

AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

DOMAIN : ARTIFICIAL INTELLIGENCE

TEAM ID : PNT2022TMID32449

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 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. 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.)

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 forbeing a healthy individual. Knowing and monitoring how much food is consumed during the day, following the calorie and nutrition of these foods helps tocontrol 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 micro-nutrients 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

1. "Approximate Estimation of the Nutrients of Consumed Food by Deep Learning" by İbrahim Berkan Aydılek Published in [2017 International Conference on Computer Science and Engineering \(UBMK\)](#), IEEE, 2017.
2. "Validation of a deep learning system for the full automation of bite and meal duration analysis of experimental meal videos" D Konstantinidis, K Dimitropoulos, B Langlet, P Daras... - *Nutrients*, 2020
3. "Precision Nutrient Management Using Artificial Intelligence Based on Digital Data Collection Framework" by Hsiu-An Lee, Tzu-Ting Huang, Lo-Hsien Yen, Pin-Hua Wu, Kuan-Wen Chen, Hsin-Hua Kung, Chen-Yi Liu and Chien-Yeh Hsu *Appl. Sci.* 2022, 12, 4167
4. "AI Nutrition Recommender System" by Thamos Theodoridis, Vassilios Solachidis, Kosmos Dimitropoulos, Lazaros Gymnopoulos and Petros Daras in the 12th Pervasive Technologies Related to Assistive Environments Conference.

PROBLEM STATEMENT DEFINITION

Food is a necessity for human life and has been addressed in numerous medical conventions. Modern dietary evaluation and nutrition analysis technologies give consumers more possibilities to explore nutrition patterns, comprehend their daily eating habits, and keep up a balanced diet. The biggest challenge for fitness lovers is keeping track of their daily nutrition intake, which is crucial for staying in shape. But with today's busy world and the abundance of internet fitness resources, keeping track of your nutrition will become increasingly difficult and inaccurate. Fitness fanatics typically stick to their diet programmers, but they have trouble keeping track of the food's nutritional value. Fruits are easily digestible since they are high in vitamins, fiber, and minerals, but eating too much of them can cause weight gain and even diabetes because fruit contains natural sugar. Fitness aficionados eat a diet high in fruits, vegetables, foods high in protein, and low in carbohydrates. However, it is difficult to identify and keep track of the nutritional components of unknown foods, such as fiber, protein, and nutrition.

I am (USER)

User has to upload the food (fruits and vegetables) image to know the healthy content.

I am Trying To

Instead of waiting for a diet expert, users may acquire dietary specifics through this application.

But

This might be the result of a human error, such as a lack of quality control, poor customer service, or even a lack to provide healthy suggestions.

Because

It is hard, and there is a delay to know about the food details and also awkward for providing our healthy facts.

