

PROJECT REPORT
AI-POWERED NUTRITION ANALYZER FOR FITNESS
ENTHUSIASTS

TEAM ID : PNT2022TMID26372

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1. INTRODUCTION

Project overview

A nutritional analyzer is a device that is used to analyze the nutrient contents of food. Nutritional analyzers can be used to determine the Calorie, Fat, Protein, Carbohydrate, and the Fiber contents of food. Nutritional analyzers can also be used to determine the vitamin and mineral contents of food.

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. It ensures compliance with trade and food laws.

1.2. Purpose

The purpose of a nutritional analyzer is to provide users with information about the nutritional content of their food. This information can be used to make informed decisions about what to eat and how to maintain a healthy diet.

The goal of this project is to develop a nutritional analyzer that can be used to quickly and easily assess the nutritional value of foods. The analyzer will be able to identify the nutrient content of foods, as well as the caloric value. Additionally, the analyzer will be able to provide recommendations on how to improve one's diet.

LITERATURE SURVEY

2.1.Existing Problem

- Progressive Spinal Net architecture for FC layers - In this paper the Progressive Spinal Net progressive computational network for FC layers of deep- networks is introduced as an upgraded version of the DNN concept. - Praveen Chopra
- Spinal Net: Deep Neural Network with Gradual Input - In this research, the SpinalNet DNN model was introduced. The chordate nervous system, which has a special way of connecting a lot of sensing data and making local decisions, is mimicked in the construction of Spinal Net. - H M Dipu Kabir
- Classification of Fruits Using Deep Learning Algorithms - In this study a deep learning-based system for classifying fruits is suggested. A DCNN model, an AlexNet model, and a MobileNetV2 model were investigated in the proposed framework. Three datasets with different sizes and levels of complexity were used to test the recommended framework. - Mirra K B
- A Comprehensive Study on Torch vision Pre- trained Models for Fine-grained Interspecies Classification - This study attempts to investigate various pre-trained models provided in the PyTorch library's Torch vision package. And look into how well they can classify fine- grained photos. - Feras Albardi
- Fruits classification by using machine learning - An experiment using popular approaches on local data - In this paper, we examine the methods for classifying images that can be used to categorise fruits. The study's findings can be used to place fruit on the correct shop shelves, spot fruit mismatches there, or check fruit prices without using a barcode scanner. Three well-known classification models—Random Forest, K-Nearest Neighbours (KNN), and Support Vector Machine—are employed in this study (SVM). - Nguyen Vuong Thinh
- Fruit Recognition and Classification with Deep Learning Support on Embedded System (fruit net) - This suggested study employs image processing techniques for fruit recognition. Convolutional Neural Networks (ConNN)* deep learning model for classification is created in the study. The Keras platform was used to construct the suggested model. - Haci Bayram Unal

- Using Natural Language Processing and Artificial Intelligence to Explore the Nutrition and Sustainability of Recipes and Food - According to this paper's point of view, Interdisciplinary approaches should be used to address food and recipe research in order to address health and sustainability issues. These approaches should combine NLP and other AI techniques with historical food research, food science, nutrition, and sustainability expertise. - Marieke van Erp
- Fruits Classification using Convolutional Neural Network - This study investigates a CNN-based classification of fruits. For five scenarios utilising the fruits-360 dataset, the accuracy and loss curves were created using various combinations of hidden layers. This paper discusses several computer vision-based approaches and algorithms for fruit recognition and classification. - Mehenag Khatun
- Fruit classification by HPA-SLFN - In this study, we introduced a brand-new fruit classification method called HPASLFN. The findings indicated that HPAClassification SLFN's accuracy of 89.5% was superior to those of other classification techniques. - Siyuan Lu
- Date fruits classification using texture descriptors and shape-size features - In this study a suggested technique breaks down a visual image of a date into its component colours. The local texture descriptor, such as a Weber local descriptor (WLD) histogram or a local binary pattern (LBP), is then applied to each component in order to encode the texture pattern of the date. To characterise the image, the texture patterns from each component are combined. - Ghulam Muhammad.

References

- [1] Muhammad, Ghulam. "Date fruits classification using texture descriptors and shape-size features." *Engineering Applications of Artificial Intelligence* 37 (2015): 361-367.
- [2] Lu, Siyuan, et al. "Fruit classification by HPA-SLFN." 2016 8th International Conference on Wireless Communications & Signal Processing (WCSP). IEEE, 2016.
- [3] Khatun, Mehenag, et al. "Fruits Classification using Convolutional Neural Network." *GRD Journals-Global Research and Development Journal for Engineering* 5.8 (2020).

[4] Ünal, Hacı Bayram, et al. "Fruit recognition and classification with deep learning support on embedded system (fruitnet)." 2020 Innovations in Intelligent Systems and Applications Conference (ASYU). IEEE, 2020.

[5] Thinh, Nguyen Vuong, et al. "Fruits classification by using machine learning-An experiment using popular approaches on local data." 2021 IEEE International Conference on Machine Learning and Applied Network Technologies (ICMLANT). IEEE, 2021.

[6] Albardi, Feras, et al. "A comprehensive study on torchvision pre-trained models for finegrained inter-species classification." 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC). IEEE, 2021.

[7] KB, Mirra, and R. Rajakumari. "Classification of Fruits Using Deep Learning Algorithms." Available at SSRN 4068366.

[8] Chopra, Praveen. "Progressivespinalnet architecture for fc layers." arXiv preprint arXiv:2103.11373 (2021).

[9] Kabir, HM Dipu, et al. "Spinalnet: Deep neural network with gradual input." IEEE Transactions on Artificial Intelligence (2022).

[10] Van Erp, Marieke, et al. "Using natural language processing and artificial intelligence to explore the nutrition and sustainability of recipes and food." Frontiers in artificial intelligence 3 (2021): 621577.

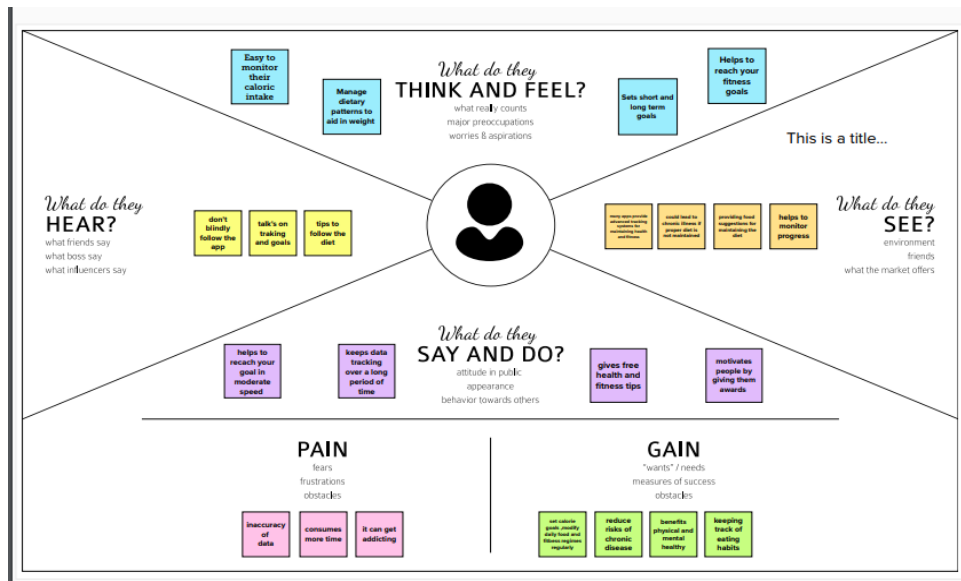
Problem Statement Definition

The main aim of the project is to build 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 to the trained model. The model analyses the image and detects the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.)

