AI – POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

Submitted by

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CHAPTER-1

Introduction

A new food photo app that recognises your food instantly and simplifies calorie counting. “Scan my nutria” allows you to easily log your food by tapping to take a photo, we do some magic, and you simply swipe the food to confirm. That’s it; our app can recognise over one hundred thousand foods and packages. and it can detect a variety of global foods. the more accurate it gets. Get started with this free app now.

1.1 Project Overview

An scan Everyone can use my nutria, which aids Foodviser. To unlock exclusive access to our team of dietitians, diet plans, and recipes, subscribe to the premium version. To begin, scan the food with the camera. The app will recognise the food you scan with the cameras and provide information about it such as its fat, protein, carbohydrate, vitamin, fiber, and calorie content. and its food API utilises highly trained models that are not only able to recognise a variety of dishes but have the granularity to differentiate between different presentation styles, preparation methods, and regional variations.

1.2 Purpose

The Main motive of this project is scan my nutri makes instant nutrition and calorieestimates from your meals ,just snap the food photo and scan my nutria let do the rest.the app uses computer vision.

CHAPTER-2

LITERATURE SURVEY

2.1 Existing problem

While the accuracy is not 100 percent, it's a funny way to use photos to effortlessly track calories and basic daily food intake. As with similar apps, those that focus on food tracking and calorie counting are not for everyone and should be used with the guidance of a healthcare professional. It has many drawbacks, such as errors during scanning and suggesting wrong details.

2.2 References

- Official webpage of the Calorie mama instant food recognition at:https://www.caloriemama.ai/
- Official webpage of the most advanced plan for smart weigthtloss of healthifyme: healthifyme.com/in/
- Official webpage of the pssio AI-Enhancing Human life with AI: https://www.passio.ai/

2.3 Problem Statement Definition

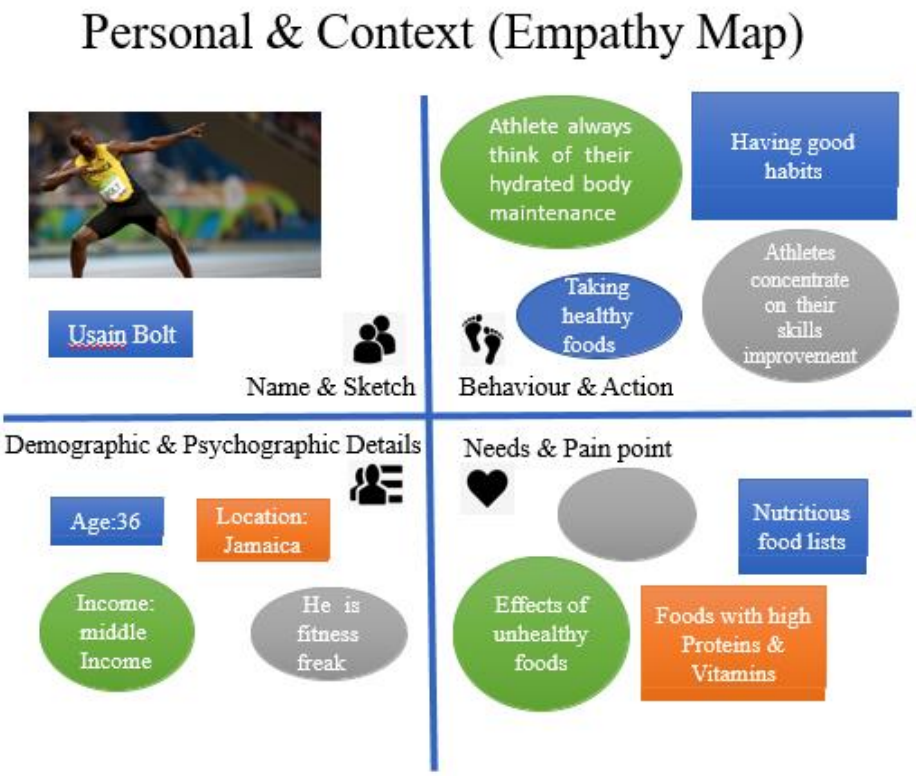
People all over the world are becoming more health conscious, eating more nutritious foods and avoiding junk food; therefore, a system that can measure calories and nutrition in everyday meals can be very beneficial to one's health.Food calorie and nutrition measurement systems are very beneficial for dieticians and patients to measure and manage their daily food intake. This application consists of the user interface, which will be publicly displayed on the application.

CHAPTER-3

IDEATION AND PROPOSED SOLUTION

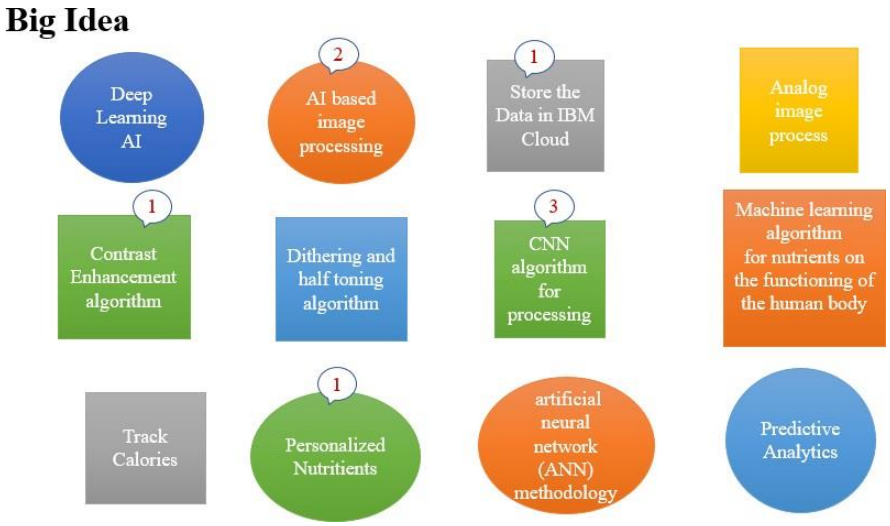
3.1 Empathy Map Canvas

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Muchlike a user persona, an empathy map can represent a group of users, such as a customer segment.



