

# **AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS**

**A PROJECT REPORT**

**TEAM ID: PNT2022TMID13691**

**TEAM MEMBERS:**

<b>NITHARSANA S</b>	<b>(621319205028)</b>
<b>GOKILA S</b>	<b>(621319205008)</b>
<b>MARY DAYANA RANI D</b>	<b>(621319205022)</b>
<b>RUBIKA V</b>	<b>(621319205040)</b>

**TEAM MENTOR:**

**MR.R.PALANIKUMAR.,M.E.,**

<b>SI.NO</b>	<b>TITLE</b>	<b>PAGE NO</b>
<b>1.</b>	<b>INTRODUCTION</b>	4
	1.1 Project Overview	5
	1.2 Purpose	6
<b>2.</b>	<b>LITERATURE SURVEY</b>	7
	2.1 Existing problem	12
	2.2 References	13
	2.3 Problem Statement Definition	14
<b>3.</b>	<b>IDEATION &amp; PROPOSED SOLUTION</b>	15
	3.1 Empathy Map Canvas	15
	3.2 Ideation & Brainstorming	16
	3.3 Proposed Solution	17
	3.4 Problem Solution fit	18
<b>4.</b>	<b>REQUIREMENT ANALYSIS</b>	19
	4.1 Functional requirement	19
	4.2 Non-Functional requirements	20
<b>5.</b>	<b>PROJECT DESIGN</b>	21
	5.1 Data Flow Diagrams	21
	5.2 Solution & Technical Architecture	25
	5.3 User Stories	26
<b>6.</b>	<b>PROJECT PLANNING &amp; SCHEDULING</b>	27
	6.1 Sprint Planning & Estimation	27
	6.2 Sprint Delivery Schedule	28

6.3 Reports from JIRA	32
<b>7. CODING &amp; SOLUTIONING</b>	33
7.1 Feature 1	33
7.2 Feature 2	34
<b>8. TESTING</b>	43
8.1 Test Cases	43
8.2 User Acceptance Testing	43
<b>9. RESULTS</b>	48
9.1 Performance Metrics	48
<b>10. ADVANTAGES &amp; DISADVANTAGES</b>	52
<b>11. CONCLUSION</b>	53
<b>12. FUTURE SCOPE</b>	54
<b>13. APPENDIX</b>	55
Source Code	
GitHub & Project Demo Link	

## **CHAPTER 1**

### **INTRODUCTION**

When used to analyze intricate medical data, AI (artificial intelligence) refers to the use of sophisticated software and sophisticated algorithms that mimic human perception. In contrast to more established medical technology, AI technology has the capacity to gather data, analyze it, and provide a user with a thorough conclusion. These features of AI technology are made possible by machine learning algorithms. AI systems are able to recognise patterns in behaviour and create reasoning. To reduce the error margin, experts evaluate AI algorithms on a regular basis. There are two contrasts between human behaviour and AI systems in this area. Algorithms are accurate, to start. In addition, if a goal is given, the algorithm remains unchanged and only acknowledges the explicit instructions. Further, algorithms put a dark box there. The second distinction suggests that while algorithms are capable of estimating accurate goals, they do not examine the underlying causes or contributing factors. As a result, AI is the capacity of computer algorithms to draw conclusions without direct human input.

The field of health care is being rapidly transformed by artificial intelligence. Pioneers develop technologies to improve clinical treatment, address deficiencies, and advance medical research, powered by big data and powerful machine learning systems. These technologies rely on software and algorithms created from medical data that can make recommendations or forecasts. The majority of algorithms, in the opinion of experts, are difficult to explicitly explain or understand. As a result, some experts take these algorithms into consideration. The research focuses on how artificial intelligence is perceived, which includes potential applications. The legal ramifications of AI in medicine, including regulation, privacy, tort, and intellectual property law, are also discussed in the study. The use of AI in the healthcare sector appears to be useful, and it involves some ethical, and ethical issues that should be resolved to raise the prominence of this technology. AI has great potential for success. It may introduce new approaches to instruction that will help pupils understand concepts more effectively. Since we can use artificial intelligence in so many different fields.

## 1.1 PROJECT OVERVIEW

Artificial intelligence has a wide range of applications in the nutritional industry. AI applications are utilized in analysis to create complex machines that can recognise cancer cells and detect diseases. In order to ensure early diagnosis, artificial intelligence can assist in analyzing chronic illnesses with lab and other medical data. For the purpose of discovering new categories, AI combines powered intelligence with historical data.

**Food analyst:** Applications like sorting fresh produce, managing supply chains, monitoring food safety compliance, effective cleaning in place systems, anticipating consumer preference, and new product development have all benefited from the successful deployment of AI. These applications also resulted in greater efficiency and time and resource savings. **Image Recognition:** Facial recognition algorithms are used by our favorites gadgets, such as mobile phones, laptops, and PCs, to identify and In order to grant secure access, one must identify. Facial recognition is a popular Artificial Intelligence use outside of personal use, even in highly secure settings in many businesses.

**Diet and Exercise:** Diet greatly enhances packaging, lengthens shelf life, combines the menu using AI algorithms, and improves food safety by creating a more open supply chain management system. The future of the food industry is entirely dependent on smart farming, robotic farming, and drones thanks to AI and ML. cleaning up existing systems, predicting consumer preferences, and developing new products more effectively while saving time and resources **System of Recommendations:** The recommendation is used by many platforms that we use every day, including e-commerce, entertainment websites, social media, video sharing platforms like YouTube, etc.mechanism to gather user information and offer consumers personalized recommendations to boost engagement. Almost all industries employ this artificial intelligence technology, which is highly widespread.

**Image recognition:** Facial recognition techniques are used by our favorites gadgets, including phones, laptops, and computers, to detect and identify users in order to grant safe access. Facial recognition is a popular application of artificial intelligence (AI) outside of personal use, even in highly secure sectors of many companies.

## 1.2. PURPOSE

- Food is necessary for human life and has been a topic of discussion at numerous medical meetings. Modern dietary evaluation and nutrition analysis technologies give consumers more possibilities to explore nutrition patterns, comprehend their daily eating habits, and keep up a balanced diet. Finding out a food's nutritional value is done through nutritional analysis. Information about the chemical makeup, processing, quality control, and contamination of food is a crucial component of analytical chemistry.
- The project's primary goal is to construct a model that will be used to categories fruits according to their various attributes, such as color, shape, and texture. Here, users can take pictures of various fruits, which are subsequently uploaded to a trained algorithm for analysis. The algorithm examines the image and determines the nutritious content of fruits such (Sugar, Fiber, Protein, Calories, etc.).
- Contrarily, the goal of nutritional evaluation is to determine a patient's nutritional status, spot clinically relevant malnutrition, and keep track of any changes to that condition. It includes information on anthropometric, nutritional, and biochemical data as well as clinical history, physical exam results, and other criteria. Nutritional assessment tools include the Subjective Global Assessment and the Mini Nutritional Assessment. The fact that nutritional screening tools require less training to use than nutritional evaluation tools is a benefit. The population to be screened or examined, the type of hospital, and the resources available all influence the instrument selection.
- At last, the precision of the change of supplement aggregates from sustenance dietary records relies upon the exactness and accessibility of the food fixing information base for transformation to calories and supplements. In rundown, the two kinds of mistakes lessen the judgment of the connection among diet and wellbeing, as well as the exactness of the factual examination. Nonetheless, while there might be a few slight deviations in the data set of the connections tried when the consequences of critical examinations are appropriately assessed, legitimate ends can be drawn.

## **CHAPTER 2**

### **LITERATURE SURVEY**

**[1] TITLE: A SURVEY OF NUTRITION AI RECOMMENDATION**

**SYSTEMAUTHOR: Thomas Theodoridis, Vassilios Solachidis, Lazaros**

**YEAR OF PUBLICATION: 2020**

Registered dietitians now have a fresh way to practice their trade and contribute to the healthcare industry through nutrition informatics. Recommendation systems are regarded as a useful technological tool to help people modify their eating habits and achieve the objective of eating food and following a diet that is healthier. In this study, nutrition recommendation systems (NRS) and its characteristics are being reviewed for the first time. A wide range of scholarly databases were used as reference sources for the systematic review, providing access to numerous publications in the area. The PRISMA strategy served as the foundation for the article selection process. From our initial investigation, the database, and the advice of experts, we determined the keywords. Searches were conducted on the databases of PubMed, Web of Sciences, Scopus, Embase, and IEEE. Following evaluation, they Two independent reviewers gathered records from databases, using inclusion and exclusion criteria to each retrieved work to choose the works of interest. Our critical viewpoint made the observation that our definition of hate speech is more inclusive and all-encompassing than that of other viewpoints found in the literature. This is true because we advocate for the need to identify subtle instances of discrimination on the internet and in online social networks.

#### **DISADVANTAGES:**

- The inability to validate tools for particular patient populations at a high level is one of the limitations of nutrition screening.
- Inaccurate information, modifications to a patient's condition while they are in the hospital, and the use of faulty laboratory results.