2. IDEATION & PROPOSED

SOLUTION3.1.Empathy Map Canvas

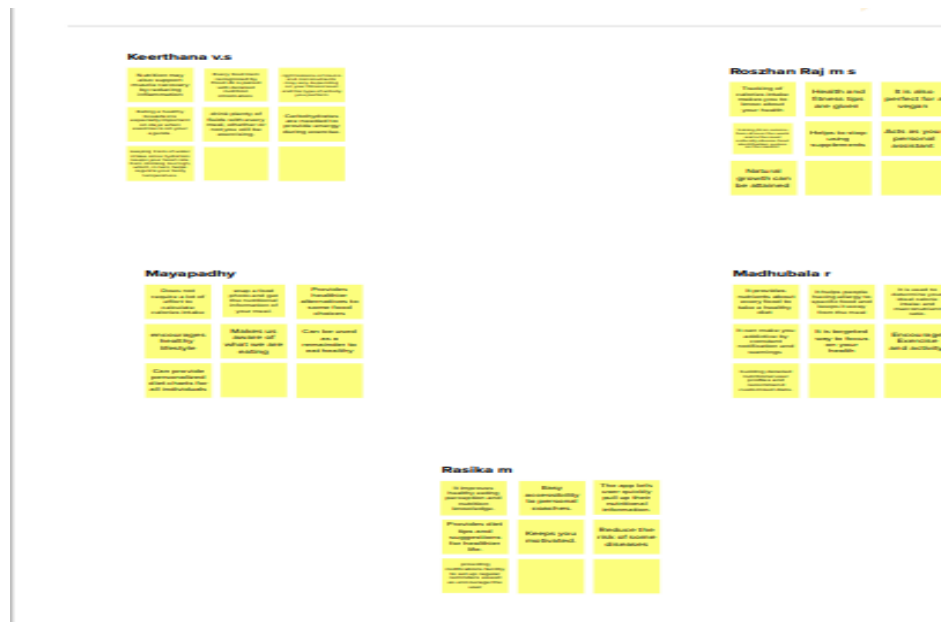
An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. The empathy map was originally created by Dave Gray and has gained much popularity within the agile community.



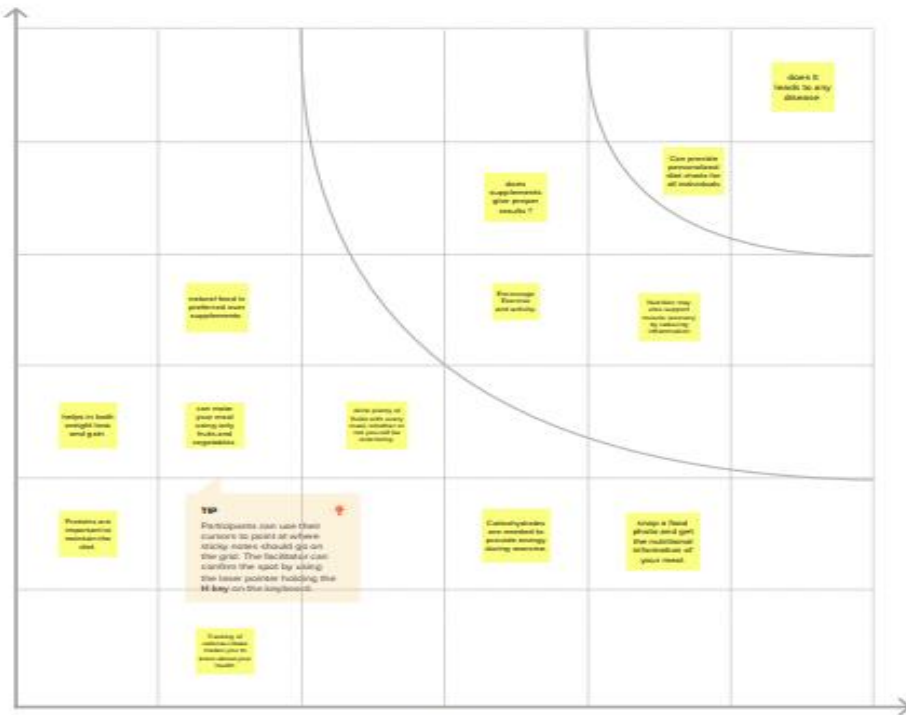
IDEATION AND BRAINSTORMING

Ideation is the process of forming ideas from conception to implementation, most often in a business setting. Ideation is expressed via graphical, written, or verbal methods, and arises from past or present knowledge, influences, opinions, experiences, and personal convictions.

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity.




Importance
 If each of these factors could get three different ratings (difficult, no need, which would have the most positive impact)



Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none">● The emergence of technology has made our life more inactive● The App Store and Google Play are already saturated with fitness and sports apps. Thus, users are finding it difficult to make a choice.● I am a fitness enthusiast, I'm trying to maintain fitness but unable to maintain fitness because of improper intake of nutrition which makes me feel the need to intake proper amount of nutrition
2.	Idea / Solution description	<ul style="list-style-type: none">● The online artificial dietitian is a bot, with artificial intelligence about human diets.● It acts as a diet consultant like a real dietitian.● This type of app helps the users have a well-fine-tuned workout experience.
3.	Novelty / Uniqueness	<ul style="list-style-type: none">● AI augments the capabilities of differently abled individuals● fitness apps raise the bar when it comes to the user's standard of wellness.● AI operates 24x7 without interruption or breaks and has no downtime.

4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> ● The main objective of this study is to know the influence of the use of the fitness application (app) on sports habits, customer satisfaction and maintenance intention of fitness centre users.
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> ● It can be developed with minimum cost and provide high effective process at less time ● Due to the cost of app development technology, the amount of physical work has almost diminished which is the root cause of various problems.
6.	Scalability of the Solution	<ul style="list-style-type: none"> ● In the further advancement, users can post their queries and get more advice from other users ● In the further advancement, users can integrate this app with fitness trackers

Problem Solution Fit

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.

