AI - POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

A PROJECT REPORT

Submitted by

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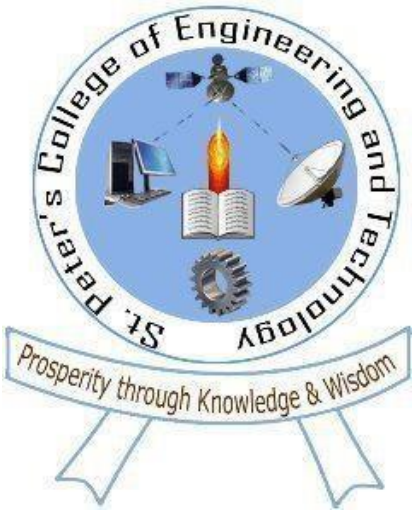
in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING



St. PETER's COLLEGE OF ENGINEERING AND TECHNOLOGY

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DECEMBER 2022

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BONAFIDE CERTIFICATE

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Submitted for the University examination held on _____

INTERNAL EXAMINER

EXTERNAL EXAMINER

Project Report

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AI-Powered Nutrition Analyser For Fitness Enthusiasts

1. INTRODUCTION

1. Project Overview

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

2. Purpose

- Know fundamental concepts and techniques of Convolutional Neural Network.
- Gain a broad understanding of image data.
- Knowhow to pre-process/clean the data using different data pre-processing techniques.
- Know how to build a web application using the Flask framework.

2. LITERATURE SURVEY

2.1. EXISTING PROBLEM

Many people, have their own method or app to analyze their daily intake of nutrition , which they feel is one of the main factor for maintaining a healthy body and one of the important steps among many towards fitness. It is a good habit for a person to record daily intake of nutrition but due to unawareness and lack of proper applications to suit their privacy, lacking proper predefined plans based on actual data of nutrition present in various food, they tend to either give up, or use methods which are not that much helpful. Due to lack of a complete tracking system, there is a constant struggle to properly know the necessary amount of nutrition needed and the amount we intake, then the total estimation till the end of a certain period.

2.2. REFERENCES

S.NO	TITLE & AUTHOR	YEAR & PUBLICATIONS	METHODOLOGY & ALGORITHM	ADVANTAGE	DRAWBACK
1	Artificial intelligencein food science and nutrition Infomation	**April 2019** Published by Oxford University Press on behalf of the International Life Sciences Institute.	AI in areas such as immunity boosting foods, dietary assessment, gut microbiome profile analysis, and toxicity prediction of food ingredients.chniques	tells exactly what to eat according to the body type. All of this is packaged in a comprehensive	The AI system may not always make the right decisions, but it will eventually learn from

	Technolgies Institute(ITI) Kosmas Dimitropou los		are growing rapidly. They are a type of ML algorithms that requires very little human supervision when training and can crunch huge amounts of data in a short time. As for their application in healthcare, ANNs are used to analyze medical imaging, biochemical studies.	nutrition and activity tracker	these errors and adjust its decision making processes to improve over time.
2.	Artificial Intelligencein Nutrients Science BALAKRISH NA .Y	**JUNE 2022** This article belongs to the Section Nutrition Methodology & Assessment	The possibilities of artificial intelligence in the field of medical diagnostics, risk prediction and support of therapeutic. AI algorithms may help better understand	creation of a global network that will be able to both actively support and monitor the personalized supply of nutrients..	The AI System May Be Buggy At First it can take time to work correctly. This is normal.

			and predict the complex and nonlinear interactions between nutrition related data and health		
3.	AI-Based Dietician Professor, Department of Computer Science, Dayananda Sagar Academy of Technology	**April 2022** International Journal of Creative Research Thoughts (IJCRT	Consulting a dietician is something that everyone cannot afford. Also, consulting a dietician could be time-consuming. An expert system method to recommend a personalized diet plan. AI could significantly improve packaging, increasing shelf life, a combination of the	Helps the user to interact better with the system, Provide information to the system as input and take the recommended diet plan as output	Doesn't have acknowledgabledietician Don't value customer time Worst service

			menu by using AI algorithms, and food safety by making a more transparent supply chain management system.		
4.	Virtual Nutritionistusing AI International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249-8958, Volume-8 Issue-5,	**June 2019** Blue Eyes Intelligence Engineering and science publication	It will generate the diet plan as well as it also monitor the user health to classify the category of the disease and to create the diet plan. It will also reduce the cost of consulting the person nutritionist. Gradient boosting Regression was used to generate the model, as the method non-linear relationships between PGGR and	A user can track his/her progress towards his/her goal from the day he'd started using the application. Reminders for every meal. Inbuilt personalized customization of meals depending upon one's preferred foods.	High Costs. No creativity. AI is that it cannot learn to think outside the box.Unemployment Make Humans Lazy. No Ethics. Emotionless. No Improvement

			different factors in our dataset.Gradient boosting Regression uses decision trees to classify the data.		
5.	A Computer Visionbased Indian Food Detection and Nutrition CalculationApp Durgesh Samariya	**MAY 2022** DEVELOPERS CORNER	The task of food detection/classification is not easy as it seems. all possible options related to the given Image. For example, if a user uploads a dal image then the Foodify.ai app return all dal's from our nutrition database such as Dal Tadka, Dal Fry, Dal Makhni, etc. AI algorithms can help the food delivery systems to manage the orders	Easy to use Highly productive No more man power required	Calculation cannot be accurate Software development is difficult Image processing can always not be correct

			accurately. It will reflect the customer's order to two different delivery partners, one who is in the nearby location of the delivery address and the other who is in the nearby location of the restaurant where the customer has ordered the food		
6.	Diet Monitoring and Health Analysis Using Artificial Intelligence AUTHOR		Our food recognition system employs visual sensors to capture food images as the source data. Due to the recent advances of electronics, visual sensors are now available in many	The diseases can be identified accurately by the classifiers Wearable are used by the user to keep track of the diet.Intake of the food is taken into count	By integrating AI with the user data, map its user's nutritional patterns and needs fitness coach is an AI

	: R. Divya Final year Students, Dept of CSE, Velammal Engineering College, Chennai, India(TN) S. Vithiya Lakshmi YEAR :2021		Internet -of -Things(IoT) devices, such as smart phones Control of health and well -being. Additionally, AI increases the ability for healthcare professionals to better understand the day -to -day patterns and needs of the people they care for, and with that understanding they are able to provide better feedback, guidance and support for staying healthy	and suggestionsare provided to improve the health of the user.	

