DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IBM

PROJECT TITLE

AI-POWERD NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

(2022-2023)

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AI-powered Nutrition Analyzer for Fitness Enthusiast

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1.INTRODUCTION

1.1 Project Overview

As the world grows more fitness-conscious with passing time, the demand for technological solutions to cater to this burgeoning demand is diversifying. Lately, a number of startup in India and worldwide are using predictive analytics artificial intelligence and natural language processing to help scores of fitness enthusiasts to track and monitor their nutrition and calorie intake.

2.LITERATURE SURVEY

S. No	TITLE AND AUTHOR	YEAR AND PUBLICATIONS	METHODOLOGY	ADVANTAGE	DRAWBACKS
1.	Artificial Intelligence in Nutrients Science Research JaroslawS, Magdalena Suchodols.	**2020** MDPI Publication	Artificial Neural Networks (ANN), Machine Learning (ML), Deep Learning (DP).	Improving predictive models of diet and disease outcomes, to better collecting, processing and understanding complex nutrition related data.	Research creates a very diverse spectrum of problems. Not limited to the field of biomedical sciences.
2.	Nutrition For Exercise in Hot Environment Alan J. McCubbin, Ben Desbrow, Ollie Jay	**2020** Human kinetics publication	Hydration Status Assessment Techniques.	Accuracy and reliability. Can be completed independently by athletes and low cost.	Resources required and long equilibration time and requiring rest.

3.	Prediction of Vitamin Interacting Residues in a Vitamin Binding Protein Using Evolutionary Information Bharat Panwar, Sudheer Gupta.	**2013** BMC Bioinformatics	Prediction of Vitamin -A interacting residues (VAIRs), Analysis of different protein-interacting residues of different vitamin classes.	Able to get all the nutrients you need for a balanced diet.	Dietary supplements are not regulated as strictly as pharmaceutical drugs.
4.	Dietary Fiber, Genetic Variations of Gut Microbiota-derived Short-Chain Fatty Acids, and Bone Health. Mengying Wang, Hao Ma.	**2021** Endocrine SocietyOxford Publications.	Bone Mineral Density (BMD), DualEnergy X-ray Absorptiometry (DXA), Hardy-Weinberg Equilibrium (HWE).	Through interaction with our gut microbes, dietary fiber also influences microbial ecology and enhances the production of key microbial metabolites.	No association was found between dietary fiber intake and all fractures.
5.	AI Based System to Provide Diet Plan for Older Hospitalized Patients. Hussain Quarishi, Mohammed Zaid, Dinesh Choudhary.	**2014** Journal of Emerging Technologies and Innovative Research (JETIR)	By using Python Programmer 3.6 with Related Libraries.	No more taking appointments from the dietician. Less expensive with greater efficiency and correct results.	If in accurate details are given to the system the output generated might be irrelevant to the user shealth condition.
6.	AI – Supported Automated Nutritional Intervention on Glycemic Control in patients with Type-2 Diabetes Mellitus Ayaka Yasugi, Yuko Gondoh.	**2019** Adis Diabetes Ther Publication.	AI Supported Nutrition Therapy. Human Nutrition Therapy.	The mobile phone app used for this study is called Askenand is one of the most popular aps for behaviour change among individuals aspiring to lose weight.	Participants are limited to those who won and use a mobile phone, the results may not be generalized to generations with relatively lower information and communication technology literacy

7.	Validation of a Deep Learning System for the Full Automation of Bite and Meal Duration Analysis of Experimental Meal Videos. Petros Daras,Billy Langlet	**2020** MDPI Publications	Rapid AutomaticBite Detection (RABID).	This is time consuming. RABID achieved perfect agreement between algorithmand human annotations.	However, this methodolog y is time consuming and it is often affected by human errors, limitingits scalability.
8.	An Ontology to Standardize Research Output of Nutritional Epidemiology. Henry Ambayo,Carl Lachat, Filip Pattyn.	**2019** MDPI Publication	Review and Selection Process onOntologies for Nutritional Epidemiology.	This study introduced a comprehensive ontology for reporting nutritional epidemiologic studies and data.	It requires the contribution of researches working in multiple research area.
9.	Multiomics Approach to Precision Sport Nutrition David C.Nleman	**2021** Frontiors in Nutrition	Collect Individuals Specific Science Based Information.	Physician nutritionrelies are what canbe accurately assessed at the individual level.	Lot the studies are needed that focus on mechanisms underlying metabolic, heterogeneity with deep phenotyping multiaccess and machine learning.
10.	Artifical Intelligence Applications in Nutrition and Diatetics. Izzet Ulker, Feride Ayyildiz.	**2021** Akilli Sistemler ve Uygulamalan Dergisi Publiction	Multiple ComponentMethod (MCM)	The further apps willhelp both in health promotion and monitoring and evaluation of dietaryassessment.	It reflects only foods consumed in a single irregular day and maybe less representativ e of an estimated individuals in take.

2.1 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 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.

2.2 References

1. Artifical Intelligence in Nutrients Science Research JaroslawSak, Magdalena Suchodolska. 2020 MDPI Publication.

2. Nutrition for Exercise in Hot Environment Alan J. McCubbin, Ben Desbrow, Ollie Jay 2020 Human kinetics publication.

3. Prediction of Vitamin Interacting Residues in a Vitamin Binding Protein Using Evolutionary Information Bharat Panwar, Sudheer Gupta. 2013 BMC Bioinformatics.