Project Title: AI-powered Nutrition Analyzer for Fitness Enthusiasts		Project Design Phase-I - Solution Fit Template		Team ID: PNT2022TMD26372	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS <ul style="list-style-type: none">Children, Adolescents, and adults of all ages require physical activity to maintain good healthFitness and sports enthusiasts who are passionate about their fitness and health, who see their diet as an essential part of their well-beingPeople living with chronic illnessPeople with food allergies	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none">ability to keep track of the nutrient intake or to maintain a proper diet.Limited supervision.Limited information about the food and its nutritional factsability to identify the nutritional values of the foodGetting a personalized fitness recommendation is expensiveAccuracy in nutritional informationNot having a compatible device for image recognition	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none">Personal training has been an integral part of the fitness industry for decades, with the use of AI, customers are offered personalized fitness recommendations at a much lesser price.Customers can get the nutrition of their food checked anytime unlike a nutritionist who cannot be available all the time.Nutrition facts aid consumers in making informed decisions. Consumers continue to demand to know the nutritional value that is in their food. It doesn't matter if they follow a ketogenic diet, gluten-free, or vegan, they want accurate information.	Explore AS, differentiate	
	2. JOBS-TO-BE-DONE / PROBLEMS J&P <ul style="list-style-type: none">Maintaining a proper diet plan in order to maintain healthusing cameras to take the picture of food to keep track of their food consumptionsCustomers must actively try to educate themselves. They need to check for the ingredients and lookout for things to avoid	4. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none">Many people are unaware of what is in the foods that they consumeCustomers don't actively try to educate themselves. They need to check for the ingredients and lookout for things to avoidLack of supervisionLack of detailed nutritional informationNot getting a personalized fitness or nutrition tracking	7. BEHAVIOUR BE <ul style="list-style-type: none">Directly related: Customers must take a picture of the food by pointing a Smartphone camera to foods, then draw a bounding box and then food image recognition is activated for the given bounding box.Indirectly associated: Customers must follow the suggestions provided to ensure proper eating habits	Focus on J&P, fit into BE, understand	
Identify strong TR & EM	3. TRIGGERS TR <ul style="list-style-type: none">Seeing others maintaining proper health and fitnessReading about the advantages of proper healthLearning about the impacts an improper diet could lead toSelf-awareness through the articles available in the internet and social media platforms	10. YOUR SOLUTION SL <ul style="list-style-type: none">This is a platform that provides real time information to its users about the nutrition and calorie intake.The app uses AI and image classification technology to identify the food correctly and accurately and also calculates the amount of calories just from the pictureFirst a user points a Smartphone camera to foods, then a bounding box is drawn and then food image recognition is activated for the given bounding box. The top candidates for the bounding box are shown on the screen. If a user touches one of the candidate items, the food category name and the photo are recorded as a daily food record in the system.The app identifies food items then displays the user with the nutritional value that it would provide based on different characteristics like color, shape, texture etc. Artificial intelligence offers unparalleled opportunities of progress and applications in nutrition.	8. CHANNELS of BEHAVIOUR CH <ul style="list-style-type: none">1. ONLINE<ul style="list-style-type: none">Comparing the nutritional facts with sources available on the internet. And learn about the benefits of maintaining a proper diet with the help of platforms like social media2. OFFLINE<ul style="list-style-type: none">Customers must educate themselves regarding the information or suggestions produced and must try to follow them	Extract online and offline CH of	
	4. EMOTIONS: BEFORE / AFTER EM <p>BEFORE:</p> <ul style="list-style-type: none">Confused not knowing how to maintain a healthy diet or keeping track of itConfused about the quantity and qualityWorried about the volume of intake and the ingredientsWorried about the effects of the ingredients present in it <p>AFTER:</p> <ul style="list-style-type: none">Confident about the intake, quantity and be informed about the ingredients used so as to avoid those that might affect their healthUntroubled since a personalized fitness tracking is being implemented				

3. REQUIRMENT ANALYSIS

Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Image Acquisition	Capture the Image and Check the Top and Side View of Image
FR-4	Object Detection	Get a series of Bounding Boxes, which means objects are located.
FR-5	Image Segmentation	Get a series of food images stored in matrix with values of background pixels replaced by zeros.
FR-6	Volume Estimation	To estimate the volume, calculate the scale factors on calibration objects.
FR-7	Calorie Estimation	After estimating the volume, the next step is to estimate each food's mass

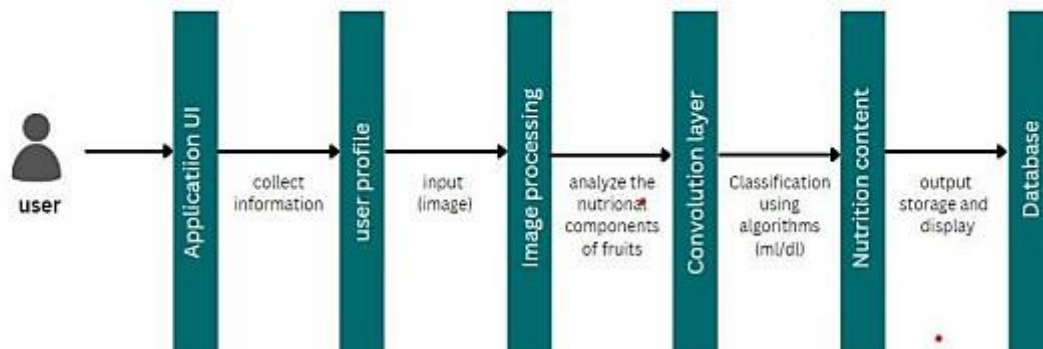
Non Functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Informs you how nutrient dense your food is.
NFR-2	Security	The information is visible to user only and image was secured highly.
NFR-3	Reliability	The food packages are important for calculate the calories
NFR-4	Performance	It is based on the package of food used for the calorie calculation
NFR-5	Availability	It is available for all users to calculate the calorie of the foods
NFR-6	Scalability	Increasing the calculation of the calorie in foods