**[2] TITLE: NUTRITIONAL ASSISTANCE DURING EXERCISE OR PHYSICAL**

**AUTHOR: Jinti Roy and Chandrama Baruah**

**YEAR OF PUBLICATION: 2020**

A disruptive technology called artificial intelligence (AI) is being used to learn more about tailored diets in nutrition and wellness. The links between the many nutritional elements that impact us have been modeled in both linear and nonlinear ways by experts. To improve their predictions and dietary decisions, food businesses and tailored food product services employ this model. To make accurate forecasts and suitable food recommendations, deep learning is used to analyze the genetic information of the individuals. AI may be incredibly helpful for their mining. This chapter discusses the significance of diet and exercise for health and wellbeing, as well as what precision medicine, artificial intelligence (AI), precision nutrition, and precision fitness are, how these topics may be aided by AI, and a decision-making algorithm for dietary menu planning. AI applied in genetic tests for precision nutrition and fitness; AI-based diet and supplements; The storm front and crowd fewer datasets are used to collect Twitter data for an AI approach to nutritious meal planning for AI-based nutrition and fitness assistance systems and applications, as well as some obstacles and future possibilities. An NLP method is used to process the gathered data. The NLP tokenization method eliminates data characters, hash tags, user information, and other undesirable features. The system examines Tweets in terms of their sentences and individual words before generating NLP features such as semantic, sentiment, unigram, and pattern features. Consuming nutrients will replace fluid losses and provide carbohydrates to maintain blood glucose levels.

**DISADVANTAGES:**

- Inaccurate reporting of food intake and poor record keeping reduce the accuracy of diet analysis.



### **[3] TITLE: PERSONALISED NUTRITION USING AI**

**AUTHOR: Daniela Braconi , Vittoria Cicaloni , Ottavia Spiga**

**YEAR OF PUBLICATION: 2020**

Efforts should centre on developing predictive tools that promptly monitor the individual's health reactions to food in order to comprehend the underlying health dynamics while taking into account inter-individual variability and executing individualized nutrition-driven therapies. A systems science viewpoint can assist doctors in creating individualized nutrition plans, understanding the heterogeneity in therapy responses, and tailoring focused treatment. The development of information-processing representations of digestion, absorption, and metabolism could be led by personalized nutrition techniques. Through data integration at all relevant scales, results from cutting-edge machine learning (ML) models, the generation of counterintuitive hypotheses, and experimental validation using preclinical and clinical trials with standardized nutritional interventions, these provide links between molecular events and health outcomes. As the big data era has progressed, data specific to the consumption of sales statistics for meals, functional foods, and beverages can be retrieved. Initiatives supported by health informatics can be used to mine and extract data from databases of insurance claims and electronic health records (EHRs). The nutritional and data sciences' expertise can be merged with the EHR data to create computer models and artificial patient cohorts. To do predictive analysis and assess the system-level reactions to the customized meal suggestions, these artificial patients can be utilized as avatars that reflect inter-individual variation. The complex regulatory mechanisms of nutritional interventions at the intersection of immunity, metabolism, and gut microbiome can be clarified using these prognostic insights.

#### **DISADVANTAGES:**

- The inability to validate methods for particular patient populations is one of the constraints of nutrition screening.
- When a patient's condition changes while they are in the hospital, the use of inaccurate information is invalidated.

**[4] TITLE: PROSPECTS AND PITFALLS OF MACHINE LEARNING IN  
NUTRITIONAL EPIDEMIOLOGY**

**AUTHOR: Stefania Russo and Stefano Bonassi**

**YEAR OF PUBLICATION: 2020**

Observational data are used in nutritional epidemiology to identify links between food and disease risk. However, current dietary data analysis techniques are frequently subpar, with little consideration given to or examination of the relationships between the researched variables and nonlinear behaviors in the data. The artificial intelligence field of machine learning (ML) has the potential to enhance the modeling of nonlinear correlations and confounding that are present in nutritional data. Despite these possibilities, it is important to use caution when applying ML to nutritional epidemiology in order to preserve the objectivity of the findings and offer reliable interpretations. A thoughtful application of these tools is required given the complex environment surrounding ML in order to provide nutritional epidemiology with a novel analytical resource for dietary measurement and assessment as well as a tool to model dietary patterns. the intricate relationship between dietary intake and health. In addition to describing the uses of ML in nutritional epidemiology, this paper offers advice on how to steer clear of frequent mistakes when using predictive statistical models to analyze nutritional data. Furthermore, it offers new potential future directions in the area of ML in nutritional epidemiology and aids unfamiliar readers in better evaluating the significance of their results.

**DISADVANTAGES:**

- There is a chance that the data could not only be purposely changed, but also be intentionally flawed.
- The information that "teaches" the machine learning algorithms, either through data or neural networks.
- Be designed to introduce bias or steer clinicians in the wrong direction..

**[5] TITLE: NUTRITION SYSTEMS FOR CHILDREN**

**AUTHOR: Ahmed Raza and Nita dalmiya**

**YEAR OF PUBLICATION: 2020**

Digital media advertising for brands and unhealthy eating are two things that kids are continuously exposed to. The marketing of harmful foods and brands has a negative impact on children's diet quality and diet-related health, according to the evidence. The volume, velocity, and variety of digital media prevent monitoring techniques based on human labor, despite an increasing number of nations, including Canada, attempting to control unhealthy food/brand marketing to children on digital media. We are creating an artificial intelligence solution to close this gap that automatically and continually tracks marketing activities across numerous digital platforms, such as websites, YouTube, and mobile apps including social media. Our system combines multiple data science, machine learning, and software engineering techniques in order to help policymakers monitor digital food/brand marketing and thereby enhance child health. We utilized a useful app. Building scalable, predictive models that were verified for certain use cases required analytics data from our 45,000 users as well as user insights. With heterogeneous data, we were able to forecast user churn with a 93% accuracy rate by using the Random Forest model. Our forecasts of user lives on the mobile app had an RMSE of 25.09 days and an R2 value of 0.91, which indicated that the predictions were highly correlated. With the help of these predictive algorithms, we can reward consumers with tailored offers and cross-channel cues, boosting their content consumption as well as other desired online and offline behaviors. By enhancing tailored experiences and allocating scarce health resources to populations that are most resistant to digital first initiatives, the algorithms also maximize the efficacy of our intervention. this and related We will be able to extend and strengthen our relationships with health consumers over the course of their lifetimes thanks to AI-powered algorithms, which will encourage more of them to take an active role in enhancing children's nutrition, health, and early cognitive development.

**DISADVANTAGES:**

- Multiple forms of malnutrition affect children and adolescents, and nutrition systems are essential for enhancing their diets.

## **2.1EXISTING PROBLEM**

An expert system for diagnosing, managing, and monitoring human nutrition is known as an expert system for human nutrition analysis. The system analyses the user's physical attributes to establish their nutritional state and offers suggestions for achieving nutritional requirements and a balanced diet. As a result, a knowledge database containing the user's food habits and nutritional status is created. The system continually encourages the user to use the app and improve their eating habits by generating challenges, warnings, and other stimuli. On a Windows Web Server, the expert system is built using the Expert System and running as a Web Service. The system computes the optimal weight, body composition, frame size, and uses nutritional data to determine BMI, or Body Mass Index. This is the foundation of our dietary analysis of the suggested system All users will be able to utilize this system as a tool to improve their eating routines and nutritional health. The objective is to assist people develop and keep up healthy eating habits by integrating this application into their daily life. A conventional application and/or subfield of artificial intelligence, an expert system or electronic diagnosis system is a software hardware system that aims to replicate the performance of one or more human experts, typically in a particular issue domain. An expert system or knowledge-based system is created when the computer repository of this expert knowledge in some way effectively replaces the human expert by coming to the same conclusion. This software is intricate.(Program) created to mimic the ideas and methods of decision-making used by human specialists in a certain field. The expert system was created using AI programming techniques and is an offspring of artificial intelligence (AI).

### **DISADVANTAGES:**

- Information can be retrieved.
- Food can serve as an instant diagnosis

## 2.2. REFERENCE

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### **2.3.PROBLEM STATEMENT DEFINITION**

The goal of our project is to locate and recognise food items whose details are present in the created database and provide us with information like the calories and nutrients. The food item includes, and our project also advises on how many calories and nutrients the user should consume based on his or her details and the quantity that is necessary for a healthy diet and fitness. Finding out what nutrients are in food is done through nutritional analysis. Food is necessary for human life and has been the subject of many medical conventions. This aids the fitness enthusiast in tracking and monitoring their calorie and nutritional intake. Modern dietary assessment and nutrition analysis technologies give people more possibilities to explore nutrition patterns, understand their daily eating habits, and maintain a balanced diet. Finding out a food's nutritional value is done through 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.

## CHAPTER 3

### IDEATION & PROPOSED SOLUTIONS

#### 3.1. EMPATHY MAP CANVAS

The basic empathy map, which aids in identifying and describing the user's wants and pain locations, is expanded upon in an empathy map canvas. Additionally, this data is useful for enhancing user experience. Real user insights are crucial for creating effective canvases because they help paint a true picture of how they feel about the product. This gives information about the most frequently used features and how they are used. And with this information, teams are better equipped to make the changes that will benefit users and add value to the product.

