KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HX 8001-PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

NALAIYA THIRAN PROJECT REPORT 2022

Submitted by

PRADEEPA J	**621319106066**
PRANEETHA R	**621319106067**
MOHANA B	**621319106058**
SUGANTHI K	**6213191060315**

Team ID: PNT2022TMID13551

NOVEMBER 2022

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The topic of artificial intelligence (AI) is quickly developing and provides unmatched prospects for advancement and applications in many areas of healthcare. In this review, itgive an overview of the most important and recent uses of AI in nutrition research and point out areas that still need improvement in order to fully develop this new area. The complicated and non-linear relationships between nutrition-related data and health outcomes may be better understood and predicted with the use of AI algorithms, especially when massive volumes of data need to be organized and integrated, as in the case of metabolomics. By increasing effectiveness and resolving systematic and random errors related to self-reported assessments of food intakes, AI-based techniques, including picture recognition, may also improve nutritional assessment. Human survival depends on food, which is why it has been a topic of discussion at several medical congresses. Today's advancements in dietary analysis and evaluation technologies provide additional chances for consumers to explore nutrition patterns, understand their daily eating habits, and maintain a balanced diet. The technique of figuring out what nutrients are in food is called nutritional analysis. Information on the chemical make-up, preparation, quality assurance, and contamination of food is provided by this crucial aspect of analytical chemistry.

1.2 PURPOSE

The major goal of the project is to create a model that will be used to categorize fruits according to their many features, such as color, shape, and texture. Here, users may take pictures of various fruits, which are subsequently uploaded to a trained algorithm for analysis. The algorithm examines the picture to determine the nutrients present in the fruits, such as sugar, fiber, protein, and calories. By carefully adjusting the network's parameters, it may categorize an item with a better level of accuracy. The major goal is to add a sub-layer after each convolution layer in order to decrease the network's computation complexity and training time. Building a model that can be used to categorise fruits according to their many attributes, such as colour, shape, and texture, is the project's major goal. Here, users may take pictures of various fruits, and the pictures will subsequently be transmitted to a trained model. The model examines the image and determines the nutrients based on fruits and its quality content.

CHAPTER 2

LITERATURE REVIEW

[1] TITLE: System Development and Validation of a Personalized Voice-Based Diet Assistant for Alzheimer Disease and Related Dementias

As the world's elderly population grows, Alzheimer's disease and other dementias are predicted to become more common (ADRD). The prevention and slowing of the course of ADRD, as well as the health status and quality of life of ADRD patients, may be achieved by proper nutrition and excellent eating habits. Since informal caregivers handle the majority of ADRD care, helping them control their patients' diets is crucial.

[2] TITLE: Wiebren Zijlstra and Jochen Klenk's evaluation of accelerometer-based fall detection algorithms on real-world falls (2012)

Despite significant preventative measures, falls remain a leading cause of illness and death in the elderly. Rapid medical aid may be made possible by the real-time detection of falls and their prompt communication to a telecare centre, boosting the elderly's sense of security and lessening some of the harmful effects of falls. Inertial sensors have been used in a variety of ways to automatically detect falls. Even while previously published algorithms claimed to have excellent specificity (SP) and sensitivity (SE), authors typically only evaluated their algorithms on simulated falls carried out by healthy volunteers. As a part of the SensAction-AAL European project, authors recently gathered acceleration data during a number of actual falls among a patient group with a high fall-risk. The current study's objective is to compare the effectiveness of thirteen published fall-detection systems. when authors are used to analyse the database of 29 falls from actual life. This is, as far as the first comprehensive analysis of fall detection

algorithms evaluated against actual falls. The SP average of the thirteen algorithms, according to the authors, was (meanstd) 83.0%30.3% (highest value = 98%). The SE was significantly lower than the values obtained from simulated falls (SE = 57.0%27.3%, highest value = 82.8%), and the performance of the existing methods is also reviewed when used with actual falls. These results highlight the significance of testing fall-detection algorithms in real-world scenarios in order to create automatic warning systems that are more effective and more widely accepted. The current findings also provide credence to the notion that a sizable, publicly accessible database of actual falls may, theoretically, offer a better understanding of the fall process as well as the knowledge required to build and test a high-performance fall detector.

[3] TITLE: Detecting Falls Using Body-Worn Sensors Jorunn L. Helbostad and Lorenzo Chiari (2013)

Older adults' falls continue to be a serious public health issue. To better understand the underlying mechanics and kinematics of falls, body-worn sensors are required. This systematic review's objective is to compile, extract, and critically analyse the data from published research as well as the traits of these investigations (fall documentation and technical characteristics). Methods: The search for works on fall detection using body-worn sensors in publicly available electronic literature databases yielded 96 items (33 journal articles, 60 conference proceedings, and 3 project reports) that were all published between 1998 and 2012. Two impartial professional reviewers conducted separate analyses of these articles. Information was gathered and analysed with SPSS using a specially created data form (SPSS Inc., Chicago, IL, USA). Results: A significant paucity of actual fall recordings and a lack of conformity across methodology and documentation procedures (study, fall reporting, and technical features) were the primary findings. The absence of a consensus fall definition was noted as a methodological problem in the majority of papers. There were large differences across investigations in the types of sensors used and their technical characteristics. Conclusion: Body-worn sensor-based fall detection studies were found to have little

methodological agreement. There is currently a paucity of published evidence-based backing for commercially available fall detection systems. To address basic concerns including event verification, the creation of standards for fall reporting, and the creation of a standard fall definition, a global research group consensus is required.

[4] TITLE: Triaxial Acceleration-Based Low-Power Fall Detection Algorithm Based On Barometric Pressure Wang Changhong and Narayanan Michael (2014)

A low-power fall detection technique based on triaxial accelerometry and barometric pressure signals is suggested in this research. In order to conserve power, the programme dynamically modifies the sampling rate of an accelerometer and controls data transfer between sensors and a controller. The findings of the simulation demonstrate that, when applied to a previously gathered dataset consisting of 20 adolescent actors executing a combination of simulated falls and activities of daily life, the suggested fall detection algorithm's sensitivity and specificity are both over 96%. Even with a 10.9% reduction in power use, this level of performance is still possible.

[5] TITLE: Gravitational Search Algorithm for Feature Selection and Classifier Parameter Estimation for EEG Signal Peak Detection Adam Asrul and Mokhtar Norrima (2014)

Because peaks may indicate substantial brain processes, peak identification is a crucial step in electroencephalography (EEG) data analysis. Peak point identification can be done in the time domain, frequency domain, time-frequency domain, or using nonlinear methods. Finding the relevant peak features in the time domain is the primary goal of this study, and gravitational search algorithm (GSA) and particle swarm optimization are two feature selection techniques that can help with this (PSO). The GSA technique, a fresh computational intelligence algorithm, is the main topic of this work. GSA enables the simultaneous estimate of the classifier's parameters and the choice of its peak features. Based on the experimental findings, the peak identification algorithm's major

peak characteristics, with an average test accuracy of 77.74%, were identified.

[6] TITLE: Optimizing Smartphone Battery Life to Increase Compliance with Remote Healthcare Systems Suneil Nyamathi and Jo-Ann Eastwood (2015)

A way to lessen the financial burden caused by unhealthy lifestyles and ageing populations is remote health monitoring (RHM). Improved compliance with medical regimens advised by doctors is a crucial obstacle for many systems, even ones that use smartphone technology. In order to increase users' adherence to remote monitoring systems, authors of this study offer a method to raise smartphone battery consumption and investigate the impact of smartphone battery lifespan on compliance. The authors use a wearable smartphone to deploy WANDA-CVD, a RHM system for patients at risk of cardiovascular disease (CVD). The battery optimization approach was put to the test in a lab-based pilot research, and its effects on compliance were confirmed in the Women's Heart Health Study. The battery optimization approach increased battery longevity by an average of 192%, which increased study compliance by 53%. The lifespan of smartphone batteries can be extended by a technology like WANDA-CVD to support RHM systems that track physical activity.

[7] TITLE: Fall Detection And Classification Of Activities Of Daily Living Using Power-Efficient Interrupt-Driven Algorithms, KokKiong Tan and Jian Yuan (2015)

Elderly people who fall significantly worsen their health. Immediate assistance might significantly raise the chance of returning to independent life while reducing the danger of complications and mortality. Automatic fall detectors are helpful tools that may notify loved ones and caregivers in those life-threatening situations. The majority of algorithms will be implemented in microcontroller units (MCUs) with slow processing speeds and random-access memory, which is usually ignored in traditional accelerometer-based fall

studies, which concentrate on accuracy. Additionally, a battery life of several weeks or months is preferred for a fall detector. A fall detection system and a classification algorithm for daily living activities utilising a wrist-worn wearable device are presented in this study. Both algorithms can be readily implemented on an 8-bit MCU and are power-efficient. The authors use a contemporary digital micro electro mechanical systems accelerometer that supports interruptions and data buffering to adopt an interrupt-driven strategy. Compared to typical algorithms, which must scrutinise and process each bit of data sampled at high frequencies, the method is entirely different. With the interrupt-driven method, a host MCU may analyse much less data and only do processing in response to interruptions from the accelerometer or timer.

[8] TITLE: FoodAI: Food Image Recognition via Deep Learning for Smart Food Logging.Author: Doyen Sahoo, Wang Hao, Wu Xiongwei, Steven C. Hoi.

Modern deep-learning based picture identification capabilities are provided by FoodAI. Singapore is the location where FoodAI was created, and it has a specific focus on local cuisine. A corpus of 400,000 food photos from 756 distinct classifications was used to train the FoodAI models. FoodAI models were trained on a corpus of 400,000 food images from 756 different classes. The Singaporean Health Promotion Board's mobile app, Healthy 365, is powered in part by FoodAI, which has been made available as an API service. Actively get many API queries each day and have over 100 registered entities (universities, businesses, and start-ups) subscribe to theservice. FoodAI has simplified food logging, promoting wise consumption and a healthy way of life.