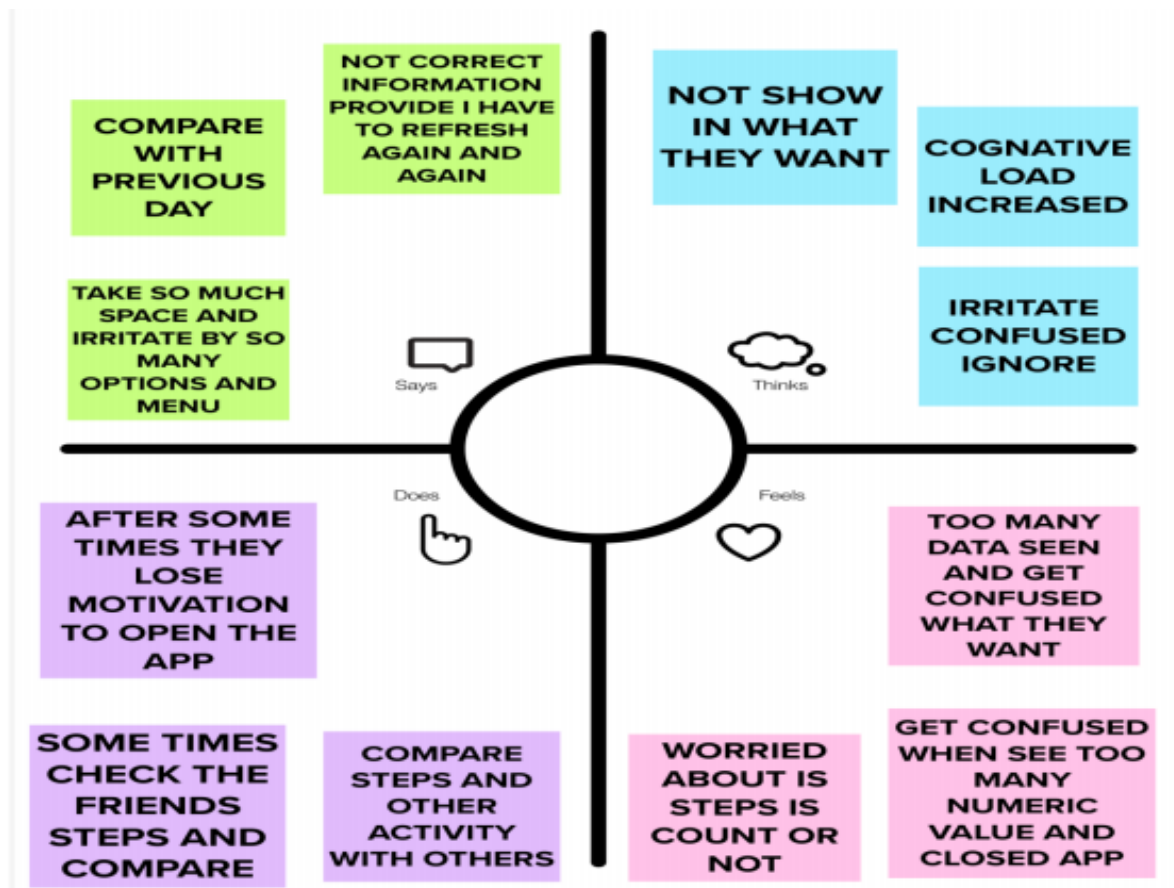
Which makes me feel?

Deep learning algorithms may assist to address these challenges by automating nutrition content assessment. Finally, by analysing the nutritional components in the images, compute the calories, fat, carbs, and protein amounts to give a dietary evaluation report.



Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's It is a useful tool to helps teams better understand their users.Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



Problem-Solution Fit

1. Customers Segment: Fitness enthusiasts are our customers. The people interested in maintaining fitness are of different age groups so it is suitable for all age groups

2. Problems/ Pains: The problem occurs when the model doesn't identify the image and doesn't display the accurate nutritional value

3. Triggers: By getting awareness to maintain their body fit. Seeing their neighbour using this to maintain balanced diet. Through internet, by seeing the feedback of others.

4. Emotions: BEFORE: Eating lot of food leads to many health issues. So they worry about their health, they become anxiety and fear. AFTER: Customer feels motivated while using this model to live a healthy life. So they will be happy

5. Available solution: Available solution takes lot of time in identifying the image. But this model identifies the image accurately in minimum amount of time.

6. Customer Constraints: Customer may feel lazy to check the nutritional value everytime. Less awareness about their health.

7. Behaviour: Directly related: They may stop using the model. Indirectly related: customer verify the nutritional value with well known person.

8. Channels of behaviour:

Online:

User get all the nutritional values at one place. Time consuming is less. Easy process to maintain balanced diet.

Offline:

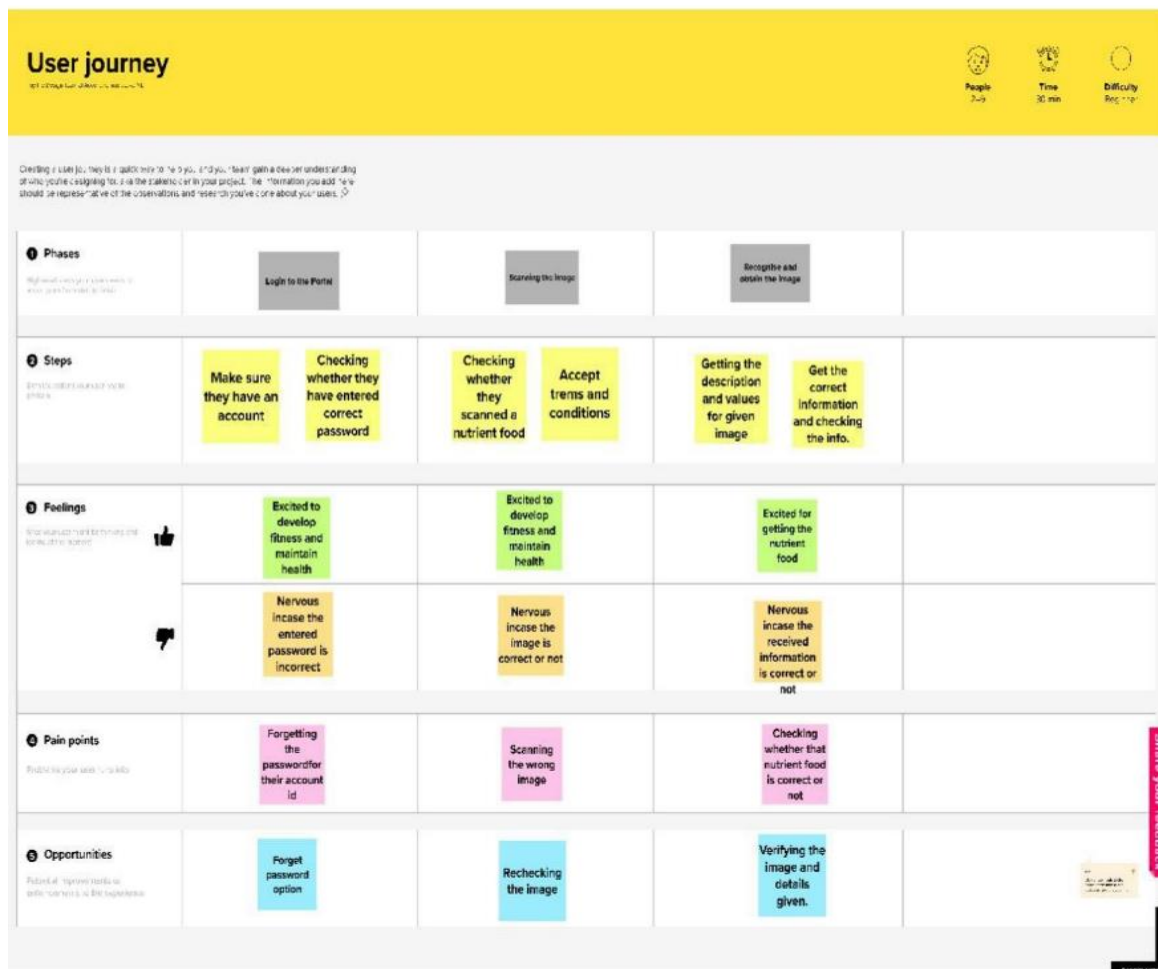
Customer need to go to doctor to maintain balanced diet. It takes time to check each nutritional values.

9. Problem Root Cause: User may feel lazy to check the nutritional value everytime. They may think whether the nutritional values are accurate. They may think it will be time taking process

10. Your Solutions:

Existing solution takes time to identify the image. But this model takes less time than the existing one. It will also display the benefit of eating that fruit.

CUSTOMER JOURNEY:



REQUIREMENT ANALYSIS

Functional Requirement

Functional Requirements

Upload Image

In this module, upload the nutrition datasets in the form of CSV file format. In addition, the data is saved in a database for future use. Fruits and vegetables calorie, protein, fat, carbohydrate, vitamin, and cholesterol values are included in the dataset. These values are taken from the Kaggle website and saved as integer values.

Filtering Noise

Filter techniques are used to remove noise in images in order to evaluate nutrients based on the fruits or vegetables. The filter's objective is to remove noise from photos. It is supported by a statistical methodology. The usual frequency response of a filter is built. Filtering is a nonlinear image processing technique used to minimise "salt and pepper" noise. When edge preservation and noise reduction are concerns, a median filter is superior to convolution.

Classification

The food image uploaded from the user end will be compared with the food items in the system database for the features obtained in the feature extraction step. The specific food item will be recognised when the perfect match is obtained based on the attributes matched. The name of the detected food item and the nutrition details will be displayed over the food.

Nutrition Detection

The request for an insurance claim can be viewed and approved by the insurance company. Once the damaged image has been uploaded and the degree of the damage has been determined, the user may receive insurance only if the firm accepts the damaged image and the condition is greater than 80%.¹³

Non - Functional Requirements

Usability

The system shall allow the users to access the system with pc using web application.

The system uses a web application as an interface. The system is user friendly which makes the system easy

Availability

The system is available 100% for the user and is used 24 hrs a day and 365 days a year. The system shall be operational 24 hours a day and 7 days a week.