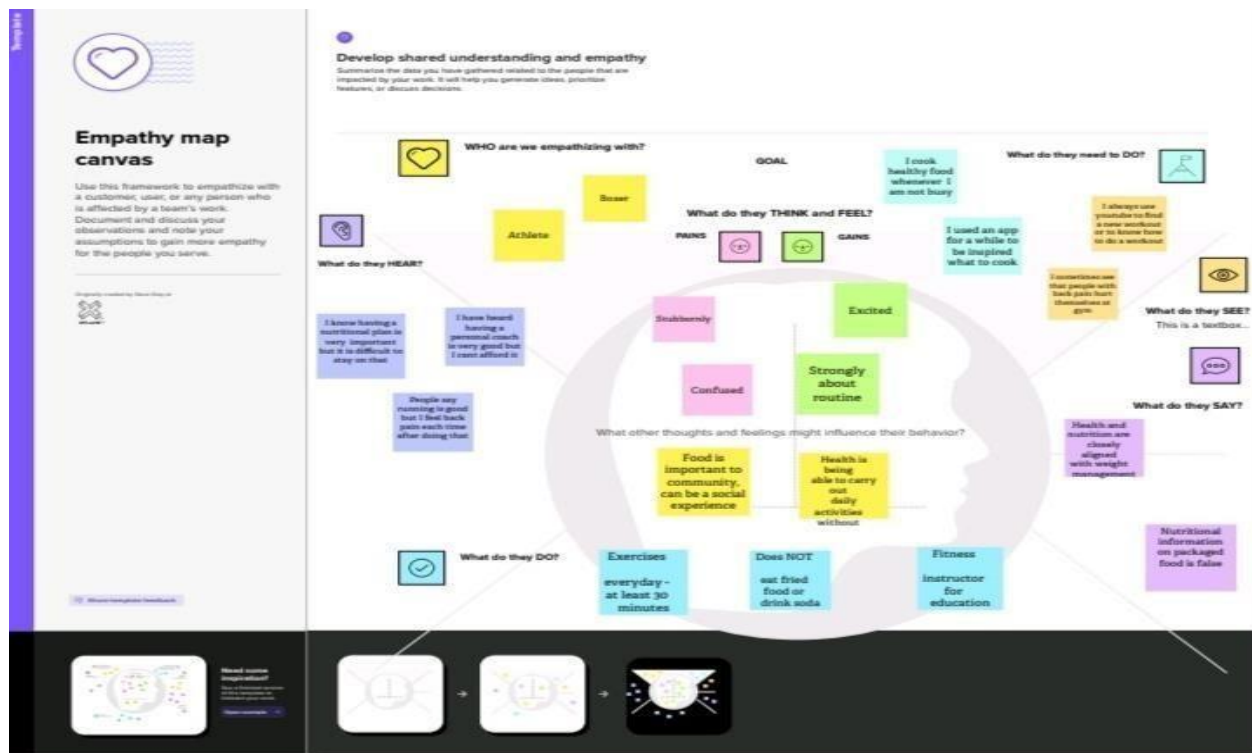


FIGURE 3.1.1

### 3.2. IDEATION AND BRAINSTORMING

The process of ideation entails coming up with new concepts and solutions through exercises like sketching, prototyping, brainstorming, writing in the head, coming up with the worst possible idea, and a variety of other ideation approaches. The third step of the Design Thinking process is also known as ideation. The process of originating, developing, and sharing ideas is known as ideation. It's crucial to remember that these concepts don't necessarily have to be original. You can brainstorm solutions to particular issues, consider fresh approaches to putting a plan into action, or even gather input and assess concepts. As you can see, ideation is more than simply a single brainstorming session or period of idea development. Actually, these three phases of ideation—generation, selection, and development—can be separated. The brainstorming process is described below to help paint a clearer image. The four categories of concepts used in nutritional dietary assessment are shown in this diagram.

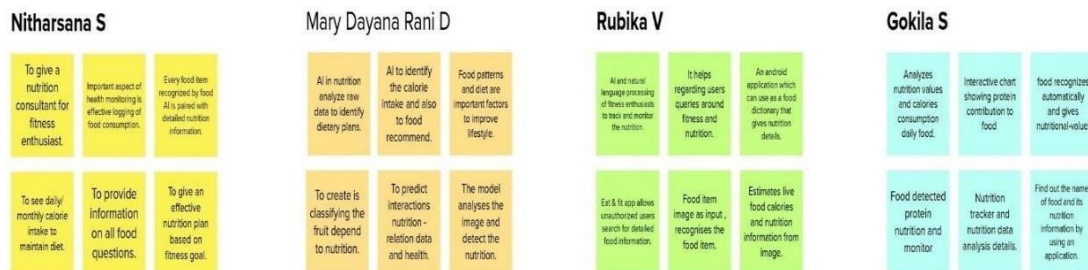


FIGURE 3.2.1



### 3.3.PROPOSED SOLUTION

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	To provide a real-time update about nutrition intake.
2.	Idea / Solution description	The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).
3.	Novelty / Uniqueness	Novelties in the field include the concept of energy availability, meal-based protein recommendations, and ergogenic effects of carbohydrate mouth rinse.
4.	Social Impact / Customer Satisfaction	Social Media has had a great impact in the fitness and health industries due to people's instant accessibility to content.
5.	Business Model (Revenue Model)	The determination towards a healthy lifestyle encourages the health industry to do more and grow more. while the leading brand is investing in the healthcare industry that simply means fitness is a future trend. So, creating a fitness app is a profitable and sustainable idea.
6.	Scalability of the Solution	Scaling up of nutrition refer to processes aimed at maximizing the reach and effectiveness of a range of nutrition relevant actions, leading to sustainable impact on nutritional outcomes.

FIGURE 3.3.1

### 3.4. PROBLEM SOLUTION FIT

Project Title: AI-Powered Nutritional Analyzer for fitness enthusiast		Project Design Phase-I - Solution Fit Template		Team ID: PNT2022TMID/13691	
Define CS, fit into	<b>1. CUSTOMER SEGMENT(S)</b> <b>CS</b> Body Builder Athlete Boxer	<b>6. CUSTOMER CONSTRAINTS</b> <b>CC</b> Network connection, Available device, Quality camera	<b>5. AVAILABLE SOLUTIONS</b> <b>AS</b> Try to eat more protein and fat, and less simple sugars.	Explore AS, differ	
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <b>J&amp;P</b> To provide right nutrition for particular needs. i.e. Nutrition according to separate fitness people.	<b>9. PROBLEM ROOT CAUSE</b> <b>RC</b> In addition to consuming sufficient amounts of calories and macronutrients, athletes may also require more vitamins, minerals, and other nutrients for peak recovery and performance.	<b>7. BEHAVIOUR</b> <b>BE</b> The sum of all planned, spontaneous, or habitual actions of individuals or social groups to procure, prepare, and consume food as well as those actions related to storage and clearance.		
Focus on J&P, tap into BE, understand		Focus on J&P, tap into BE, understand			
<b>3. TRIGGERS</b> <b>TR</b> Market levels will trigger the customers to act	<b>4. EMOTIONS: BEFORE / AFTER</b> <b>EM</b> lost, worried > Happy, confident	<b>10. YOUR SOLUTION</b> <b>SL</b> the app delivers nutrition-based analytics and data to its users and becoming a leading platform for delivering AI fitness services	<b>8. CHANNELS of BEHAVIOUR</b> <b>CH</b> <b>8.1 ONLINE</b> The system will give result in online mode. <b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from and use them for customer development.		

FIGURE 3.4.1

## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1. FUNCTIONAL REQUIREMENTS

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	User interacts by logging in to the website.	HTML, CSS, JavaScript .
2.	Application Logic-1	For building a model used for classifying food and providing related nutritional value.	Python.
3.	Application Logic-2	We can provide an API to add speech transcription capabilities to applications.	IBM Watson STT service
4.	Application Logic-3	Through Watson service we can train, deploy and manage our AI model.	IBM Watson Assistant
5.	Database	Data type will be text and image, which consists of image of the food and corresponding nutritional values.	MySQL.
6.	Cloud Database	We can also use cloud based service for higher security and management of data.	IBM DB2, IBM Cloudant etc.
7.	File Storage	The Data should available on all time and it should be reliable.	Local Filesystem
8.	Machine Learning Model	It allows the user to feed a computer algorithm an immense amount of data and have the computer analyze and make data-driven recommendations and decisions based on only the input data.	Object Recognition Model.
9.	Infrastructure (Server / Cloud)	Application developed on local system.	Local.

FIGURE 4.1.1

## 4.2.NON-FUNCTIONAL REQUIREMENTS

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	A software for which the original source code is made freely available and may be redistributed and modified according to the requirement of the user.	Chrome,jupiter.
2.	Security Implementations	All network connections are protected by a firewall, a hardware or software component that prevents unauthorized access to or from a network.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	A scalable architecture supports higher workloads without any fundamental changes to it.	Jupiter.
4.	Availability	It makes use of AI to provide a real-time update about nutrition intake.	Web application to access the system.
5.	Performance	Data analysis of their physical health status, an evaluation report, and real-time return to the server through the cloud platform can help to increase the performance.	Convolutional neural networks.


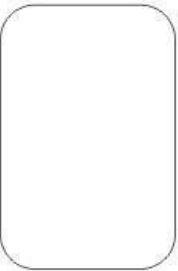


**FIGURE 4.2.1**

## CHAPTER 5

### PROJECT DESIGN

#### 5.1.DATA FLOW DIAGRAMS

How data is handled and moved within a system is depicted in a two-dimensional figure. Each data source is identified, along with how it interacts with other data sources to produce a common result, in the graphical representation. To create a data flow diagram, a person must first identify external inputs and outputs, then figure out how the inputs and outputs relate to one another, and then visually demonstrate these connections and the outcomes they produce. Teams involved in business development and design can use this type of diagram to identify or improve certain aspects of the data processing process.