[9] TITLE: Computer Vision and Machine Learning based approaches for Food Security

AUTHOR: Shivani Sood & Harjeet Singh

The analysis of many research applications has benefited from the development of

excellent image-processing techniques. The investigation of image processing-based applications in the food industry and agricultural sector is the main goal of this study. Decision-making, disease prediction, categorization, fruit sorting, soil quality assessment, etc. are all aided by these applications. Additionally, a thorough analysis of the various computer vision and statistical methods employed in the food and agricultural industries has been conducted, and the findings show that Deep Learning (DL) based methods deliver superior outcomes, particularly for image processing applications.

[10] TITLE: Color, Flavor, Texture, and Nutritional Quality of Fresh-Cut Fruits and Vegetables: Desirable Levels, Instrumental and Sensory Measurement, and the Effects Of Processing
AUTHOR: Diane M. Barrett, John C. Beaulieu, Rob Shewfelt

Review of both acceptable and unattractive fresh-cut fruit and vegetable product quality characteristics. It is described how to determine these essential quality qualities using both objective and sensory assessments. The benefits and drawbacks of using instruments and the senses to judge quality are discussed. The manufacture of fresh-cut items is examined in terms of typical unit activities. The implications of fresh-cut processing methods and treatments on sensory qualities, such as the look, feel, flavour (taste and fragrance), and appearance of fruits and vegetables, are discussed in length.

2.1 EXISTING PROBLEM

On the subject of categorizing images, several research has been done. To create a product identification system for use in supermarkets, Veggie-Vision was first effort. In order to gather more information, the system was able to examine colour, texture, and density. By dividing the weight by the fruit's surface area, density was obtained. Combining colour and texture information resulted in an accuracy of about 95%, according to the findings.
The automated recognition of produce in supermarkets was addressed by Faria et al. with a framework for classifier fusion. To boost the recognition rate, merged low-cost classifiers that had been trained on certain classes of interest. The colour histogram and statistical texture traits were used by Chowdhury et al. to identify 10 distinct vegetables. Using a neural network as a classifier, can able to achieve classification accuracy as high as 96.55%.

For identifying and categorising photos of 15 various varieties of produce, Dubey presented a framework. The method entails extracting the region of interest from an image by segmenting it, and then computing the features from that segmented region. A multi-class support vector machine then uses these features for training and classification. In this also suggested an enhanced sum and difference histogram (ISADH) texturing feature for this particular type of issue. The robot's ability to harvest well is heavily impacted by fruit identification because the environment is unstructured and the illumination is always changing. Bulanon et al. used a red chromaticity coefficient to increase the amount of fruit-filled space in photos and a circle detection algorithm to distinguish individual fruits and its nutrients contents can be displayed in the UI.

2.2 REFERENCE

[1]. Jie Cai, Yaping Zhao, and Jinhai Sun published a study titled "Factors Influencing Fitness App Users' Behavior in China" on May 17, 2021.

[2]. In low-cost fitness clubs, the benefits of a feeling of community on perceived value, customer happiness, and future intention Hüseyin Evik and Ali Sevilmiş, August 25, 2022

[3]. Pengfei Lu and Yajuan Su's analysis of the effects of the national fitness environment on youth basketball coordination and mental health was published on July 31, 2022.

[4]. Jingang Fan and Jiabao Liu's study, "Data Mining and Analysis of Management Theory on the Emotional Recognition of Students' Physical Fitness Improvement," was published on May 9, 2022.

[5]. IBM Watson-powered chatbot for managing fitness - Sai Rugved Lola, Rahul Dhadvai, Wei Wang, and Ting Zhu - 30 Dec 2021.

[6]. Fads or flesh-formers? Historical perspectives on the current protein-enriched food craze - Lauren 18 June 2021 Alex O'Hagan

[7]. Lessons Learned from COVID-19: Using Digital Technology to Improve Responses to Health Care Challenges - Darshan H. BrahmbhattMB, BChir, MPhilHeather J. Ross - February 2022

[8]. Rambalak Yadav, Arunangshu Giri, and Satakshi Chatterjee - October 2022 -

Understanding the consumers' motivation and hurdles in using healthcare apps: A mixed-method approach employing behavioural reasoning theory

[9]. Dr. Eden Potter, Dr. Frada Burstein, Dr. Daphne Flynn, Dr. Dae Hwang, Dr. Tina Dinh, Dr. DesHons, Dr. Tian Yu Goh, Dr. Mina Mohammad Ebrahim, and Dr. Christopher Gilfillan conducted a study to determine whether a type 2 diabetes self-management app that includes doctor-authored feedback is acceptable.

[10]. Finding Engagement Personas in a Digital Program to Prevent Diabetes - Jonathan H. Hori, Elizabeth X. Sia, Kimberly G. Lockwood, Lisa A. Auster-Gussman, Sharon Rapoport, OraLee H. BranchORCID, and Sarah A. Graham - 24 May 2022.

2.3 PROBLEM STATEMENT DEFINITION

Healthy food must be consumed on a daily basis. It is difficult to seek out a dietician on a regular basis.Finding the healthiest meals is now feasible thanks to AI-based software.Based on the fruit's various characteristics, such as colour, form, texture, and so on, an AI model will categorise it.This is done by keeping track of the fruits that a user likes to eat, and an AI model will suggest a fruit by estimating its nutritional worth based on the fruits that the user has already chosen (Sugar, Fibre, Protein,Calories,etc.)

CHAPTER 3

IDEATION & PROPOSED SYSTEM

3.1 EMPATHY MAP CANVAS

It is intended to quickly and simply outline user needs, especially for stakeholders like clients or executives who weren't involved in the research and design process. It's an excellent tool to use while creating new products and services. This is because it aids in the ability to maintain concentration on the final objective of providing the clients with solutions that fulfil their demands or address their issues.

Fig 3.1.1 EMPATHY MAP CANVAS

3.2 IDEATION & BRAINSTORMING

Ideation and the brainstorming process, which is one method of generating new ideas, are frequently linked. Though brainstorming is nearly usually done in groups, ideation is typically seen as being more of a solitary activity. This is the main distinction between the two processes. A brainstorming session is often held by a group of individuals to generate fresh, comprehensive concepts or answers to specific problems or circumstances. Since the invention of brainstorming software like Bright Idea and Idea Wake, the distinction between ideation and brainstorming has grown increasingly muddled. These software tools are intended to inspire employees to develop creative fixes to enhance operations and, eventually, bottom-line profitability.

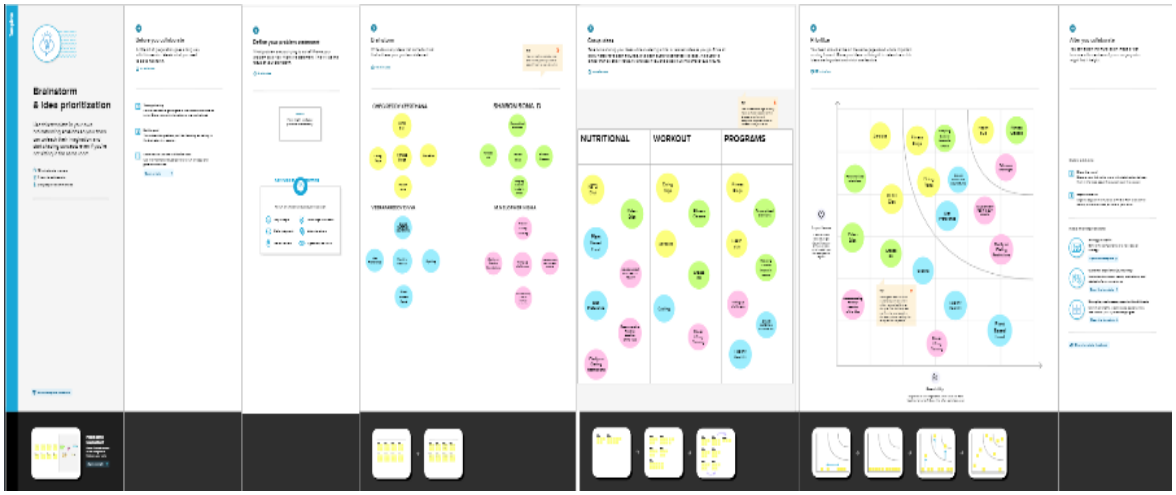

Fig 3.2.1 IDEATION AND BRAINSTORMING

3.3 PROPOSED SOLUTION

The phrase "proposed solution" refers to the combination of all the necessary services (such as any installation, implementation, training, maintenance, and support services) in addition to any other items or equipment, software, hardware, or other items or equipment that are necessary to implement the solution that the vendor has proposed.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	**Food is vital to human existence and has been a topic of discussion at several medical meetings. These days, additional chances exist to assist people in understanding their daily eating habits, examining nutrition patterns, and maintaining a balanced diet thanks to new dietary evaluation and nutrition analysis technologies. The technique of figuring out a food's nutritional makeup is called nutritional analysis. It is an essential component of analytical chemistry that offers details on the chemical make-up, processing, quality assurance, and contamination of food. Building a model that can be used to categorize fruits according to their many attributes, such as color, shape, and texture, is the project's major goal. Here, users may take pictures of various fruits, and the pictures will subsequently be transmitted to a trained model. The model examines the image and determines the nutrients based on fruits such as (Sugar, Fiber, Protein, Calories, etc.)**
2.	Idea / Solution description	**The software contains a number of distinctive characteristics. The biggest benefit is that the user may follow a fit and nutritious diet without having to go see or contact a nutritionist or dietician. This software has the capability to scan fruits and vegetables and analyze their whole nutritional makeup. For people with a restricted range of food choices, it offers a tailored dietary need.**
3.	Novelty / Uniqueness	**A detailed information about nutrition through this and get information about it. No longer is the diet programme followed. Kids may learn about the nutrients contained in each food item by being informed about them. By taking a picture of a food item and transmitting it, thus it may learn about the nutrition of that food item, including how much carbohydrates, fats, proteins, vitamins, and minerals it contains. This will improve the health and fitness of others.**
4.	Social Impact / Customer Satisfaction	**The greatest approach to get the word out about the application is through social media, and can draw in regular people by working with influencers. using nearby gyms to group and target the exercise enthusiasts. The way it can make money is by allowing nutritional product merchants (third parties) to advertise their items on the app. It is much better if the goods are marketed through ads.**
5.	Business Model (Revenue Model)	**Artificial intelligence (AI) may be used to swiftly and accurately anticipate the results of investments, as well as to develop plans or set long-term objectives. In order to best meet the demands of the current scenario, scalable AI refers to how data models, infrastructures, and algorithms may change their complexity, speed, or size at scale. AI models may be constructed with billions of parameters as data storage and processing capacity continue to advance. The goal of scaling up nutrition is to enhance maternal and**