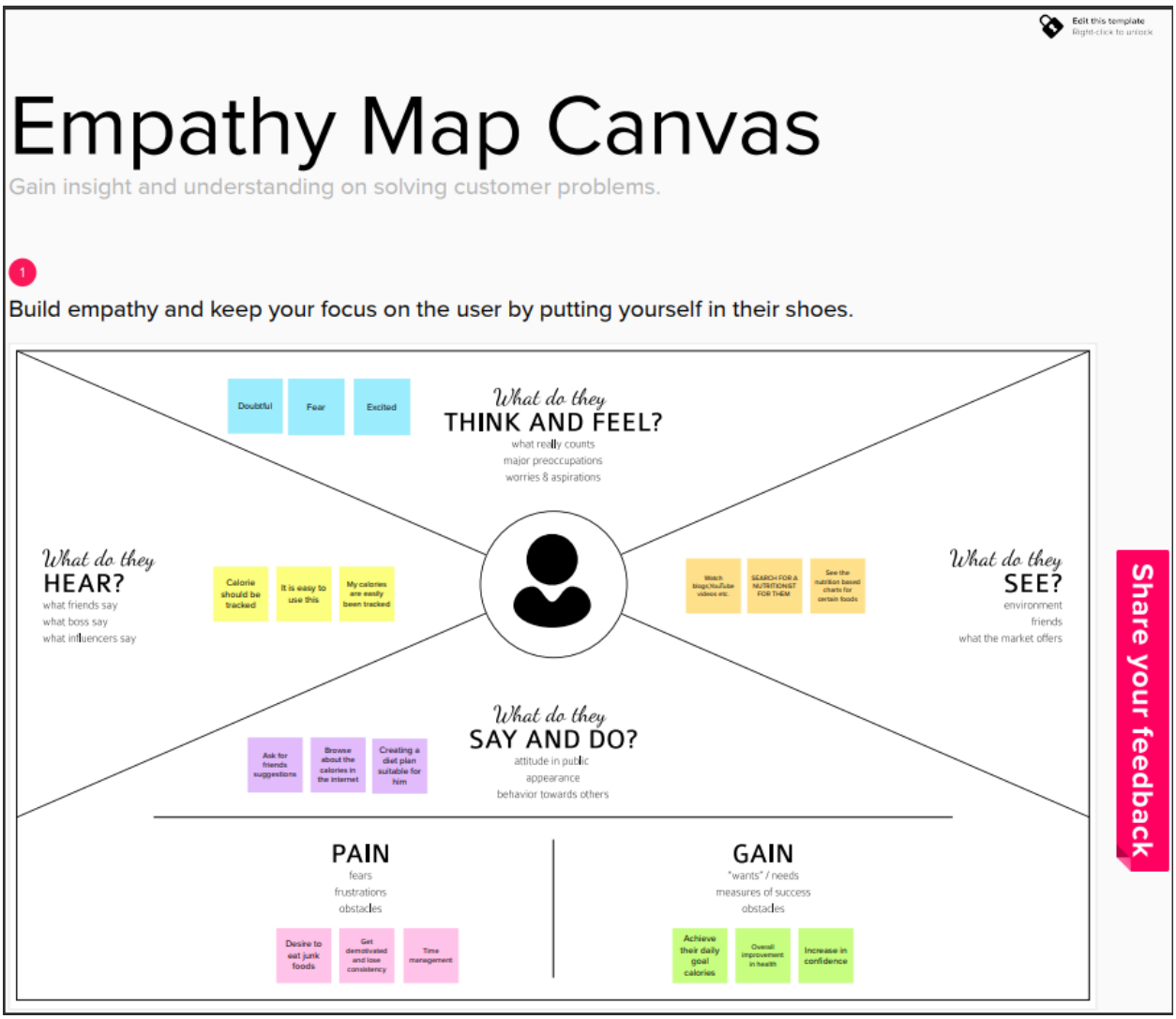
2.3 PROBLEM STATEMENT DEFINITION

The user needs information about the nutritional values of different types of food as accurately as possible to determine the necessary amount of calorie intake to maintain their health and also to manage their schedule.

3. IDEATION & PROPOSED SOLUTION

3.1. EMPATHY MAP CANVAS

Gain insight and understanding on solving customer problems.



GAIN

"wants" / needs
measures of success
obstacles

- Achieve their daily goal calories
- Overall improvement in health
- Increase in confidence

What do they SEE?

environment
friends
what the market offers

- Watch blogs,YouTube videos etc.
- SEARCH FOR A NUTRITIONIST FOR THEM
- See the nutrition based charts for certain foods

What do they THINK AND FEEL?

what really counts
major preoccupations
worries & aspirations

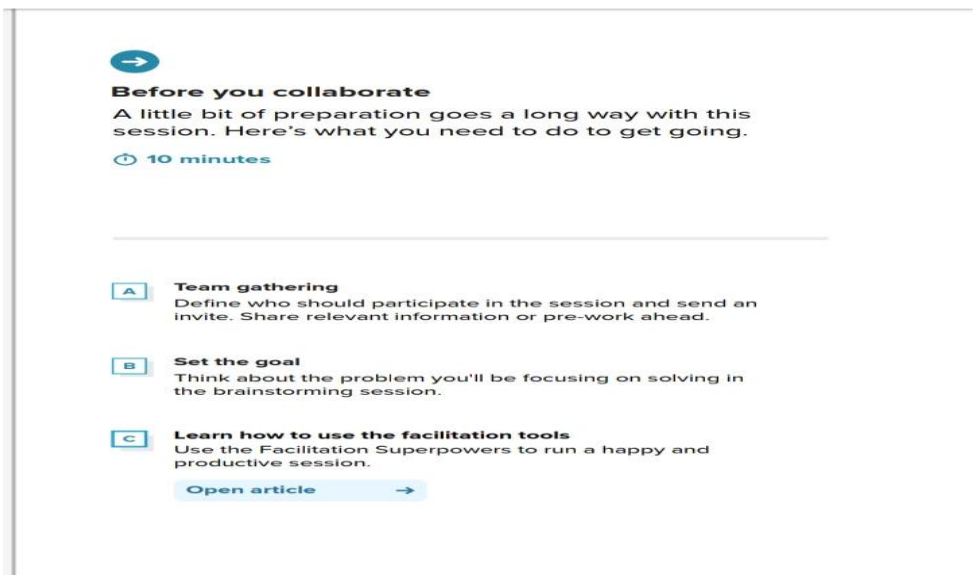
- Doubtful
- Fear
- Excited

What do they SAY AND DO?

attitude in public
appearance
behavior towards others

- Ask for friends suggestions
- Browse about the calories in the internet
- Creating a diet plan suitable for him

3.2 IDEATION & BRAINSTORMING



2

Brainstorm

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

10 minutes

TIP

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

VASEEKARAN

- GIVING WARNING WHENEVER MISSES THEIR SCHEDULED DIET PLAN.
- BY INFORMING THEM OF THE INTAKE OF CARBOHYDRATE AND PROTEIN
- BY INTRODUCING THEM TO VARIOUS DIET PLANS.
- BY TRACKING THE INTERVAL BETWEEN EVERYTIME THEY EAT
- INFORMING THEM OF VARIOUS EASILY AVAILABLE FOOD RICH ON WHATEVER THEY REQUIRE
- BY MAKING A DIET OF PLANS FOR THEIR NECESSARY NEEDS
- BY INFORMING THEM OF CONTENT THE WANT TO AVOID IN FOOD
- BY INFORMING THEM OF BASIC NUTRITION THEY GET IN EACH OF THEIR FOOD.

Godwin Jose

- Track their calories by using the information in the internet
- Build a app so that they can track the calorie easily
- Give them a easiest diet chart to eat
- Stay Hydrated
- Go for Healthier Options
- Portion Your Meals
- Give them a proper nutritional plan
- Track their sleep cycle
- Analyze about their day to day activities

ANUSUYA S

- Indicating the every diet plan as alarm
- Inspite of carbohydrates consume protein
- A diet which focuses on whole food rich in nutrients
- Avoid sugar and sugar - sweetened drinks
- Eat rich fiber foods
- Exercise regularly

Gobinath K

- Make sure they get a Quality Sleep
- Misinformation should be avoided
- Giving them a proper diet plan
- Make them happy to relieve from stress
- Track their nutritional goals

NAVEEN

MAINTAINING THE DIET PLAN AS PER THE SCHEDULE

DRINKING MORE WATER CAN REDUCE THE WEIGHT

EAT PROPER FOOD FOR EVERY PHYSICAL ACTIVITYS YOU DO

PROTEIN DIET PLAN IS HELPS WEIGHT LOSS AND WEIGHT GAIN

A WELL-BALANCED DIET PROVIDES IMPORTANT VITAMINS,MINERALS,AND NUTRIENTS TO KEEP THE BODY AND MIND STRONG

MAKE SURE THEY HAVE THE KNOWLEDGE ABOUT NUTRITIONAL CONTENT OF EACH FOODS

MOHAMMED HASSAIN

ALERT THEM TO AVOID EATING JUNKFOOD

MEASURE THE AMOUNT OF FOOD TAKEN EACH TIME OF DAY.