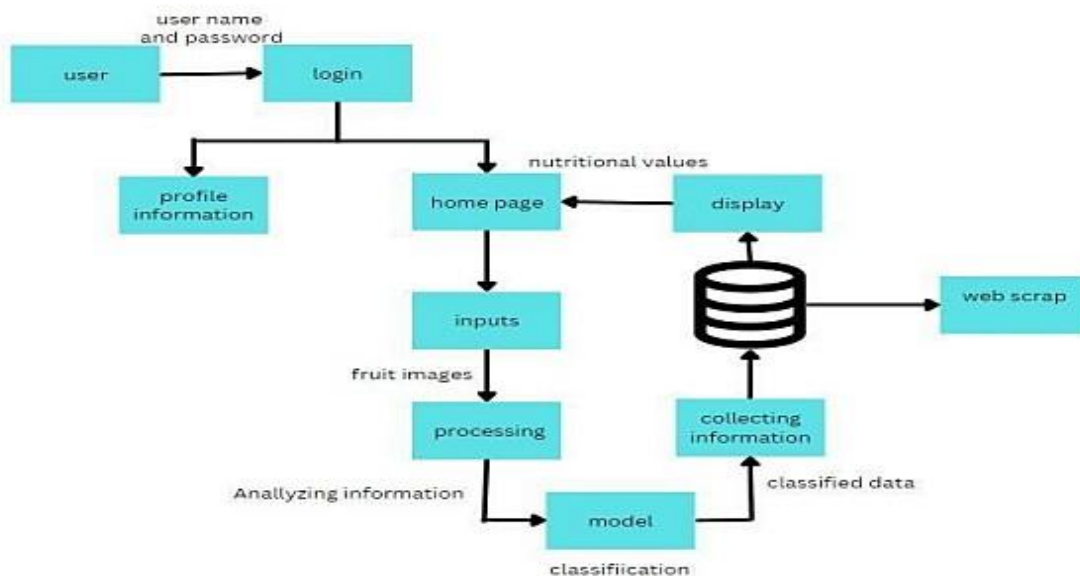
4. PROJECT DESIGN

Data Flow Diagrams

Simplified diagram

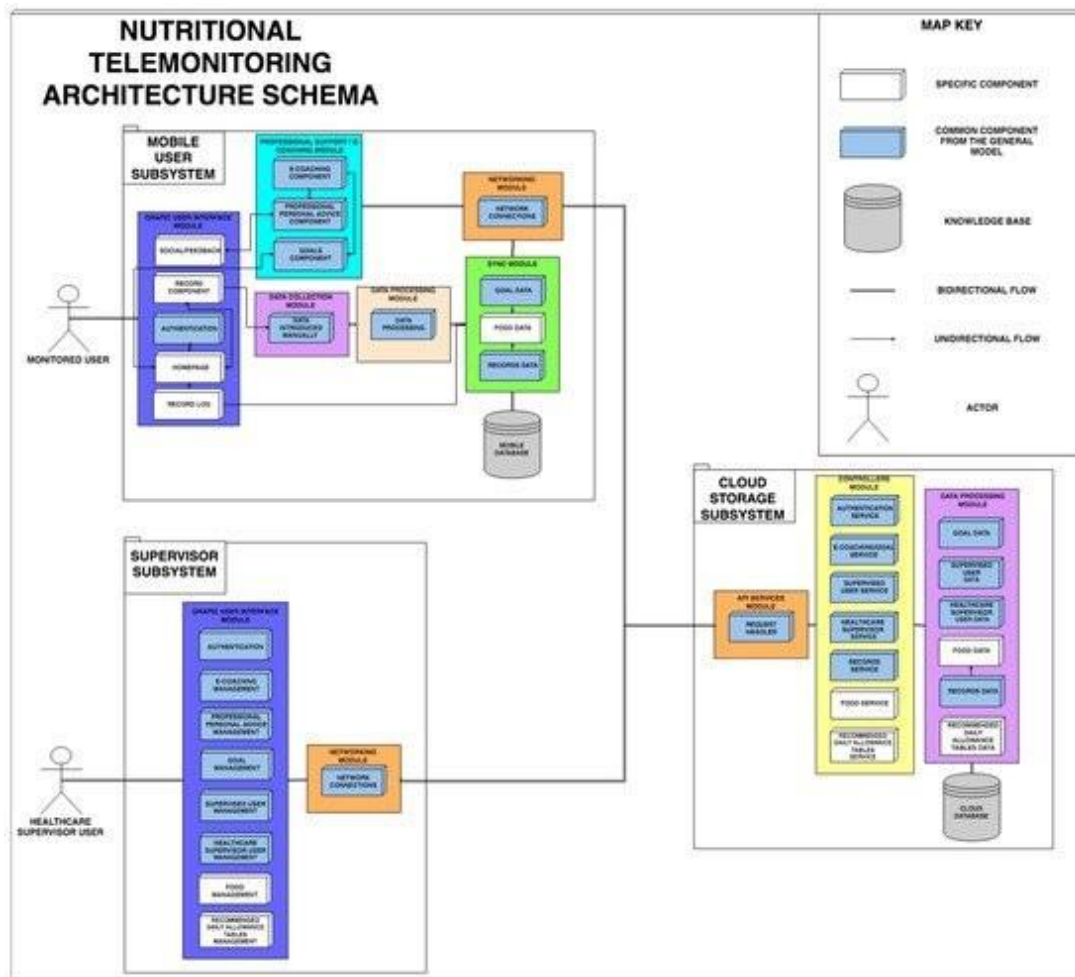


DFD Level 0 (Industry Standard)



Solution and Technical Architecture

Based on the complexity of the deployment, a solution architecture diagram may actually be a set of diagrams documenting various levels of the architecture. The diagram relates the information that you gather on the environment to both physical and logical choices for your architecture in an easily understood manner.



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	I can receive confirmation	High	Sprint-1
			have registered for the application	email & click confirm		
		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	I can register through already existing mail account.	Medium	Sprint-1

	Login	USN-5	As a user, I can log into the application by entering email & password	After registration, I can log in via only email & password.	High	Sprint-1
	Dashboard	USN-6	Display the nutrition values, line graph / bar graph real time.	I can expect the prediction in various formats.	Low	Sprint-3
Customer (Webuser)	Login	USN-7	As the user, I can login by using Gmail or Facebook	Existing users can easily login.	High	Sprint-2

			account or LinkedIn or by registering.			
Customer Care Executive	Support	USN-8	The Customer care service will provide solutions for any FAQ and provide Chat-Bot.	I can solve the problems raised.	High	Sprint-3
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release

		er				
Administrator	Access Contr ol	USN-9	Admin can control the accessofusers.	Access permiss ionfor Users.	High	Sprint-4
	Database	USN-10	Admin can store the details of users.	Stores User details.	Medi um	Sprint-4
	News	USN-11	Admin will give the recent newsof food nutrition values	Provide the recent food details.	Medi um	Sprint-4
	Notification	USN-12	Admin will notify when the food nutrition valueschanges.	Notificat ionby Gmail.	High	Sprint-4

5. PROJECT PLANING AND SCHEDULING

Sprint Planning & Estimation

Project Planning Phase
Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	22 October 2022
Team ID	PNT2022TMID26372
Project Name	AI – Powered Nutrition Analyzer for fitness Enthusiasts
Maximum Marks	8 Marks

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	Data Collection	USN-1	Download Food Nutrition Dataset	2	Medium	Roszhana Raj M S
Sprint-1	Data Preprocessing	USN-2	Importing The Dataset into Workspace	1	Low	Rasika M
Sprint-1		USN-3	Handling Missing Data	3	Medium	Roszhana Raj M S
Sprint-1		USN-4	Feature Scaling	3	Low	Madhubala R
Sprint-1		USN-5	Data Visualization	3	Medium	Maya Padhy
Sprint-1		USN-6	Splitting Data into Train and Test	4	High	Keerthana V S
Sprint-1		USN-7	Creating A Dataset with Sliding Windows	4	High	Keerthana V S ,Maya Padhy