		child nutrition as well as numerous health issues
6.	Scalability of the Solution	**The domains of phishing sites show the characteristics that set them apart from other websites and domains. (Google, www.google.com, and any other random phishing website, www.google.com, are two examples.) When compared to other websites and domain names, phishing Uniform Resource Locators and "domain names" frequently differ in length. This affects both the training accuracy and testing accuracy of all the models. The variance in train and test accuracy numbers demonstrates that the models are not being overfit to the extensive dataset.**

Fig 3.3.1 PROPOSED SOLUTION

3.4 PROBLEM SOLUTION FIT

Entrepreneurs, marketers, and corporate innovators may identify ideas with greater acceptance chances, spend less time testing solutions, and get a deeper grasp of the current situation by using the Problem-Solution tool. These facts are typically discovered "on the fly," after several rounds of changes and customer interviews, but the crucial to the success. Based on the principles of Lean Startup and User Experience design, this canvas has everything you need to identify trends and determine what might work and why. Whether it's the same issue solved differently or something new presented in a similar way, simply go where the customers are and fulfil a true need. These requirements are present in this project.

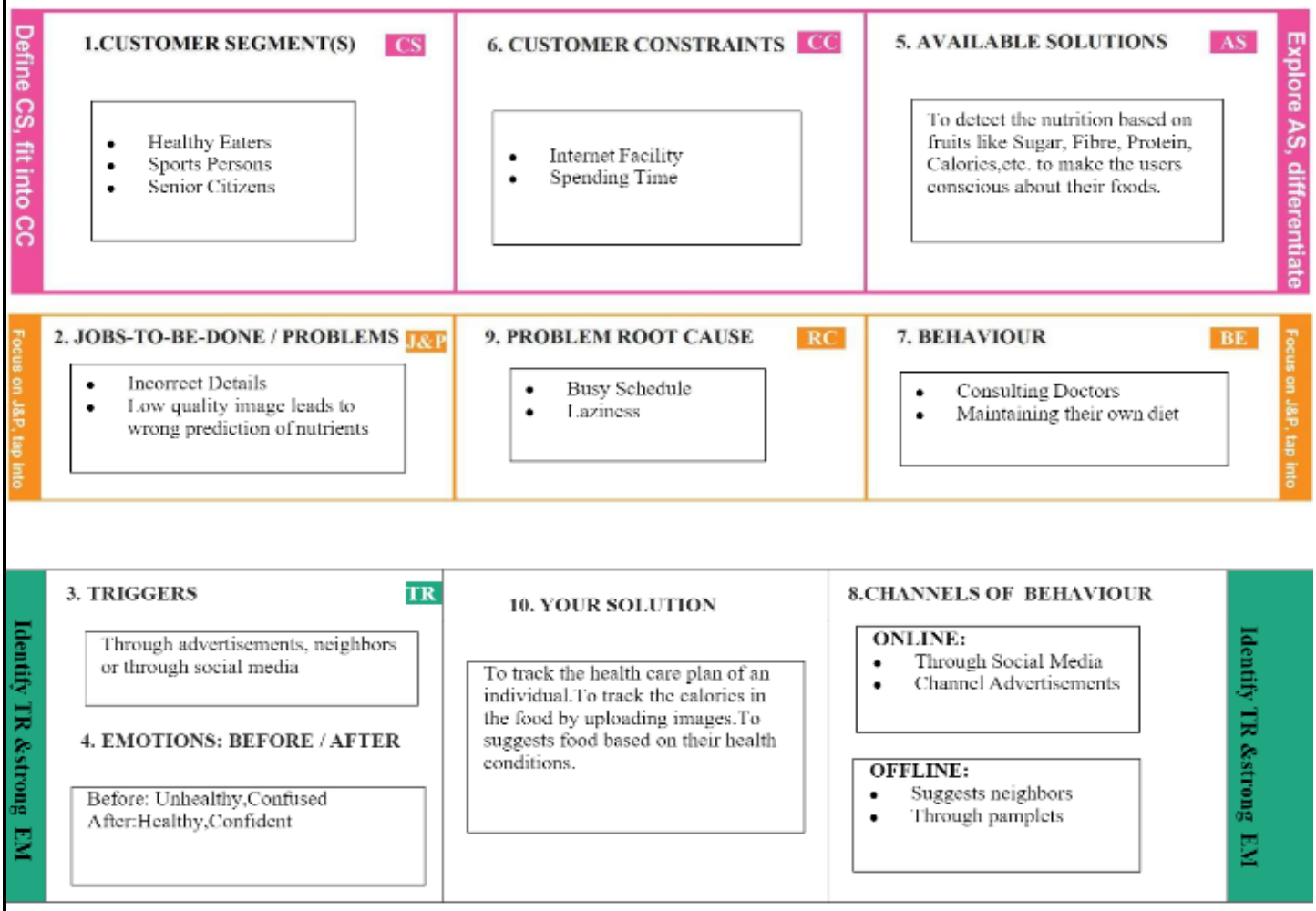

Fig 3.4.1 PROBLEM SOLUTION FIT

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

The three phases of writing planning, translation (writing), and review should be supported by the system. It should enable quick and precise transcription during these phases as well as the simple movement, modification, and deletion of characters, words, and phrases. It should also give planning ideas. It should have file-handling capabilities and some spelling assistance. The recognition component should be able

to function even when kids write slowly, deal with "wobbly" writing, and be able to identify typical character misinterpretations needs for data. The system must be able to handle numerous users, multiple documents from each user, and several files attached to each document. These could be connected text and ink files, in addition to being possible text files. Following an editing procedure, updated versions of each text or ink file may exist.

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 Access	Should be able to Access the current as well as the previous data.
FR-4	User Security	Application should be secured and also it should have two step verification.
FR-5	Performance	Application should be able to access huge amount of data and provide information in a span of time
FR-6	Display	The Application should display the information in same page and their should be a download option

Fig 4.1.1 FUNCTIONAL REQUIREMENT

4.2 NON-FUNCTIONAL REQUIREMENT

A set of specifications known as non-functional requirements, or NFRs, explain the system's operational capabilities and limitations and make an effort to increase its functionality. In essence, these specifications describe how well it will function, covering aspects like speed, security, dependability, and data integrity.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Datasets based on fruits are used for all kinds of fruit classification.
NFR-2	Security	Fruit information and nutrients content can be

		displayed
NFR-3	Reliability	The image processing performs consistently well with high quality
NFR-4	Performance	Performance of the system consistently well with high quality
NFR-5	Availability	It can work in different platforms and user-friendly environment
NFR-6	Scalability	Increase in nutrients of predicting the results

Fig 4.2.1 NON - FUNCTIONAL REQUIREMENT

CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

Ten different handwritten digits are recognized by an artificial neural network system. These numbers range from 0 to 9. Here, the entire dataset is trained using a back-propagation neural network. The main issue is that because the numerals are handwritten, there is a great deal of variation. Numerous individuals used a wide range of sizes, styles, and tools to write digits. With back-propagation, real-world picture recognition issues can be solved without the need for a time- consuming pre-processing stage that requires careful engineering. Instead of feature vectors, the learning network is fed directly with images. The image must first be closed so there are no little gaps before the data is entered into the network. The image is then downsized to 16x16 pixels.