4. Dietary Fiber, Genetic Variations of Gut Microbiota derived Short Chain Fatty Acids, and BoneHealth. Mengying Wang, Hao Ma. 2021 Endocrine Society Oxford Publications.

5. AI Based System to Provide Diet Plan for Older Hospitalized Patients. Hussain Quarishi, Mohammed Zaid, Dinesh Choudhary. 2014 Journal of Emerging Technologies and Innovative Research (JETIR).

6. AI – Supported Automated Nutritional Intervention on Glycemic Control in patients with Type-2 Diabetes Mellitus Ayaka Yasugi, Yuko Gondoh. 2019 Adis Diabetes Ther Publication.

7. Validation of a Deep Learning System for the Full Automation of Bite and Meal Duration Analysis of Experimental Meal Videos. Petros Daras, Billy Langlet 2020 MDPI Publications.

8. An Ontology to Standardize Research Output of Nutritional Epidemiology. Henry Ambayo, Carl Lachat, Filip Pattyn. 2019 MDPI Publication.

9. Multiomics Approach to Precision Sport Nutrition David C.Nleman 2021 Frontiors in Nutrition

10. Artifical Intelligence Applications in Nutrition and Diatetics. Izzet Ulker, Feride Ayyildiz. 2021 Akilli Sistemler ve Uygulamalan Dergisi Publiction.

2.3 Problem Statement Definition

Food is vital to human existence and has been a topic of discussion at several medical meetings. These days, additional chances exist to assist people in understanding their daily eating habits, examining nutrition patterns, and maintaining a balanced diet thanks to new dietary evaluation and nutrition analysis technologies. The technique of figuring out a food's nutritional makeup is called nutritional analysis. It is an essential component of analytical chemistry that offers details on the chemical makeup, processing, quality assurance, and contamination of food. Building a model that can be used to categorize fruits according to their many attributes, such as color, shape, and texture, is the project's major goal. Here, users may take pictures of various fruits, and the pictures will subsequently be transmitted to a trained model. The model examines the image and determines the nutrients based on fruits such as (Sugar, Fiber, Protein, Calories, etc.)

I am	Describe customer with 3-4 key characteristics - *who are they?*	Describe the customer and their attributes here
I'm trying to	*List their outcome or "job" the care about - what are they trying to achieve?*	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way – *what bothers them most?*	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists – *what needs to be solved?*	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view – *how does it impact them emotionally?*	Describe the emotions the result from experiencing the problems or barriers

Reference:

https://miro.com/app/board/uXjVPRGMeak=/

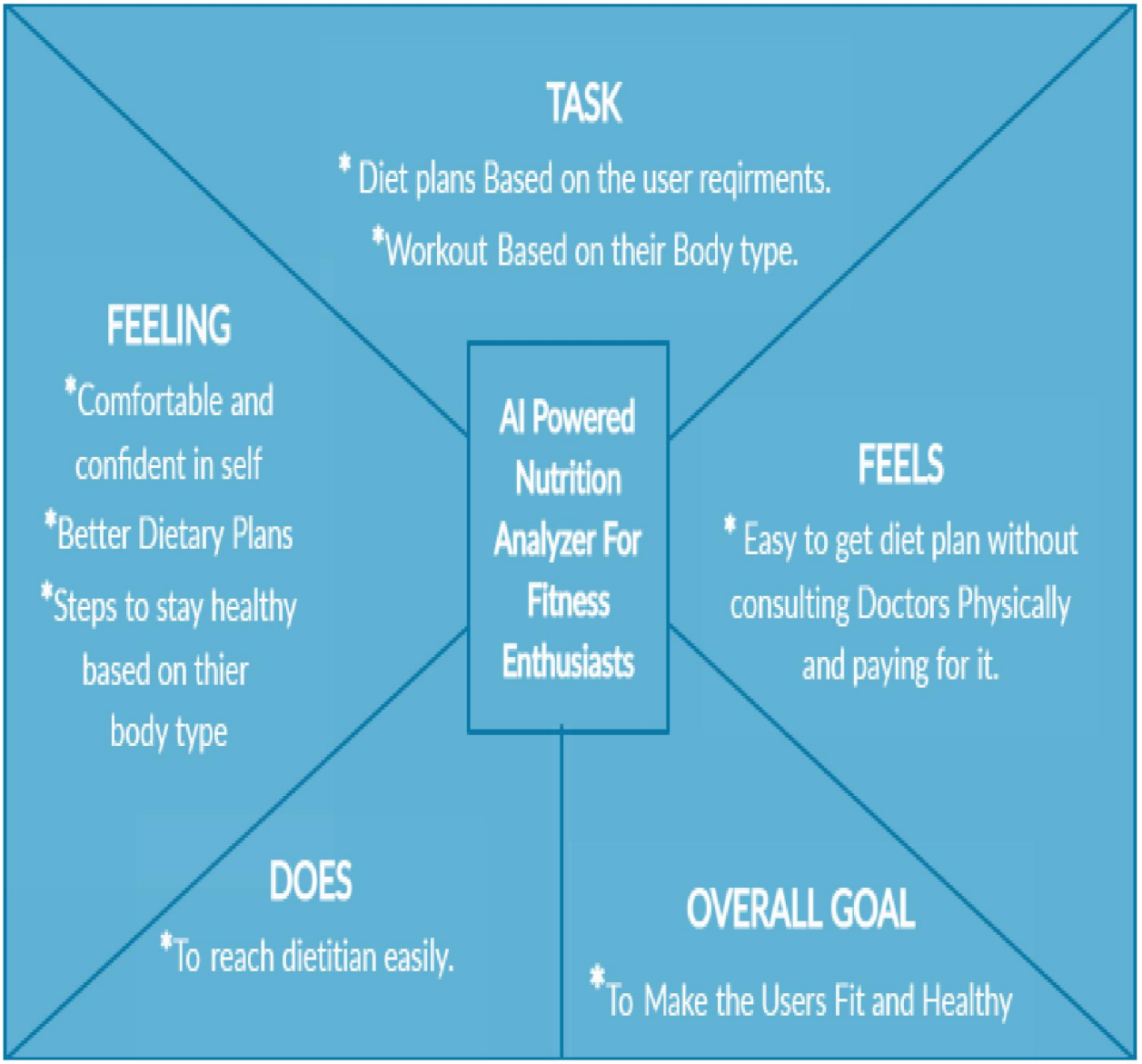
EXAMPLE

Problem Statement (PS)	**am (Customer)**	**I'm trying to**	**But**	**because**	**Which makes me feel**
PS-1	Fitness Advice	Maintain fitness and health	Not able to maintain the health	Can't find and follow the right food	Angry and depressed
PS-2	Food recommendation	Analyze the food quality	It leads to complex on manual process	It takes more time and inaccuracy	Health issues

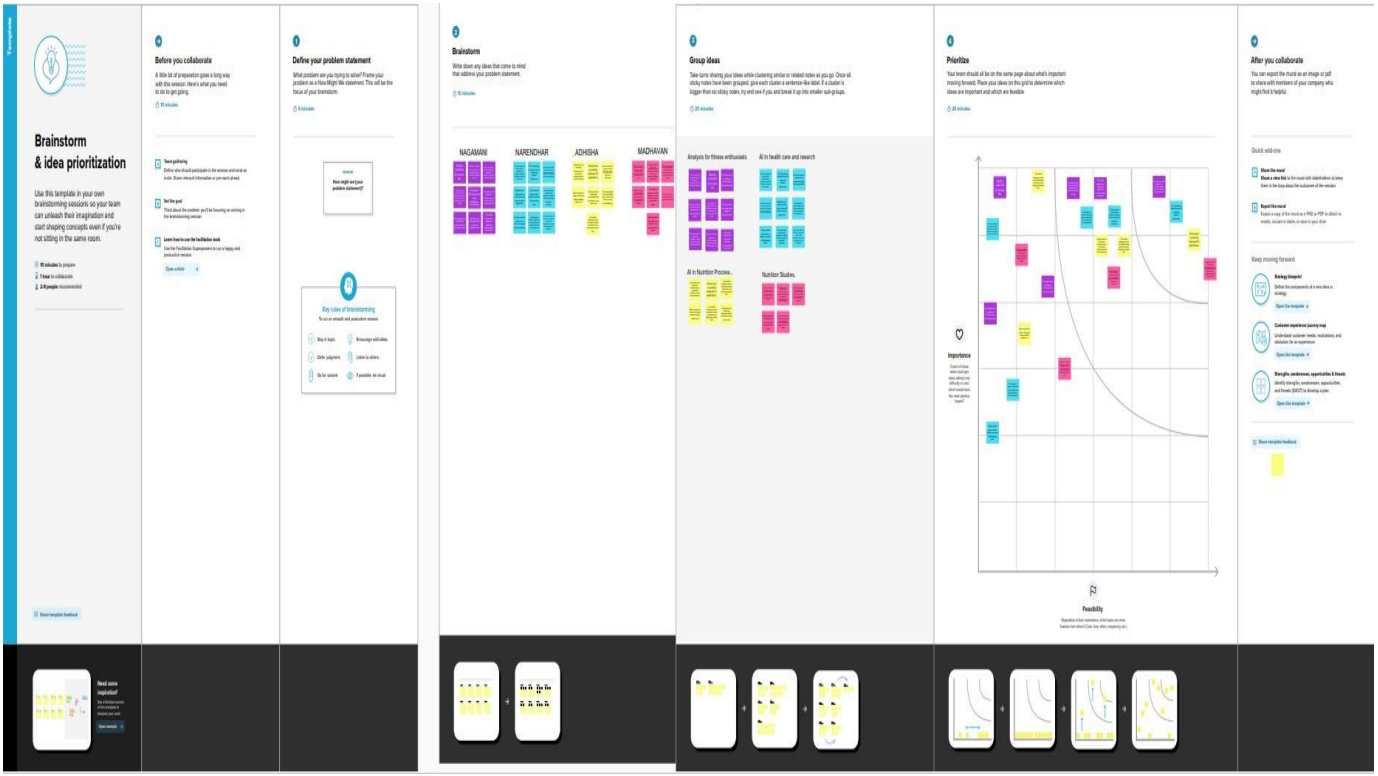
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