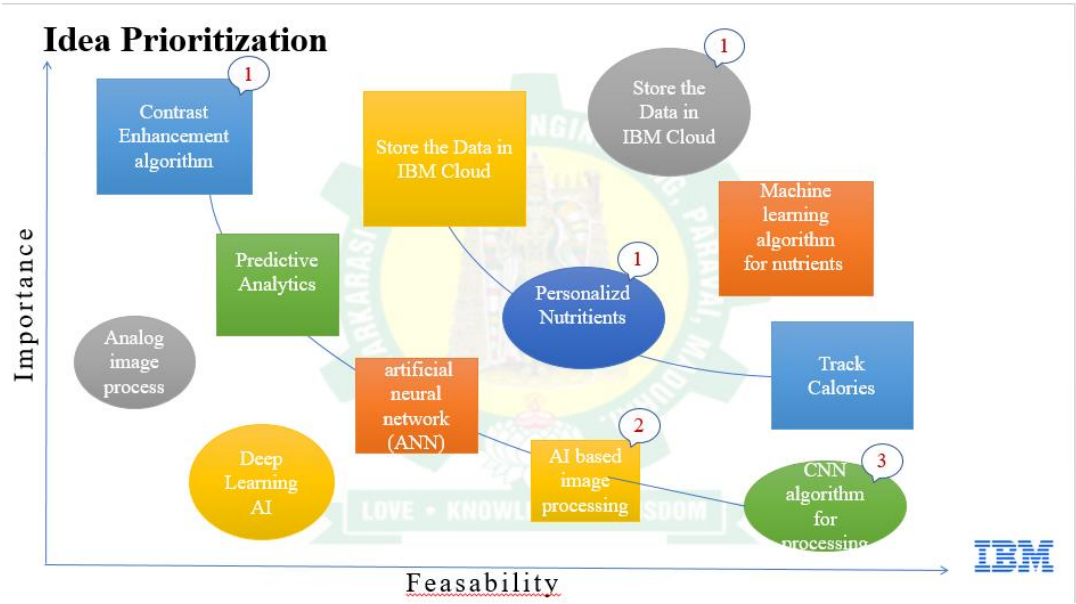
3.2 Ideation And Brainstorming

It consists of all the ideas of instruments and equipments that we are going to implement in this project.

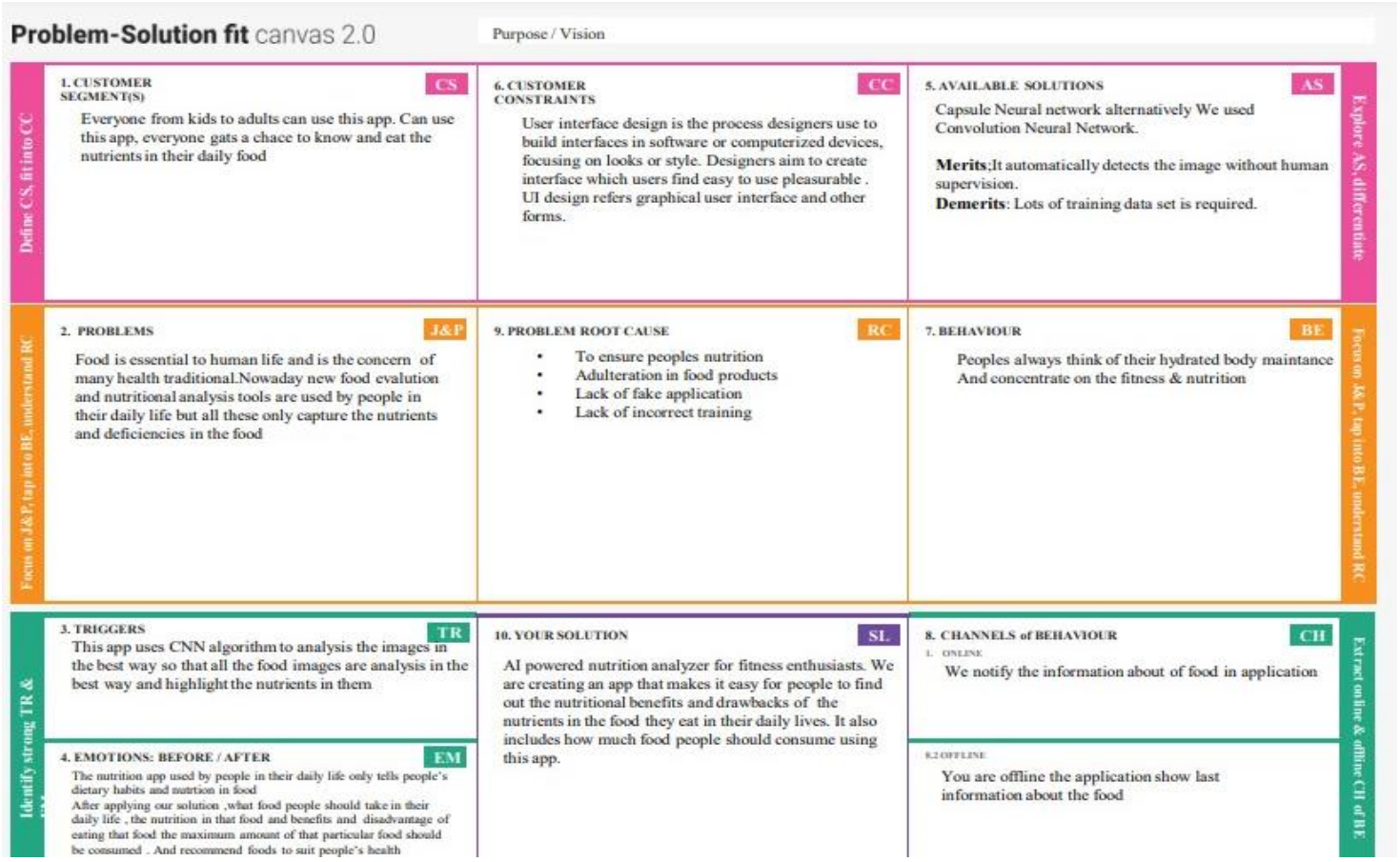


Idea Prioritization

It deals with the prioritizing of the big ideas in order of highest to lowest likes.