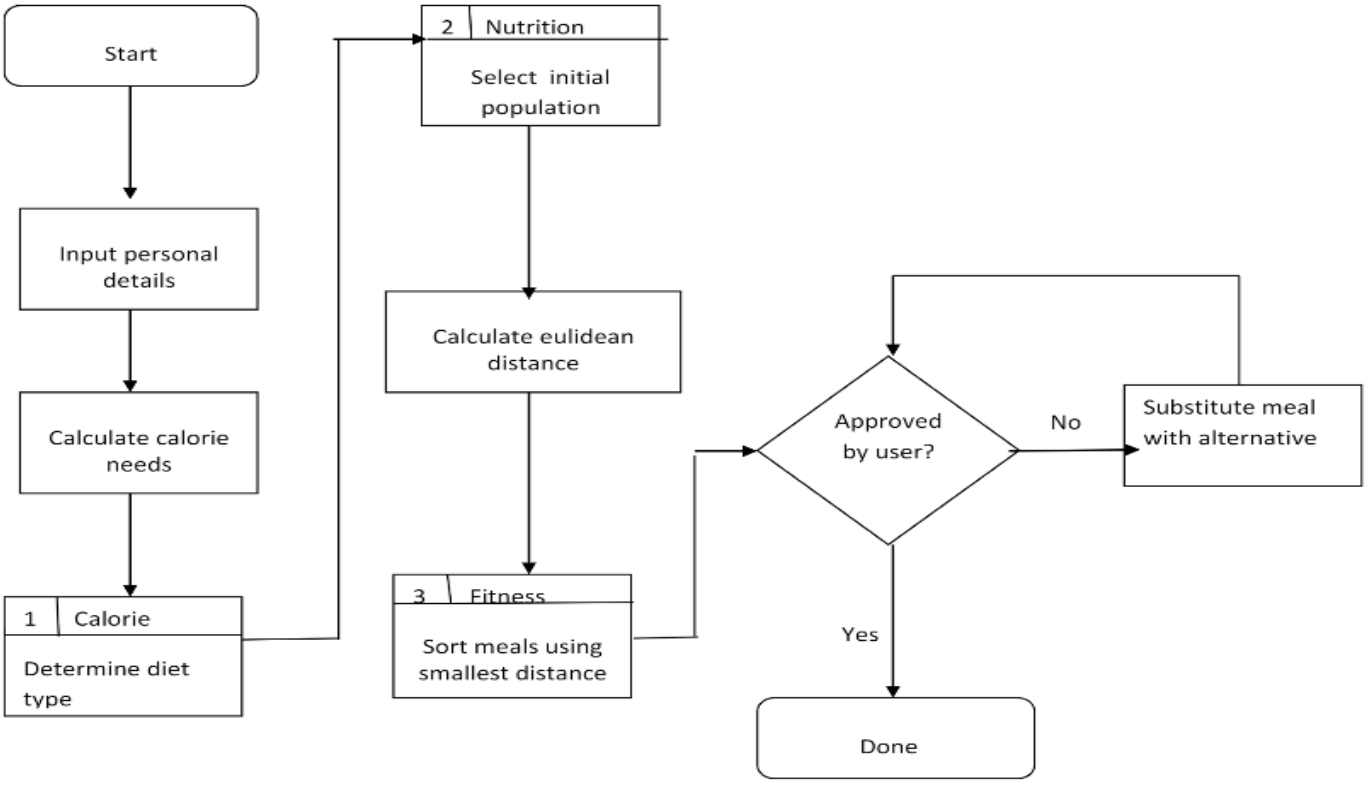

Fig 5.1.1 DATA FLOW DIAGRAM

5.2 SOLUTION & TECHNICAL ARCHITECTURE

Handwriting digit recognition is one of the most fascinating areas of research now being conducted. Computers now have the ability to automatically recognize and comprehend handwritten numbers or letters. Everything is becoming digitalized in order to save on labor thanks to advancements in science and technology. Therefore, in many real-time applications, handwritten digit recognition is required. The 70000 handwritten digits in the MNIST data collection are used frequently in this recognition method. The deep learning model is created by training these photos using artificial neural networks. An image of a handwritten digit can be uploaded by the user through a web application. This picture is examined by the model. It has the ability to return the detected result to the user interface.

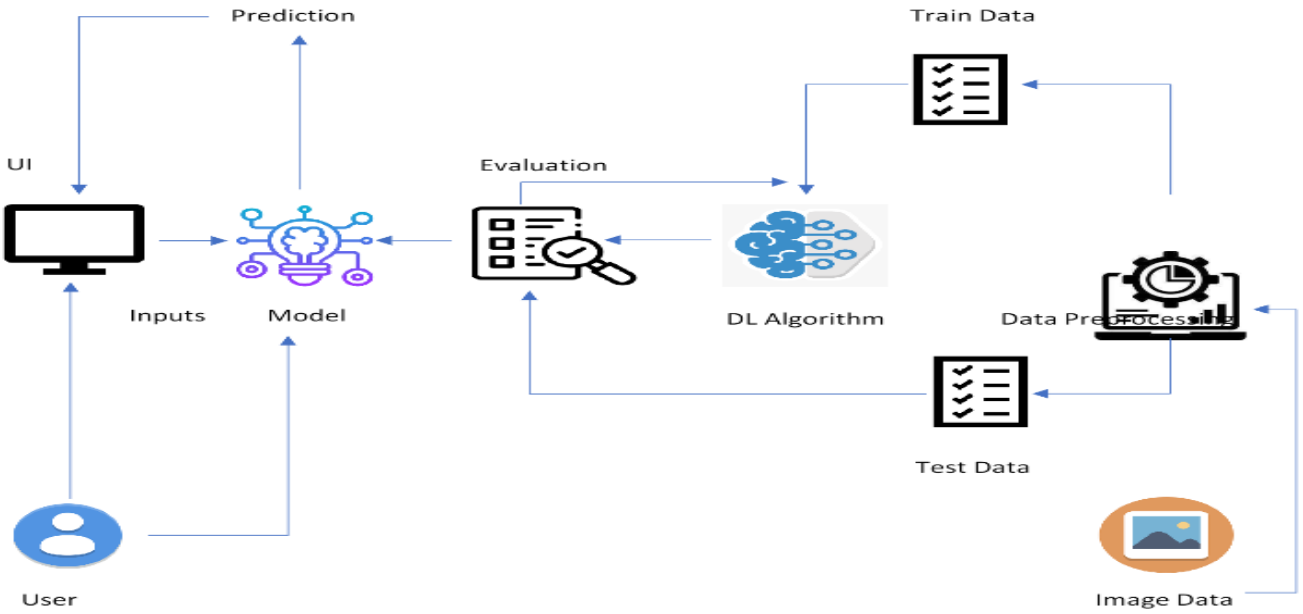

Fig 5.2.1 SOLUTION ARCHITECTURE

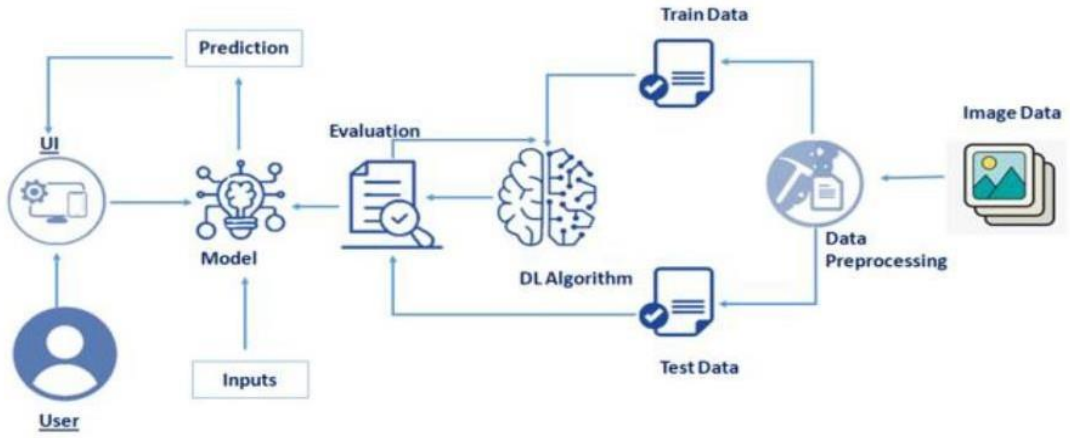

Fig 5.2.2 TECHNICAL ARCHITECTURE

5.3 USER STORIES

Here, used MNIST as a primary dataset to train the model, and it consists of 70,000 handwritten raster images from 250 different sources out of which 60,000 are used for training, and the rest are used for training validation. The proposed method mainly separated into stages, preprocessing, Model Construction, Training & Validation, Model Evaluation & Prediction. Since the loading dataset is necessary for any process, all the steps come after it.

USER TYPE	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	ACCEPTANCE CRITERIA	PRIORITY	RELEASE
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by Entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the Application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the applicationt hrough Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-1	As a user, I can see my dashboard and go	I can access my dashboard	High	Sprint-1

			through the functions provided by the system.			
Customer (Web user)	Registration		As a user, I can register for my account through web and login to my webpage.			
Customer Care Executive	Login	USN-1	Make a call to the customer care executive and rectify the queries.	Help the user how to access the system.	High	Sprint-1
Administrator	User account control	USN-1	Responsible for carring out the administration process	Manage the total team	High	Sprint-1

Fig 5.3.1 USER STORIES

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task
Sprint-1	Data Collection	USN-1	Collecting the required images of food items such apples, banana, orange, pineapple for analysis
Sprint-1	Image Preprocessing	USN-2	Increasing the amount of data by generating new data points from existing data
Sprint-1		USN-3	Used for getting the input of the original data
Sprint-1		USN-4	Applying image data generator functionality
Sprint-2	Model Building	USN-5	Building the model using deep learning approach and CNN layers
Sprint-2		USN-6	Training, Saving, Testing and Predicting the model
Sprint-3	Creating HTML page	USN-7	Home page creation
Sprint-3		USN-8	User to feed the input images and display predicted output
Sprint-4	Application Phase	USN-9	Building the flask module into the project
Sprint-4		USN-10	To perform routing the HTML pages using flask
Sprint-4	Deployment Phase	USN-11	Deployment of application using IBM cloud

Fig 6.1.1 SPRINT PLANNING & ESTIMATION

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 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