AVOID SNACKING ON ITEMS FREQUENTLY

CALCULATING THE AMOUNT OF PROTEIN INTAKE

NOTIFY THEM OF THEIR FAT CONSUMPTION

ALERT THEM TO EAT THEIR BREAKFAST ON TIME

GEETHA V

Nourish your body with healthy fats

Get serious about your sleep hygiene

Get enough sunshine to boost your vitamin D reserves

Meditate to relieve life stress

Do some stretching every morning

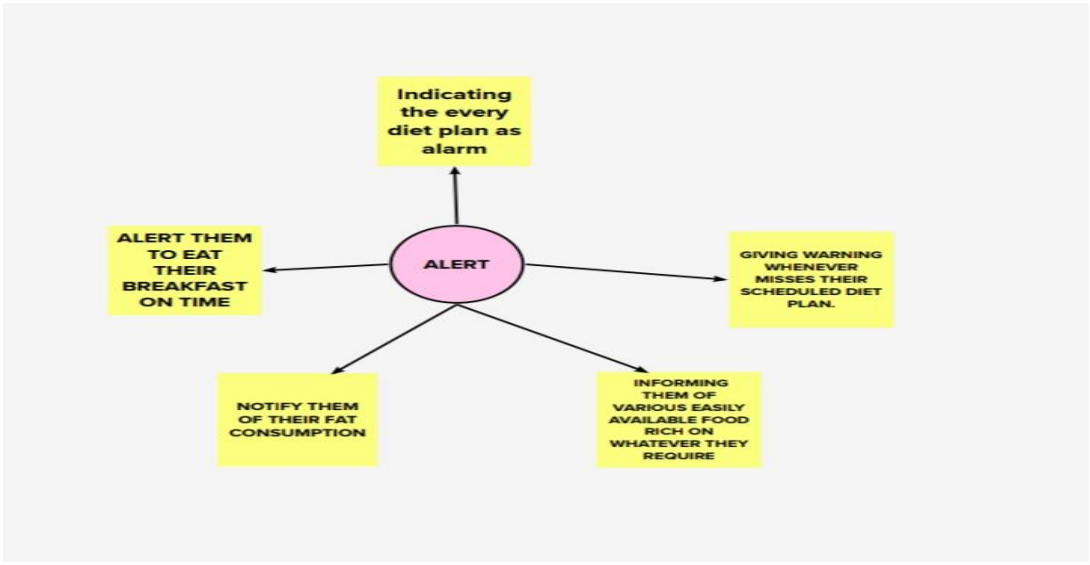
Use a food diary to track your nutrition

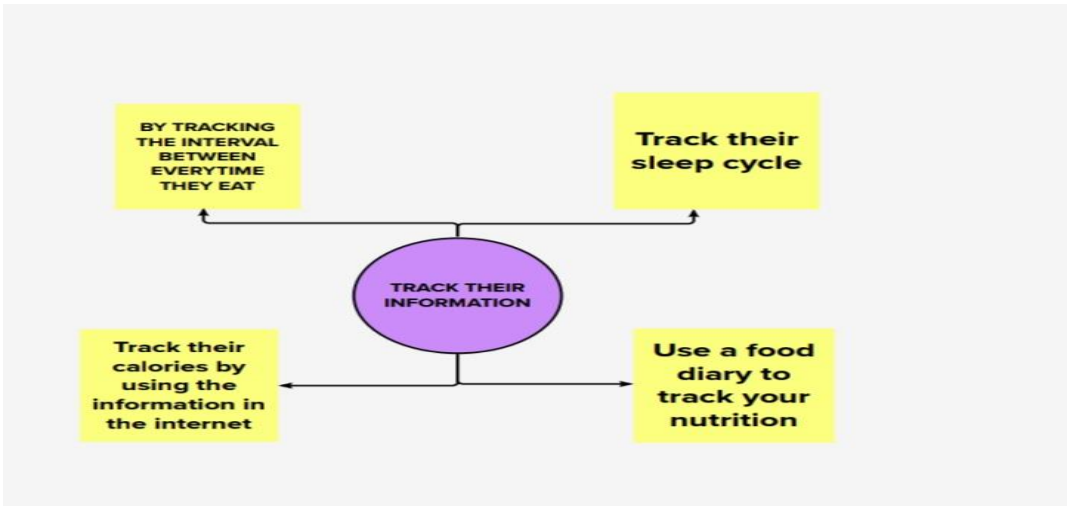
3

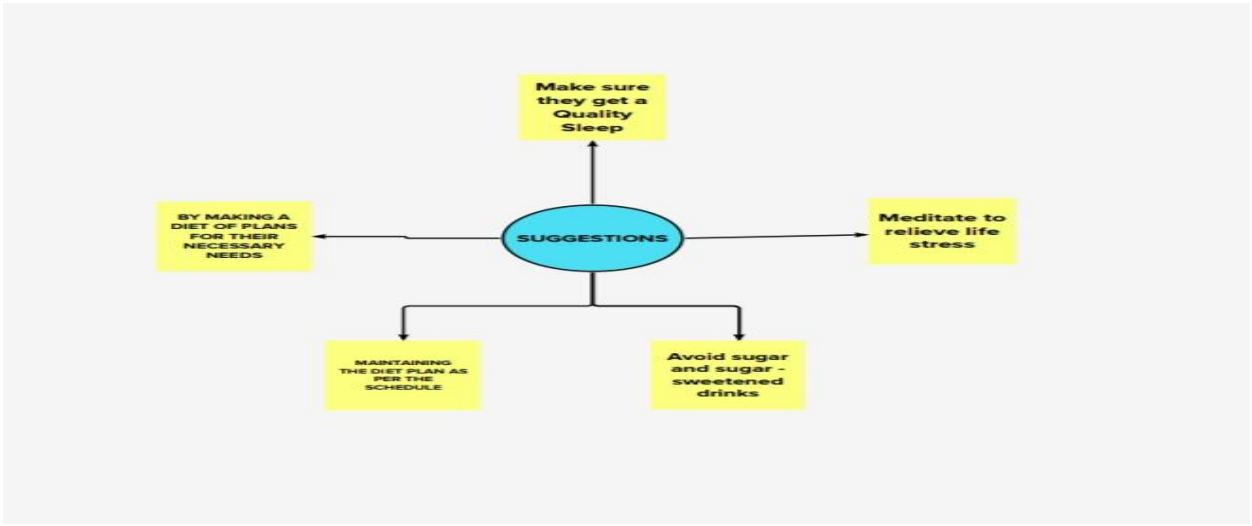
Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes


Indicating the every diet plan as alarm
ALERT THEM TO EAT THEIR BREAKFAST ON TIME
ALERT
GIVING WARNING WHENEVER MISSES THEIR SCHEDULED DIET PLAN.
NOTIFY THEM OF THEIR FAT CONSUMPTION
INFORMING THEM OF VARIOUS EASILY AVAILABLE FOOD RICH ON WHATEVER THEY REQUIRE


BY TRACKING THE INTERVAL BETWEEN EVERYTIME THEY EAT
Track their sleep cycle
TRACK THEIR INFORMATION
Track their calories by using the information in the internet
Use a food diary to track your nutrition