3.3 Problem Solution Fit



3.4 Proposed Solution

S.No.	Parameter	Description
1.	**Problem Statement (Problem tobe solved)**	AI-Powered Nutrition Analyzer For Fitness Enthusiasts
2.	**Idea / Solution description**	We are creating one web application using flask. The main aim of the project is to building a model which is usd for classifying thefoodsdepends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of differents fruits and vegetable and then the image will be send the trained model .the trained model analyses the image and detect the nutrition , advantage and problem
3.	**Novelty / Uniqueness**	Image detection using **Convolutional Neural NetworkAlgorithm**
4.	**Social Impact / Customer Satisfaction**	Food is essential for human life and has been the concern of many healthcare conventions .Now a days 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. This app is very useful for users to keep their body healthy. And the application act as a advisor.

CHAPTER-4

REQUIREMENT ANALYSIS

4.1 Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User registration	Registration through GmailCreate an account Follow the instructions
FR-2	User Confirmation	Confirmation via EmailConfirmation via OTP
FR-3	User details	Users are required to register their personal details. like name, age, weight, height, Diseases, body condition and etc.
FR-4	User requirement	The user simply inputs food image. The software will instantly generate an accurate reading of the based on the nutrition analysis in a readable format familiar to theconsumer. It compares the information already given and states the nutrients and deficiencies in that food

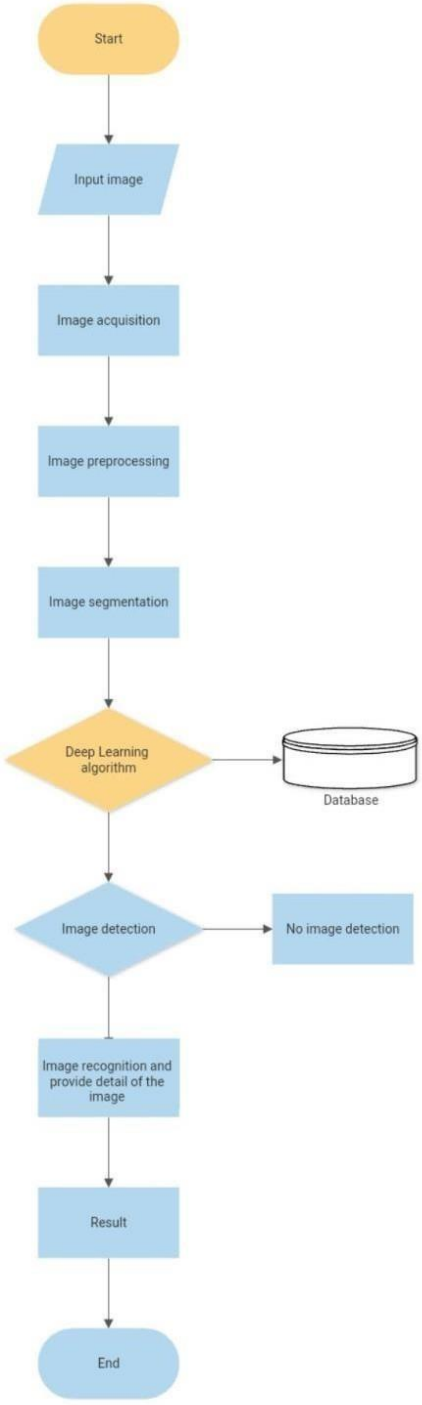
4.2 Non-Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Efficient for the frequent users.users can easilyunderstandwhat the application does and feel satisfied with the system.
NFR-2	**Security**	• AI powered nutrition analyzer for fitness shouldcontain more security in which our data which entered or maintainedshould be more security. • With the help of the username and password it providesmore security in which it can access more securable and the data are private
NFR-3	**Reliability**	This application must perform without failure in 95percent ofuse cases during a month
NFR-4	**Performance**	This application supporting 1,000 users per hour mustprovide 6 seconds or less response time in a desktop browser, including the rendering of text andimages,over an LTE connection.
NFR-5	**Availability**	The web dashboard must be available to user's 99.9 percent of the time every month during businesshours EST. Users can access every time..
NFR-6	**Scalability**	The application must be scalable enough to support10,000visits at the same time while maintaining optimal performance