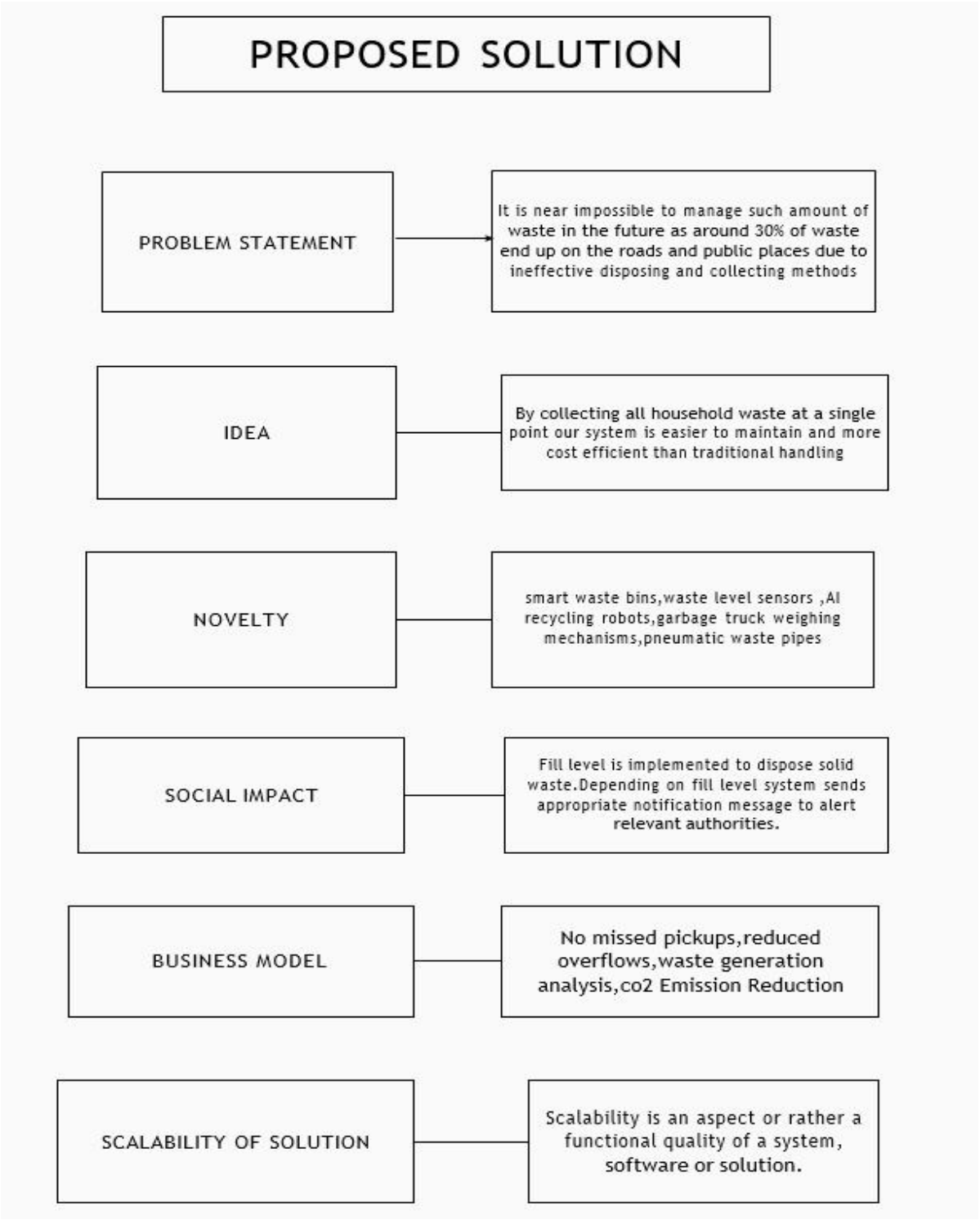
EMPATHY MAP:


TASK
* Diet plans Based on the user reqirments.
*Workout Based on their Body type.
FEELING
*Comfortable and confident in self
*Better Dietary Plans
*Steps to stay healthy based on thier body type
AI Powered Nutrition Analyzer For Fitness Enthusiasts
FEELS
* Easy to get diet plan without consulting Doctors Physically and paying for it.
DOES
*To reach dietitian easily.
OVERALL GOAL
*To Make the Users Fit and Healthy

3.2 Ideation & Brainstorming



3.3 Proposed Solution



3.4 Problem Solution fit

SOLUTION FIT

1. CUSTOMER SEGMENT(S)

It can also have customized communication with potential leads without any human interference.

6. CUSTOMER CONSTRAINTS

Low cost, power consumption, lack of awareness for nutrition analyzer, fear of buying application it may work or not.

5. AVAILABLE SOLUTIONS

AI has the potential to be used to aid early detection of infectious disease outbreaks and sources of epidemics, such as water contamination.

2. JOBS-TO-BE-DONE / PROBLEMS

The application relies on artifical Intelligence to produce custom data related to calorie intake and accordingly make suggestions. It changes in diet affect the evolution of chronic non communicable like cardiovascular diseases, obesity, and depression.

9. PROBLEM ROOT CAUSE

Randomized trials in the nutrition field are complex because this technique demands sticking to a diet for years resulting in higher human error chances.

7. BEHAVIOUR

AI has the potential to be used in planning and resource allocation in health and social care services.

3. TRIGGERS

Smartphone photos of individuals plates of food are being analyzed by deep learning, a sub type of Artifical Intelligence, to streamline the food logging process as well as eliminating the risk of human error

10. YOUR SOLUTION

NVIDIA's pioneering systems, apps and models combined with the expertise and comprehensive set of computing and infrastructure breakthroughs from HPE can help you unlock the value of AI and lead to data-first modernization.

