding: 20px;
margin: 20px; height: 500px;
}

.header {
position: relative; top:0; margin:0px; z-index: 1; left: 0px;
}
.topnav { overflow: hidden;

right: 0px; position: fixed;
background-color: #8B008B ; color: white;
box-shadow: 0px 8px 4px grey; overflow: hidden;
padding-left:20px;
font-family: 'Josefin Sans'; font-size: 2vw;
width: 100%; height:8%;
text-align: center;
```

```
background-color: #FCAD98;
}

.topnav-right a { float: left; color: black;
text-align: center; padding: 14px 16px; text-decoration: none; font-size: 18px;
}

.topnav-right a:hover { background-color: #FF69B4; color: black;
}

.topnav-right a.active { background-color: #DA70D6; color: black;
}

.topnav-right { float: right;
padding-right:100px;
}
</style>
</head>
<body>
<div class="header">
<div    style="width:50%;float:left;font-size:2vw;text-align:left;color:black;    padding-top:1%;padding-
left:5%;"> Nutrition
<div class="topnav-right"style="padding-top:0.5%;">

<a href="{{ url_for('home')}}">Home</a>
<a class="active" href="{{ url_for('image1')}}">Classify</a>
</div>
</div>
<br>

</div>
<div class="container">
<center>
<div id="content" style="margin-top:2em"></div></center>
</div>
</body>

<footer>
<script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>
</html>
```

index.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 -->
<div class="results">
<p style="padding-top: 150px; color:blue;"><h4 style="color:blue;">Food Classified is: <h4><b><h4
style="color:red;"><u>{{showcase1}}<h4><br><h4 style="color:red;"><u>{{showcase}}<h4></p>

</div></div>
</body>
</html>
```

8. TESTING

import numpy as np
from tensorflow.keras.models import load_model from tensorflow.keras.preprocessing import image
model=load_model('train.h5')   model=load_model('dataset.h5')   model=load_model('nutrition.h5')
img=image.load_img(r"/content/drive/MyDrive
/CNN/Dataset/TEST_SET/PINEAPPLE/125_100.jpg")
Img

img=image.load_img(r"/content/drive/MyDrive
/CNN/Dataset/TEST_SET/PINEAPPLE/125_100.jpg", target_size=(64,64))
Img

```
x=image.img_to_array(img) x
array([[[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],
...,


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
```

```
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]]]], dtype=float32)
x=np.expand_dims(x,axis=0)
[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]],


[[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.],
...,
[255., 255., 255.],
[255., 255., 255.],
[255., 255., 255.]]]], dtype=float32)
pred = model.predict pred
array
([[0.25227112, 0.17414774, 0.15219809, 0.20493415, 0.21644896],
[0.26760292, 0.1759095 , 0.15206912, 0.19424875, 0.21016978],
[0.26474723, 0.165203 , 0.14452063, 0.20434381, 0.2211853 ],
...,
```

[0.24550524, 0.1721549 , 0.16282505, 0.21065485, 0.20885986],
[0.25395462, 0.1735253 , 0.16055605, 0.20655352, 0.20541045],
[0.24495909, 0.15889102, 0.16927534, 0.20705006, 0.21982446]],
dtype=float32
<bound method Model.predict of <keras.engine. sequential.Sequential object at 0x7f94abfd7c10>>
predict_x=model.predict(x_test)

classes_x=np.argmax(predict_x,axis=1) classes_x
array([0, 0, 0, ..., 0, 0, 0])
x_test.class_indices index=['APPLE','BANANA','ORANGE','WATERMELON','PINEAPPLE']
result=str(index[classes_x[0]]) result
'Pineapple'

8.1 **TEST CASES**
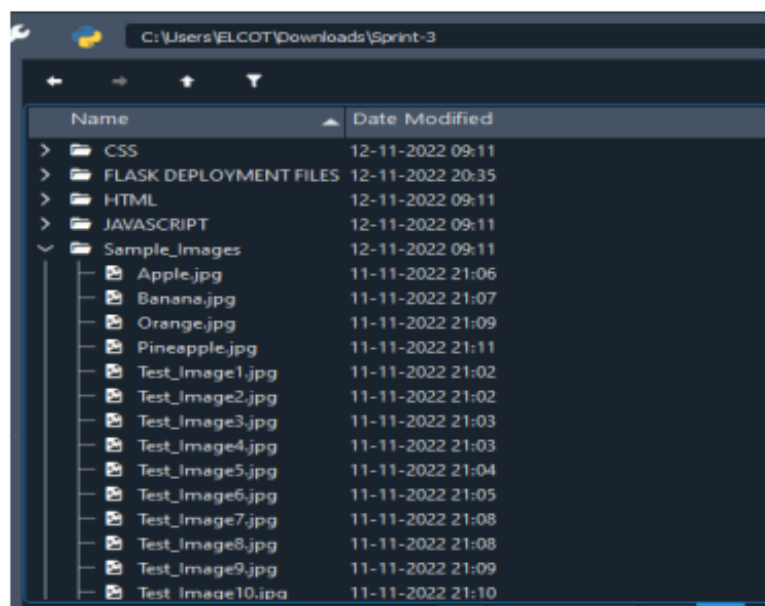
USER ACCEPTANCE TESTING:

APPLE   BANANA   ORANGE   PINEAPPLE   WATERMELON   TEST_IMAGE1

TEST_IMAGE2   TEST_IMAGE3   TEST_IMAGE4   TEST_IMAGE5   TEST_IMAGE6

PERFORMANCE TESTING:

Epoch 1/10
110/110 [==============================] - 27s 242ms/step - loss: 0.4205 - accuracy: 0.8861
-       val_loss: 48.9065 - val_accuracy: 0.1488 Epoch 2/10
110/110 [==============================] - 27s 245ms/step - loss: 0.0082 - accuracy: 0.9989
-       val_loss: 62.1670 - val_accuracy: 0.1280 Epoch 3/10
110/110 [==============================] - 28s 255ms/step - loss: 0.0014 - accuracy: 1.0000
-       val_loss: 66.6759 - val_accuracy: 0.1488 Epoch 4/10
110/110 [==============================] - 27s 242ms/step - loss: 3.3364e-04 - accuracy:
1.0000 - val_loss: 70.6794 - val_accuracy: 0.1488 Epoch 5/10
110/110 [==============================] - 27s 248ms/step - loss: 1.9990e-04 - accuracy:
1.0000 - val_loss: 74.1865 - val_accuracy: 0.1488 Epoch 6/10
110/110 [==============================] - 26s 236ms/step - loss: 4.5090e-04 - accuracy:
1.0000 - val_loss: 75.5190 - val_accuracy: 0.1308 Epoch 7/10
110/110 [==============================] - 27s 248ms/step - loss: 1.0600e-04 - accuracy:
1.0000 - val_loss: 78.4789 - val_accuracy: 0.1488 Epoch 8/10
110/110 [==============================] - 26s 237ms/step - loss: 7.9529e-05 - accuracy:
1.0000 - val_loss: 80.7918 - val_accuracy: 0.1403 Epoch 9/10
110/110 [==============================] - 26s 236ms/step - loss: 9.2201e-05 - accuracy:
1.0000 - val_loss: 80.3610 - val_accuracy: 0.1431 Epoch 10/10
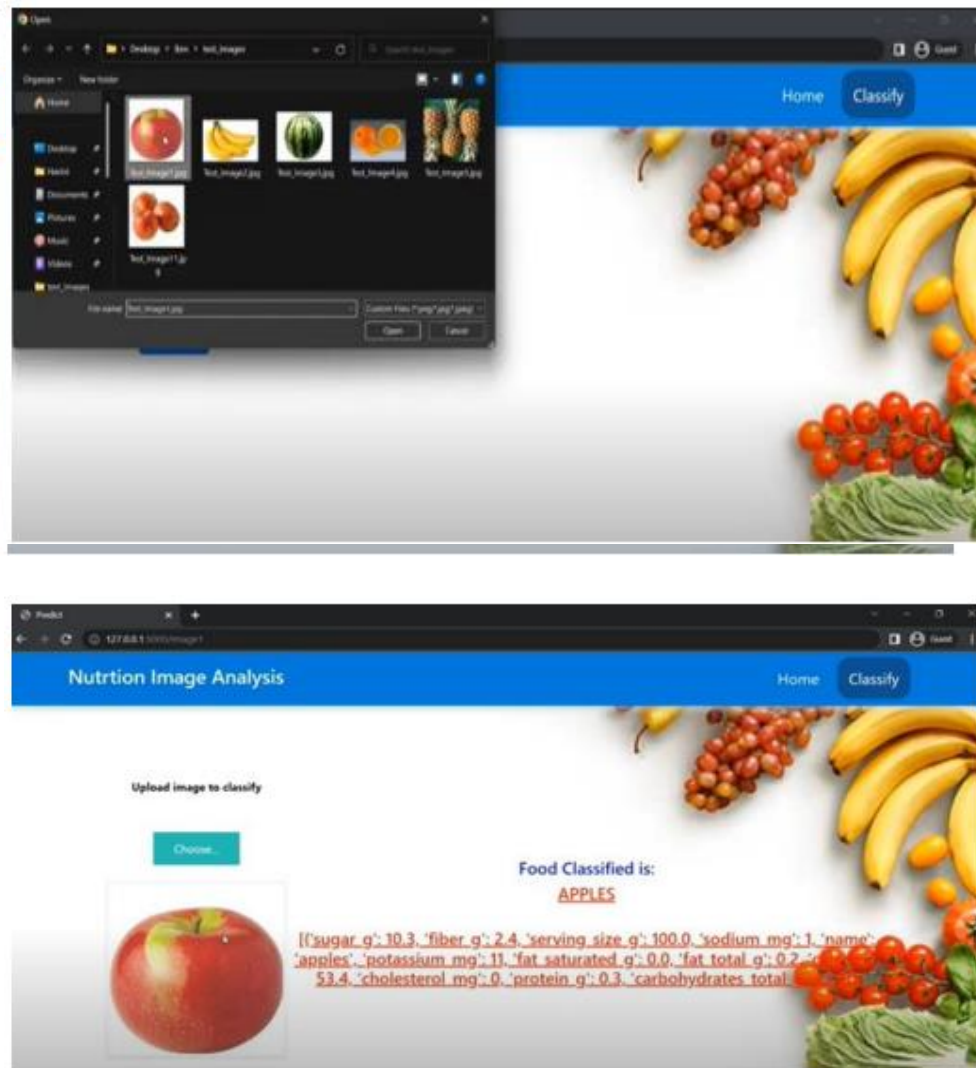110/110 [==============================] - 29s 266ms/step - loss: 9.1324e-05 - accuracy:
1.0000 - val_loss: 83.0943 - val_accuracy: 0.1393
<keras.callbacks.History at 0x7fbcb5cb4b10>