Scalability

Scalability is the measure of a system's ability to increase or decrease in performance

and cost in response to changes in application and system processing demands.

Security

A security requirement is a statement of needed security functionality that ensures one of many different security properties of software is being satisfied.

Performance

The information is refreshed depending upon whether some updates have occurred or not in the application. The system shall respond to the member in not less than two seconds from the time of the request submittal. The system shall be allowed to take more time when doing large processing jobs. Responses to view information shall take no longer than 5 seconds to appear on the screen.

Reliability

The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete data. The system will run 7 days a week. 24 hours a day.

Technical and Solution Architecture

Technical Architecture:

ABSTRACT :

- The main aim of the project is to building 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 the trained model. The model analyses the image and detect 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 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.
- 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, replenish 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.

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, replenish 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

FUNCTIONAL REQUIREMENT:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Dashboard and food logging	User will find information such as food intake, progress in achieving fitness goals and various nutritional and healthy eating tips.
FR-4	Integration with fitness trackers	Feature for integration of wearables or fitness trackers.
FR -5	Push notifications	An important element of any mobile app must utilize it for health and diet app development

NON_FUNCTIONAL REQUIREMENT:

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The app will be user-friendly and provide accurate results
NFR-2	Security	Nutrition app allow users to monitor their physical activity which leads to maintain a proper healthy diet
NFR-3	Reliability	Home-based fitness assessments using x app were reliable and feasible in young and healthy adults
NFR-4	Performance	The app will increase the high performance
NFR-5	Availability	The property of an application is there and ready to carry out its task when you need it to be
NFR-6	Scalability	The model developed using multiple datasets which will be useful for future enhancement, however it improves scalability

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

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.

2. Idea / Solution description

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

Instead of searching information, The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

4. Social Impact / Customer

Satisfaction Nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.

5. Business Model (Revenue Model)

It is cost-efficiency but also it provides best results.

6. Scalability of the Solution

This model can be expanded to include more attributes for more accurate detection. Training the model with even more attributes will increase the efficiency further.

PROJECT PLANNING & SCHEDULING

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	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	5	High	Umavathi
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	4	High	Sowmiya
Sprint-1		USN-3	As a user, I can register for the application through Gmail	5	Medium	Sneha
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	5	High	Umavathi Sowmiya
Sprint-1	Dashboard	USN-5	As a user I can access the dashboard able to see options to view contents chart, select diet plans, and exercise	5	High	Vinishika

Sprint-2		USN-6	As a user I can see my profile	4	Medium	Sneha
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Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3		USN-7	As a user I can update my profile	3	Low	Vinishika
Sprint-2		USN-8	As a user I can change my password	4	Medium	Sneha
Sprint-1	Service Request	USN-9	As a user I can request to display nutrition content of food items	5	High	Umavathi Sowmiya
Sprint-2		USN-10	As a user I can request to suggest a diet plan according to my medical details	4	High	Umavathi
Sprint-2		USN-11	As a user I can request to suggest exercise routines according to my medical details	4	Medium	Vinishika
Sprint-3	Notification	USN-12	track the status of diet targets through a dashboard or email services	3	Low	Sneha
Sprint-3		USN-13	As a user get an email about revised exercise routines based on recent records.	3	Medium	Sowmiya
Sprint-1		USN-14	A user noticed after successfully achieved the target workout	5	High	Umavathi
Sprint-3		USN-15	Upload Progress Reports	3	Low	Vinishika
Sprint-4		USN-16	Making UI more interactive	2	Low	Sneha
Sprint-2		USN-17	As a user I give feedback	4	High	Umavathi



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

[Share template feedback](#)



Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#)



Define your problem statement

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, improving 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.

PROBLEM

How might we [your problem statement]?



Key rules of brainstorming

To run a smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Sneha

DIET	HEALTHY DIET	BODY WEIGHT
EXERCISE	FATS	ENERGY
FRUITS	VEGETABLES	FIBRE
CORRECT NUTRITION	OVERWEIGHT	UNDER WEIGHT

Sowmiya

EXERCISE	HEALTHY DIET	CALORIES
EXERCISE	HEALTHY DIET	CALORIES
EXERCISE	HEALTHY DIET	CALORIES
EXERCISE	HEALTHY DIET	CALORIES

Umavathi

HEALTHY DIET	NUTRITIONAL RATIO	EXERCISE
SPORTS	AGE	HEIGHT
ACTIVITY	DEFICIENCY	REGULAR SLEEPING
GENDER	AVOID JUNK FOODS	ENOUGH SLEEPING

