

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION  
ENGINEERING**

**IBM  
PROJECT TITLE**

**AI-POWERD NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS**  
(2022-2023)



**SUBMITTED BY**

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**FINAL YEAR B.E. (ECE)  
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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 PUBLICATION S          | METHODOLOGY  | ADVANTAGE  | DRAWBACKS  |
|-------|--|---------------------------------|--|--|--|
| 1.    | Artificial Intelligence in Nutrients Science Research<br><br>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<br><br>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. | <p>Prediction of Vitamin Interacting Residues in a Vitamin Binding Protein Using Evolutionary Information</p> <p>Bharat Panwar, Sudheer Gupta.</p>       | <p><b>2013</b><br/>BMC Bioinformatics</p>   | <p>Prediction of Vitamin -A interacting residues (VAIRs), Analysis of different protein-interacting residues of different vitamin classes.</p> | <p>Able to get all the nutrients you need for a balanced diet.</p>  | <p>Dietary supplements are not regulated as strictly as pharmaceutical drugs.</p>  |
| 4. | <p>Dietary Fiber, Genetic Variations of Gut Microbiota-derived Short-Chain Fatty Acids, and Bone Health.</p> <p>Mengying Wang, Hao Ma.</p>               | <p><b>2021</b><br/>Endocrine SocietyOxford Publications.</p>                            | <p>Bone Mineral Density (BMD), DualEnergy X-ray Absorptiometry (DXA), Hardy-Weinberg Equilibrium (HWE).</p>                                    | <p>Through interaction with our gut microbes, dietary fiber also influences microbial ecology and enhances the production of key microbial metabolites.</p>       | <p>No association was found between dietary fiber intake and all fractures.</p>  |
| 5. | <p>AI Based System to Provide Diet Plan for Older Hospitalized Patients.</p> <p>Hussain Quarishi, Mohammed Zaid, Dinesh Choudhary.</p>                   | <p><b>2014</b><br/>Journal of Emerging Technologies and Innovative Research (JETIR)</p> | <p>By using Python Programmer 3.6 with Related Libraries.</p>  | <p>No more taking appointments from the dietician. Less expensive with greater efficiency and correct results.</p>  | <p>If in accurate details are given to the system the output generated might be irrelevant to the user shealth condition.</p>  |
| 6. | <p>AI – Supported Automated Nutritional Intervention on Glycemic Control in patients with Type-2 Diabetes Mellitus</p> <p>Ayaka Yasugi, Yuko Gondoh.</p> | <p><b>2019</b><br/>Adis Diabetes Ther Publication.</p>                                  | <p>AI Supported Nutrition Therapy. Human Nutrition Therapy.</p>  | <p>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.</p> | <p>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</p> |

|     |   |   |   |  |   |
|-----|---|---|---|--|---|
| 7.  | <p>Validation of a Deep Learning System for the Full Automation of Bite and Meal Duration Analysis of Experimental Meal Videos.</p> <p>Petros Daras,Billy Langlet</p> | <p><b>2020</b><br/>MDPI<br/>Publications</p>                              | Rapid AutomaticBite Detection (RABID).                                  | This is time consuming. RABID achieved perfect agreement between algorithm and human annotations.        | However, this methodology is time consuming and it is often affected by human errors, limiting its scalability.                                 |
| 8.  | <p>An Ontology to Standardize Research Output of Nutritional Epidemiology.</p> <p>Henry Ambayo,Carl Lachat, Filip Pattyn.</p>   | <p><b>2019</b><br/>MDPI Publication</p>                                   | 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.  | <p>Multimiomics Approach to Precision Sport Nutrition</p> <p>David C.Nleman</p>   | <p><b>2021</b><br/>Frontiers in Nutrition</p>                             | 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. | <p>Artificial Intelligence Applications in Nutrition and Diatetics.</p> <p>Izzet Ulker, Feride Ayyildiz.</p>  | <p><b>2021</b><br/>Akilli Sistemler ve Uygulamalan Dergisi Publiction</p> | 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 representative 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. Artificial Intelligence in Nutrients Science Research Jaroslaw Sak, 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 Bone Health. 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 Frontiers in Nutrition
10. Artificial Intelligence Applications in Nutrition and Dietetics. Izzet Ulker, Feride Ayyildiz. 2021 Akilli Sistemler ve Uygulamalar Dergisi Publication.