Fig 6.2.1 SPRINT DELIVERY SCHEDULE

6.3 REPORTS FROM JIRA

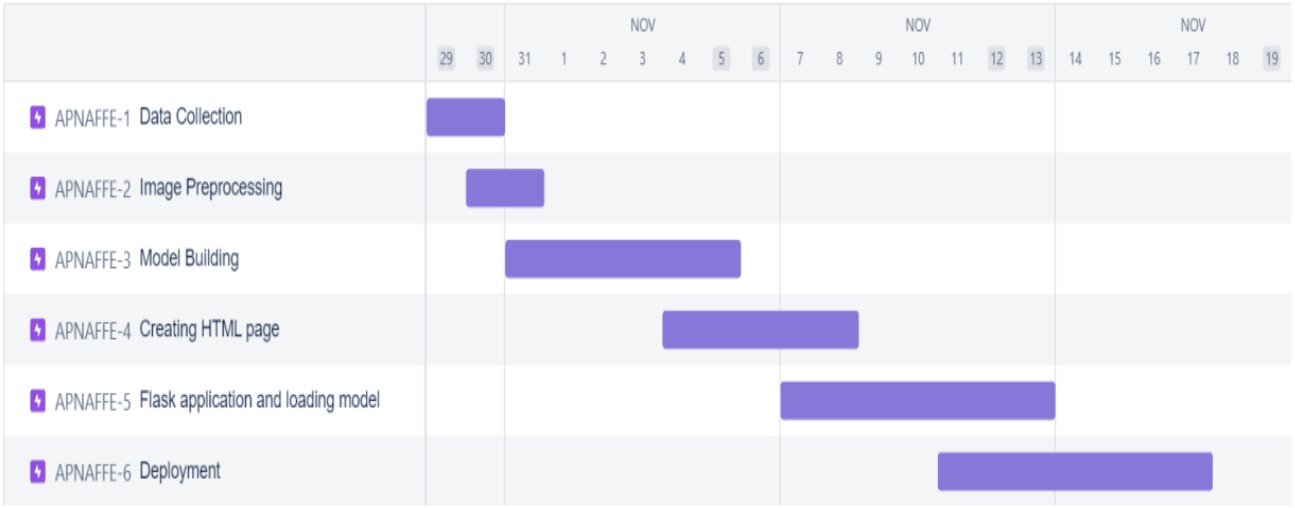

Fig 6.3.1 REPORTS FROM JIRA

CHAPTER 7

CODING & SOLUTIONING

7.1 FEATURE 1

7.1.1 FRUIT RECOGINITION

Designing an incremental model for fruit recognition using image processing entails focusing only on the fruit's size, shape, and color while disregarding outside factors like the surrounding environment, background noise, and lighting. Simply focusing on a certain fruit's appearance allows for its identification. Accurate findings are obtained utilizing a classification method that employs a Support Vector Machine Classifier with very high operating efficiency. Performance is enhanced thanks to the system. The project is simple to maintain and is in the control.