Symbol	Description
	An <b>entity</b> . A source of data or a destination for data.
	A <b>process</b> or task that is performed by the system.
	A <b>data store</b> , a place where data is held between processes.
	A <b>data flow</b> .

**FIGURE 5.1.1**

## LEVEL 0

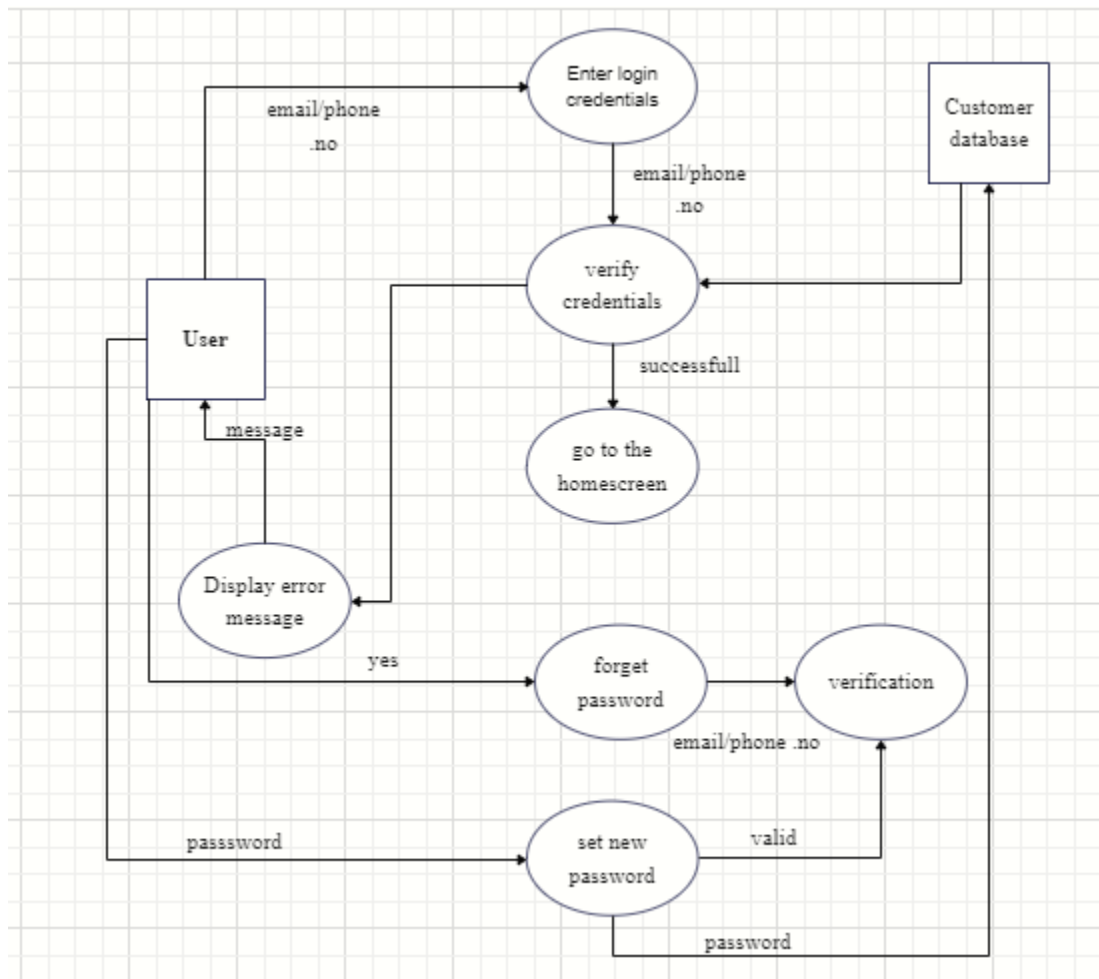


FIGURE 5.1.2

## LEVEL 1

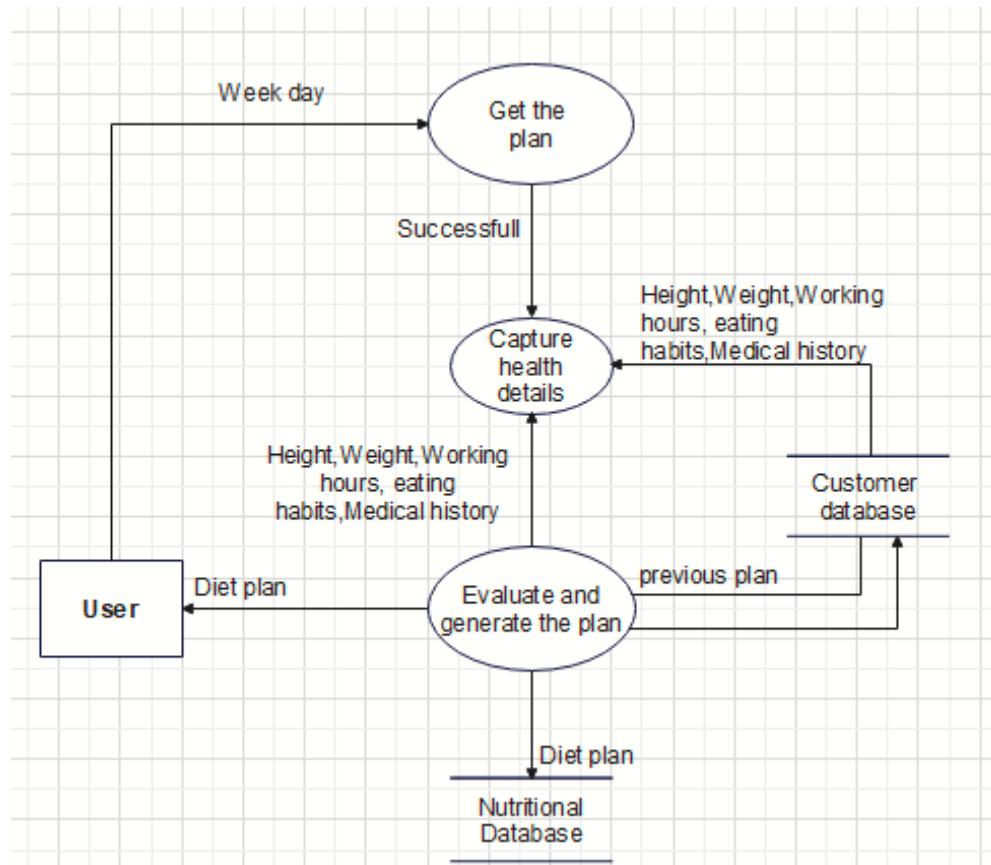


FIGURE 5.1.3

## LEVEL 2

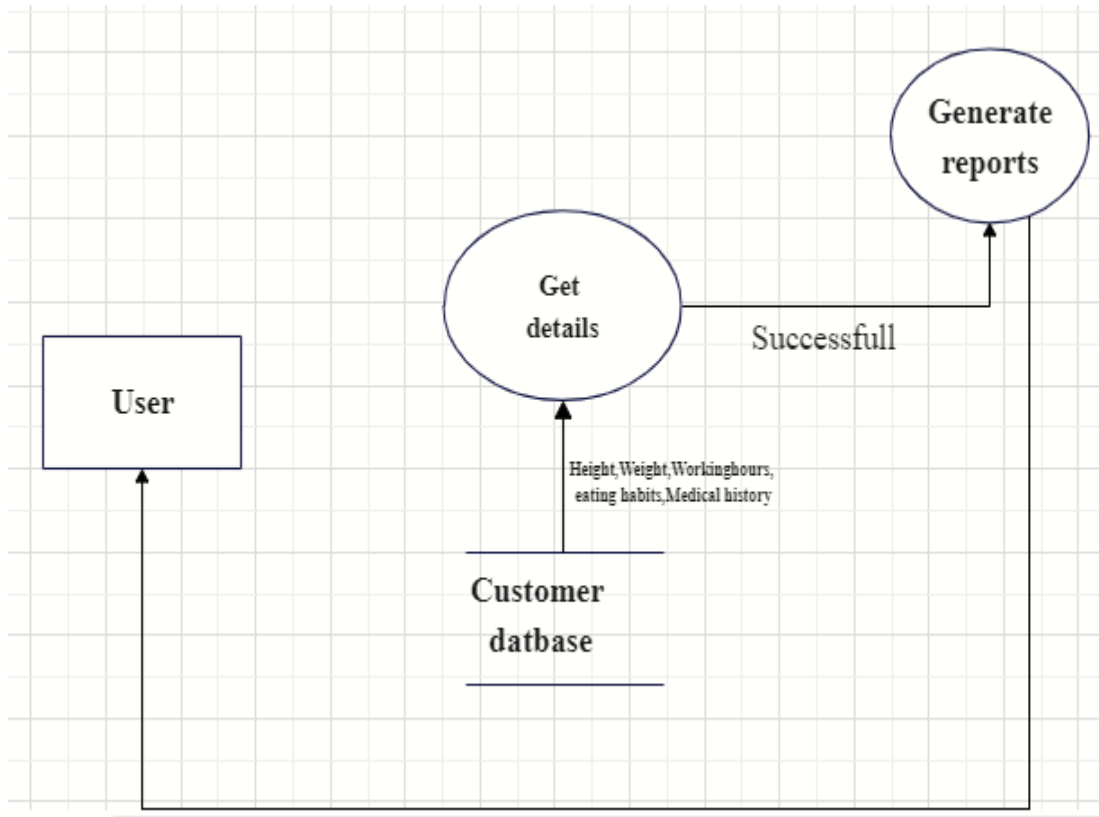


FIGURE 5.1.4



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Solution architecture makes it easier to visualize how various business, informational, and technological components come together in a given solution. Therefore, a solution architecture diagram should represent the aforementioned three essential components in a form that is helpful to engineers as well as business stakeholders. A solution architecture diagram could actually be a collection of diagrams outlining different layers of the architecture, depending on how complicated the deployment is. The diagram makes it simple to understand how the data you gather about the environment relates to both the physical and logical decisions you make for your design.