## 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.)

|                            |  |   |
|----------------------------|--|---|
| <b>I am</b>                | Describe customer with 3-4 key characteristics - who are they?                                 | Describe the customer and their attributes here                             |
| <b>I'm trying to</b>       | List their outcome or "job" the care about - what are they trying to achieve?                  | List the thing they are trying to achieve here                              |
| <b>but</b>                 | Describe what problems or barriers stand in the way - what bothers them most?                  | Describe the problems or barriers that get in the way here                  |
| <b>because</b>             | Enter the "root cause" of why the problem or barrier exists - what needs to be solved?         | Describe the reason the problems or barriers exist                          |
| <b>which makes me feel</b> | 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=](https://miro.com/app/board/uXjVPRGMeak=/)



## EXAMPLE

| <b>Problem Statement (PS)</b> | <b>am (Customer)</b> | <b>I'm trying to</b>        | <b>But</b>                            | <b>because</b>                       | <b>Which makes me feel</b> |
|-------------------------------|----------------------|-----------------------------|---------------------------------------|--------------------------------------|----------------------------|
| <b>PS-1</b>                   | Fitness Advice       | Maintain fitness and health | Not able to maintain the health       | Can't find and follow the right food | Angry and depressed        |
| <b>PS-2</b>                   | 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



## 3.2 Ideation & Brainstorming

### 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.

- It's suitable to prepare
- It's easy to collaborate
- It's highly customizable

[View template details](#)

#### Before you collaborate

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

- [Brainstorming](#)

[View template details](#)

#### Define your problem statement

What problem are you trying to solve? Frame your problem as a challenge statement. This will be the focus of your brainstorm.

[View details](#)

idea

How might we...?

Key rules of brainstorming

To get the most out of your brainstorm:

- Try to have 10-15 ideas
- Brainstorm with others
- Only judges, no critics
- Take notes
- Be creative
- Quantity over quality

#### Brainstorm

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

[View details](#)

| NAGAMANI   | NARENCHAR  | JCHESHA  | MACHAWAN   |
|--|--|--|--|
| 1. I want to see a doctor who can help me with my health.  | 1. I want to see a doctor who can help me with my health.  | 1. I want to see a doctor who can help me with my health.  | 1. I want to see a doctor who can help me with my health.  |
| 2. I want to see a doctor who can help me with my health.  | 2. I want to see a doctor who can help me with my health.  | 2. I want to see a doctor who can help me with my health.  | 2. I want to see a doctor who can help me with my health.  |
| 3. I want to see a doctor who can help me with my health.  | 3. I want to see a doctor who can help me with my health.  | 3. I want to see a doctor who can help me with my health.  | 3. I want to see a doctor who can help me with my health.  |
| 4. I want to see a doctor who can help me with my health.  | 4. I want to see a doctor who can help me with my health.  | 4. I want to see a doctor who can help me with my health.  | 4. I want to see a doctor who can help me with my health.  |
| 5. I want to see a doctor who can help me with my health.  | 5. I want to see a doctor who can help me with my health.  | 5. I want to see a doctor who can help me with my health.  | 5. I want to see a doctor who can help me with my health.  |
| 6. I want to see a doctor who can help me with my health.  | 6. I want to see a doctor who can help me with my health.  | 6. I want to see a doctor who can help me with my health.  | 6. I want to see a doctor who can help me with my health.  |
| 7. I want to see a doctor who can help me with my health.  | 7. I want to see a doctor who can help me with my health.  | 7. I want to see a doctor who can help me with my health.  | 7. I want to see a doctor who can help me with my health.  |
| 8. I want to see a doctor who can help me with my health.  | 8. I want to see a doctor who can help me with my health.  | 8. I want to see a doctor who can help me with my health.  | 8. I want to see a doctor who can help me with my health.  |
| 9. I want to see a doctor who can help me with my health.  | 9. I want to see a doctor who can help me with my health.  | 9. I want to see a doctor who can help me with my health.  | 9. I want to see a doctor who can help me with my health.  |
| 10. I want to see a doctor who can help me with my health. | 10. I want to see a doctor who can help me with my health. | 10. I want to see a doctor who can help me with my health. | 10. I want to see a doctor who can help me with my health. |