8.CHANNELS of BEHAVIOUR

Nutrigenomics strives to integrate genomic science with nutrition to improve nutritional-based Artifical Intelligence. DNA tests recommend a personalized diet plan focusing on specific aspects of a person's microbiome, including lifestyle.

4. EMOTIONS: BEFORE / AFTER

Issues that arise with the use of assistive technologies and telehealth.

4. REQUIREMENT ANALYSIS

4.1 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Certificate Requirements	Regulation Rules Profession wide.
FR-4	Authorization	Healthcare provider User group.
FR-5	Business Rules	Decision making Marketing.
FR-6	External Interfaces	Wide Area Network (WAN) Screen layouts.

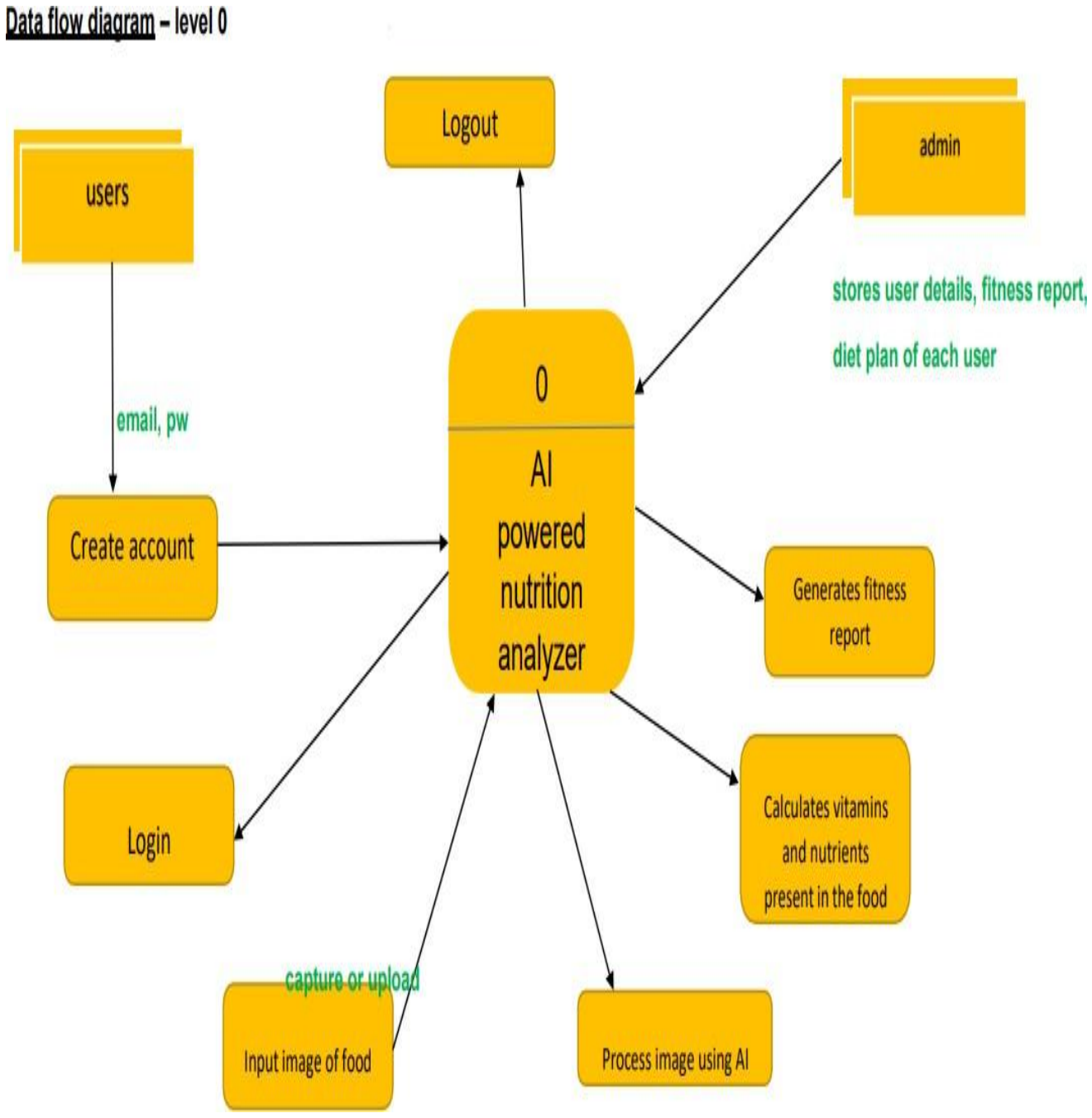
4.2 Non-functional Requirements:

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

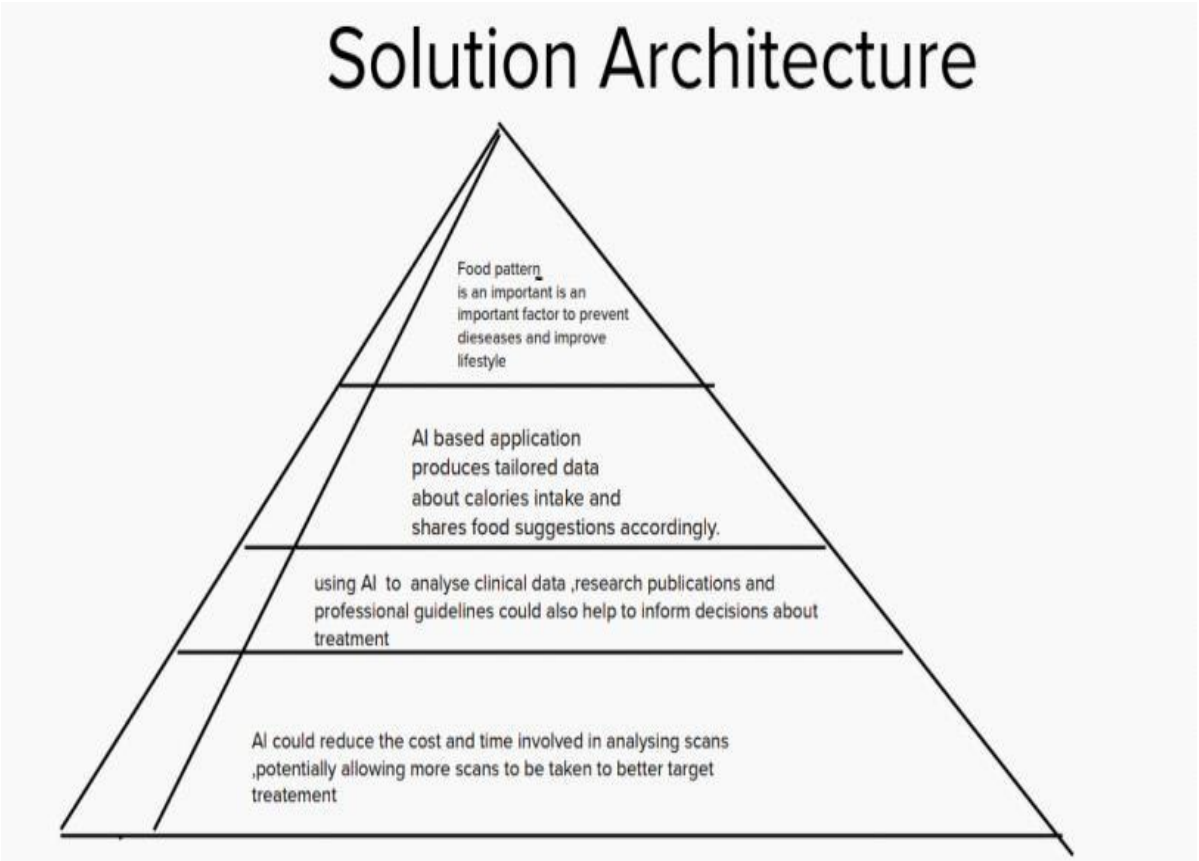
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to determine the nutritional content of food.
NFR-2	**Security**	Analysis of quality control and contamination of food.
NFR-3	**Reliability**	Change eating habits to prevent non-communicable diseases.
NFR-4	**Performance**	Prevention from severe health related problems.
NFR-5	**Availability**	Streamline the food logging process as well as eliminating the risk of human error.
NFR-6	**Scalability**	Support and monitor the personalized supply of nutrients.

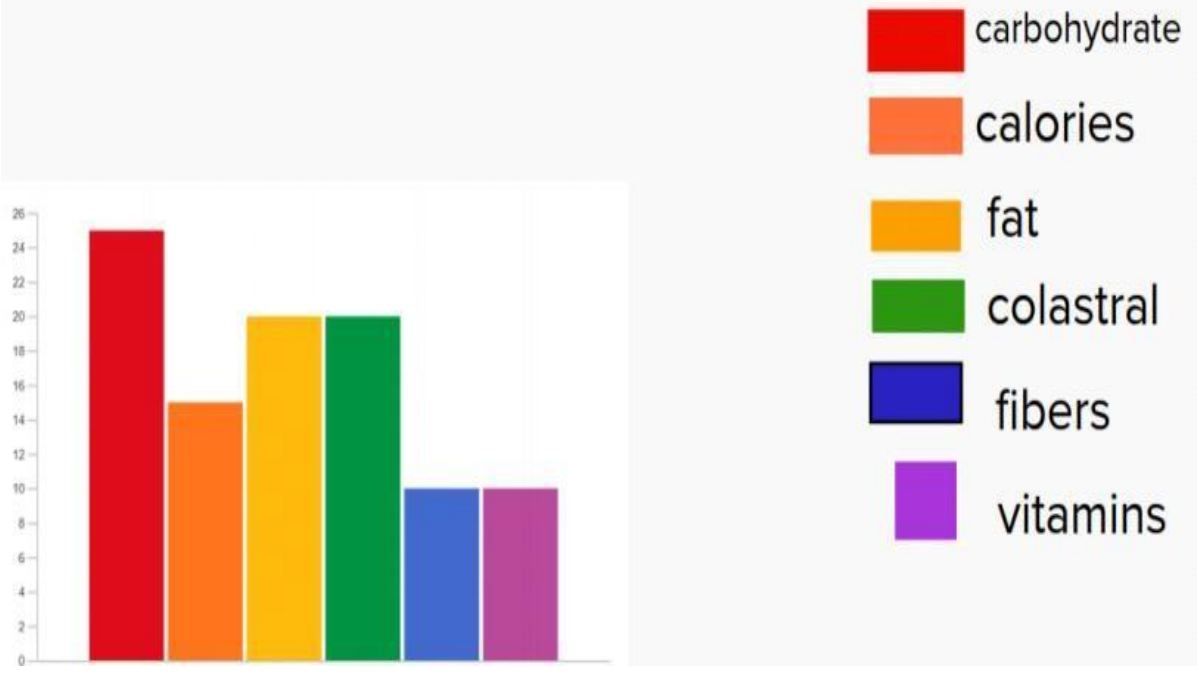
5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture





TECHNICAL ARCHITECTURE:

The Deliverable shall include the architectural diagram as below.and the information as per the table1 & table 2

Table-1: Components & Technologies:

S.No	Component	Description	Technology
1	User Interface	How user interacts with application Web UI, Mobile App, Chatbot etc.	HTML, CSS,
2	Application Logic-1	Logic for a process in the application	Python
3	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5	Database	Data Type, Configurations etc.	MySQL
	Cloud Database	Database Service on Cloud	IBM Cloud ant
6	File Storage	File storage requirements	IBM Block Storage or local Filesystem
7	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
8	External API-2	Purpose of External API used in the application	Aadhar API, etc.
9	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
1	Infrastructure (Server /Cloud)	Application Deployment on Local System /Cloud Local Server Configuration: Cloud Server Configuration:	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	List the open-source frameworks used	Google Collab
2	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	Encryptions, IAM Controls
3	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	HTML, python
4	Availability	Justify the availability of applications (e. g. use of load balancers, distributed servers etc.)	HTTP
5	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use ofCDN’s) etc.	Cloudflare

5.3 User Stories

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	As a user, I can edit my profile details		Medium	Sprint-2
Customer (Web user)	Registration	USN-7	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-8	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-9	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-10	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-11	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-12	As a user, I can edit my profile details		Medium	Sprint-2
Customer Care Executive	Queries	USN-13	As a user, I can raise and submit their queries in the Q&A section	I can raise the queries how to use the application in Q&A.	Medium	Sprint-1
	Diet plans	USN-14	As an executive, I must give the right nutrition with proper diet plans	A complete guide for nutrition provided to user	High	Sprint- 1
Administrator	Community Chart	USN-15	User can create a community and chat with them accordingly	Users can interact with other users.	Medium	Sprint- 2
	Stores user data	USN-16	As an admin, I must store records of users	Users can get proper diet plans	High	Sprint- 1

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

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 confirmingmy password.	2	High	NAGAMAI, NARENDRAPRASATH ADHISHA, MADHAVAN
Sprint-1		USN-2	As a user, I will receive confirmation email onceI have registered for the application	1	High	NAGAMAI, NARENDRAPRASATH ADHISHA, MADHAVAN
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	NAGAMAI, NARENDRAPRASATH ADHISHA, MADHAVAN
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	NAGAMAI, NARENDRAPRASATH ADHISHA, MADHAVAN
Sprint-1	Login	USN-5	As a user, I can log into the application byentering email & password	1	High	NAGAMAI, NARENDRAPRASATH ADHISHA, MADHAVAN

6.2 Sprint Delivery Schedule

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

7.

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 analyses the image and detect the nutrition based on the fruits like (Sugar, Fiber, 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 modelfrom 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 pagedef home():
return render_template('home.html')
@app.route('/image1',methods=['GET','POST'])# routes to the
index htmldef image1():
return render_template("image.html")
@app.route('/predict',methods=['GET', 'POST'])# route to show the predictions
in a web UIdef 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 folderf.save(filepath)#saving the file
img=image.load_img(filepath,target_size=(64,64)) #load and
reshaping the imagex=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','WATERMELO
N']
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/nutritio
n"querystring = {"query":"Pineapple"}
headers = {
"X-RapidAPI-Key":
"8wdA1tuH2jZwE7U_RYBa35UPCTBCglPbe_mXAvQnYx","X-
RapidAPI-Host": "calorieninjas.p.rapidapi.com"
}
response = requests.request("GET", url, headers=headers,
params=querystringprint(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:5p
x;
```

```
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:5p
x;
background-
color:#c0df84;width:
400px; color:#00000;
font-family:'Roboto',sans-
serif;font-style: italic;
border-
radius:20px;font-
size:15px;
}a
{
color:#c0df8
4;
float:center;
text-
decoration:none;
```

```
font-style:normal;
padding-
right:20px;
}
a:hover{ backgrou
nd- color:black;
color:white;
border-
radius:15px;0font-
size:30px;
padding-left:10px;
}
.div1{ backgroun
d-color:
lightgrey;width: 500px;
border: 10px solid
peach;padding: 20px;
margin:
20px;height:
500px;
}
.header {position:
relative;top:0;
margin:0p
x;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
{ overflo
w:
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>

<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%;">Nutrtion 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>
<br>
<br>
<br>
<br>
<br>
<br>
<br>
<br>
<h1>
<center>
<h3>


</h3>
</center>
</h1>
```

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

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{ ba
ckground-
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:0p
x;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
{ overflo
w:
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>
```

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
imagemodel=load_model('train.h5')
model=load_model('dataset.h5')
model=load_model('nutrition.h5')
img=image.load_img(r"/content/drive/MyD
rive
/CNN/Dataset/TEST_SET/PINEAPPLE/125_10
0.jpg")img
img=image.load_img(r"/content/drive/MyDrive
/CNN/Dataset/TEST_SET/PINEAPPLE/125_1
00.jpg",target_size=(64,64))
img
x=image.img_to_array(i
mg)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