7.1.2 OVERVIEW OF FRUIT RECOGNTION

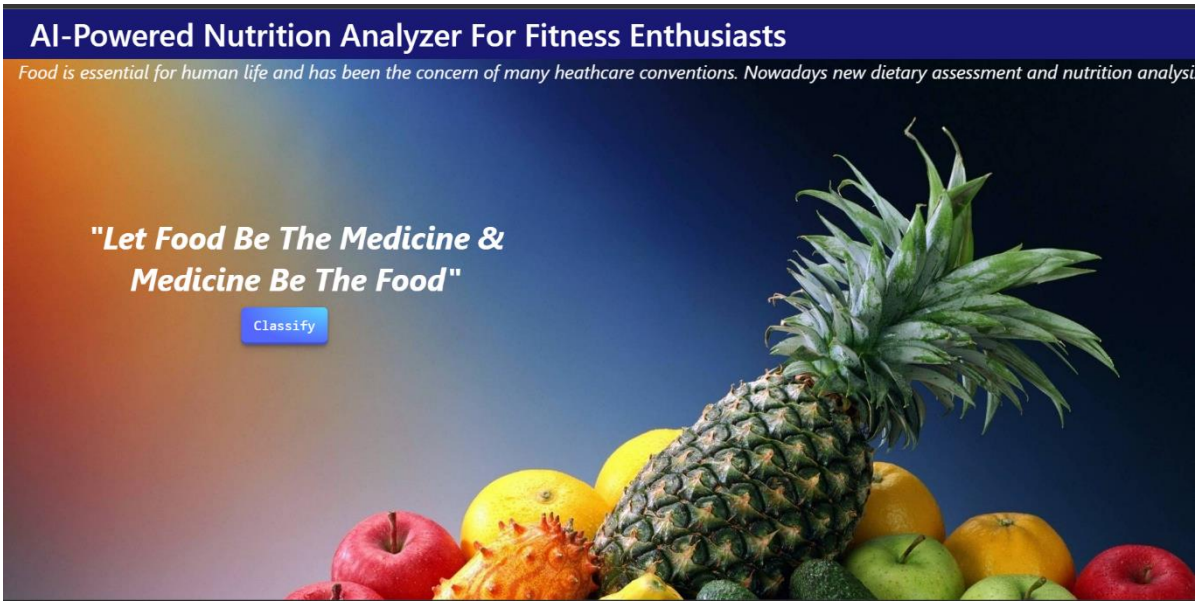

Fig 7.1.2.1 HOMEPAGE

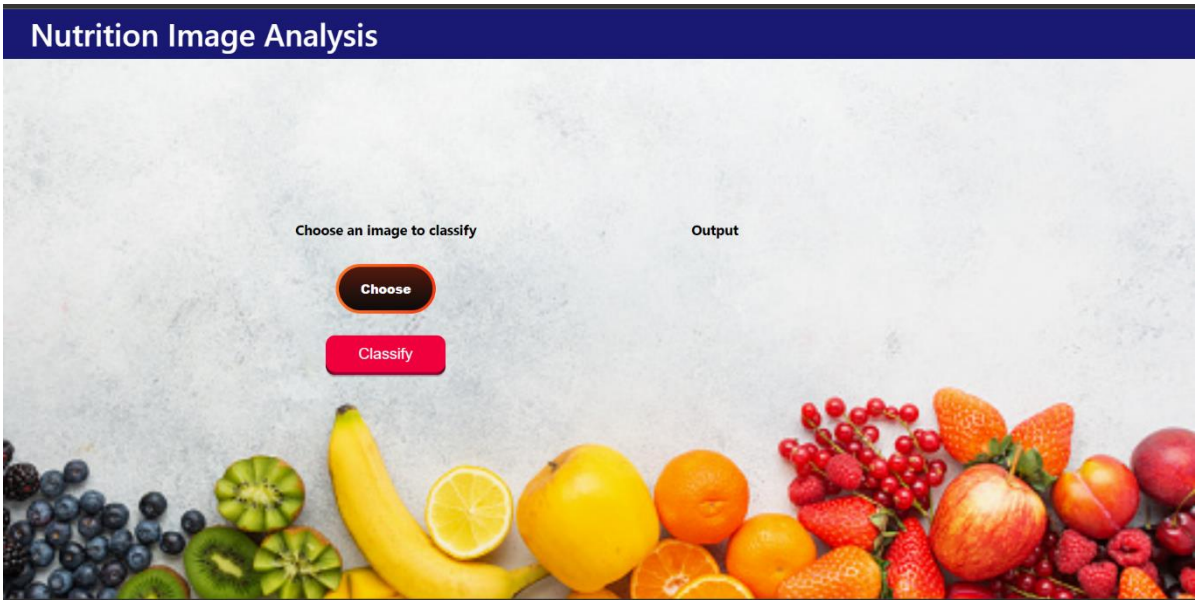

Fig 7.1.2.2 IMAGE UPLOADING PAGE

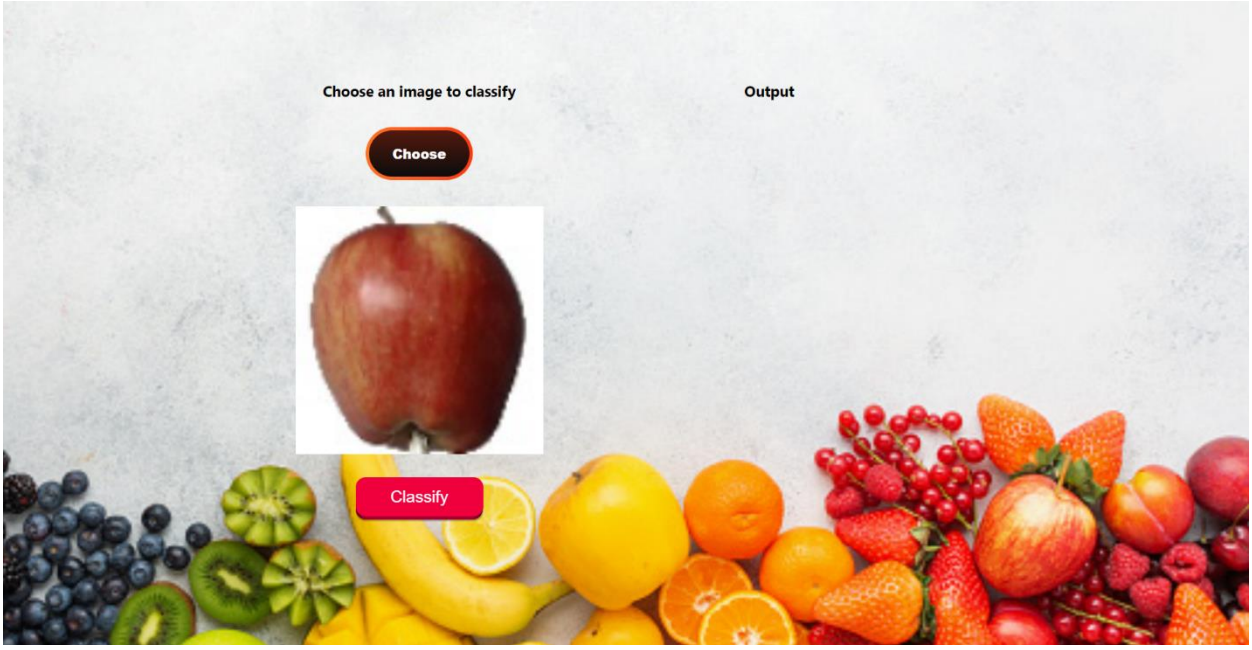

Fig 7.1.2.3 IMAGE UPLOADED PAGE

7.2 FEATURE 2

7.2.1 CODING

```
from flask import Flask,render_template,request, jsonify

import os
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import requests

app = Flask(__name__,template_folder="../templates",
          static_folder='../static')

model = load_model('nutrition.hdf5.h5')
print("Loaded model from disk")

@app.route('/')
def home():
   return render_template('home.html')

@app.route('/image')
def image1():
   return render_template("image.html")

@app.route('/imageprediction')
def imageprediction():
   return render_template("imageprediction.html")


@app.route('/predict',methods=['POST'])
def launch():
   if request.method=='POST':
      f=request.files['file']

      basepath=os.path.dirname('/')
      filepath=os.path.join(basepath, f.filename)
      f.save(filepath)

      img=image.load_img(filepath,target_size=(64,64))
      x=image.img_to_array(img)
      x=np.expand_dims(x,axis=0)
```

```
        pred=np.argmax(model.predict(x),axis=1)
        print("prediction",pred)
        index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']

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

        final_result = {
              "result" : result,
              "apiResult" : apiResult
           }
        print(final_result)
        return final_result

def nutrition(index):

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

    querystring = {"query":index}

    headers = {  'X-RapidAPI-Host': 'calorieninjas.p.rapidapi.com',
    'X-RapidAPI-Key': '8c43e02098mshcb4fea7ab8fdea2p175878jsn0d0669a8826c'}

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

    return response.json()['items']

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

7.2.2 OUTPUT

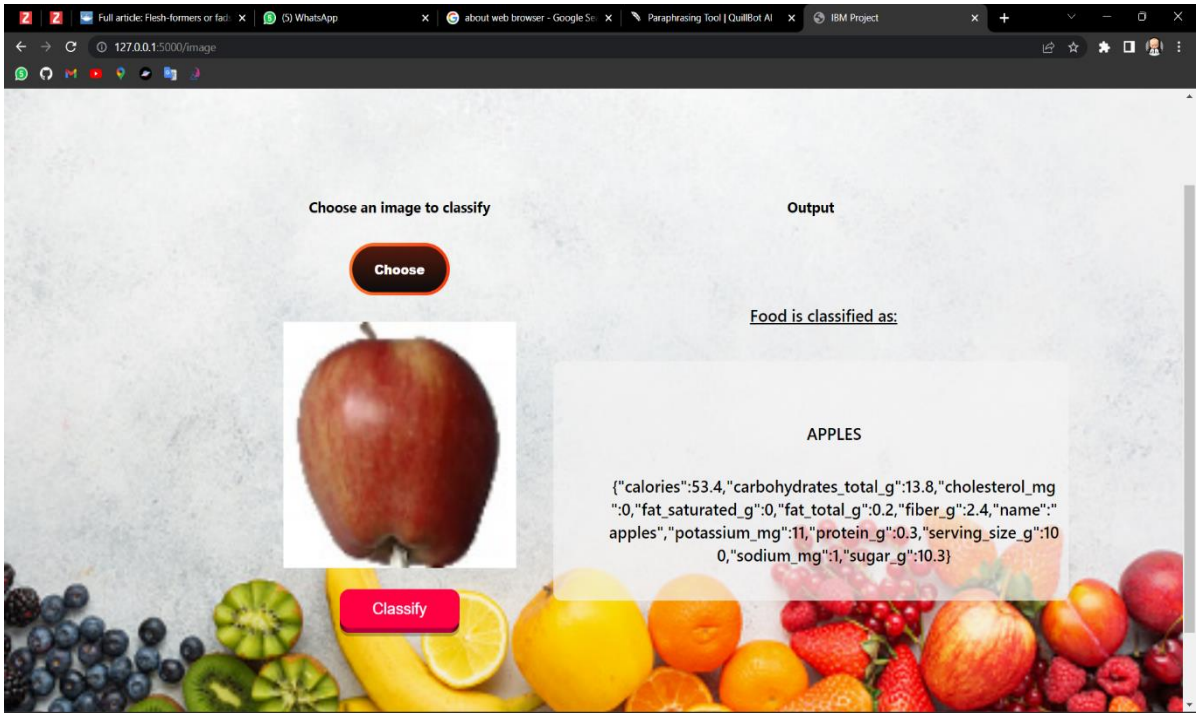

Fig 7.2.2.1 RESULT PAGE

CHAPTER 8

TESTING

8.1 TEST CASES

A test case is a sequence of activities performed on a system to check for software compliance and appropriate operation. The goal of a test case is to determine if various system features perform as expected and to confirm that the system conforms to all relevant standards, guidelines, and user requirements. Making a test case is a good way to find problems or errors with the system. Members of the testing team or the quality assurance (QA) team frequently design test cases, which serve as step-by-step instructions for each system test. Testing may begin once a system feature or set of features has been finished by the development team. A collection or set of test cases is referred to as a test suite.

8.1.1 WHITE BOX TESTING

White box testing is a technique that enables testers to examine and validate a software system's internal operations, including its code, infrastructure, and integrations with external systems.

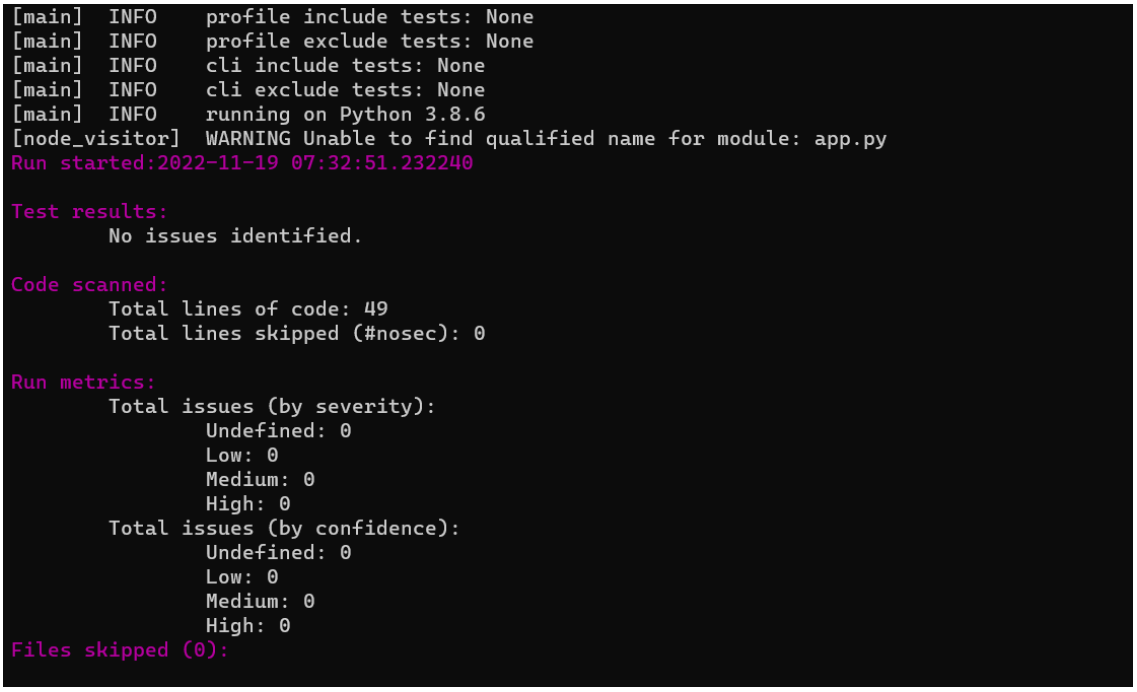

Fig 8.1.1.1 TESTING PYTHON USING BANDIT

8.1.2 BLACK BOX TESTING

Black box testing looks at a system just from the outside. Neither the tester nor the operator are aware of the internal mechanisms that make the system react to test inputs. If the only way to understand the behavior of a system is to look at its inputs and outputs, the system is said to be a "black box".

8.2 USER ACCEPTANCE TESTING

Before deploying the software program to a production environment, the end user or

client does a sort of testing known as user acceptance testing, or UAT. After functional, integration, and system testingare complete, UAT is carried out as the last stage of testing.

8.2.1 PURPOSE OF USER ACCEPTANCE TESTING

UAT's primary goal is to verify the whole business process. It doesn't concentrate on minor typos, misspellings, or system testing. User Acceptance Testing is performed using production-like dataprepared in a separate testing environment. It will resemble black box testing and involve two or more end users.

8.2.2 NEEDS OF USER ACCEPTANCE TESTING

After software has undergone Unit, Integration, and System testing, User Acceptance Testing becomes necessary because developers may have built software based on requirements documents according to their own understanding and further required changes during development may not have been effectively communicated to them. This makes it necessary to test whether the final product is accepted by the client or end-user.

- Product is created by developers based on requirements documents, which may notaccurately reflect the demands of the client for the software.
- During the project, requirements changes might not be successfully conveyed to thedevelopers.

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS

Performance metrics are defined as figures and data that reflect a company's operations, capabilities, and overall standard of excellence. Sales, profit, ROI, customer contentment, customer reviews, personal reviews, general quality, and reputation in the market are just a few examples of the many different performance metrics that may be used. Performance metrics may vary significantly when compared across different sectors. Performance metrics are crucial to a company's success. Businesses must select their core performance measures and concentrate on these areas since these metrics help steer and evaluate an organization's success. Important success factors are only beneficial if it acknowledged and tracked. Attentive management is also necessary for business measurements to offer correct results and for the right questions to be asked.

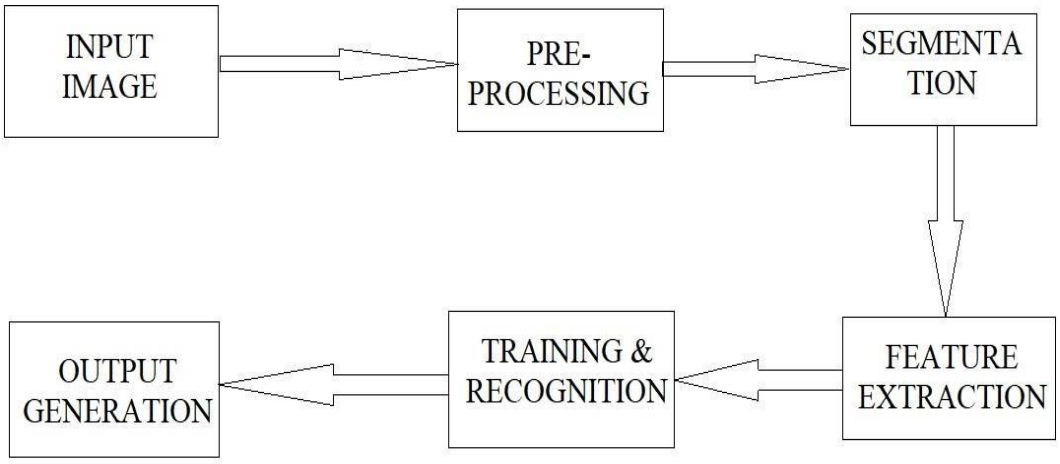

Fig 9.1.1 PERFORMANCE METRICS

CHAPTER 10

ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGES

- Fruit classification is a necessary activity to distinguish between the many varieties of the same family of fruits. The majority of the time, only size and colour distinguish the many fruits belonging to the same family.
- Fruits are classified using image processing for fruit grading, taking into account the disease severity, fruit defects, and fruit contamination.
- Grading is a crucial phase of the post-harvest procedure. Fruit grading by hand is a laborious and inaccurate procedure. In this regard, it is necessary to adapt the automated faster system.
- The capacity to operate quickly, consistently provide quality work, and increase product stability and safety are some other advantages.

10.2 DISADVANTAGES

- The majority of study on fruits has been done from only one angle. It is also difficult to judge the quality of fruits while only looking at one side of them.
- Limited fruits
- Blurred image
- Poor image of fruit
- Various types of fruits
- In poor imaging conditions, it does not offer reliable identification.

CHAPTER 11

CONCLUSION

In this research, got the opportunity to look at some of the deep learning algorithms and identify their strengths and weaknesses. By learning about deep learning, and created a tool that can identify fruits from images. It is suggested to use the convolutional neural network technique to create a new classification scheme for fruits. The findings above were produced using seven test samples that were selected from the real 2626 and 1050 photos that were used for training and testing.

Anaconda software was used to code and test the aforementioned algorithm. For training and testing, many fruit kinds with various histories were chosen. The suggested algorithm's accuracy rate was 98%. This research investigates a CNN-based categorization of fruits.

For five scenarios involving fruits, the accuracy and loss curves were produced using various hidden layer configurations. CNN performed better in order to classify fruits more accurately.

Believing that the findings and methods presented in this study may be further expanded to a bigger assignment. From the perspective, increasing the neural system's accuracy is one of the main objectives. This entails pursuing more options with relation to the system's structure.

CHAPTER 12

FUTURE SCOPE

Ideally, this research may be expanded in the future with a larger dataset that includes more fruit and vegetable categories. It also have the intention of putting into practise a few additional CNN-based models in order to assess their efficacy on the same dataset. Additionally, can be work on adding a few more features for grading and classification that could be used to classify different types of fruit diseases or fruit

texture structures. Future directions are all of these.

CHAPTER 13

APPENDIX

13.1 SOURCE CODE:

DATA COLLECTION, IMAGE PREPROCESSING AND MODEL BUILDING.