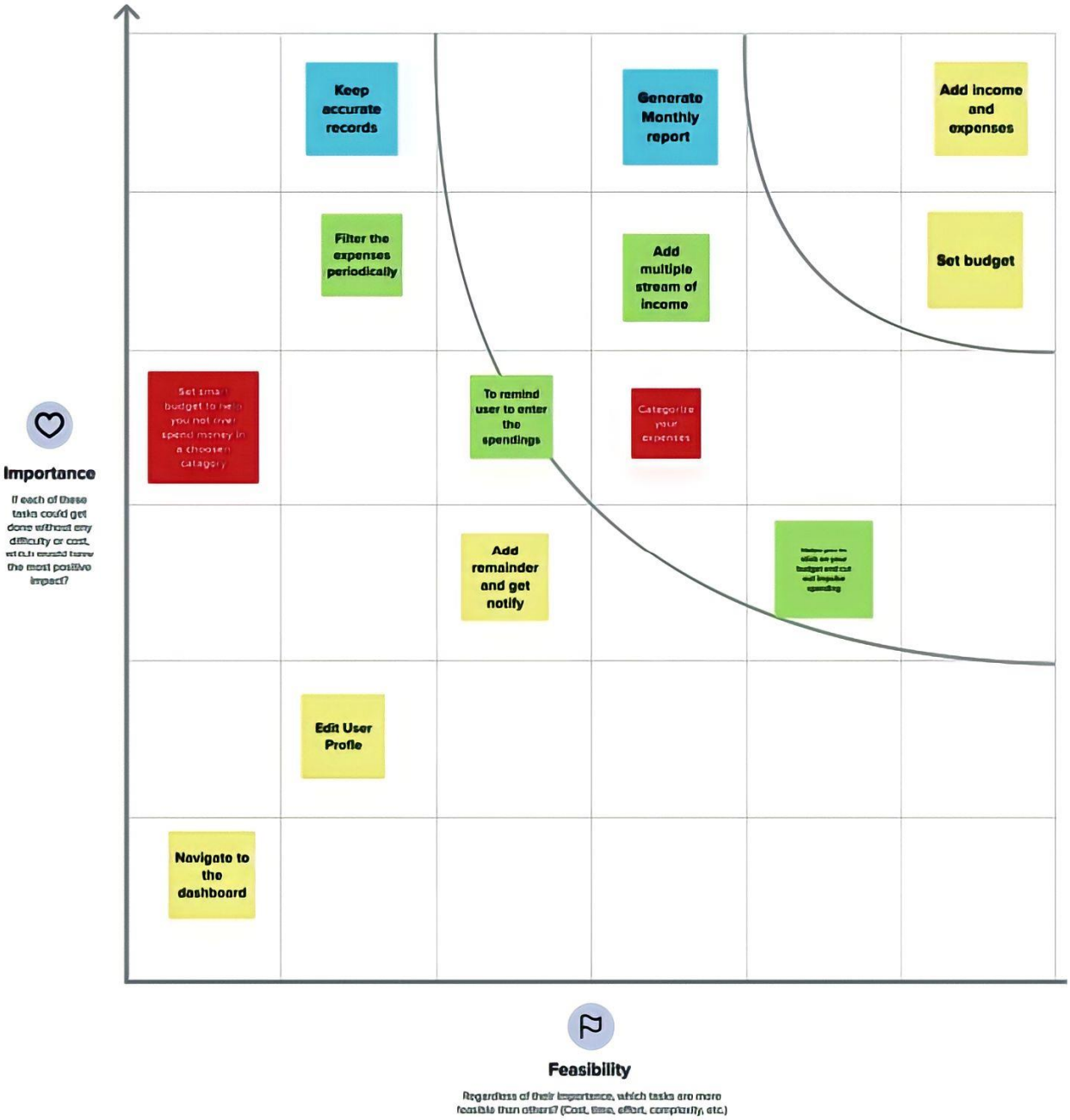

Make sure they get a Quality Sleep
BY MAKING A DIET OF PLANS FOR THEIR NECESSARY NEEDS
SUGGESTIONS
Meditate to relieve life stress
MAINTAINING THE DIET PLAN AS PER THE SCHEDULE
Avoid sugar and sugar - sweetened drinks

4

Prioritize

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

20 minutes



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

3.3. PROPOSED SOLUTION

Proposed Solution:

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The user needs information about the nutritional values of different types of food as accurately as possible to determine the necessary amount of calorie intake to maintain their health and also to manage their schedule.
2.	Idea / Solution description	To determine the calorie consumption for the individual based on their health aspects. To provide them with regular remainder on nutrition requirement for the customer/individual. To provide the amount of consumption of food based on the calorie value predicted using the model.
3.	Novelty / Uniqueness	Easier prediction of calorie utilization, preparing diet sheet based upon their calorie intake, improve customer satisfaction by providing information about the food items which are easily available in their locality.
4.	Social Impact / Customer Satisfaction	Regular suggestion on fitness maintenance and healthy diet suggestion.
5.	Business Model (Revenue Model)	• Key Partners are supporting organization and fitness enthusiasts. • Key Activities are done as prediction, suggestion for calorie consumption and healthy life suggestion. • Showing advertisements and promoting certain brands by collaborating with Google Adsense. • Channels are email, mobile, helpline and health care. • Subscription based service to the user.
6.	Scalability of the Solution	Every Customer must get Healthy Life and Proper Diet Maintenance based on the Healthy Measure and Calorie prediction. Also suggest the feedback to maximize the Application usage. Every user can easily access our product from their smartphones for free and easy to understand interface.

3.4. PROBLEM SOLUTION FIT

1.CUSTOMER SEGMENTS User has to upload the food (fruits and vegetables) image to know the nutrition data	**5. AVAILABLE SOLUTIONS** Helps to know the facts of food habits and health	**8.CHANNELS OF BEHAVIOUR** Users should be able to interact with the recommended system and obtain information both online and offline.
2.JOBS TO BE DONE / PROBLEM Ineffectual to get the details systematically	**6.CUSTOMER CONSTRAINTS** Takes more time to get the information	**9.PROBLEM ROOT CAUSE** There isn't a systematic approach to gather dietary information rapidly. One must wait hours to visit a diet specialist.
3.TRIGGERS Help to fitness people to analyze and to know the food calories and so on	**7.BEHAVIOUR** The digitalized nutrition assistant makes it simpler for people to obtain information.	**10 YOUR SOLUTION** Analyze the nutritional elements in the images, and then compute the calories, fat, carbs, and protein levels to give a dietary evaluation report. The system's effectiveness and accuracy will also be increased by expanding the dataset to cover a larger variety of food kinds.
4. EMOTIONS: BEFORE / AFTER Before, waiting for a diet expert took a lot of time. After, getting aware of health foods just image.		

4. REQUIREMENT ANALYSIS

4.1. FUNCTIONAL REQUIREMENT

Following are the functional requirement 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	User Login	Give the login ID Give the password that is created during registration
FR-4	Dataset	The dataset that is being uploaded includes various fruit photos.
FR-5	Image Input	examining the user-provided image input
FR-6	Process	using different convolution layers to test the image
FR-7	Result	The specific fruit's nutrient content is shown.