Vinisha

NOTIFY FOODS	HEALTHY DIET	HEALTHY FOODS
HEALTHY DIET	FITNESS	FOODTIMES
DEFICIENCY REMINDER	REGULAR FOODCYCLE	EXERCISE
FOODS VARIATION	CALORIES COUNTER	SCHEDULED FOODS



4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⌚ 20 minutes

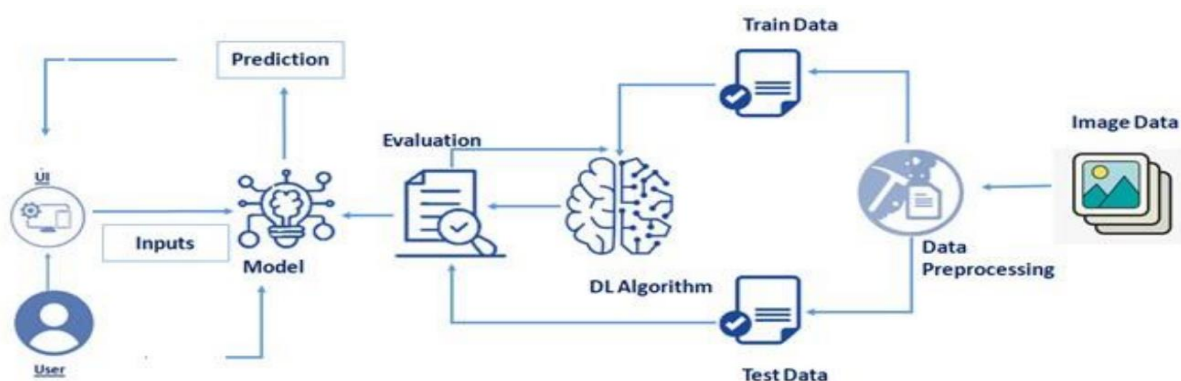


Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



Problem-Solution fit canvas 2.0

Purpose / VisionProject Title : AI powered nutrition analyzer for fitness enthusiasts

Team ID : PNT2022TMD32449

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <small>Who is your customer? I.e. working parents of 0-5 y.o. kids</small> A person from the age of 18 to 50 years old.	CS	6. CUSTOMER CONSTRAINTS <small>What constraints prevent your customers from taking action or limit their choices of solutions? I.e. spending power, budget, no cash, network connection, available devices.</small> People who are stressed. People who want to improve their physical well-being. People who want to look and feel younger. People who want to boost their energy levels. Then customer takes nutrition foods.	CC	5. AVAILABLE SOLUTIONS <small>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? I.e. pen and paper is an alternative to digital notetaking</small> 1. Keep your daily calorie intake to a reasonable amount 2. Enjoy your food but eat less. 3. Keep portion sizes of food to a reasonable and recommended amount.	AS
	2. JOBS-TO-BE-DONE / PROBLEMS <small>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</small> To detect the nutrient food for fitness enthusiasts To analyse the nutrition food values and suggestions for fitness.	J&P	9. PROBLEM ROOT CAUSE <small>What is the real reason that this problem exists? What is the back story behind the need to do this job? I.e. customers have to do it because of the change in regulations.</small> • cancer. • liver disease. • conditions that cause nausea or make it difficult to eat or swallow. • taking medications that make eating difficult — due to nausea, for example.	RC	7. BEHAVIOUR <small>What does your customer do to address the problem and get the job done? I.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (I.e. Greenpeace)</small> Nutritional behavior is "the sum of all planned, spontaneous, or habitual actions of individuals or social groups to produce, prepare, and consume food as well as those actions related to storage and clearance."	BE
Identify strong TR & EM	3. TRIGGERS <small>What triggers customers to act? I.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</small> Health and fitness enthusiasts are people passionate about fitness and health.	TR	10. YOUR SOLUTION <small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small> You can improve your health by keeping a balanced diet. You should eat foods that contain vitamins and minerals. This includes fruits, vegetables, whole grains, dairy, and a source of protein.	SL	8. CHANNELS of BEHAVIOUR 8.1 ONLINE <small>What kind of actions do customers take online? Extract online channels from #7</small> Search for nutrition food channels.	CH
	4. EMOTIONS: BEFORE / AFTER <small>How do customers feel when they face a problem or a job and afterwards? I.e. lost, insecure > confident, in control - use it in your communication strategy & design.</small> Fitness can also heighten existing emotions, and may leave you feeling more stressed out than before you started.	EM			8.2 OFFLINE <small>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</small> Visit the best Nutritionists doctors to develop their fitness.	