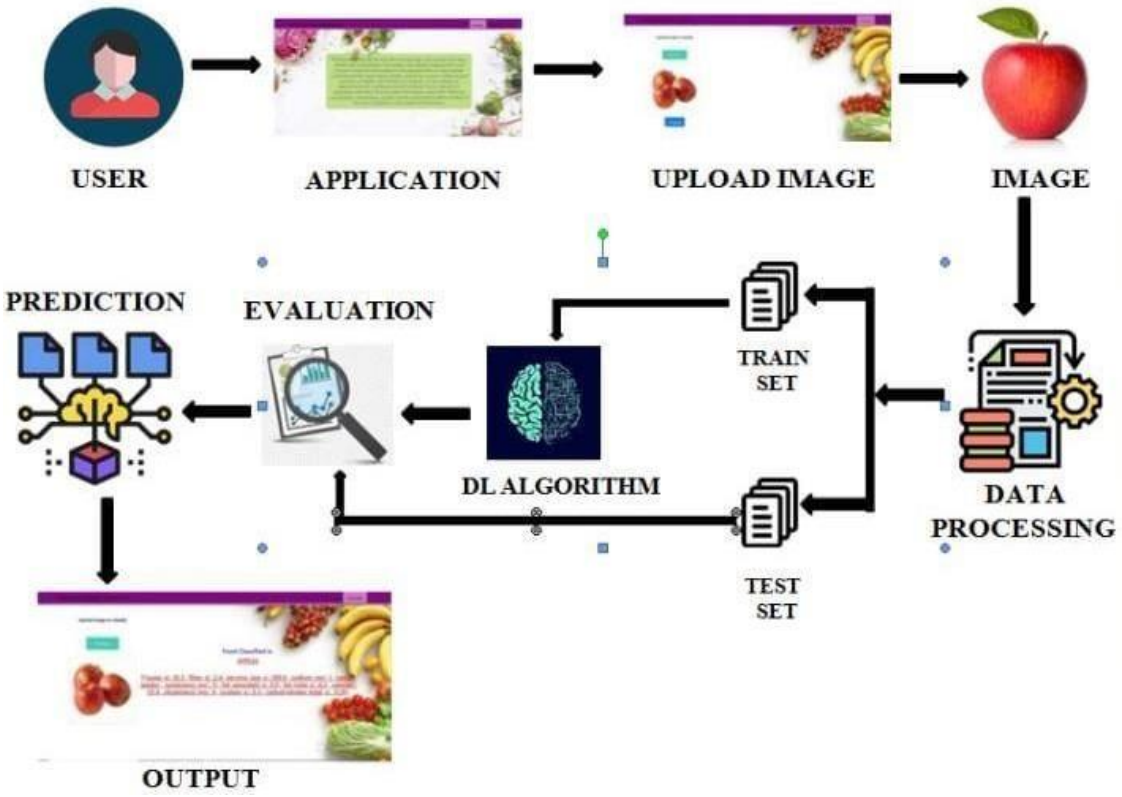
CHAPTER-5

PROJECT DESIGN

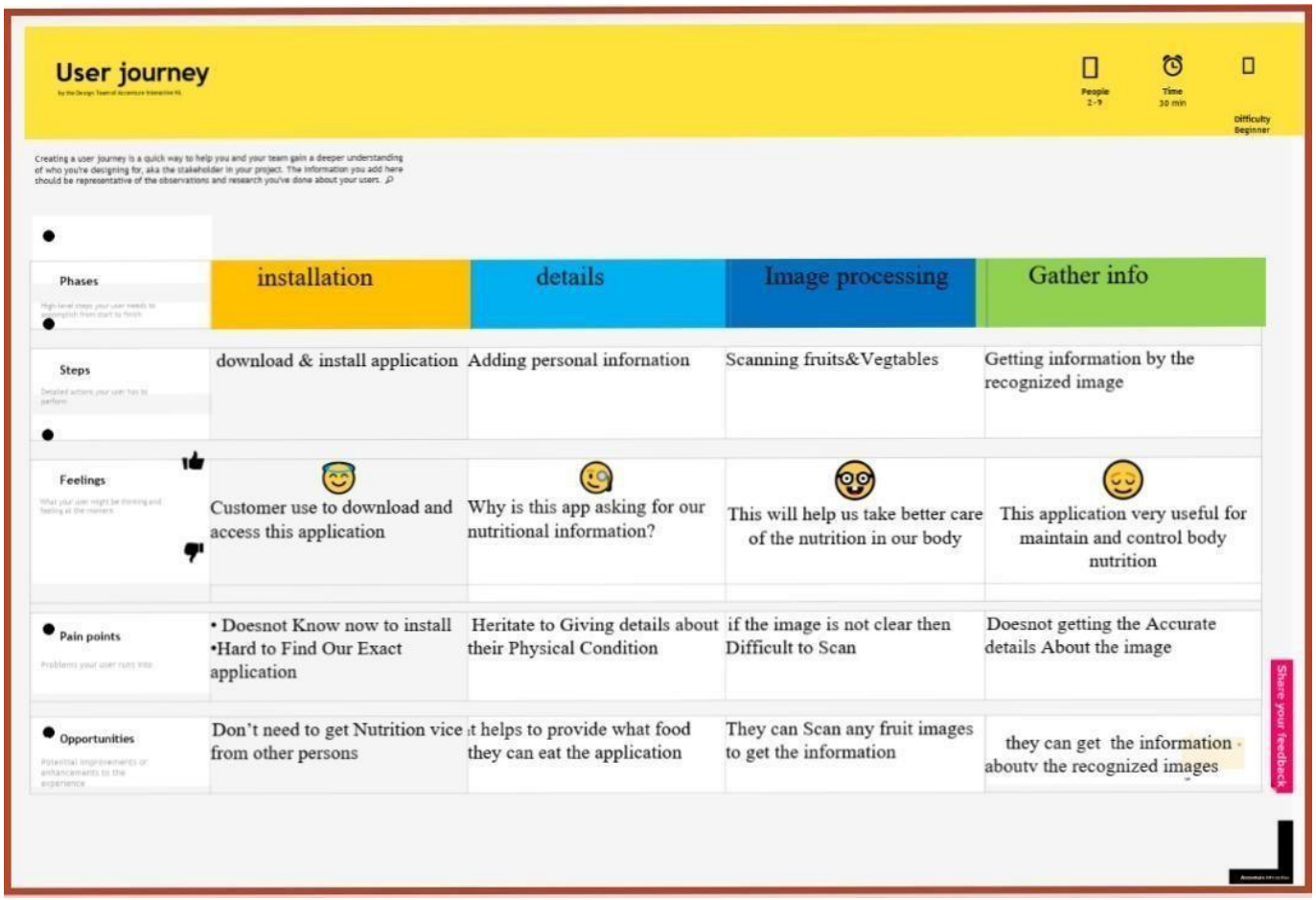
5.1 Data Flow Diagram



5.2 Solution And Technical Architecture



5.3 Customer Journey Map



CHAPTER-6

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning, Schedule & Estimation

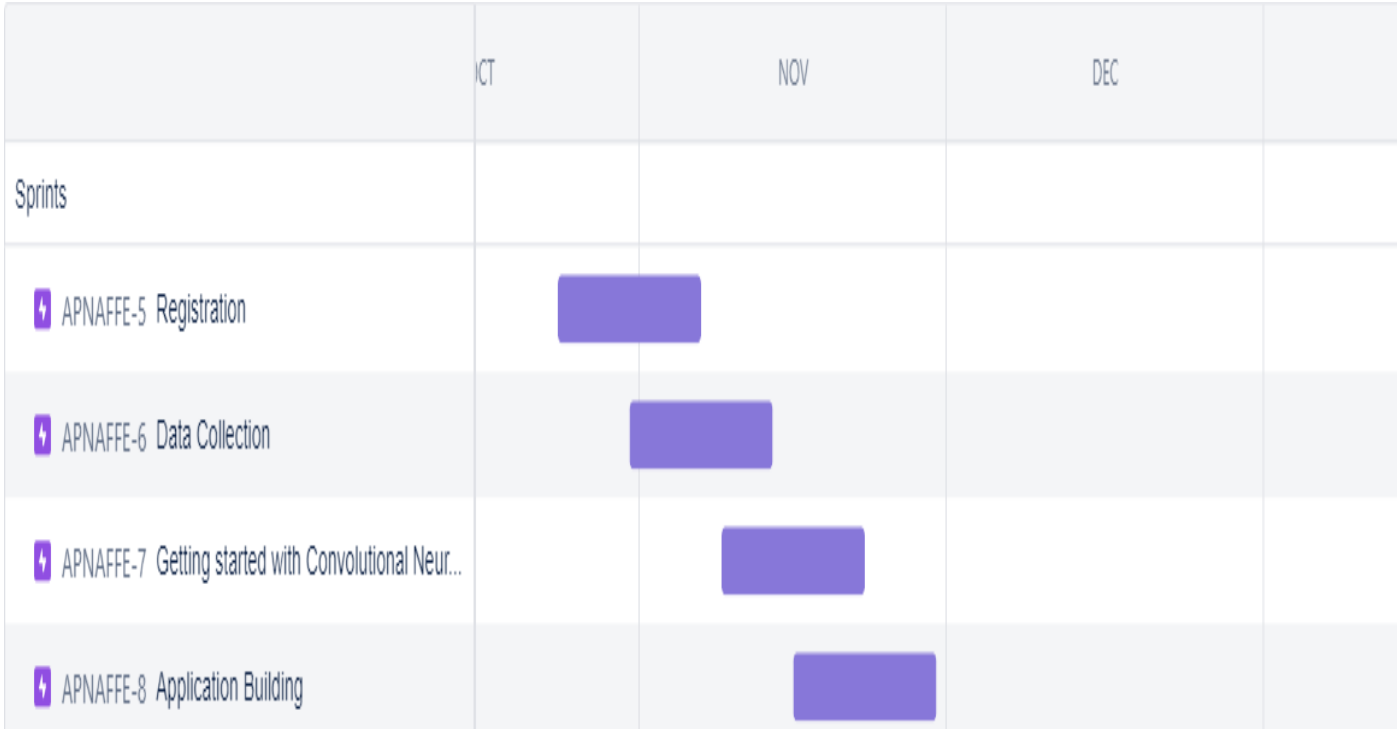
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As an biogeography, I can register for the application by entering my email, password, and confirming my password.	2	High	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-1	User Confirmation	USN-2	As an biogeography, I will receive confirmation email once I have registered for the application	1	Medium	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-1	Login	USN-3	As an biogeography, I can log into the application by enteringemail & password	2	High	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-2	Data Collection	USN-1	Download the dataset used in Digital Naturalist – AI Enabled tools for Biodiversity Researchers.	2	High	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-3	Image Preprocessing	USN-1	Improving the image datathat suppresses unwilling distortions or enhances some image features important for further processing, although performing some geometric transformations of images like rotation, scaling, etc.	2	High	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-4	Getting started with Convolutional NeuralNetwork	USN-1	Neural network are integral forteaching computers to think andlearn by classifying information, similar to how we as humanslearn. With neural networks, thesoftware can learn to recognizeimages, for example. Machinescan also make predictions and decisions with a high level of accuracy based on data inputs.	1	Medium	K Abeesh P Suriyaprakash

Sprint-3	Evaluation and modelsaving	USN-1	well a model behaves after eachiteration of optimization. An accuracy metric is used to measure the algorithm's performance in an interpretable way. The accuracy of a model isusually determined after the model parameters and is calculated in the form of a percentage. Saving The Modelget_weights , set_weights .	1	medium	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-4	Application Building	USN-2	After the model is built, we will be integrating it to a web application so that normal users can also use it. The users need togive the images of species	1	high	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M
Sprint-4	Train the Model onIBM	USN-3	Build Deep learning model andcomputer vision Using the IBMcloud.	1	high	Mugeshkumar M Manikandaprabhu M Arun O Aravidh M