Technical Architecture:

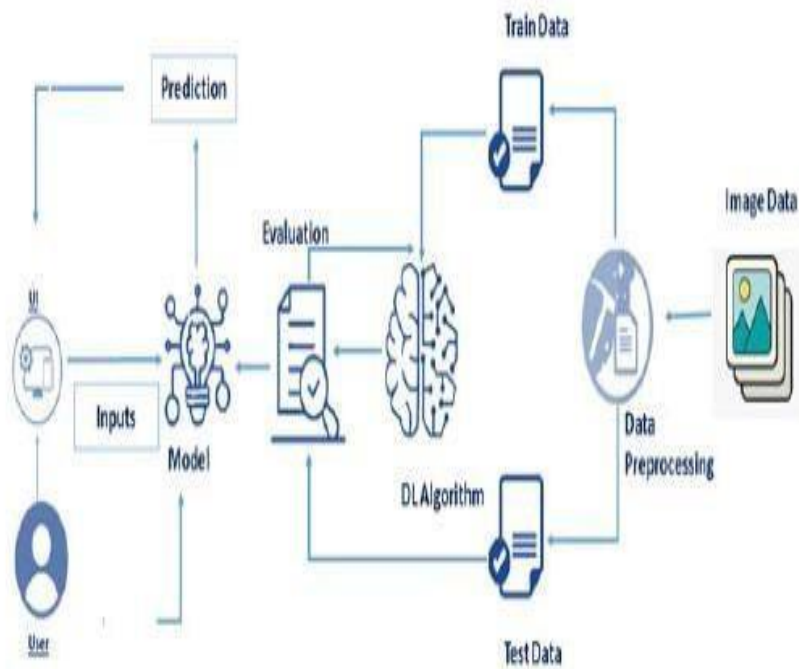
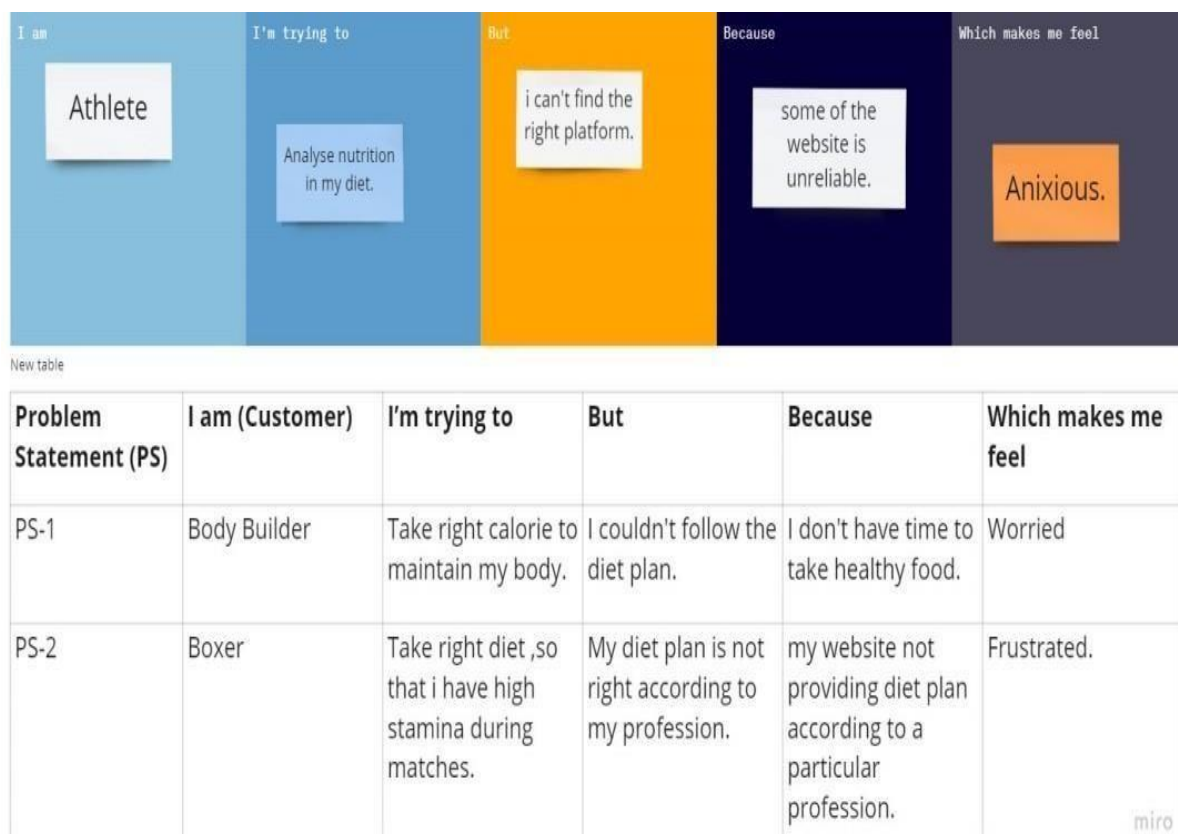


FIGURE 5.2.1

## 5.3 USER STORIES



**FIGURE 5.3.1**

## **CHAPTER 6**

### **PROJECT PLANNING AND SCHEDULING**

#### **6.1 SPRINT PLANNING & ESTIMATION**

In the scrum process, sprint planning marks the beginning of the sprint. Sprint planning's goal is to specify what can be completed in a sprint and how it will be done. The entire scrum team collaborates on sprint planning. Planning One focuses on choosing ready items from the Product Owner's list, answering outstanding queries, and defining the Sprint Goal. The second sprint planning session is dedicated to developing a work schedule to complete each item. The Sprint Backlog is made up of the tasks and plans of action.

- Look into the team's availability.
- Establish your team's velocity.
- Plan the sprint planning session.
- Start by looking at the big picture.
- Outline recent updates, criticism, and problems.
- Verify the capacity and speed of the team.
- Review the backlog of items.
- Determine who owns the task.

## 6.2. SPRINT DELIVERY SCHEDULE

### Project Planning Phase

Date	16 October 2022
Team ID	PNT2022TMID13691
Project Name	AI-Powered Nutrition Analyzer For Fitness Enthusiasts
Maximum Marks	8 Marks

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

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Dataset - Collecting images of food items apples , banana, orange, pineapple, watermelon for analysis	5	High	Nitharsana S
Sprint-1	Image Preprocessing	USN-2	Image data augmentation - Increasing the amount of data by generating new data points from existing data	4	Medium	Rubika V
Sprint-1		USN-3	Image Data Generator Class - Used for getting the input of the original data	4	Medium	Nitharsana S
Sprint-1		USN-4	Applying image data	4	Medium	Mary Dayana Rani D

			generator functionality to train set and test set			
Sprint-2	Modeling Phase	USN-5	Defining the model architecture - Building the model using deep learning approach and adding CNN layers	4	High	Gokila S
Sprint-2		USN -6	Training , saving, testing and predicting the model	5	High	Nitharsana S
Sprint-2		USN- 7	Database creation for the input classes	4	High	Mary Dayana Rani D

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint- 2	Development phase	USN- 8	User database creation - It contains the details of users	3	Medium	Rubika V
Sprint-2		USN- 9	Home page creation - It shows options of the application	2	Low	Nitharsana S
Sprint-2		USN- 10	Login and registration page creation - User can register and login through gmail with Id and password	2	Low	Gokila S
Sprint-3		USN- 11	Dashboard creation – Dashboard contains the information of user profile and features of the application	2	Low	Mary Dayana Rani D
Sprint-3		USN- 12	User Input Page Creation - It is for the user to	4	Medium	Gokila S

			feed the input images			
Sprint-3		USN- 13	Analysis and prediction page creation - It shows the prediction of given userinput	4	Medium	Nitharsana S
Sprint-3		USN- 14	Creation of about us , feedback and rating page – It shows application historyand feedback page to users	4	Medium	Rubika V
Sprint-3	Application Phase	USN- 15	Building the python code and importing the flask module into the Project	6	High	Mary Dayana Rani D
Sprint-4		USN- 16	Create the Flask application and loadingthe model	5	High	Gokila S
Sprint-4		USN- 17	API integration - Connecting front end and back end and perform routing and runthe application	5	High	Nitharsana S
Sprint-4	Deployment Phase	USN-18	Cloud deployment – Deployment of application by using IBM cloud	4	High	Rubika V

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Testing Phase	USN-19	Functional testing – Checking usability and accessibility	3	Medium	Mary Dayana Rani D