Sprint-2	Model Building	USN-8	Importing The Model Building Libraries	1	Medium	Rasika M
Sprint-2		USN-9	Initializing The Model	1	Medium	Keerthana V S
Sprint-2		USN-10	Adding LSTM Layers	2	High	Roszhana Raj M S
Sprint-2		USN-11	Adding Output Layers	3	Medium	Keerthana V S
Sprint-2		USN-12	Configure The Learning Process	4	High	Maya Padhy
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2		USN-13	Train The Model	2	Medium	Roszhana Raj M S
Sprint-2		USN-14	Model Evaluation	1	Medium	Maya Padhy
Sprint-2		USN-15	Save The Model	2	Medium	Rasika M
Sprint-2		USN-16	Test The Model	3	High	Madhubala R
Sprint-3	Application Building	USN-17	Create An HTML File	4	Medium	Roszhana Raj M S
Sprint-3		USN-18	Build Python Code	4	High	Keerthana V S
Sprint-3		USN-19	Run The App in Local Browser	4	Medium	Rasika M
Sprint-3		USN-20	Showcasing Prediction On UI	4	High	Maya Padhy
Sprint-4	Train The Model On IBM	USN-21	Register For IBM Cloud	4	Medium	Roszhana Raj M S
Sprint-4		USN-22	Train The ML Model On IBM	8	High	Keerthana V S
Sprint-4		USN-23	Integrate Flask with Scoring End Point	8	High	Maya Padhy

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	03 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	10 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

6. CODING & SOLUTIONING

7.1 Feature 1

The aim of pre-processing is an improvement of the image data that suppresses unwilling distortions or enhances some image features important for further processing, although geometric transformations of images (e.g. rotation, scaling, translation) are classified among pre-processing methods here since similar techniques are used.

Code:

```
from google.colab import drive
drive.mount('/content/drive')

cd//content/drive/MyDrive/Colab Notebooks/Dataset

import numpy as np#used for numerical analysis
import tensorflow #open source used for both ML and DL for computation
from tensorflow.keras.models import Sequential #it is a plain stack of layers
from tensorflow.keras import layers #A layer consists of a tensor-in tensor-out
computation function
#Dense layer is the regular deeply connected neural network layer
from tensorflow.keras.layers import Dense,Flatten
#Faltten-used fot flattening the input or change the dimension
from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout #Convolutional
layer
#MaxPooling2D-for downsampling the image
from keras.preprocessing.image import ImageDataGenerator

#setting parameter for Image Data agumentation to the training data
train_datagen =
ImageDataGenerator(rescale=1./255, shear_range=0.2, zoom_range=0.2, horizontal_flip
=True)
#Image Data agumentation to the testing data
test_datagen=ImageDataGenerator(rescale=1./255)

#performing data agumentation to train data
x_train = train_datagen.flow_from_directory(
    r'/content/drive/MyDrive/content/TRAIN_SET',
    target_size=(64, 64), batch_size=5, color_mode='rgb', class_mode='sparse')
```

```

#performing data agumentation to test data
x_test = test_datagen.flow_from_directory(
    r'/content/drive/MyDrive/content/TEST_SET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')

print(x_train.class_indices)#checking the number of classes

print(x_test.class_indices)#checking the number of classes

from collections import Counter as c
c(x_train .labels)

```

7.2.Feature 2

model training on IBM Watson Studio

```

!pip install watson-machine-learning-client

from ibm_watson_machine_learning import APIClient
wml_credentials = {
    "url" : "https://us-south.ml.cloud.ibm.com",
    "apikey" : "o49g8_rjLtMfFOXWPrBuja8eQPmNZtIK-uGy3_MzolZp"
}

client = APIClient(wml_credentials)

client = APIClient(wml_credentials)

def giud_from_space_name(client,space_name):
    space = client.spaces.get_details()
    return(next(item for item in space['resources'] if
item['entity']['name'] == space_name)['metadata']['id'])

space_uid = giud_from_space_name(client,'Nutrition Analyzer')
print("Space UID = "+ space_uid)

client.set.default_space(space_uid)

client.repository.download('4e26aed0-bb0c-4b3d-8476-9630f3617dc2',
'my_model.tar.gz')

```

7. TESTING

Test Cases

A test case is a set of actions performed on a system to determine if it satisfies software requirements and functions correctly. A test case is a document, which has a set of test data, preconditions, expected results and postconditions, developed for a particular test scenario.

	A	B
1		
2		Test Scenarios
3		Home page
4	1	Verify user is able to see the home page
5	2	verify user is able to see the contents in the homepage
6	3	Verify user is able to see the background image of the home screen
7	4	Verify user is able to move to classify page or not?
8		
9		
10		Classsify
11	1	verfiy user is able to see the background image of the classify screen
12	2	Verify user is able to see the choose image in classify page
13	3	Verify user is able to upload proper image of choice
14	4	Verify user is able to see the submit button to upload the image
15	5	Verify user is able to see the uploaded image
16	6	Verify user is able to see the classsify button in classify page
17	7	verify if user is able to see the output of the classified image in the classify screen
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1					Date	19-Nov-22								
2						PNT 2022TMD06372								
3					Project Name	Project - AI-powered Nutrition Analysis								
4					Maximum Marks	4 marks								
5	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
6	Homepage_TC_00	UI	Home Page	verify user is able to see the		1.Enter URL and click go	http://27.0.0.15000	the contents of the homepage must	Working as	Pass				Roshan Raj MS
7	LoginPage_TC_00	UI	Home Page	Verify if user is able to click on		1.Enter URL and click go	http://27.0.0.15000	the user must be on classify page	Working as	pass				Keerthana VS
8	LoginPage_TC_00	Functional	classify	Verify user is able to press the		1.Enter URL and click go	http://27.0.0.15000	User should be able to click the	Working as	Pass				Maya Padhu
9	LoginPage_TC_00	UI	classify	Verify user is able to preview the		1.Enter URL and click go	http://27.0.0.15000	User should be able to preview the	working as	pass				Madhubala R
10	LoginPage_TC_00	UI	classify	verify user is able to see the		1.Enter URL and click go	http://27.0.0.15000	user should be able to view the details	working as	pass				Rasika M
11	LoginPage_TC_00													
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User Acceptance Testing

User acceptance testing (UAT), also called application testing or end-user testing, is a phase of software development in which the software is tested in the real world by its intended audience. UAT is often the last phase of the software testing process and is performed before the tested software is released to its intended market. The goal of UAT is to ensure software can handle real-world tasks and perform up to development specifications. In UAT, users are given the opportunity to interact with the software before its official release to see if any features have been overlooked or if it contains any bugs. UAT can be done in-house with volunteers, by paid test subjects using the software or by making the test version available for download as a free trial. The results from the early testers are forwarded to the developers, who make final changes before releasing the software commercially. UAT is effective for ensuring quality in terms of time and software cost, while also increasing transparency with users.