9.   RESULTS:

9.1 Performance Metrics

10.   ADVANTAGES AND DISADVANTAGES

Advantages:

➤ Food and food habits are ever-changing and evolving. People and professionals need to quickly adapt to new food products, diets, and changing preferences. The best way to instantly adapt to these changes is to have software that changes and adapts with you.

➤ Using automated nutrition analysis software will allow you to free up more time to innovate or grow your business. If you find a nutrition analysis software that has all the features you need, you can create much more time to focus on improving your business.

➤ Features such as a quick preview of nutrients while adding foods to diets, menus, and recipes give you the ability to save time when new recipes and food products are introduced.

➤ Having quick and easy software to help them plan their meals will save you tons of time.

Disadvantages:

➤ This methodology is still limited by its dependency on time-consuming and error-prone manual video annotations, with many studies resorting to the use of multiple human annotators.

➤ Often suffers from reliability issues.

➤ It is extremely expensive due to the semantics analysis model and nutritional analysis model.

➤ In order to make recommendations, the system needs to collect nutritional needs from users. Most of the information is only provided through

continuous interactions with users. However, in reality, recording nutritional intake from users cannot avoid faults because users usually forget or give wrong information about the foods they have consumed.

➤ Moreover deep learning requires expensive GUIs and hundreds of machines.

This increases the cost to the users.

11.   CONCLUSION

Food is essential for human life and has been the concern of many health care

conventions. In this project we have built a nutrition analysis model that classifies the nutritional content of the food through the image uploaded by the user. Such Nutritional analysis helps people understand their daily eating habits, exploring nutrition patterns and maintaining a healthy diet. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The nutritional analysis model is implemented using a Convolutional neural network and the web application is built and implemented using the Flask framework. As for the future work, the model can be trained and tested on more datasets to provide accurate results and better performance.

12.   FUTURE SCOPE

The future scope of this project is very broad. Few of them are:

●   The model could be trained using a massive database in order to increase the accuracy of results.

●   The Backend framework of the web application can be improved so that the uploaded images can be handled appropriately.

●   In addition to the nutrition analysis, the application can also be designed to provide recipes that can be prepared using the nutrient-rich foods

●   A database can also be implemented for the system so that users can save their data and relook into it later.

●   The Web application can be further developed and launched as an Android

App so that anyone anywhere with or without internet connection can access it and get benefited from its use cases.

13.   APPENDIX

Source Code:

```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our application.
#request-for accessing file which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import load_model#to load our trained model
from tensorflow.keras.preprocessing import image
import requests


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
```

```python
        index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']

        result=str(index[pred[0]])

        x=result
        print(x)
        result=nutrition(result)
        print(result)

        return render_template("0.html", showcase=(result),showcase1=(x))
def nutrition(index):


    url = "https://calorieninjas.p.rapidapi.com/v1/nutrition"

    querystring = {"query":"tomato"}

    headers = {
            "X-RapidAPI-Key": "3829e57930msh3f787ea218e9060p15c5f8jsnea834296388f",
            "X-RapidAPI-Host": "calorieninjas.p.rapidapi.com"
}

    response = requests.request("GET", url, headers=headers, params=querystring)

    print(response.text)
    return response.json()['items']
if __name__ == "__main__":
  # running the app
  app.run(debug=False)
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-12736-1659460414

Project Demo Link:

https://youtu.be/kS_v8ecN_G8