```
from keras.preprocessing.image import ImageDataGenerator
train_datagen =
ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
test_datagen = ImageDataGenerator(rescale=1./255)
# # Loading our data and performing data augmentation
#performing data augmentation to train the data
x_train=train_datagen.flow_from_directory(r'C:\Users\Asmi Bhardwaj\Downloads\AIPowered
Nutrition Analyser for Fitness
Enthusiasts\Dataset\TRAIN_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_
mode='sparse')
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=5,activation='softmax'))
classifier.summary()
classifier.compile(optimizer='adam',loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
classifier.fit_generator(generator=x_train,steps_per_epoch =
len(x_train),epochs=20,validation_data=x_test,validation_steps = len(x_test))
classifier.save('nutrition.h5')
from tensorflow.keras.models import load_model
from keras.preprocessing import image
model = load_model("nutrition.h5")
img = image.load_img(r"C:\Users\Asmi Bhardwaj\Downloads\AI-Powered Nutrition
Analyser for Fitness Enthusiasts\Dataset\TEST_SET\APPLES\5_100.jpg",
grayscale=False,target_size= (64,64))
x= image.img_to_array(img)
x= np.expand_dims(x,axis = 0)
pred=np.argmax(model.predict(x),axis=1)
pred
index=['APPLES', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
result=str(index[pred[0]])
result
```

13.1.1 APPLICATION BUILDING:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>IBM Project </title>
  <link rel="stylesheet" href="{{url_for('static', filename='css/styles.css')}}">
</head>
<body>
  <nav>
    <h2> <span>AI-Powered Nutrition Analyzer For </span> Fitness Enthusiasts</h2>
  </nav>
  <main id="home-main">
    <marquee behavior="scroll" direction="left">
      Food is essential for human life and has been the concern of many heathcare
conventions. Nowadays new dietary assessment and
      nutrition analysis tools enable more oppurtunitites 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
      containimination of food. It ensures compliance with trade and food laws.
    </marquee>

    <p>
      "Let Food Be The Medicine & Medicine Be The Food"
    </p>
  </main>
  <a href="/image">
    <button class="button-29" role="button">Classify</button>
  </a>
</body>
</html>
```

13.1.1 Image.html

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>IBM Project </title>
   <link rel="stylesheet" href="{{url_for('static', filename='css/styles.css')}}">
</head>
<body class="classify-body">
   <nav>
      <h2> <span>Nutrition</span> Image Analysis</h2>
   </nav>
   <main id="classify-main">
      <div>
         <h3>Choose an image to classify</h3>
         <button class="button-78">Choose</button>
         <img src="" alt="" id="image-viewer">
      <button class="button-82-pushable" role="button">
         <span class="button-82-shadow"></span>
         <span class="button-82-edge"></span>
         <span class="button-82-front text">
         Classify
         </span>
      </button>
      </div>
      <div id="output">
          <h3>Output</h3>
          <p>Food is classified as:</p>
          <div id="output-wrapper">
             <p id="output-result"></p>
             <p id="output-api-result"></p>
          </div>
      </div>
   </main>
</body>
<script src="{{url_for('static', filename='js/app.js')}}"></script>
</html>
```

13.1.2 style.css

```
*{
    box-sizing: border-box;
```

```
    margin: 0;
    padding: 0;
}
:root{
    --primary-color: blue;
    --primary-color-opacity: rgba(144, 238, 144, 0.8);
}
body{
    background: url("../images/pexels-lukas-1410138.jpg") no-repeat center top/cover;
    font-family:'Segoe UI', Tahoma, Geneva, Verdana, sans-serif;
}
ul{
    list-style: none;
}
a{
    text-decoration: none;
}

/* Classes */
.page-selected{
    background: rgb(25, 25, 114);
    color: white;
}
.page-selected a{
    color: white;
}
.primary-button, .secondary-button{
    padding: 0.8rem;
    font-size: 1.2rem;
    border: none;
    color: white;
    font-weight: 500;
    border-radius: 5px;
}
.primary-button{
    background: var(--primary-color);
}
.secondary-button{
    background: rgb(50, 50, 208);
}
.primary-button:hover, .secondary-button:hover{
    cursor: pointer;
}

/* Nav bar */
```

```
nav{
    display: flex;
    justify-content: space-between;
    align-items: center;
    padding: 0 2rem;
    background: rgb(25, 25, 114);
}
nav > h2{
    font-size: 2.5rem;
    font-weight: 500;
    color: white;
    padding: 3px;
    padding-top: 5px;
    padding-bottom: 5px;
}

/* Home Page */
#home-main{
    /*background: var(--primary-color-opacity);*/
    margin: 23rem auto;
    width: 40rem;
    color: white;
    padding: 21rem;
    font-size: 1.5rem;
    border-radius: 15px;
    text-align: center;
    display: contents;
    font-style: italic;
}
p{
    margin-top: 10%;
    margin-left: 5%;
    width: 600px;
    padding: 10px;
    font-weight: bolder;
    font-size: 40px;
}

/* CSS */
.button-29 {
  margin-left: 20%;
  align-items: center;
  appearance: none;
  background-image: radial-gradient(100% 100% at 100% 0, #5adaff 0, #5468ff 100%);
  border: 0;
```

```
  border-radius: 6px;
  box-shadow: rgba(45, 35, 66, .4) 0 2px 4px,rgba(45, 35, 66, .3) 0 7px 13px -3px,rgba(58, 65,
111, .5) 0 -3px 0 inset;
  box-sizing: border-box;
  color: #fff;
  cursor: pointer;
  display: inline-flex;
  font-family: "JetBrains Mono",monospace;
  height: 48px;
  justify-content: center;
  line-height: 1;
  list-style: none;
  overflow: hidden;
  padding-left: 16px;
  padding-right: 16px;
  position: relative;
  text-align: left;
  text-decoration: none;
  transition: box-shadow .15s,transform .15s;
  user-select: none;
  -webkit-user-select: none;
  touch-action: manipulation;
  white-space: nowrap;
  will-change: box-shadow,transform;
  font-size: 18px;
}

.button-29:focus {
  box-shadow: #3c4fe0 0 0 0 1.5px inset, rgba(45, 35, 66, .4) 0 2px 4px, rgba(45, 35, 66, .3) 0
7px 13px -3px, #3c4fe0 0 -3px 0 inset;
}