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
No background image	6	3	2	3	20
Image not uploaded	2	0	3	0	4
Output not visible	3	2	0	1	6
Fixed	9	4	4	20	37
No preview of uploaded image	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	20	14	13	26	77

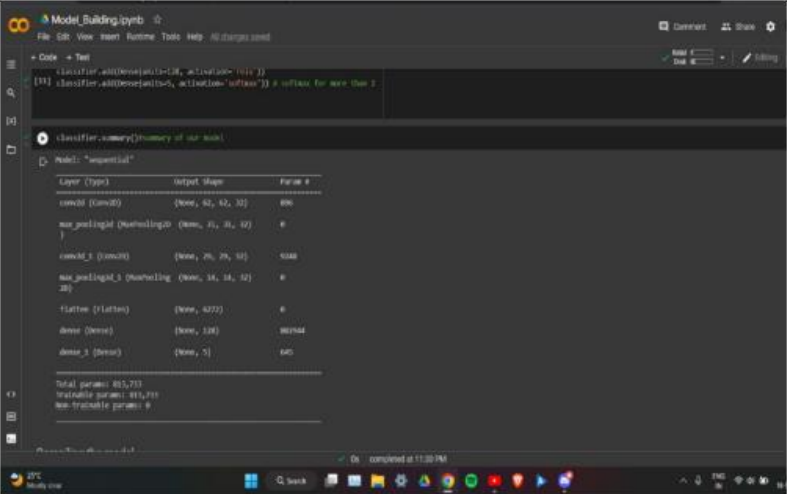
Section	Total Cases	Not Tested	Fail	Pass
Homepage	2	0	0	2
Contents of homepage	5	0	0	51
Background image in homepage	4	0	0	2
Moving to classify page	6	0	0	3
Choose image	4	0	0	9
Uploaded image preview	4	0	0	4
Contents of the output	3	0	0	2

8. RESULTS

Performance Metrics

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	Total params: 813,733 Trainable params: 813,733 Non-trainable params: 0	 A screenshot of the PyTorch Model Building Summary window. The window title is 'Model_Building.py:nb'. It shows a code editor with a PyTorch neural network definition. Below the code, there is a 'Model: "sequential"' section with a table of layers. The table has three columns: 'Layer (Type)', 'Output Shape', and 'Param #'. The layers listed are: conv2d (conv2d) with output shape (None, 64, 64, 32) and 896 parameters; max_pooling2d (Maxpooling2d) with output shape (None, 32, 32, 32) and 0 parameters; conv2d_1 (conv2d) with output shape (None, 64, 64, 32) and 896 parameters; max_pooling2d_1 (Maxpooling2d) with output shape (None, 32, 32, 32) and 0 parameters; flatten (Flatten) with output shape (None, 4096) and 0 parameters; dense (dense) with output shape (None, 100) and 409600 parameters; and dense_1 (dense) with output shape (None, 1) and 100 parameters. At the bottom, it summarizes: 'Total params: 813,733', 'Trainable params: 813,733', and 'Non-trainable params: 0'. The status bar at the bottom indicates 'completed at 11:20 PM'.

2.	Accuracy	Training Accuracy - 99.6% Validation Accuracy – 99.6%	<div><div>Model_Building.ipynb</div><div>File Edit View Insert Runtime Tools Help All changes saved</div><div>+ Code + Test</div><div><div>0</div><div>classifier_fit_generator(generator=train_steps_per_epoch = len(x_train), epochs=10, validation_data=test, validation_steps = len(x_test))# 10 of 10 images in test set</div></div><div><div>[/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py]: Overwarning: 'Model_Fit_generator' is deprecated and will be removed in a future version. Please use 'Model_Fit_generator' instead. This is separate from the ipykernel package so we can avoid doing imports until</div><div>Epoch 1/10 512/512 [-----] 402s 512ms/step - loss: 0.1300 - accuracy: 0.9488 - val_loss: 0.0108 - val_accuracy: 0.9924 Epoch 2/10 512/512 [-----] 296s 512ms/step - loss: 0.0013 - accuracy: 1.0000 - val_loss: 0.0108 - val_accuracy: 0.9977 Epoch 3/10 512/512 [-----] 325s 512ms/step - loss: 0.0540 - accuracy: 0.9679 - val_loss: 0.0129 - val_accuracy: 0.9991 Epoch 4/10 512/512 [-----] 285s 512ms/step - loss: 1.4322e-04 - accuracy: 1.0000 - val_loss: 0.0151 - val_accuracy: 0.9953 Epoch 5/10 512/512 [-----] 314s 512ms/step - loss: 7.0770e-05 - accuracy: 1.0000 - val_loss: 0.0096 - val_accuracy: 0.9953 Epoch 6/10 512/512 [-----] 385s 512ms/step - loss: 6.4230e-05 - accuracy: 1.0000 - val_loss: 0.0062 - val_accuracy: 0.9991 Epoch 7/10 512/512 [-----] 296s 512ms/step - loss: 7.5320e-05 - accuracy: 1.0000 - val_loss: 0.0040 - val_accuracy: 1.0000 Epoch 8/10 512/512 [-----] 285s 512ms/step - loss: 1.4400e-05 - accuracy: 1.0000 - val_loss: 0.0137 - val_accuracy: 0.9953 Epoch 9/10 512/512 [-----] 325s 512ms/step - loss: 7.9020e-06 - accuracy: 1.0000 - val_loss: 0.0104 - val_accuracy: 1.0000 Epoch 10/10 512/512 [-----] 285s 512ms/step - loss: 7.9537e-06 - accuracy: 1.0000 - val_loss: 0.0112 - val_accuracy: 0.9981 Keras.callbacks.History at 0x7fedff3090</div><div>• Saving our model</div><div>Qs completed at 11:32 PM</div><div>23°C Mostly clear</div></div></div>
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9. ADVANTAGES &

DISADVANTAGESADVANTAGES

There are many advantages to using an AI-powered nutrition analyzer for fitness enthusiasts. Some of these advantages include:

1. The software is powerful and can be used for a long time

The software is easy to operate, powerful, and can be used for a long time. Provide customers with free software upgrades for life.

2. Automated analysis of nutrient content

The instrument is equipped with a spectrum of nutrient analysis software for automatic analysis of nutrient content.

3. It is suitable for food research and development, clinical nutrition, dietitian and other departments

It is suitable for food research and development, clinical nutrition, dietitian and other departments. According to the analysis results, the nutrition of the human body is improved, and the weight loss effect is obvious.

4. To solve the problem of food nutrition labeling

The instrument can quickly and accurately analyze the nutrient content of food, and is an indispensable instrument for solving food nutrition labeling.