6.2 Sprint Delivery Schedule

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint ReleaseDate (Actual)**
Sprint-1	20	4 Days	24 Oct 2022	27 Oct 2022	20	29 Oct 2022
Sprint-2	20	5 Days	28 Oct 2022	01 Nov 2022	20	04 Nov 2022
Sprint-3	20	8 Days	02 Nov 2022	09 Nov 2022	20	11 Nov 2022
Sprint-4	20	9 Days	10 Nov 2022	18 Nov 2022	20	19 Nov 2022

6.3 Reports From JIRA



CHAPTER-7

CODING AND SOLUTION

7.1 Feature 1

- The database used in this project are Xammp and MySQL.
- We provide lots of facilities in our page anybody can access any time anywhere .
- First you have to register on our page. Registration process is very simple. Language is not a barrier in our page. We used simple understandable language.
- After the registration process is finished, the login page will appear in which you have to enter your email id or username as you wish.
- After that you have to create very strong password in our login page .
- All the details are sent to your email id.

7.2 Feature 2

- In this login page you can update your image, change your password, change your username.
- As same as feature 1 here also registration and login page are available. In this feature 2 We provide additional facilities such as update your image, editing your username.
- In this feature you can give the home page to know more about our details.

7.3 Database Schema

```
  -- phpMyAdmin SQL Dump
-- version 5.1.1
-- https://www.phpmyadmin.net/
--
-- Host: 127.0.0.1
-- Generation Time: Aug 14, 2021 at 07:07 PM
-- Server version: 10.4.20-MariaDB
-- PHP Version: 8.0.9

SET SQL_MODE = "NO_AUTO_VALUE_ON_ZERO";
START TRANSACTION;
SET time_zone = "+00:00";


/*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
/*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
/*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
/*!40101 SET NAMES utf8mb4 */;

--
-- Database: `login`
--

-- --------------------------------------------------------

--
-- Table structure for table `users`
--

CREATE TABLE `users` (
  `id` int(11) NOT NULL,
  `name` varchar(255) NOT NULL,
  `email` varchar(255) NOT NULL,
  `password` varchar(255) NOT NULL,
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Indexes for dumped table
-- Indexes for table `users`
--
ALTER TABLE `users`
  ADD PRIMARY KEY (`id`);

--
-- AUTO_INCREMENT for dumped tables
--
-- AUTO_INCREMENT for table `users`
--
ALTER TABLE `users`
  MODIFY `id` int(11) NOT NULL AUTO_INCREMENT;
COMMIT;

/*!40101 SET CHARACTER_SET_CLIENT=@OLD_CHARACTER_SET_CLIENT */;
```