.button-29:hover {
  box-shadow: rgba(45, 35, 66, .4) 0 4px 8px, rgba(45, 35, 66, .3) 0 7px 13px -3px, #3c4fe0 0 -
3px 0 inset;
  transform: translateY(-2px);
}

.button-29:active {
  box-shadow: #3c4fe0 0 3px 7px inset;
  transform: translateY(2px);
}

/* Classify Page */
.classify-body{
```

```
    background: url("../images/classify.jpg") no-repeat center;
    background-size: cover;
}
#classify-main{
    background: none;
    width: 50rem;
    margin: 13rem auto;
    display: grid;
    grid-template-columns: 1fr 2fr;
    grid-gap: 3rem;
}
#classify-main h3{
    margin-bottom: 2rem;
    font-size: 18px;
    font-weight: bold;
}

.button-78 {
  align-items: center;
  appearance: none;
  background-clip: padding-box;
  background-color: initial;
  background-image: none;
  border-style: none;
  box-sizing: border-box;
  color: #fff;
  cursor: pointer;
  display: inline-block;
  flex-direction: row;
  flex-shrink: 0;
  font-family: Eina01,sans-serif;
  font-size: 16px;
  font-weight: 800;
  justify-content: center;
  line-height: 24px;
  margin: 0;
  min-height: 64px;
  outline: none;
  overflow: visible;
  padding: 19px 26px;
  pointer-events: auto;
  position: relative;
  text-align: center;
  text-decoration: none;
  text-transform: none;
```

```
  user-select: none;
  -webkit-user-select: none;
  touch-action: manipulation;
  vertical-align: middle;
  width: auto;
  word-break: keep-all;
  z-index: 0;
}

@media (min-width: 768px) {
  .button-78 {
    padding: 19px 32px;
  }
}

.button-78:before,
.button-78:after {
  border-radius: 80px;
}

.button-78:before {
  background-image: linear-gradient(92.83deg, #ff7426 0, #f93a13 100%);
  content: "";
  display: block;
  height: 100%;
  left: 0;
  overflow: hidden;
  position: absolute;
  top: 0;
  width: 100%;
  z-index: -2;
}

.button-78:after {
  background-color: initial;
  background-image: linear-gradient(#541a0f 0, #0c0d0d 100%);
  bottom: 4px;
  content: "";
  display: block;
  left: 4px;
  overflow: hidden;
  position: absolute;
  right: 4px;
  top: 4px;
  transition: all 100ms ease-out;
```

```
  z-index: -1;
}

.button-78:hover:not(:disabled):before {
  background: linear-gradient(92.83deg, rgb(255, 116, 38) 0%, rgb(249, 58, 19) 100%);
}

.button-78:hover:not(:disabled):after {
  bottom: 0;
  left: 0;
  right: 0;
  top: 0;
  transition-timing-function: ease-in;
  opacity: 0;
}

.button-78:active:not(:disabled) {
  color: #ccc;
}

.button-78:active:not(:disabled):before {
  background-image: linear-gradient(0deg, rgba(0, 0, 0, .2), rgba(0, 0, 0, .2)), linear-
gradient(92.83deg, #ff7426 0, #f93a13 100%);
}

.button-78:active:not(:disabled):after {
  background-image: linear-gradient(#541a0f 0, #0c0d0d 100%);
  bottom: 4px;
  left: 4px;
  right: 4px;
  top: 4px;
}

.button-78:disabled {
  cursor: default;
  opacity: .24;
}

.button-82-pushable {
  margin-top: 2rem;
  position: relative;
  border: none;
  background: transparent;
  padding: 0;
  cursor: pointer;
```

```
  outline-offset: 4px;
  transition: filter 250ms;
  user-select: none;
  -webkit-user-select: none;
  touch-action: manipulation;
}

.button-82-shadow {
  position: absolute;
  top: 0;
  left: 0;
  width: 100%;
  height: 100%;
  border-radius: 12px;
  background: hsl(0deg 0% 0% / 0.25);
  will-change: transform;
  transform: translateY(2px);
  transition:
    transform
    600ms
    cubic-bezier(.3, .7, .4, 1);
}

.button-82-edge {
  position: absolute;
  top: 0;
  left: 0;
  width: 100%;
  height: 100%;
  border-radius: 12px;
  background: linear-gradient(
    to left,
    hsl(340deg 100% 16%) 0%,
    hsl(340deg 100% 32%) 8%,
    hsl(340deg 100% 32%) 92%,
    hsl(340deg 100% 16%) 100%
  );
}

.button-82-front {
  display: block;
  position: relative;
  padding: 12px 27px;
  border-radius: 12px;
  font-size: 1.1rem;
```

```
  color: white;
  background: hsl(345deg 100% 47%);
  will-change: transform;
  transform: translateY(-4px);
  transition:
    transform
    600ms
    cubic-bezier(.3, .7, .4, 1);
}

@media (min-width: 768px) {
  .button-82-front {
    font-size: 1.25rem;
    padding: 12px 42px;
  }
}

.button-82-pushable:hover {
  filter: brightness(110%);
  -webkit-filter: brightness(110%);
}

.button-82-pushable:hover .button-82-front {
  transform: translateY(-6px);
  transition:
    transform
    250ms
    cubic-bezier(.3, .7, .4, 1.5);
}

.button-82-pushable:active .button-82-front {
  transform: translateY(-2px);
  transition: transform 34ms;
}

.button-82-pushable:hover .button-82-shadow {
  transform: translateY(4px);
  transition:
    transform
    250ms
    cubic-bezier(.3, .7, .4, 1.5);
}

.button-82-pushable:active .button-82-shadow {
  transform: translateY(1px);
```

```
  transition: transform 34ms;
}

.button-82-pushable:focus:not(:focus-visible) {
  outline: none;
}

#classify-main > div, #output{
    display: flex;
    flex-direction: column;
    align-items: center;
}
#output h3{
    margin-bottom: 4rem;
}
#output > p{
    text-decoration: underline;
    display: none;
}
#classify-main > div p{
    text-align: center;
    overflow-wrap: break-word;
    max-width: 50rem;
    font-size: 1.3rem;
    font-weight: 500;
    margin-top: 2rem;
}
#output-wrapper{
    background: rgba(243, 243, 243, 0.7);
    margin-top: 2rem;
    padding: 2rem;
    border-radius: 10px;
    display: none;
}
#output-wrapper > p:first-child{
    margin-top: none;
}
#output-wrapper > p:last-child{
    margin-top: 1rem;
}
```

13.1.3. app.js

```
const   chooseButton = document.querySelector('button.button-78'),
        classifyButton = document.querySelector('button.button-82-pushable ');
let     userFile;

// Event Listeners
chooseButton.addEventListener('click', (e)=>{
    // Creating an input element to select the file
    const input = document.createElement('input');
    input.setAttribute('type', 'file');
    input.setAttribute('accept', 'image/png, image/jpeg, image/jpg');
    input.setAttribute('name', 'file');
    input.click();
    input.onchange = function(){
        const imageViewer = document.querySelector('#image-viewer');

        // Displaying Image selected on the web page
        const reader = new FileReader();
        reader.onload = function(event){
            imageViewer.src = event.target.result;
            imageViewer.style.marginTop = '2rem';
            imageViewer.style.height = '300px';
            imageViewer.style.width = '300px';
        }
        reader.readAsDataURL(input.files[0]);
        userFile = input.files[0];
    }
})

classifyButton.addEventListener('click', (e)=> {
    const formData = new FormData();
    formData.append('file', userFile);
    fetch('/predict', {
        method: 'POST',
        body: formData
    })
    .then((response)=> response.json())
    .then((res)=> {
        const   result = document.querySelector('#output-result'),
                apiResult = document.querySelector('#output-api-result'),
                outputWrapper = document.querySelector('#output-wrapper'),
                p = document.querySelector('#output > p');
```

```
        console.log(res.apiResult[0])

        result.innerText = res.result;
        apiResult.innerHTML = `${JSON.stringify(res.apiResult[0])}`;
        p.style.display = 'block';
        outputWrapper.style.display = 'block';
    })
})
```

13.1.4. app.js

```
from flask import Flask,render_template,request, jsonify

import os
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import requests

app = Flask(__name__,template_folder="../templates",
            static_folder='../static')

model = load_model('nutrition.hdf5.h5')
print("Loaded model from disk")

@app.route('/')
def home():
    return render_template('home.html')

@app.route('/image')
def image1():
    return render_template("image.html")

@app.route('/imageprediction')
def imageprediction():
    return render_template("imageprediction.html")


@app.route('/predict',methods=['POST'])
def launch():
    if request.method=='POST':
        f=request.files['file']
```

```
        basepath=os.path.dirname('/')
        filepath=os.path.join(basepath, f.filename)
        f.save(filepath)

        img=image.load_img(filepath,target_size=(64,64))
        x=image.img_to_array(img)
        x=np.expand_dims(x,axis=0)

        pred=np.argmax(model.predict(x),axis=1)
        print("prediction",pred)
        index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']

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

        final_result = {
            "result" : result,
            "apiResult" : apiResult
          }
        print(final_result)
        return final_result

def nutrition(index):

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

    querystring = {"query":index}

    headers = {  'X-RapidAPI-Host': 'calorieninjas.p.rapidapi.com',
    'X-RapidAPI-Key': '8c43e02098mshcb4fea7ab8fdea2p175878jsn0d0669a8826c'}

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

    return response.json()['items']

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

13.1 GITHUB & PROJECT DEMO LINK

13.1.1 GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-2891-1658485746

13.1.2 PROJECT LINK:

PROJECTNAME: AI-powered Nutrition Analyzer for Fitness Enthusiasts

localhost:5000

Demo Link:

YouTube: https://youtu.be/ZhshzMQ6e14

Drive: https://drive.google.com/file/d/1olZ20e26CMuxsG90EwcUxE6a4-s5B5Cp/view?usp=share_link