[View details](#)

#### Group ideas

Take turns sharing your ideas with a partner or small group. Once all ideas have been shared, give each other a thumbs up if you like it. It's better to have too many ideas than not enough. Try to come up with ideas that are both creative and feasible.

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Analysis for three enthusiasts

AI in health care and research

AI in Nutrition Process

Nutrition Studies

#### Prioritize

Your team should sit for 10 to 15 minutes and discuss which ideas are most important. Rank your ideas on the grid to determine which ideas are most important and which are feasible.

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#### After you collaborate

You can export the results of your session as a PDF or share with members of your company who might find it helpful.

[View details](#)

Quick actions

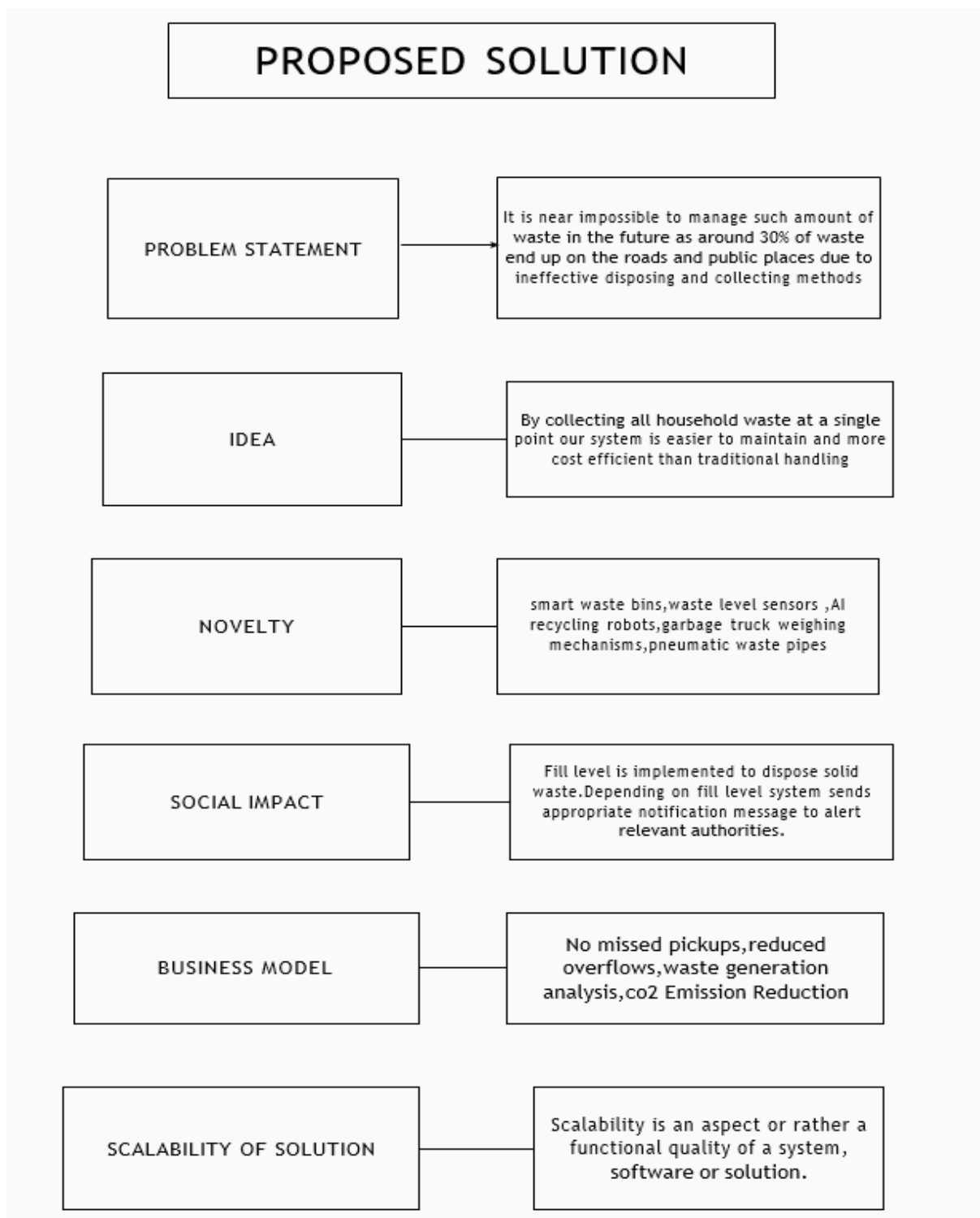
- [View the result](#)
- [Export the result](#)