Dataset	01-04-2021 11:11 AM
TEST_SET	01-04-2021 04:11 PM
TRAIN_SET	01-04-2021 04:11 PM
Flask	05-04-2021 01:37 PM
Sample_Images	01-04-2021 04:13 PM
static	02-04-2021 12:05 PM
templates	05-04-2021 01:34 PM
uploads	05-04-2021 01:23 PM
app.py	05-04-2021 01:23 PM
nutrition.h5	02-04-2021 12:04 PM
requirements.txt	09-03-2021 12:34 PM
training	02-04-2021 12:09 PM

CODING & SOLUTIONING

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 analyses the image and detect 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': "8wdA1tu4H2yjZwE7U_RYBa35UPCTBCglPbe_mXAvQnYx",
'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': "8wdA1tu4H2yjZwE7U_RYBa35UPCTBCglPbe_mXAvQnYx",
'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)

```

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_1150-37023.jpg?size=626&ext=jpg&ga=GA1.2.563514689.1667968826");
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;
}
h3
{
margin: 0px;
padding:5px;
background-color:#c0df84;
width: 400px;
color:#000000;
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;
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;
}
.topnav {
overflow: hidden;
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>
```

[illegible]

image.html

```
<div style="float:left"><br>
<br>
<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 }} {{ showcase1 }}</p> </span>
</h3>
</div>
</div>
```

ImagePrediction.html

```
!DOCTYPE html>
<html><head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
```



```
<meta http-equiv="X-UA-Compatible" content="ie=edge">
<title>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">
</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;
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;
```

```

}
.topnav {
overflow: hidden;
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%;">Nutrtion Image Analysis</div>
<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>

```

0.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>
```

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']

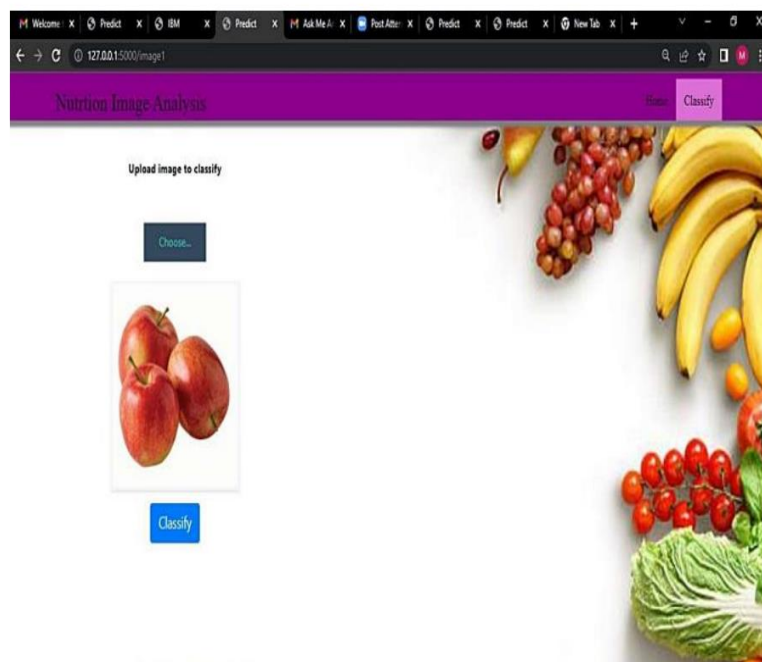
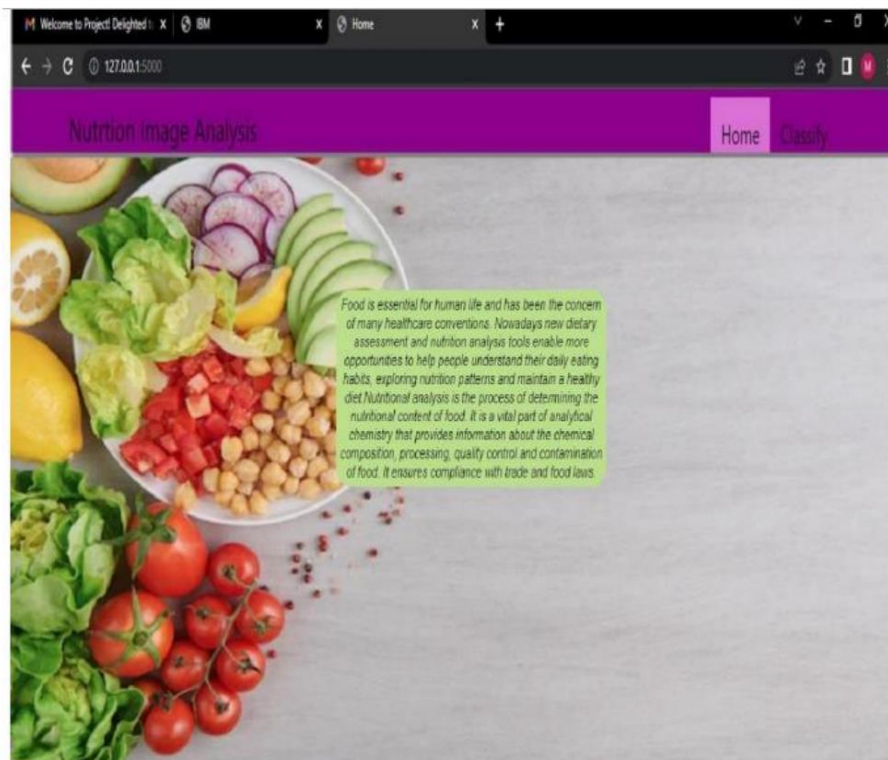
```