5. The instrument is easy to operate, accurate and reliable

The instrument is easy to operate, accurate and reliable. It is an ideal instrument for food analysis, quality control and food research.

DISADVANTAGES

Some of the potential disadvantages of an AI-powered nutrition analyzer for fitness enthusiasts include:

1. They can be expensive.
2. They require you to have a specific food item in order to get accurate results.
3. They can be time-consuming to use.
4. The results can be difficult to interpret.
5. They are not always accurate.
6. They can be frustrating to use.
7. You may not get the results you want.
8. You may not be able to find the right food item.
9. You may not be able to use the results.
10. You may not be able to find the right nutritional analyzer.

11. CONCLUSION

Overall, we believe that the AI-powered nutrition analyzer is a great tool for fitness enthusiasts. It can help them track their diet and ensure that they are getting the nutrients they need. Additionally, it can help them identify areas where they may need to make changes in their diet.

12. FUTURE SCOPE

Further enhancement can be made in the future advancement, to develop personalized nutrition plans. The plans could be based on an individual's age, weight, height, gender, activity level, and other factors. The plans could also be customized for specific medical conditions. There is a lot of potential for the Nutritional Analyzer to be used in a variety of settings. For example, it could be used in restaurants to help customers make healthier choices. It could also be used in schools to help students learn about nutrition. Additionally, the Nutritional Analyzer could be used in hospitals and other healthcare settings to help patients make better choices about their diet.

13. APPENDI

XSource Code:

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

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

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

@app.route('/image1',methods=['GET','POST'])# routes to the index htmldef
image1():
```

```
return render_template("image.html")
```

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

```
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=['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),showcase1=(x))def
```

```
nutrition(index):
```

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

```
{"query":index}
```



```

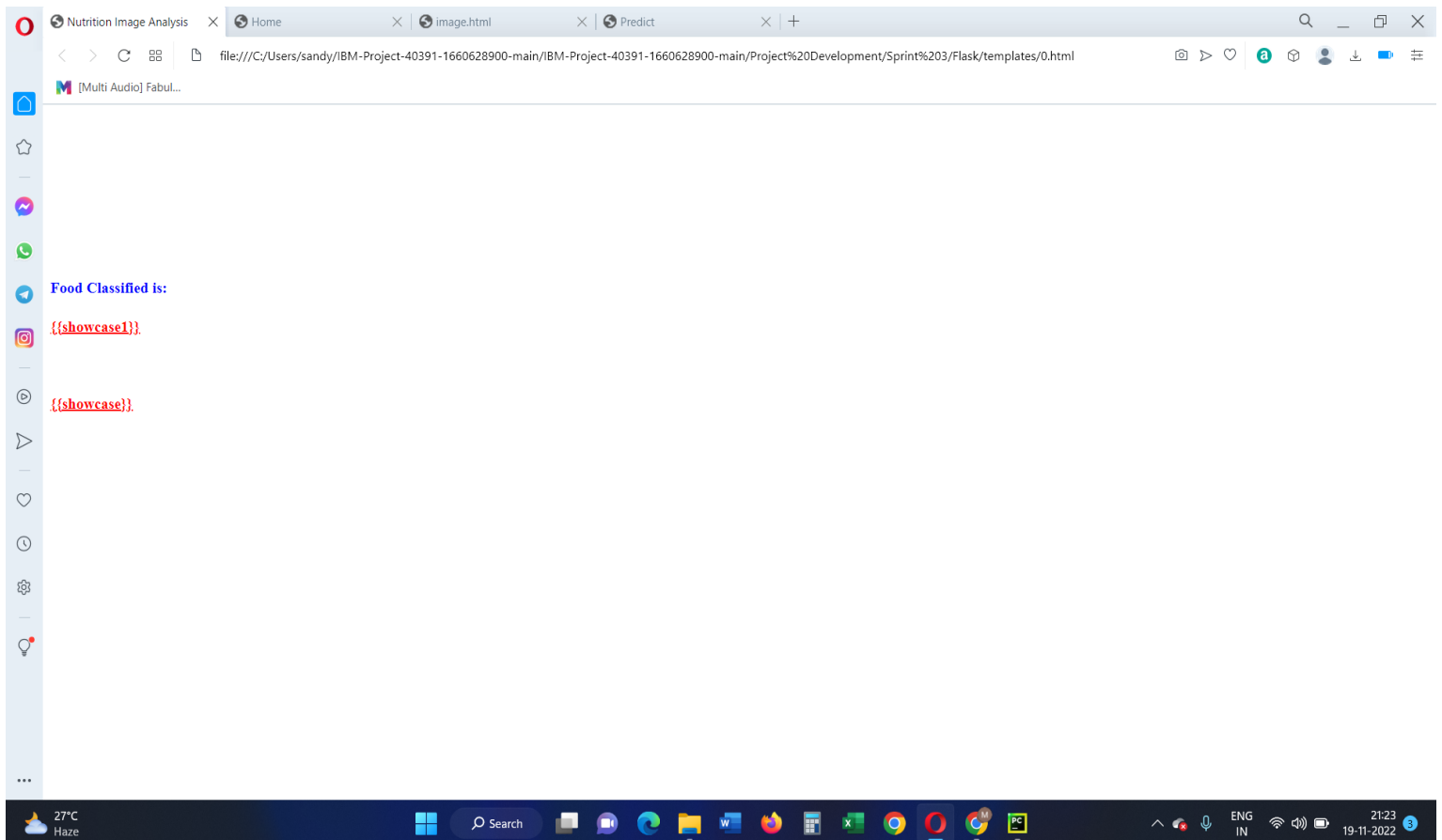
headers = {
    'x-rapidapi-key': "5d797ab107mshe668f26bd044e64p1ffd34jsnf47bfa9a8ee4", 'x-
    rapidapi-host': "calorieninjas.p.rapidapi.com"
}