Keep creating forward

- [Brainstorming](#)
- [Collaborative brainstorming](#)
- [Brainstorming with others](#)
- [Brainstorming with others](#)



### 3.3 Proposed Solution



### 3.4 Problem Solution fit

| SOLUTION FIT   |   |   |
|--|---|---|
| <p><b>1. CUSTOMER SEGMENT(S)</b></p> <p>It can also have customized communication with potential leads without any human interference.</p>   | <p><b>6. CUSTOMER CONSTRAINTS</b></p> <p>Low cost, power consumption, lack of awareness for nutrition analyzer, fear of buying application it may work or not.</p>  | <p><b>5. AVAILABLE SOLUTIONS</b></p> <p>AI has the potential to be used to aid early detection of infectious disease outbreaks and sources of epidemics, such as water contamination.</p>                         |
| <p><b>2. JOBS-TO-BE-DONE / PROBLEMS</b></p> <p>The application relies on artificial 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.</p> | <p><b>9. PROBLEM ROOT CAUSE</b></p> <p>Randomized trials in the nutrition field are complex because this technique demands sticking to a diet for years resulting in higher human error chances.</p>  | <p><b>7. BEHAVIOUR</b></p> <p>AI has the potential to be used in planning and resource allocation in health and social care services.</p>   |
| <p><b>3. TRIGGERS</b></p> <p>Smartphone photos of individuals plates of food are being analyzed by deep learning, a sub type of Artificial Intelligence, to streamline the food logging process as well as eliminating the risk of human error</p>   | <p><b>10. YOUR SOLUTION</b></p> <p>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</p> | <p><b>8.CHANNELS of BEHAVIOUR</b></p> <p>Nutrigenomics strives to integrate genomic science with nutrition to improve nutritional-based Artificial Intelligence. DNA tests recommend a personalized diet plan</p> |
| <p><b>4. EMOTIONS: BEFORE / AFTER</b></p> <p>Issues that arise with the use of assistive technologies and telehealth.</p>  | <p>modernization.</p>   | <p>focusing on specific aspects of a person's microbiome, including lifestyle.</p>  |

## 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<br>Registration through Gmail<br>Registration through LinkedIn |
| FR-2   | User Confirmation             | Confirmation via Email<br>Confirmation via OTP   |
| FR-3   | Certificate Requirements      | Regulation Rules Profession wide.  |
| FR-4   | Authorization                 | Healthcare provider<br>User group.   |
| FR-5   | Business Rules                | Decision making<br>Marketing.  |
| FR-6   | External Interfaces           | Wide Area Network (WAN)<br>Screen layouts.   |