SOURCE CODE

App.py

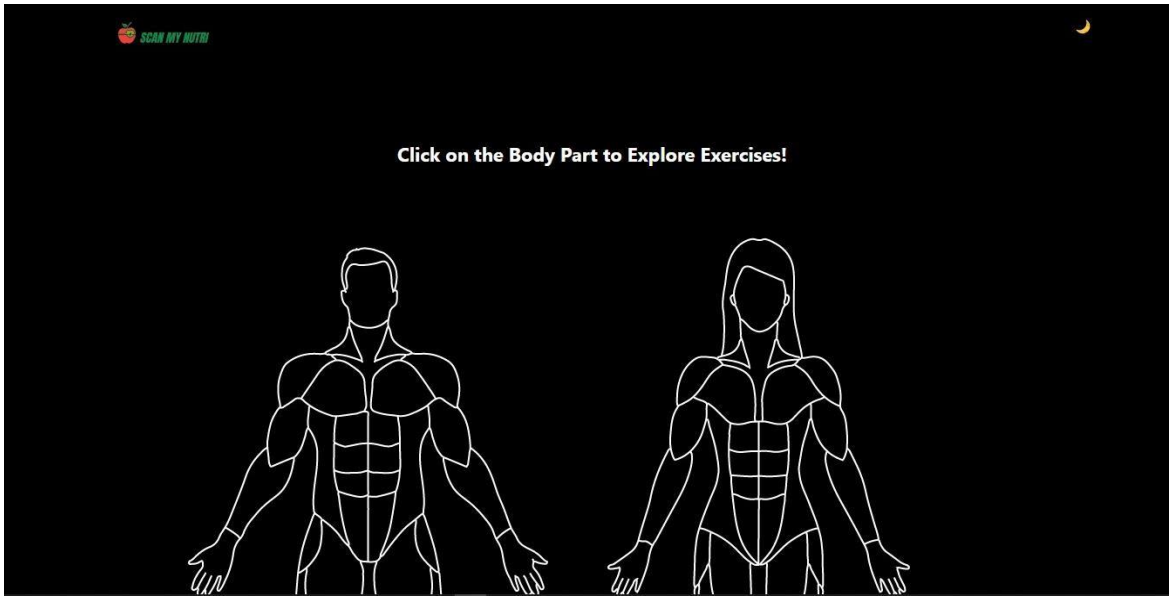
```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our
application.
#request-for accessing file which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models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


app = Flask(__name__,template_folder="templates") # initializing a flask app
# Loading the model
model=load_model('scanmynutri.h5')
print("Loaded model from disk")

conn=mysql.connector.connect(host="localhost", user="root", password="",
database="login")
cursor=conn.cursor()

@app.route('/')# route to display the home page
def home():
    return render_template('home.html')#rendering the home page

@app.route('/image1',methods=['GET','POST'])# routes to the index html
def image1():
    return render_template("image.html")

@app.route('/personalworkout')# route to display the home page
def personalworkout():
    return render_template('personalworkout.html')#rendering the home page

@app.route('/Fleiblediet')# route to display the home page
def Fleiblediet():
    return render_template('Fleiblediet.html')#rendering the home page

@app.route('/login')
def login(): # put application's code here
    return render_template('login.html')



@app.route('/login_validation', methods=['POST'])
def login_validation():
    email=request.form.get('email')
```

```
    password=request.form.get('password')

    cursor.execute("""SELECT * FROM `users` WHERE `email` LIKE'{}' AND
`password` LIKE '{}'""".format(email,password))
    users = cursor.fetchall()

    if len(users)>0:
        return render_template('image.html')
    else:
        return render_template('login.html', prediction_text = "1" )


@app.route('/add_user', methods=['POST'])
def add_user():
    name= request.form.get('name')
    email = request.form.get('email')
    password = request.form.get('password')

    cursor.execute("""INSERT INTO `users`(`id`, `name`, `email`, `password`)
VALUES (NULL,'{}','{}','{}')""".format(name,email,password))
    conn.commit()
    return render_template('login.html', prediction_text = "0")


@app.route('/predict', methods=['GET', 'POST']) # route to show the predictions
in a web UI
def launch():
    if request.method == 'POST':
        f = request.files['file']  # requesting the file
        basepath = os.path.dirname('_file_') # storing the file directory
        filepath = os.path.join(basepath, "uploads", f.filename)  # storing the
file in uploads folder
        f.save(filepath)  # saving the file

        img = image.load_img(filepath, target_size=(64, 64)) # load and
reshaping the image
        x = image.img_to_array(img)  # converting image to an array
        x = np.expand_dims(x, axis=0)  # changing the dimensions of the image

        pred = np.argmax(model.predict(x), axis=1)
        print("prediction", pred)  # printing the prediction
        index = ['Banana', 'Beetroot', 'Blueberry', 'Cauliflower', 'Cherry 1',
'Cocos', 'Corn', 'Eggplant', 'Ginger Root', 'Grape Blue', 'Grapefruit Pink',
'Guava', 'Kiwi', 'Lemon', 'Mango', 'Onion Red', 'Orange', 'Papaya', 'Pepper
Green', 'Pineapple', 'Plum', 'Potato Red', 'Raspberry', 'Strawberry', 'Tomato
1', 'Watermelon', 'burger', 'butter_naan', 'chai', 'chapati', 'chole_bhature',
'dal_makhani', 'dhokla', 'fried_rice', 'idli', 'jalebi', 'kaathi_rolls',
'kadai_paneer', 'kulfi', 'masala_dosa', 'momos', 'paani_puri', 'pakode',
'pav_bhaji', 'pizza', 'samosa']

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

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

        return render_template("0.html", showcase=(result), showcase1=(x))


def nutrition(index):
```

```
    import requests

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

    querystring = {"query": index}

    headers = {
        "X-RapidAPI-Key": "46edd36e9fmsh6278b01bee6517ep1eddecjsnc06086a00eae",
        "X-RapidAPI-Host": "calorieninjas.p.rapidapi.com"
    }

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

    print(response.text)
    return response.json()['items']



if __name__ == "__main__":
    # running the app
    app.run(debug=False)
```

Execution :


SCAN MY NUTRI
HOME
PERSONAL WORKOUT
Understand
What You Eat !
REGISTER
CLASSIFY


SCAN MY NUTRI
Click on the Body Part to Explore Exercises!

A Guide to Flexible Diet

In case you want to lose fat, maintain weight or gain muscle.