4.2. NON-FUNCTIONAL REQUIREMENT

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

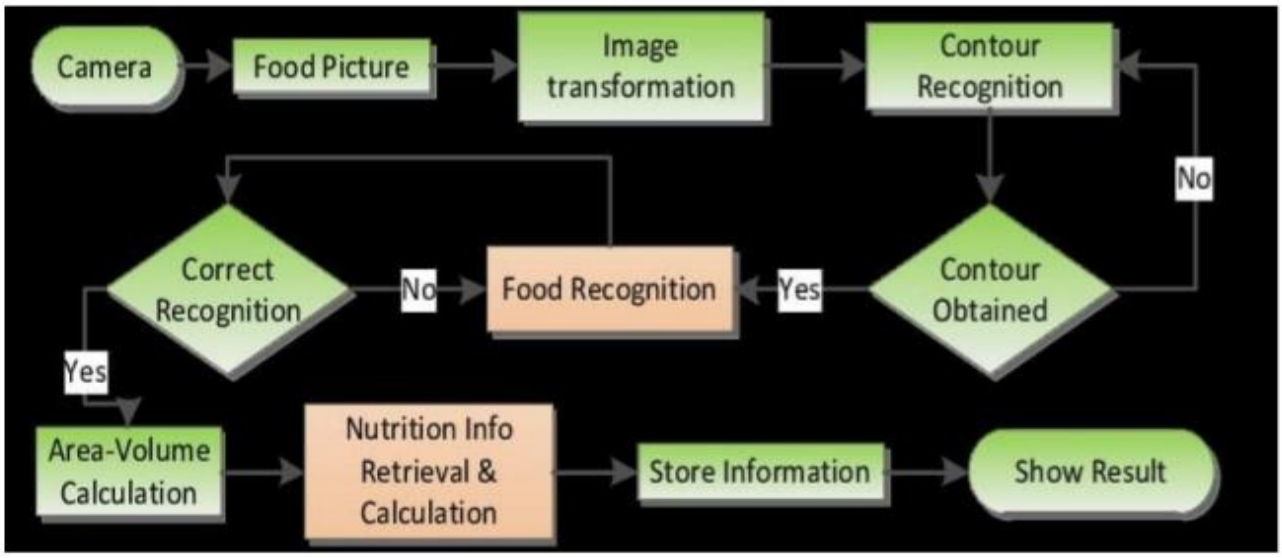
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The means by which the system will be usable by users who require special or unconventional accessibility requirements
NFR-2	**Security**	Describe the extent to which data must be safeguarded and kept private.
NFR-3	**Capacity**	ability to maintain functionality as circumstances

		change based on the input we provide.
NFR-4	**Performance**	Rapid response is accomplished.
NFR-5	**Availability**	The minimal amount of time allocated to online. The service should be accessible during these times.
NFR-6	**Scalability**	The program's capacity to deal with a rise in without performance reduction or the capacity to grow quickly.

5 . PROJECT DESIGN

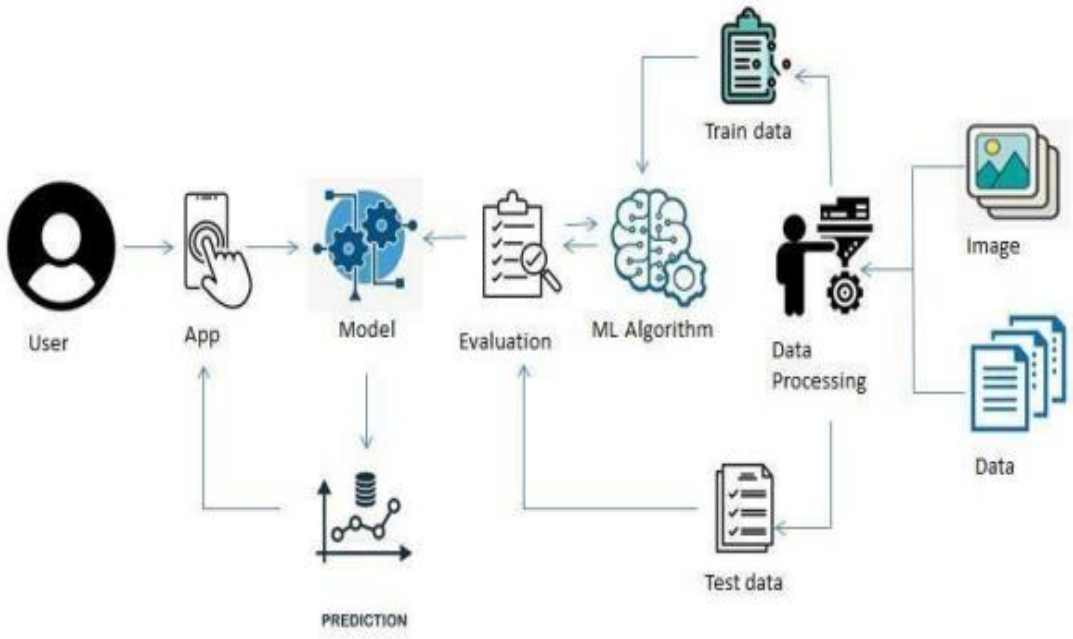
5.1 DATA FLOW DIAGRAM

Data Flow Diagrams:



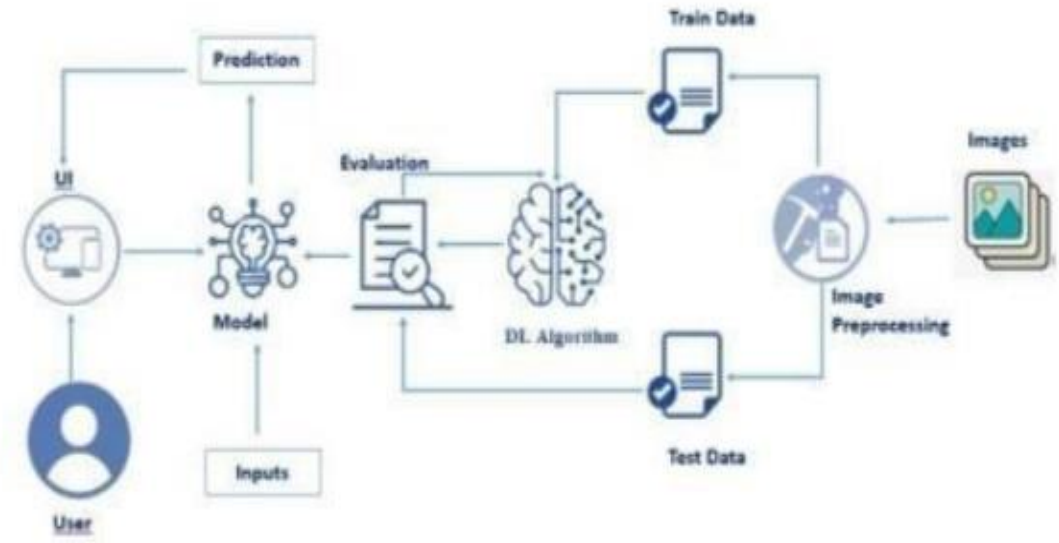
5.2 SOLUTION ARCHITECTURE

Solution architecture diagram:



TECHNICAL ARCHITECTURE

Technical stack:



5.3. USER STORIES

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Common User	Registration	USN-1	As a user, I can Register and create an account by entering my credentials	I can access my account in the website/app	High	Sprint-1
		USN-2	As a user, I can choose the social media account which I want to register with	I can choose between gmail, facebook and other accounts.	High	Sprint-1
		USN-3	As a user, I receive suggestions based on similar solutions	I can receive recommended solutions for my problem	Medium	Sprint-2
		USN-4	As a user, I can get information about the calorie intake on a daily basis	I can receive the calorie values of different food items	Medium	Sprint-2

6.PROJECT PLANNING & SCHEDULING

6.1. SPRINT PLANNING & ESTIMATION

Product Backlog, Sprint Schedule, and Estimation

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	Login method	USN-1	As a user, I can find the login method more efficient	7	High	Geetha, Gobinath
Sprint-2	Device interface	USN-2	As a user, I can use it with minimal physical interaction with the device.	6	Medium	Godwin Jose, Naveen
Sprint-4	features	USN-3	As a user, I can find Many features available	10	Low	Godwin Jose, Naveen
Sprint-3	Safety	USN-4	As a user, I need to get the Nutritional data which are accurate and safe	5	High	Vaseekaran, Anusuya
Sprint-1	Testing	USN-5	As a developer, we must ensure the app is working properly for the users	7	Medium	Vaseekaran, Godwin
Sprint-3	Correction	USN-6	To correct any bugs/Failure reported	6	High	Godwin Jose, Geetha
Sprint-1	Results	USN-7	As a user, I can rely on the results without any suspicion.	6	High	Anusuya