### 4.2 Non-functional Requirements:

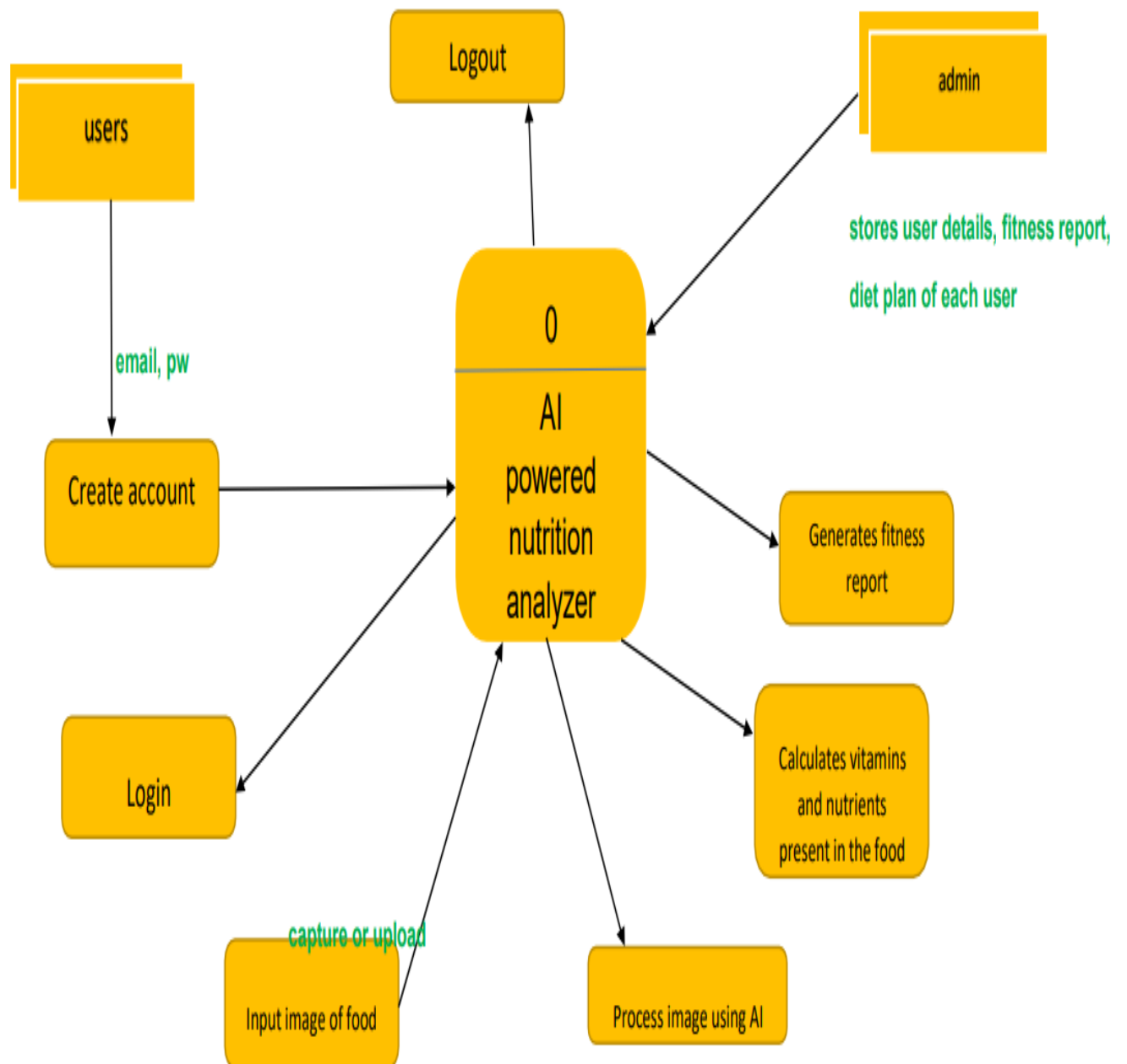
Following are the non-functional requirements of the proposed solution.