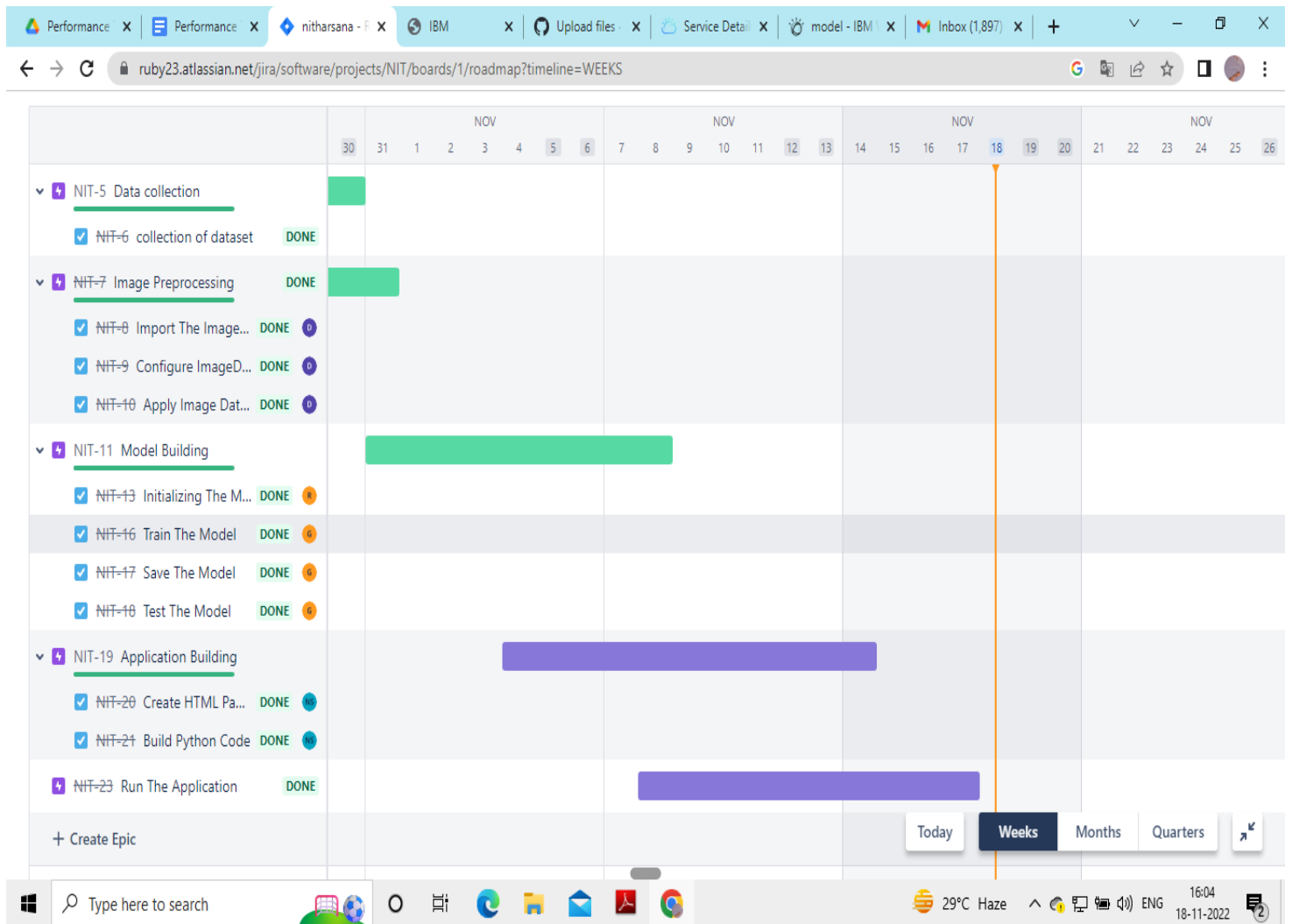
		USN-20	Non Functional testing – Checking scalability and performance of the application	3	Medium	Rubika V
--	--	--------	---	---	--------	----------

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint ReleaseDate (Actual)
Sprint-1	08	5 Days	29 Oct 2022	02 Nov 2022	20	3 Nov 2022
Sprint-2	15	5 Days	03 Oct 2022	07 Nov 2022	20	8 Nov 2022
Sprint-3	15	5 Days	08 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	25	5 Days	13 Nov 2022	17 Nov 2022	20	16 Nov 2022

### Velocity:

Average Velocity=  $12/4 = 3$

### 6.3. REPORT FROM JIRA





## **CHAPTER 7**

### **CODING & SOLUTION**

#### **7.1 FEATURE**

Customers probably want interactions to happen more quickly and kindly. Therefore, an IBM Watson Assistant (63.4 KB) is offered. To assist you attain that full functionality, it offers you a conversational AI platform. It was created to help lighten the load of traditional assistance and to provide excellent customer service based on the benefits of AI.

Additionally, it receives a brand-new, user-friendly interface that enables everyone in your company to develop and maintain virtual agents and chat bots powered by AI without writing a single line of code. By providing improved chat, intelligent AI virtual agents, and human agent contact centre support, this improves the customer experience.

The complex and non-linear relationships between nutrition-related data and health outcomes may be better understood and predicted with the aid of AI algorithms, especially when massive amounts of data need to be organized and integrated, as in the case of metabolomics.

By maximizing effectiveness and addressing systematic and random errors related to self-reported measurements of dietary intakes, AI-based approaches, including image recognition, may also improve dietary assessment.

Finally, to better understand dietary behaviors and perceptions among the population, AI applications can extract, structure, and analyze sizable amounts of data from social media platforms. In conclusion, AI-based methods are likely to enhance and advance nutrition research and support the investigation of novel applications.

## 7.2 FEATURE

### HTML CODE

```
from flask import Flask,render_template,request

# Flask-It is our framework which we are going to use to run/serve our application.

#request-for accessing file which was uploaded by the user on our application.

import os

import numpy as np #used for numerical analysis

from tensorflow.keras.models import load_model#to load our trained model

from tensorflow.keras.preprocessing import image

import requests

app = Flask(__name__,template_folder="templates") # initializing a flask app

# Loading the model

model=load_model('nutrition.h5')

print("Loaded model from disk")
```

## IMAGE HTML:

```
{% extends "imageprediction.html" %} {% block content %}
```

```
<div style="float: left">
```

```
<br>
```

```
<h5><font color="black" size="3" font-family="sans-serif"><b>Upload image to
```

```
classify</b></font></h5><br><br>
```

```
<div>
```

```
<form id="upload-file" method="post" enctype="multipart/form-data">
```

```
<label for="imageUpload" class="upload-label">
```

Choose...

```
</label><input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
```

```
</form>
```

```
<center> <div class="image-section" style="display:none;">
```

```
<div class="img-preview">
```

```
<div id="imagePreview">
```

```
<div class="img-preview">
```

```
<div id="imagePreview">
```

```
</div></center>
```

```
</div><center><div>
```

```
<button type="button" class="btn btn-primary btn-lg " id="btn-predict">Classify</button>
```

```
</center></div>
```

```
</div>
```

```
<div class="loader" style="display: none; margin-left: 450px;"></div>
```

```
<h3 id="result">
```

```
<span><p style="padding-top: 25px;"><h4>Food Classified is :
```

```
<h4><b><u>{{ showcase }} {{ showcase1 }}</p> </span>
```

```
</h3>
```

```
</div>
```

## CSS CODE:

```
.img-preview {  
    width: 256px;  
  
    height: 256px;  
  
    position: relative;  
  
    border: 5px solid #F8F8F8;  
  
    box-shadow: 0px 2px 4px 0px rgba (0, 0, 0, 0.1);  
  
    margin-top: 1em;  
  
    margin-bottom: 1em;  
  
}  
.img-preview>div  
  
width: 100%;  
  
height: 100%;  
  
background-size: 256px;  
  
background-repeat: no-repeat;  
  
background-position: center;  
  
}  
  
input[type="file"] {
```

```

        display: none;

    }

    .upload-label {

        display: inline-block;

        padding: 12px 30px;

        background: #39D2B4;

        color: #fff;

        font-size: 1em;

        transition: all .4s;

        cursor: pointer;

    }

    upload-label: hover{

        background: #34495E;

        color: #39D2B4;

    }

    .loader {

```

```

border: 8px solid #f3f3f3; /* Light grey */

border-top: 8px solid #3498db; /* Blue */

border-radius: 50%;

width: 50px;

height: 50px;

animation: spin 1s linear infinite;

}

@Keyframes spin {

    0% {transform: rotate(0deg);}

    100% {transform: rotate(360deg);}

$(document).ready (function () {

    // Init

    $('. image-section'). hide ();

    $('. loader'). hide ();

    $('#result'). hide ();

    // Upload Preview

    function read URL (input) {

```

```

if (input. Files && input. Files [0]) {

    var reader = new FileReader ();

    reader. Onload = function (e) {

        $('#imagePreview').css ('background-image', 'url (' + e. target .result + ');

        $('#imagePreview'). Hide ();

        $('#imagePreview'). fadeIn(650);

    }

    reader.readAsDataURL(input.files[0]);

}

}

$("#imageUpload").change(function () {

    $('.image-section').show();

    $('#btn-predict').show();

    $('#result').text("");

    $('#result').hide();

    readURL(this);

});

```



```
// Predict
```

```
$('#btn-predict').click(function () {
```

```
    $.ajax({
```

```
        type: 'POST',
```

```
        url: '/predict',
```

```
        data: form_data,
```

```
        contentType: false,
```

```
        cache: false,
```

```
        processData: false,
```

```
        async: true,
```

```
        success: function (data) {
```

```
            // Get and display the result
```

```
            $('.loader').hide();
```

```
            $('#result').fadeIn(600);
```

```
            $('#result').html(data);
```

```
            console.log('Success!');
```

```
        },
```

```

    });

});

$("#imageUpload").change(function () {

    $('.image-section').show();

    $('#btn-predict').show();

    $('#result').text("");

    $('#result').hide();

    readURL(this);

});

// Predict

$('#btn-predict').click(function () {

}

}

```

## **CHAPTER 8**

### **TESTING**

#### **8.1 USER CASES**

Testing is done to look for mistakes. Testing is the process of looking for any flaws or weaknesses in a piece of work. It offers a means of testing whether parts, sub-assemblies, assemblies, and/or a finished product perform properly. It is the act of testing software to make sure it complies with specifications and user expectations and doesn't fail in a way that is unacceptable.