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Uses	USN-8	As a user, I can benefit from the result as it will help me maintain a proper diet	8	Medium	Geetha, Anusuya
Sprint-2	Speed	USN-9	As a user, I can get the results on the spot immediately after the screening process.	7	Low	Mohammad Hassain, Naveen
Sprint-4	Suggestions	USN-10	As a user, I should be able to get suggestions according to my body type	10	Medium	Mohammad Hassain, Geetha
Sprint-3	Cost-effectiveness	USN-11	As a user, I can reach many people who are too occupied with their work to get a proper workout and need to maintain a proper diet	4	Medium	Godwin Jose, Vaseekaran
Sprint-2	Informative	USN-12	As a user, I can create awareness among the people to have a healthy diet habit for a healthy body	7	Low	.Gobinath,Naveen

6.2. SPRINT DELIVERY SCHEDULE

Project Tracker, Velocity & Burndown Chart

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

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV)per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

7.CODING AND SOLUTIONS

FEATURE 1:

```
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('fruits.h5')
print("Loaded model from disk")

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

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



@ app.route('/predict' ,methods=['GET','POST']) # route to show the predictions in a Web UI
def lanuch():
```

```
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=['APPLE','BANANA','ORANGE','PINEAPPLE','WATERMELON']

result=str(index[pred[0]])
print(result)
x=result
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": "85887549f4msh51e7315b280a87ep1f43e0jsn585c940f2ea6",
"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)
```

FEATURE 2: Building CNN Model

```
# Part 1 - Building the CNN
# Importing the Keras libraries and packages
from keras.models import Sequential
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense
from keras.models import model_from_json
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
batch_size = 32
```

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
# All images will be rescaled by 1./255
train_datagen = ImageDataGenerator(rescale=1/255)
# Flow training images in batches of 128 using train_datagen generator
train_generator = train_datagen.flow_from_directory(
'Data', # This is the source directory for training images
target_size=(200, 200), # All images will be resized to 200 x 200
batch_size=batch_size,
# Specify the classes explicitly
classes = ['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON'],
# Since we use categorical_crossentropy loss, we need categorical labels
class_mode=;categorical’
 import tensorflow as tf
model = tf.keras.models.Sequential([
# Note the input shape is the desired size of the image 200x 200 with 3 bytes color
# The first convolution
tf.keras.layers.Conv2D(16, (3,3), activation='relu', input_shape=(200, 200, 3)),
tf.keras.layers.MaxPooling2D(2, 2),
# The second convolution
tf.keras.layers.Conv2D(32, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The  third convolution
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The fourth convolution
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# The fifth convolution
```

```
tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
tf.keras.layers.MaxPooling2D(2,2),
# Flatten the results to feed into a dense layer
tf.keras.layers.Flatten(),
# 128 neuron in the fully-connected layer
tf.keras.layers.Dense(128, activation='relu'),
# 5 output neurons for 5 classes with the softmax activation
tf.keras.layers.Dense(5, activation='softmax')
```