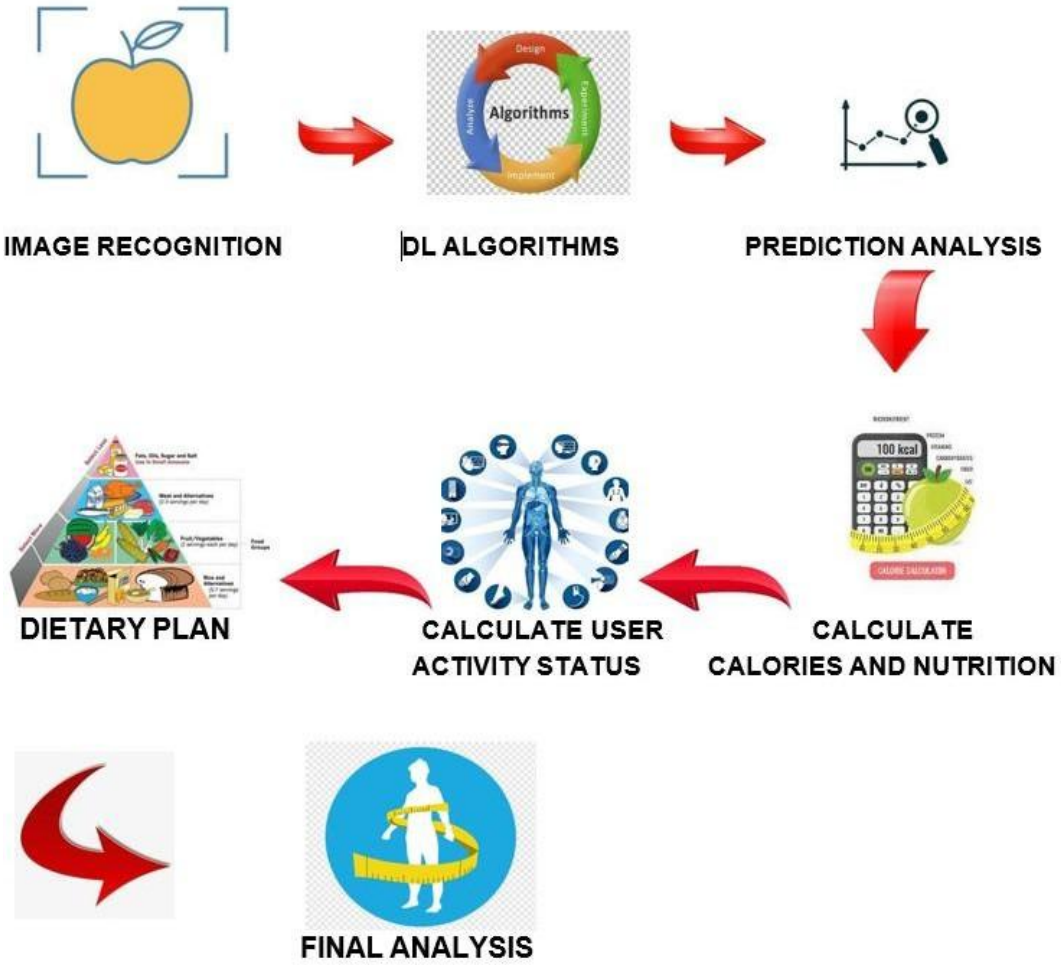
([[0.25227112, 0.17414774, 0.15219809, 0.20493415, 0.21644896],

[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’
```

9. RESULTS

9.1 Performance Metrics



10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

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.

Increase user satisfaction – more accurate training and diet recommendations help users to achieve their fitness goals faster. AI in fitness apps makes workouts more engaging and fun, thanks to providing clients with real-time analytics and professional suggestions about exercising.

DISADVANTAGES:

AI algorithms may help better understand and predict the complex and non-linear interactions between nutrition-related data and health outcomes, particularly when large amounts of data need to be structured and integrated, such as in metabolomics

11. CONCLUSION:

Artificial intelligence has revolutionised our lives in various ways such as the area of fitness and physical wellbeing. Technologies previously available to gyms and personal trainers are now available on smartphones. AI even enables exercise and fitness classes that require no person-to-person interaction.

12. FUTURE SCOPE

The future scope of this project is very brod. 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 uploadedimages can be handled appropriately.
- In addition to the nutrition analysis, the application can also be designed to provide recipesthat can be prepared using the nutrient rich foods
- A database can also be implemented for the system so that users can save their data andrelook into it later.

13. APPENDIX

13.1Source 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 modelfrom tensorflow.keras.preprocessing import image
import requests
app = Flask(__name__,template_folder="templates") # initializing a
flask app# Loading the model
```

```
model=load_model('nutrition.h
5') print("Loaded model from
disk") @app.route('/')# route to
display the home pagedef
home():
return render_template('home.html')
@app.route('/image1',methods=['GET','POST'])#
routes to the index htmldef image1():
return render_template("image.html")
@app.route('/predict',methods=['GET', 'POST'])# route to show the
predictions in a web UIdef 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 folderf.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','WATE
RMELON']
result=str(in
dex[pred[0]]
)x=result
print(x)
```

```
result=nut
rition(res
ult)
print(resu
lt)
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.de
code("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"
}
 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)
```

13.2 Github & Project Demo Link

https://github.com/IBM-EPBL/IBM-Project-43372-1660716410

Project Demo Link:

https://drive.google.com/file/d/104eXD1vzzPd1xcwkKytvMTdrsoxtSYCx/view?usp=share_link