#### **8.1 USER ACCEPTANCE TESTING**

User Acceptance Testing is necessary after software has through Unit, Integration, and System testing since developers may have constructed software based on requirements documents in accordance with their own knowledge and further required adjustments during the testing process. It's possible that development wasn't well explained to them. This necessitates testing to see if the client or end-user accepts the final product. It's possible that development wasn't adequately explained to them. This necessitates testing to see if the client or end-user accepts the final product.

- Developers build products from requirements documents, which might not fully reflect the client's expectations for the software.
- Changes to the requirements during the project may not be effectively communicated to the developers

Date	18-Nov-22
Team ID	PNT2022TMID13691
Project Name	Project –AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS.
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	BUG ID	Executed By
HP_TC_001	UI		Verify UI elements in the Home Page	1)Open the page 2)Check if all the UI elements are displayed	127.0.0.1:8000	The Home page must be displayed properly	Working as expected	PASS		Nithrasana S Mary Dayana Rani D Rubika V Gokila S
HP_TC_002	UI	Home Page	Check if the UI elements are displayed properly in different screen sizes	1)Open the page in a specific device 2)Check if all the UI elements are displayed properly  3)Repeat the above steps with different device sizes	-- Screen Sizes -- 2560 x 1801 1440 x 970 1024 x 840 768 x 630 320 x 630	The Home page must be displayed properly in all sizes	The UI is not displayed properly in screen size 2560 x 1801 and 768 x 630	FAIL	BUG_HP_001	Nithrasana S Mary Dayana Rani D Rubika V Gokila S
HP_TC_003	Functional		Check if user can upload their file	1)Open the page 2)Click on select button 3)Select the input image	test 1.png	The input image should be uploaded to the application successfully	Working as expected	PASS		Nithrasana S Mary Dayana Rani D Rubika V Gokila S

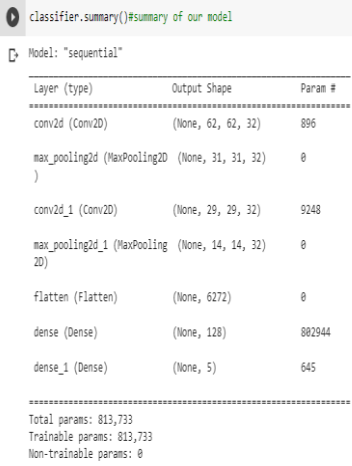
HP_TC_004	Functional	Home Page	Check if user cannot upload unsupported files	1)Open the page 2)Click on select button 3)Select a random input file	installer.exe	The application should not allow user to select a non-image file	User is able to upload any file	FAIL	BUG_HP_002	Nithrasana S Mary Dayana Rani D Rubika V Gokila S
HP_TC_005	Functional	Home Page	Check if the page redirects to the result page once the input is given	1)Open the page 2)Click on select button 3)Select the input image 4)Check if the page redirects	test 1.png	The page should redirect to the results page	Working as expected	PASS		Nithrasana S Mary Dayana Rani D Rubika V Gokila S
BE_TC_001	Functional	Backend	Check if all the routes are working properly	1)Go to Home Page 2)Upload the input image Check the results page	Test 1.png	All the routes should properly work	Working as expected	PASS		Nithrasana S Mary Dayana Rani D Rubika V Gokila S

## 8.3 PERFORMANCE TESTING

Date	10 November 2022
Team ID	PNT2022TMID13691
Project Name	Project – AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS
Maximum Marks	10 Marks

### Model Performance Testing:

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

S.No.	Parameter	Values	Screenshot
1.	Model Summary	<pre> classifier.summary() #summary of our model classifier = Sequential()  classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu')) classifier.add(MaxPooling2D(pool_size=(2, 2)))  classifier.add(Conv2D(32, (3, 3), activation='relu'))  classifier.add(MaxPooling2D(pool_size=(2, 2))) classifier.add(Flatten()) classifier.add(Dense(units=128, activation='relu')) classifier.add(Dense(units=5, activation='softmax')) # softmax for more than 2 </pre>	 <pre> classifier.summary()#summary of our model Model: "sequential" Layer (type)                Output Shape              Param # ----- conv2d (Conv2D)              (None, 62, 62, 32)       896 max_pooling2d (MaxPooling2D) (None, 31, 31, 32)       0 conv2d_1 (Conv2D)            (None, 29, 29, 32)       9248 max_pooling2d_1 (MaxPooling2D) (None, 14, 14, 32)       0 flatten (Flatten)            (None, 6272)              0 dense (Dense)                (None, 128)               882944 dense_1 (Dense)              (None, 5)                 645 ----- Total params: 813,733 Trainable params: 813,733 Non-trainable params: 0 </pre>

2.	Accuracy	<p>Training Accuracy -</p> <pre>#performing data augmentation to train data x_train = train_datagen.flow_from_directory(     r'/content/MyDrive/Colab Notebooks/Dataset/TRAIN_SET',     target_size=(64, 64),     batch_size=5, color_mode='rgb', class_mode='sparse')  Validation Accuracy - #performing data augmentation to test data x_test = test_datagen.flow_from_directory(     r'/content/MyDrive/Colab Notebooks/Dataset/TEST_SET',     target_size=(64, 64),     batch_size=5, color_mode='rgb', class_mode='sparse')</pre>	<pre>#performing data augmentation to train data x_train = train_datagen.flow_from_directory(     r'/content/drive/MyDrive/Colab Notebooks/Dataset/TRAIN_SET',     target_size=(64, 64), batch_size=5, color_mode='rgb', class_mode='sparse') #performing data augmentation to test data x_test = test_datagen.flow_from_directory(     r'/content/drive/MyDrive/Colab Notebooks/Dataset/TEST_SET',     target_size=(64, 64), batch_size=5, color_mode='rgb', class_mode='sparse')</pre> <p>Found 2626 images belonging to 5 classes. Found 1300 images belonging to 5 classes.</p>
----	----------	--	---