```
model.summary()
from tensorflow.keras.optimizers import RMSprop
early = tf.keras.callbacks.EarlyStopping(monitor='val_loss',patience=5)
model.compile(loss='categorical_crossentropy',
optimizer=RMSprop(lr=0.001),
metrics=['accuracy'])
total_sample=train_generator.n
n_epochs = 10
history = model.fit_generator(
train_generator,
steps_per_epoch=int(total_sample/batch_size),
epochs=n_epochs,
verbose=1)
model.save('model.h5')
acc = history.history['accuracy']
loss = history.history['loss']
epochs = range(1, len(acc) + 1)
# Train and validation accuracy
plt.plot(epochs, acc, 'b', label=' accurarcy')
plt.title(' accurarcy')
plt.legend()
plt.figure()
# Train and validation loss
plt.plot(epochs, loss, 'b', label=' loss')
plt.title(' loss')
plt.legend() plt.show()
```

8.TESTING

1. TEST CASES

A test case has components that describe input, action and an expected response, in order to determine if a feature of an application is working correctly. A test case is a set of instructions on "HOW" to validate a particular test objective/target, which when followed will tell us if the expected behaviour of the system is satisfied or not.

Characteristics of a good test case:

- Accurate: Exacts the purpose.
- Economical: No unnecessary steps or words.
- Traceable: Capable of being traced to requirements.
- Repeatable: Can be used to perform the test over and over.
- Reusable: Can be reused if necessary.

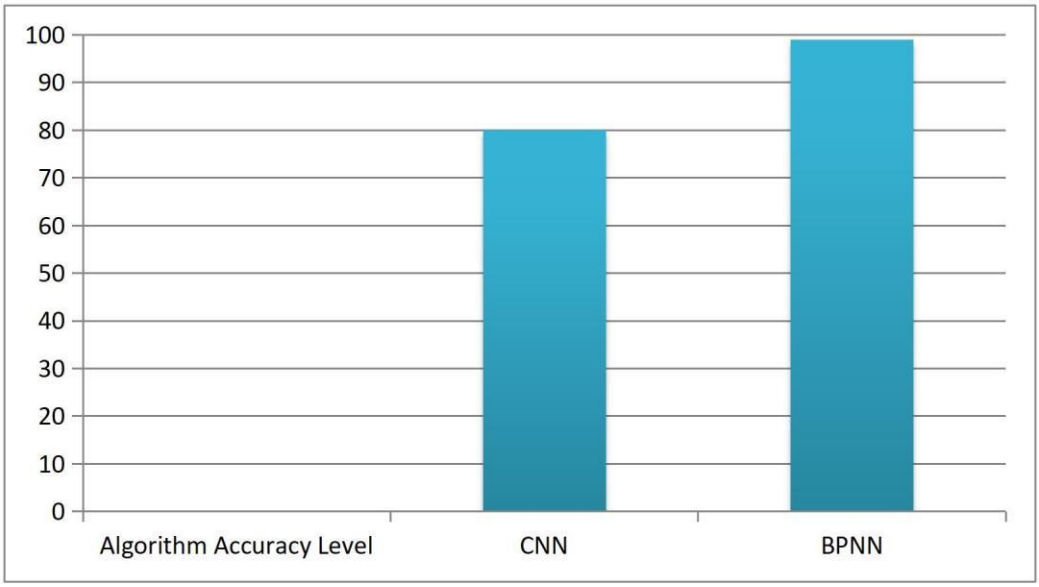
S.NO	Scenario	Input	Excepted output	Actual output
1	User login	User name and password	Login	Login success.
2	Upload Image	Upload input image (fruits and vegetables)	Predicting calorie, fat, carbs and food content of given image	Details are stored in a database.

2 USER ACCEPTANCE TESTING

This sort of testing is carried out by users, clients, or other authorised bodies to identify the requirements and operational procedures of an application or piece of software. The most crucial stage of testing is acceptance testing since it determines whether or not the customer will accept the application or programme. It could entail the application's U.I., performance, usability, and usefulness. It is also referred to as end-user testing, operational acceptance testing, and user acceptance testing (UAT).

9.RESULTS

9.1 PERFORMANCE METRICS



10. ADVANTAGES &DISADVANTAGES

ADVANTAGE

- Provide the nutrition content of Multifoods
- Helps for fitness people to maintain and know the proteins and calories of the food
- Gives accurate results in real-time application

DISADVANTAGE

- Hard to know the details of nutrition and calories of food
- Doesn’t ask to provide the users health condition
- Required more time to know the Multifoods

11.CONCLUSION

The approach for an automated food nutrition detection system that can determine the amountof nutrients in food is proposed in this project work. The machine has so far been able toplace the meal into one of the many categories listed in the dataset. The well-known food dataset was used for the categorization. The classification of the food photos into theirappropriate classifications using a deep learning approach. By reducing noise from the dataset, the classification process may be made better. The same research may be done with a larger dataset, more classes, and more photos in each class since a larger dataset increases accuracy by teaching the algorithm additional features and lowers the loss rate. The model's weights may be saved and used to create designs for food categorization, calorie extraction, and picture classification.

12.FUTURE SCOPE

The food photographs in this research study are categorised into the appropriate groups using a deep learning approach. In terms of future improvement, the classificationtask may be made better by reducing noise from the dataset. The same research may be done with a larger dataset, more classes, and more photos in each class since a larger dataset increases accuracy by teaching the algorithm additional features and lowers the loss rate. The model's weights may be saved and utilised to create a web or mobile application that classifies images and also extracts the calories from the food that has been identified.

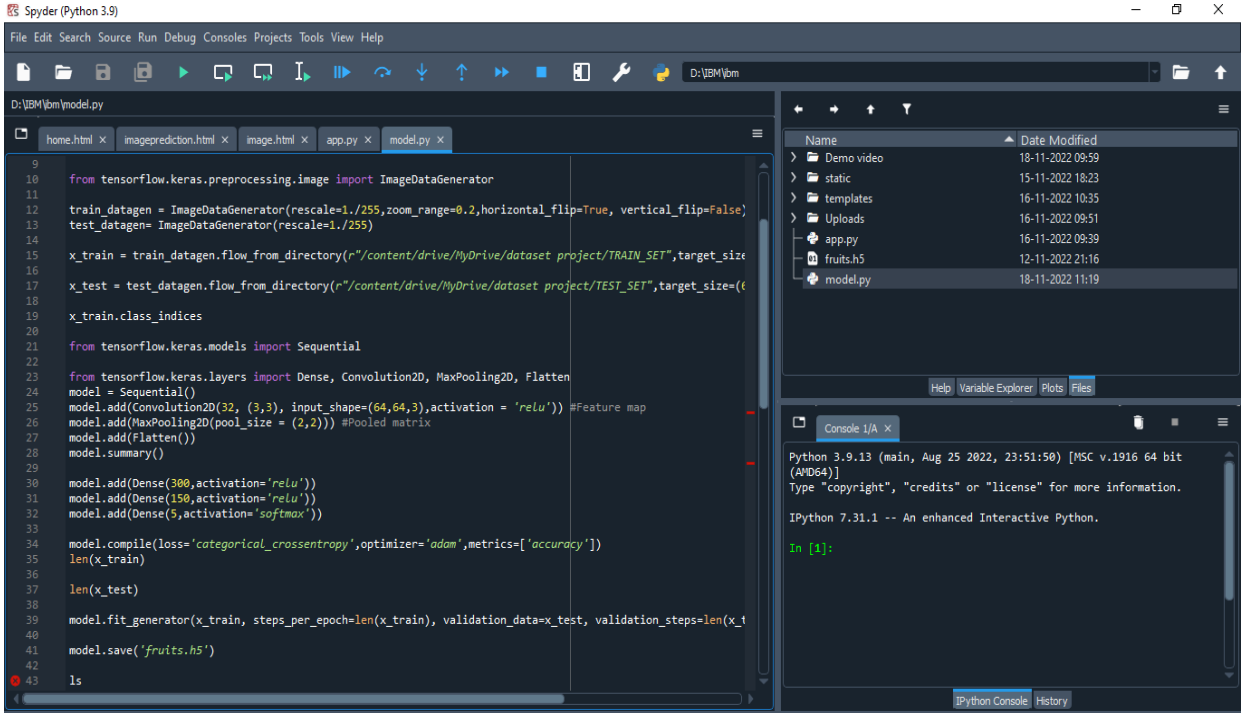
13.APPENDIX

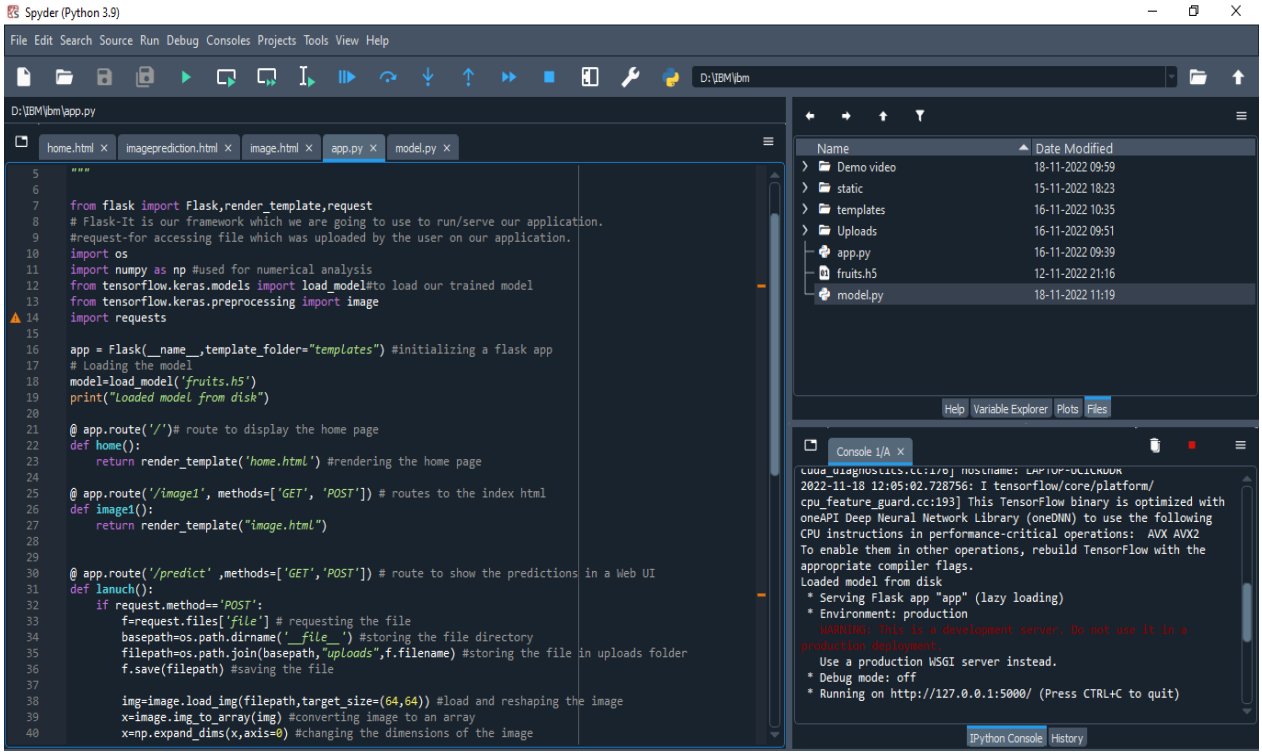
SOURCE CODE:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator


train_datagen = ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,
vertical_flip=False)

test_datagen= ImageDataGenerator(rescale=1./255)


x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset
project/TRAIN_SET",target_size=(64,64),class_mode='categorical')


x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset
project/TEST_SET",target_size=(64,64),class_mode='categorical')


x_train.class_indices


from tensorflow.keras.models import Sequential


from tensorflow.keras.layers import Dense, Convolution2D, MaxPooling2D, Flatten

model = Sequential()

model.add(Convolution2D(32, (3,3), input_shape=(64,64,3),activation = 'relu')) #Feature
map

model.add(MaxPooling2D(pool_size = (2,2))) #Pooled matrix

model.add(Flatten())

model.summary()


model.add(Dense(300,activation='relu'))

model.add(Dense(150,activation='relu'))

model.add(Dense(5,activation='softmax'))
```