| 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

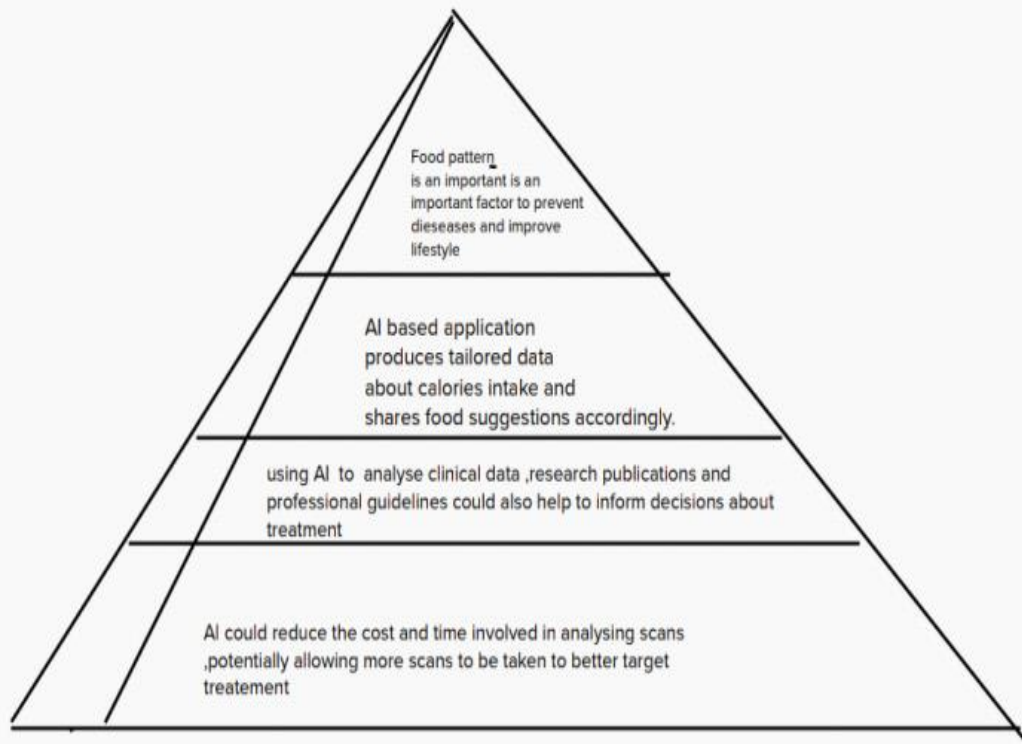
### 5.1 Data Flow Diagrams

Data flow diagram – level 0



## 5.2 Solution & Technical Architecture

### Solution 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<br>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<br>Local Server Configuration: Cloud<br>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 confirming my password. | 2            | High     | NAGAMAI, NARE<br>NDRAPRASATH<br>ADHISHA,<br>MADHAVAN |
| Sprint-1 |                               | USN-2             | As a user, I will receive confirmation email once I have registered for the application                   | 1            | High     | NAGAMAI, NARE<br>NDRAPRASATH<br>ADHISHA,<br>MADHAVAN |
| Sprint-2 |                               | USN-3             | As a user, I can register for the application through Facebook  | 2            | Low      | NAGAMAI, NARE<br>NDRAPRASATH<br>ADHISHA,<br>MADHAVAN |
| Sprint-1 |                               | USN-4             | As a user, I can register for the application through Gmail   | 2            | Medium   | NAGAMAI, NARE<br>NDRAPRASATH<br>ADHISHA,<br>MADHAVAN |
| Sprint-1 | Login                         | USN-5             | As a user, I can log into the application by entering email & password                                    | 1            | High     | NAGAMAI, NARE<br>NDRAPRASATH<br>ADHISHA,<br>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 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/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:#000000;
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{
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: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 {
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>
```

```
<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>
```

```
<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 }}</u></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: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 {
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>

```

## 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/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.],