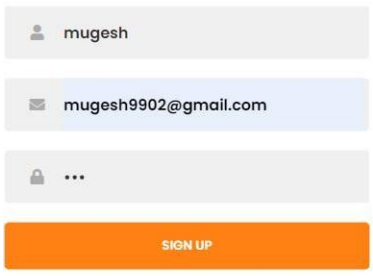
What is Flexible Diet

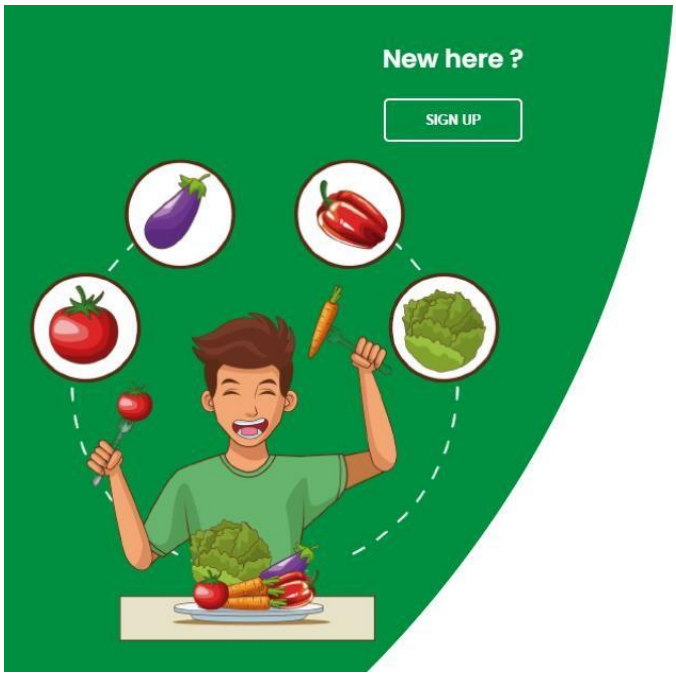
First at all, flexible diet is more of a lifestyle than a diet. What matters is how many calories you eat and the proportion of macronutrients in your diet.

What are the macronutrients and some Examples:

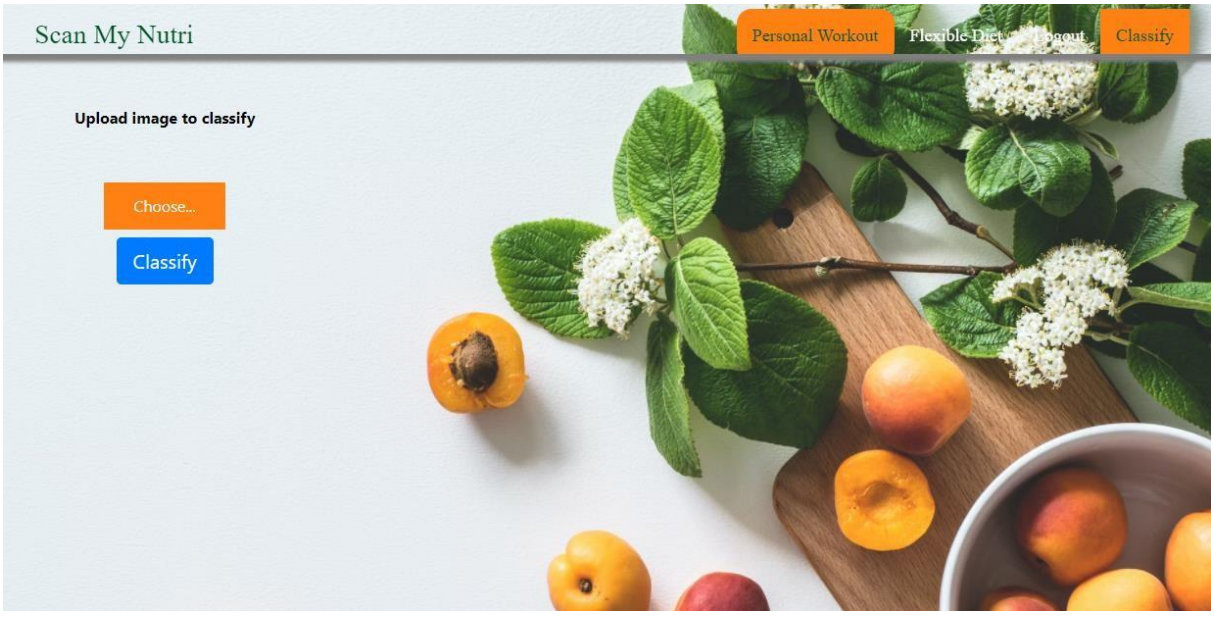
Macronutrients

Carbohydrates




New here ?
SIGN UP


Sign in
mugesh9902@gmail.com
LOGIN


Scan My Nutri
Personal Workout
Classify
Upload image to classify
Choose...
Classify


Scan My Nutri
Personal Workout
Flexible Diet
Logout
Classify
Upload image to classify
Choose...
Classify


Scan My Nutri
Personal Workout
Flexible Diet
Logout
Classify
Upload image to classify
Choose...
Food Classified is:
Tomato 1
[{'sugar_g': 2.6, 'fiber_g': 1.2, 'serving_size_g': 100.0, 'sodium_mg': 4, 'name': 'tomato', 'potassium_mg': 23, 'fat_saturated_g': 0.0, 'fat_total_g': 0.2, 'calories': 18.2, 'cholesterol_mg': 0, 'protein_g': 0.9, 'carbohydrates_total_g': 3.9}]