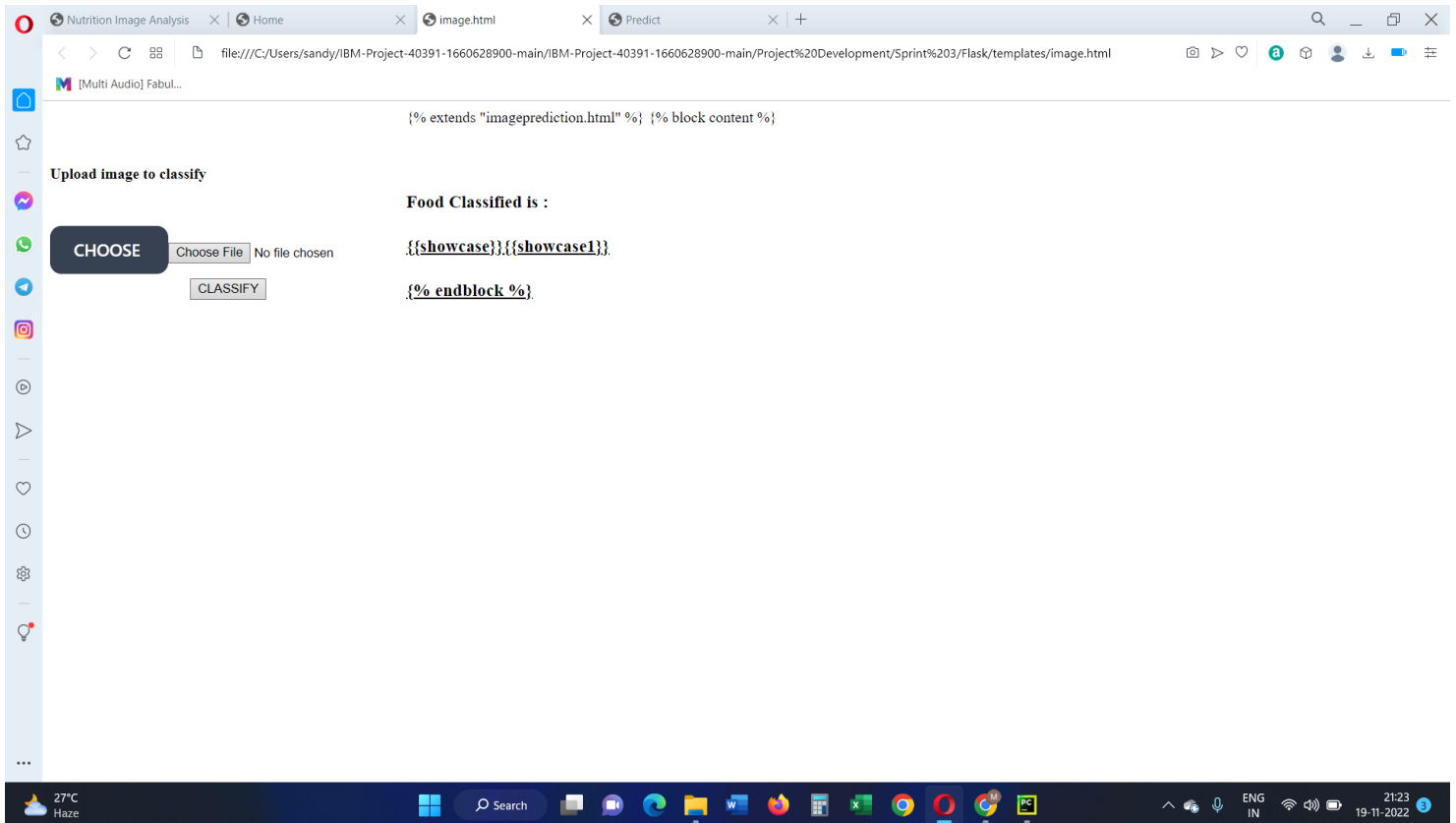
response = requests.request("GET", url, headers=headers, params=querystring)

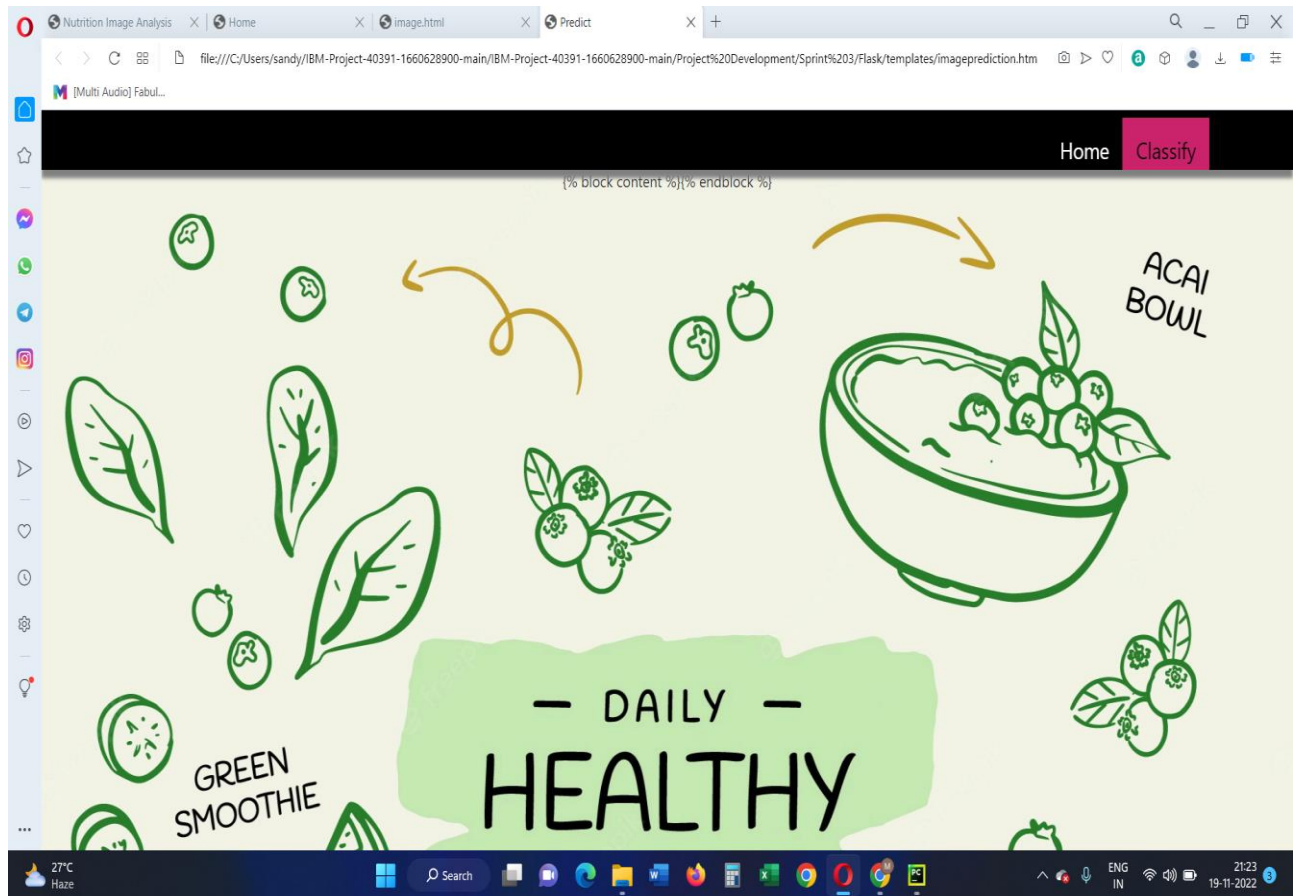
print(response.text)
return response.json()['items']if __
name__ == "__main__":
    # running the app
    app.run(debug=False)

```

Output:







GitHub Link: <https://github.com/IBM-EPBL/IBM-Project-22536-1659853629>

Project Demo Link: <https://youtu.be/SHMIIZD8Yzw>