```

[illegible]



```

[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],

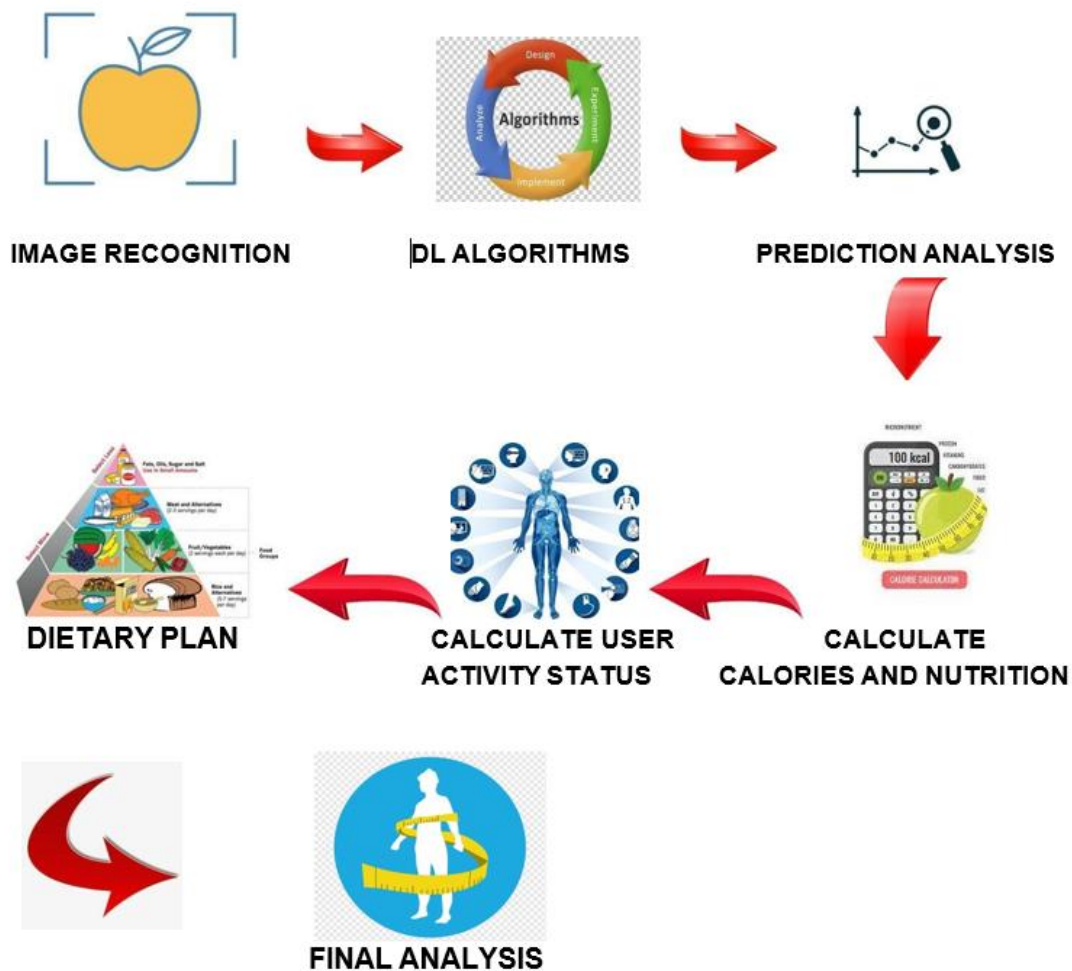
```

```
[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 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 look into it later.

## 13. APPENDIX

### 13.1 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.h
5') 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','WATE
RMELON']
result=str(in
dex[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"
}
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)

```

Github & Project Demo Link

[IBM-EPBL/IBM-Project-44966-1660727628](https://github.com/IBM-EPBL/IBM-Project-44966-1660727628)

Project Demo Link:

<https://github.com/IBM-EPBL/IBM-Project-44966-1660727628/blob/main/Final%20Deliverables/PNT2022TMID13978-Demo%20video.mp4>