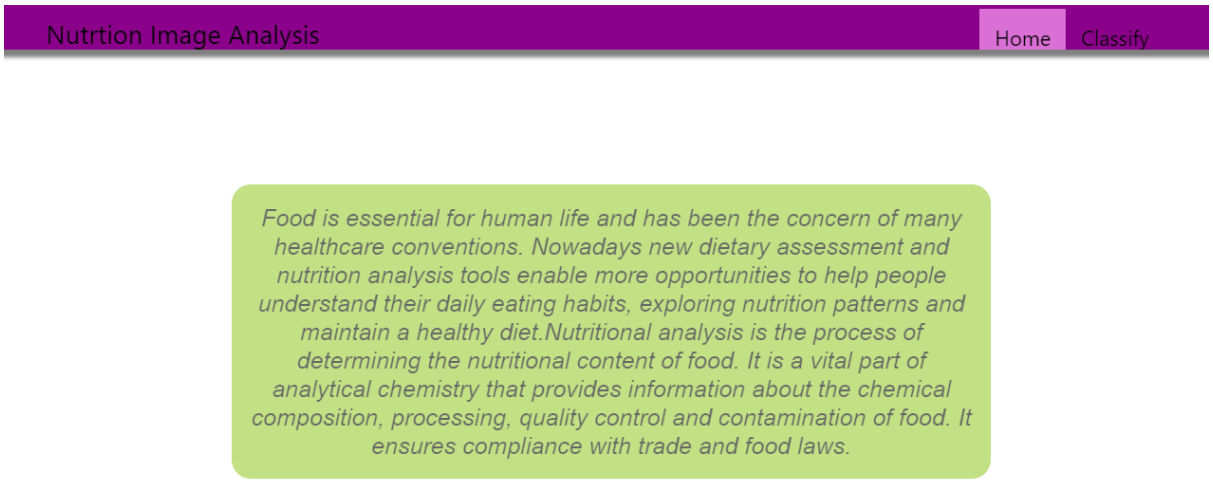
```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)

len(x_test)

model.fit_generator(x_train, steps_per_epoch=len(x_train), validation_data=x_test,
validation_steps=len(x_test),epochs=10)

model.save('fruits.h5')

ls

import numpy as np
from tensorflow.keras.models import load_model

from tensorflow.keras.preprocessing import image

model=load_model('fruits.h5')

pwd

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/WATERMELON/129_100.jpg')

img

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/WATERMELON/129_100.jpg',target_size=(64,64))
img
```

```
x=image.img_to_array(img)
x

x.shape

x= np.expand_dims(x,axis=0)
x

x.shape

y= np.argmax(model.predict(x),axis=1)
y

x_train.class_indices

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

index[y[0]]

img=image.load_img(r'/content/drive/MyDrive/dataset
project/TEST_SET/PINEAPPLE/123_100.jpg',target_size=(64,64))
img

x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
y

index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']
index[y[0]]
```


Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
D:\IBM\ibm\model.py
home.html
imageprediction.html
image.html
app.py
model.py
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True, vertical_flip=False)
test_datagen= ImageDataGenerator(rescale=1./255)
x_train = train_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset project/TRAIN_SET",target_size
x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset project/TEST_SET",target_size=(6
x_train.class_indices
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Convolution2D, MaxPooling2D, Flatten
model = Sequential()
model.add(Convolution2D(32, (3,3), input_shape=(64,64,3),activation = 'relu')) #Feature map
model.add(MaxPooling2D(pool_size = (2,2))) #Pooled matrix
model.add(Flatten())
model.summary()
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
model.add(Dense(5,activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
len(x_train)
len(x_test)
model.fit_generator(x_train, steps_per_epoch=len(x_train), validation_data=x_test, validation_steps=len(x_t
model.save('fruits.h5')
ls
Name
Date Modified
Demo video 18-11-2022 09:59
static 15-11-2022 18:23
templates 16-11-2022 10:35
Uploads 16-11-2022 09:51
app.py 16-11-2022 09:39
fruits.h5 12-11-2022 21:16
model.py 18-11-2022 11:19
Help
Variable Explorer
Plots
Files
Console 1/A
Python 3.9.13 (main, Aug 25 2022, 23:51:50) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.
IPython 7.31.1 -- An enhanced Interactive Python.
In [1]:
IPython Console
History

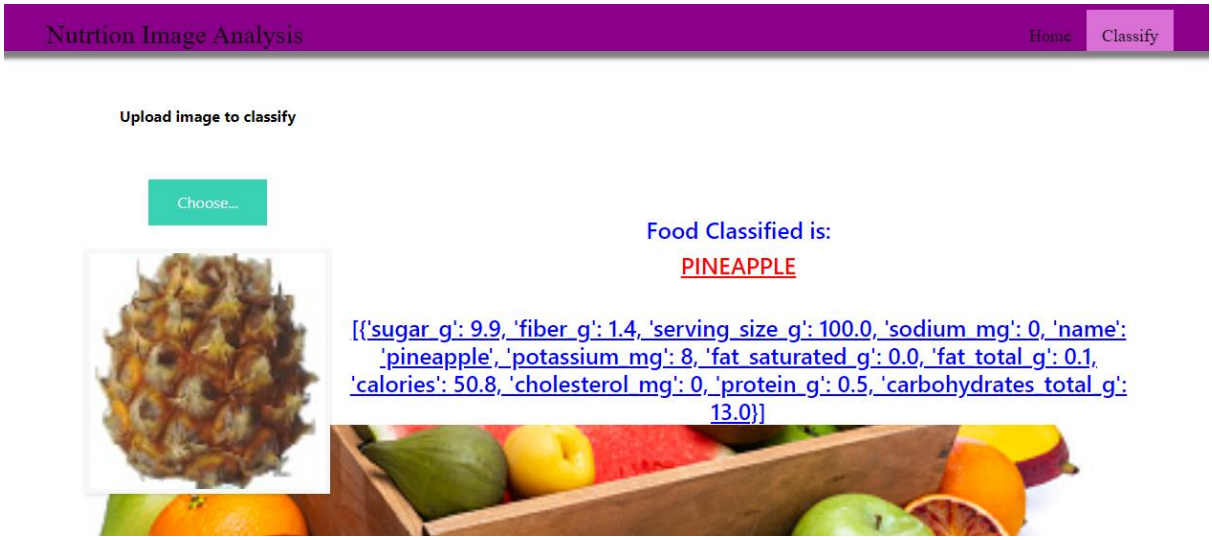

Spyder (Python 3.9)
File Edit Search Source Run Debug Consoles Projects Tools View Help
D:\IBM\ibm\app.py
home.html
imageprediction.html
image.html
app.py
model.py
"""
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use to run/serve our application.
#request-for 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
app = Flask(__name__,template_folder="templates") #initializing a flask app
# Loading the model
model=load_model('fruits.h5')
print("Loaded model from disk")
@ app.route('/')# route to display the home page
def home():
return render_template('home.html') #rendering the home page
@ app.route('/image1', methods=['GET', 'POST']) # routes to the index html
def image1():
return render_template("image.html")
@ app.route('/predict' ,methods=['GET','POST']) # route to show the predictions in a Web UI
def lanuch():
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
Name
Date Modified
Demo video 18-11-2022 09:59
static 15-11-2022 18:23
templates 16-11-2022 10:35
Uploads 16-11-2022 09:51
app.py 16-11-2022 09:39
fruits.h5 12-11-2022 21:16
model.py 18-11-2022 11:19
Help
Variable Explorer
Plots
Files
Console 1/A
2022-11-18 12:05:02.728756: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations: AVX AVX2
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Loaded model from disk
* Serving Flask app "app" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production deployment.
Use a production WSGI server instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
IPython Console
History

HOME PAGE



TEST PAGE

PREDICT PAGE



GITHUB AND PROJECT DEMO LINK

Github link: https://github.com/IBM-EPBL/IBM-Project-42331-1660659831

Demo video link: https://drive.google.com/file/d/1AoGIAo1Fhw6wx9yyp-zMx5sWTBJ8g8QG/view?usp=share_link