CHAPTER-8

TESTING

8.1 Test cases :

				Date	21-Nov-22								
				Team ID	PNT2022TMID49457								
				Project Name	AI- Powered Nutrition Analyzer For Fitness Enthusiasts								
				Maximum Marks	4 marks								
Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
HomePage_TC_OO1	Functional	Home Page	Verify user is able to see the home page or not.		1. Enter URL and click go 2. Verify whether the user is able to see the home page.	Enter URL and click go	User able to see the home page	Working as expected	Pass	Nil	N		Mayankkumar M
HomePage_TC_OO2	UI	Home Page	Verify the UI elements in Home Page		1. Enter URL and click go 2. Verify the UI elements in Home Page.	Enter URL and click go	Application should show below UI elements:	Working as expected	pass	Nil	N		Manikandaraddu M
RegisterPage_TC_OO3	Functional	RegisterPage	A Register page is able to will Input the user data.		1. Enter URL and click go 2. Verify the UI elements in Home Page 3.Click the signup button	Click in sign up home page	Application should show 'Incorrect email or password ' validation message.	Working as expected	pass	Nil	N		Arun O
LoginPageTC_OO4	Functional	login page	Verify user is able to redirect to predict page or not.		1.Enter URL and click go 2.Click on Predict button 3.Verify whether the user to redirect to predict page or not.	Click in sign in home page	Application should show 'Incorrect email or password ' validation message.	Working as expected	pass	Nil	N		Aravalli M
PredictPage_TC_OO5	UI	Predict page	Verify the UI elements in Predict Page		1. Enter URL and click go 2. Verify the UI elements in Predict Page.	Click the predict button and redirect to predict page	Application should show below UI elements: Dropdown, Label, Upload file Button, Predict button.	Working as expected	pass	Nil	N		Mayankkumar M
PredictPage_TC_OO6	Functional	Predict page	Verify user is able to select the dropdown value or not.		1.Enter URL and click go 2.Click on Predict button 3.Verify whether the user to redirect to predict page or not. 4.Verify user is able to select the dropdown value or not.	Fruit or Vegetable	Application should shows user to choose fruit or vegetable option in dropdown list.	Working as expected	pass	Nil	N		Manikandaraddu M
PredictPage_TC_OO7	Functional	Predict page	Verify user is able to upload the image or not.		1.Enter URL and click go 2.Click on Predict button 3.Verify whether the user to redirect to predict page or not. 4.Verify user is able to select the dropdown value or not. 5.Verify user is able to upload the images or not	Images to be Uploaded	Application should shows the uploaded image.	Working as expected	pass	Nil	N		Arun O
PredictPage_TC_OO8	Functional	Predict page	Verify whether the image is predicted correctly or not		1.Enter URL and click go 2.Click on Predict button 3.Verify whether the user to redirect to predict page or not. 4.Verify user is able to select the dropdown value or not. 5.Verify user is able to upload the images or not 6. Verify whether the image is predicted correctly or not	Click the Predict Button	Application shows the predicted output	Working as expected	pass	Nil	N		Aravalli M

8.2 User Acceptance Testing :

- **Purpose of Document**

The purpose of this document is to briefly explain the test coverage and open issues of the [AI- Powered Nutrition Analyzer For Fitness Enthusiasts] project at the time of the release to User Acceptance Testing (UAT).

- **Defect Analysis**

This report shows the number of resolved or closed bugs at each severity level, and how

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	7	3	6	5	21
Duplicate	4	0	3	0	7
External	1	2	0	1	4
Fixed	14	1	3	8	26
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	4	2	0	6
Totals	26	11	18	19	67

- **Test Case Analysis**

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	30	0	0	30
Security	2	0	0	2
Outsource Shipping	1	0	0	1
Exception Reporting	7	0	0	7
Final Report Output	9	0	0	9
Version Control	1	0	0	1

CHAPTER-9

TESTING

9.1 Performance Metrics

- **Model Summary**

```
[ ]  model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 max_pooling2d_1 (MaxPooling  (None, 15, 15, 32)       0
 2D)

 flatten (Flatten)           (None, 7200)              0

 dense (Dense)               (None, 128)               921728

 dense_1 (Dense)             (None, 46)                5934

=================================================================
Total params: 928,558
Trainable params: 928,558
Non-trainable params: 0
_________________________________________________________________
```

- **Accuracy**

```
[ ]  model.fit(x_train, epochs=10, steps_per_epoch=len(x_train))
```

```
Epoch 1/10
145/675 [=====>........................] - ETA: 2:59:56 - loss: 2.5187 - accuracy: 0.3308/usr/lc
  warnings.warn(str(msg))
444/675 [==================>...........] - ETA: 1:18:06 - loss: 1.6278 - accuracy: 0.5611/usr/lc
  warnings.warn(str(msg))
675/675 [==============================] - 13615s 20s/step - loss: 1.3956 - accuracy: 0.6202
Epoch 2/10
675/675 [==============================] - 327s 485ms/step - loss: 0.8247 - accuracy: 0.7630
Epoch 3/10
675/675 [==============================] - 313s 464ms/step - loss: 0.7388 - accuracy: 0.7813
Epoch 4/10
675/675 [==============================] - 314s 466ms/step - loss: 0.7007 - accuracy: 0.7899
Epoch 5/10
675/675 [==============================] - 311s 460ms/step - loss: 0.6655 - accuracy: 0.8010
Epoch 6/10
675/675 [==============================] - 321s 475ms/step - loss: 0.6452 - accuracy: 0.8053
Epoch 7/10
675/675 [==============================] - 316s 468ms/step - loss: 0.6287 - accuracy: 0.8097
Epoch 8/10
675/675 [==============================] - 322s 477ms/step - loss: 0.6165 - accuracy: 0.8142
Epoch 9/10
675/675 [==============================] - 319s 472ms/step - loss: 0.6013 - accuracy: 0.8164
Epoch 10/10
675/675 [==============================] - 320s 475ms/step - loss: 0.5884 - accuracy: 0.8221
<keras.callbacks.History at 0x7faad13e4e10>
```

CHAPTER-10

ADVANTAGES AND DISADVANTAGES

10.1 Advantages:

- Scan My Nutri also has a number of additional capabilities.
- To aid in weight management, we track both monthly progress and daily caloric intake based on goals.
- There are also meal plans and recipes for different diet types, daily water intake, or even workout plans to stay fit.

10.2 Disadvantages :

- Focuses on calorie counting and weight loss ,which may not be suitable for all users.
- Accuracy is not guaranteed though the app Gets better over time.
- Determining which nutrients are positive can be difficult depending on the type of sample use.

CHAPTER-11

CONCLUSION

Important obstacles to the accurate estimation of food quantity need to be overcome before these commercial platforms can be used as a real alternative to traditional dietary assessment methods. None of the platforms were capable of estimating the amount of food. These results demonstrate that certain platforms perform poorly while others perform decently.

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CHAPTER-12

FUTURE SCOPE

In the current project, we have implemented the idea that eating high-protein foods has many fitness benefits, including speeding recovery after exercise or injury, reducing muscle loss, building lean muscle, helping maintain a healthy weight, and curbing hunger. Studies have demonstrated that higher protein diets may spare lean body mass during weight loss, promote weight management, enhance glycemic regulation, and increase intestinal calcium absorption, which may result in long-term improvements in bone health.

CHAPTER-13

APPENDIX

Github : https://bit.ly/3XmqQEr

Demo Link : https://bit.ly/3tMtSEx