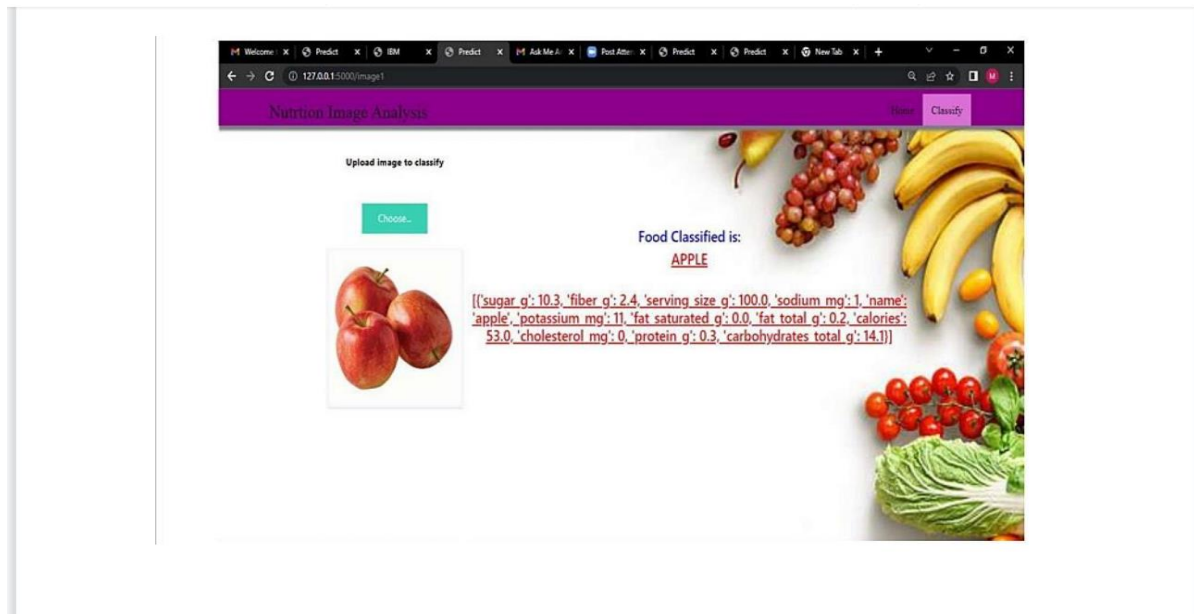
```
result=str(index[classes_x[0]])
```

```
result
```

```
'Pineapple'
```

RESULTS:





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 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 food they have consumed.

➤ Moreover deep learning requires expensive GUIs and hundreds of machines. This increases the cost to the users.

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

FUTURE SCOPE

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

- The model could be trained using vast 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.

.

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')
@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.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
        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": "8wdA1tu4H2yjZwE7U_RYBa35UPCTBCglPbe_mXAvQnYx"
    "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)
```