## CHAPTER 9

### RESULTS

#### 9.1. PERFORMANCE METRICS

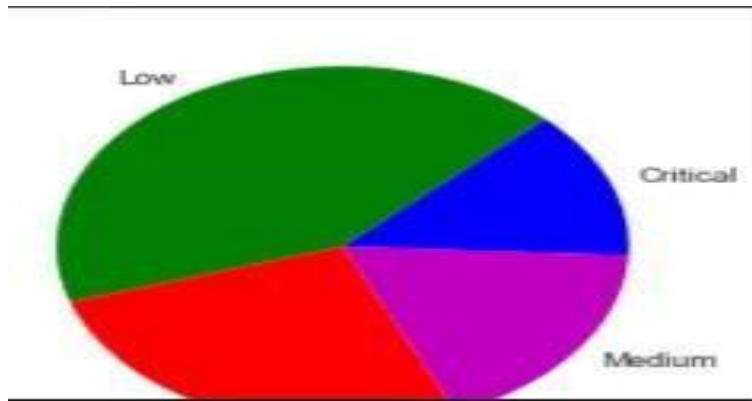


FIGURE 9.1

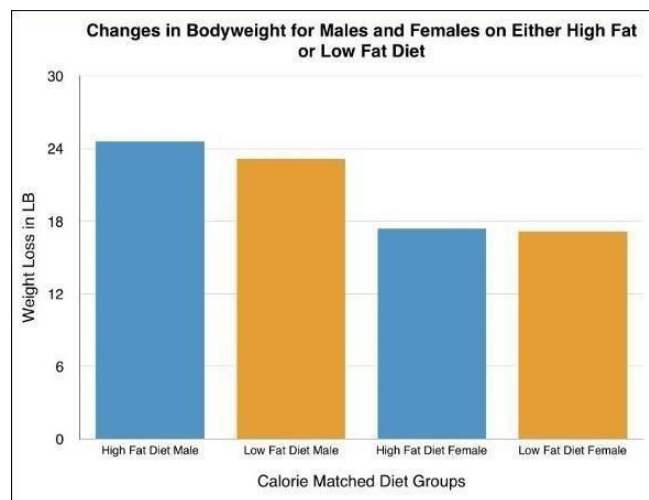


FIGURE 9.1



Desktop/16M/Flask/ x Untitled1 - Jupyter Notebook x Predict x


127.0.0.1:5000/image1

# Nutrition Image Analysis

Home Classify

Upload image to classify

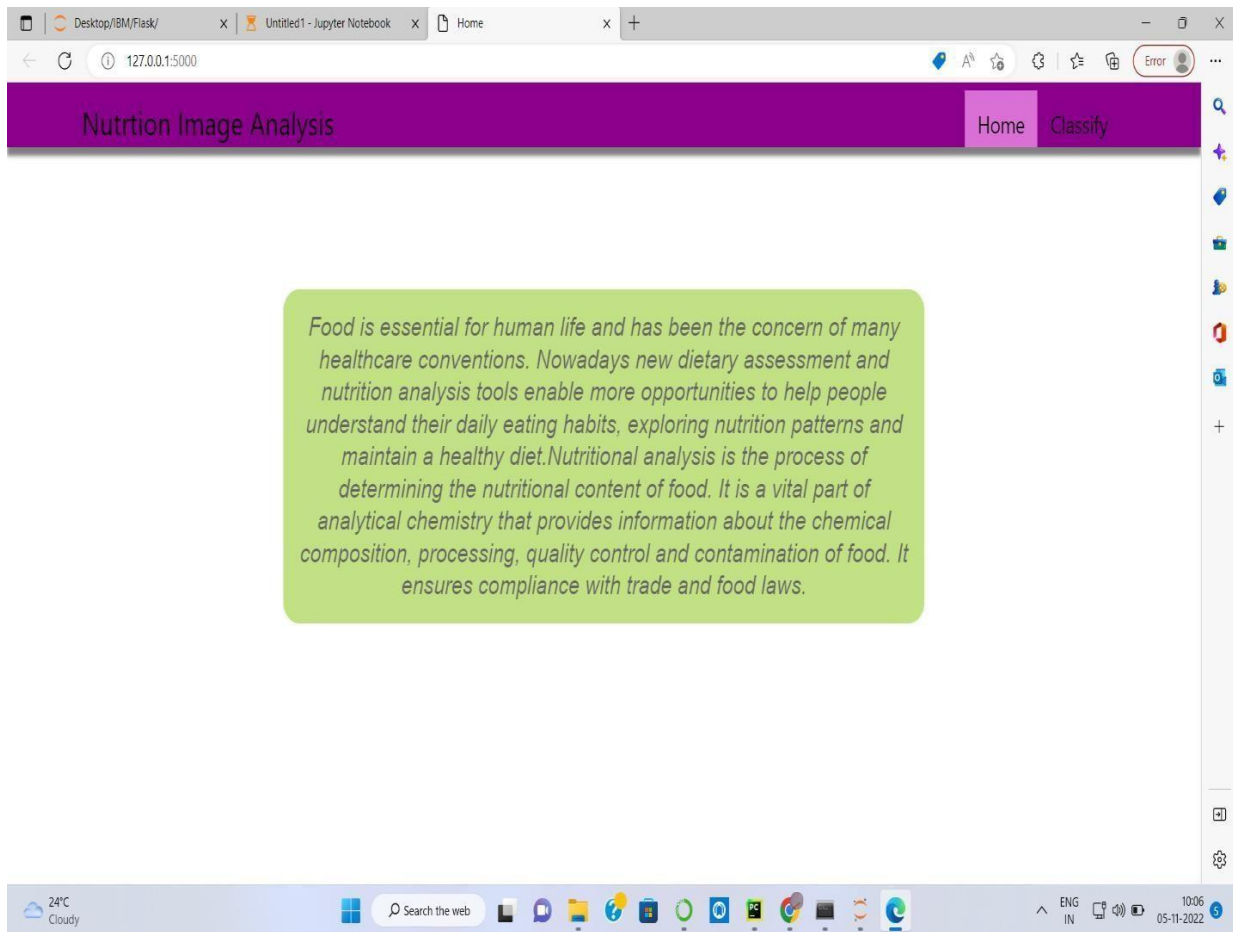
Choose...

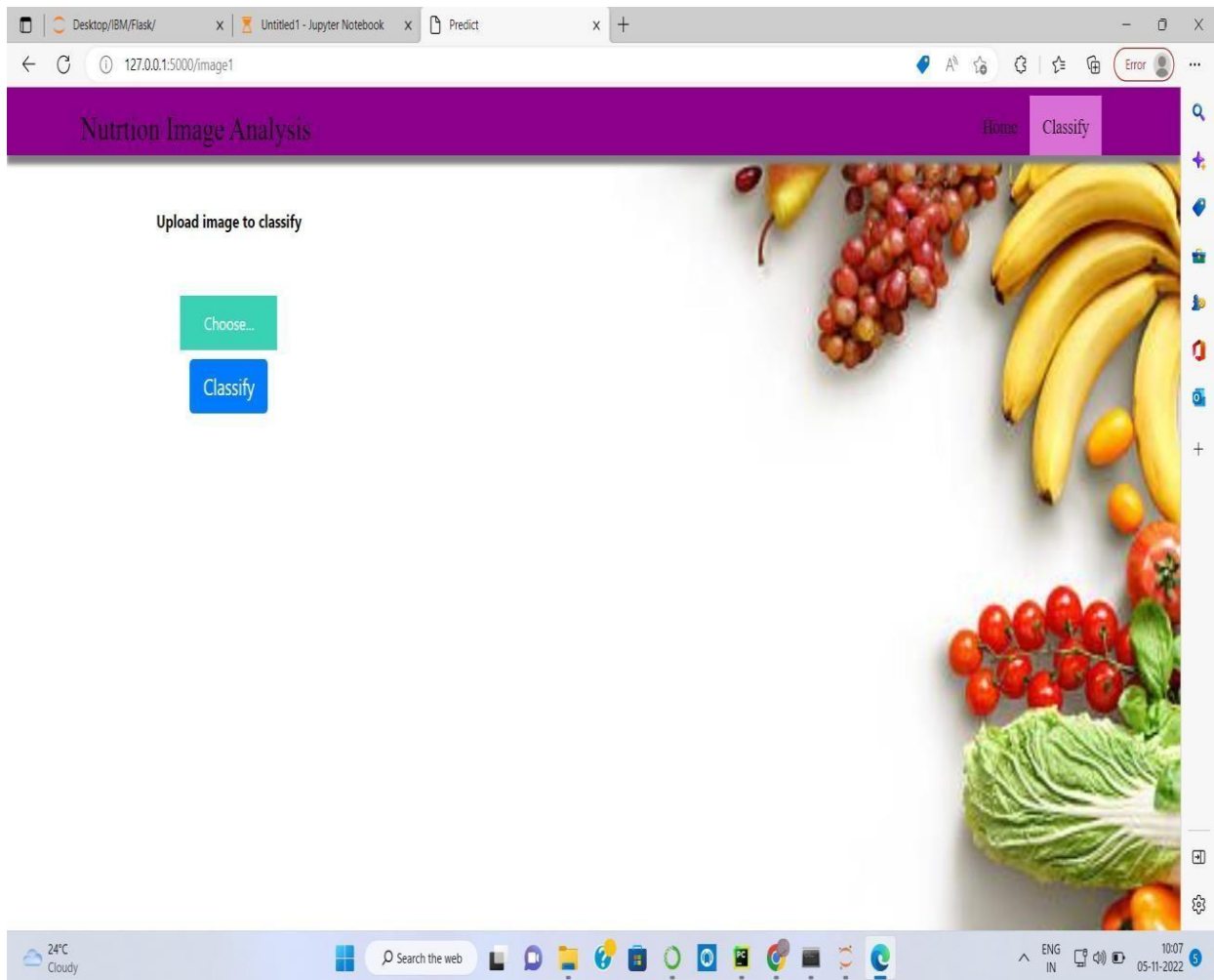


Food Classified is:  
APPLES

[{'sugar\_g': 10.3, 'fiber\_g': 2.4, 'serving\_size\_g': 100.0, 'sodium\_mg': 1, 'name': 'apples', 'potassium\_mg': 11, 'fat\_saturated\_g': 0.0, 'fat\_total\_g': 0.2, 'calories': 53.4, 'cholesterol\_mg': 0, 'protein\_g': 0.3, 'carbohydrates\_total\_g': 13.8}]

24°C Cloudy Search the web ENG IN 10:08 05-11-2022





Upload image to classify

Choose...



Classify



Upload image to classify

Choose...



Food Classified is:

APPLES

[{'sugar\_g': 10.3, 'fiber\_g': 2.4, 'serving\_size\_g': 100.0, 'sodium\_mg': 1, 'name': 'apples', 'potassium\_mg': 11, 'fat\_saturated\_g': 0.0, 'fat\_total\_g': 0.2, 'calories': 53.4, 'cholesterol\_mg': 0, 'protein\_g': 0.3, 'carbohydrates\_total\_g': 13.8}]



Upload image to classify

Choose...



Food Classified is:

WATERMELON

```
[{'sugar_g': 6.2, 'fiber_g': 0.4, 'serving_size_g': 100.0, 'sodium_mg': 0, 'name':  
'watermelon', 'potassium_mg': 10, 'fat_saturated_g': 0.0, 'fat_total_g': 0.1,  
'calories': 30.3, 'cholesterol_mg': 0, 'protein_g': 0.6, 'carbohydrates_total_g':  
7.4}]
```

Upload image to classify

Choose...



Food Classified is:

ORANGE

```
[{'sugar_g': 8.4, 'fiber_g': 2.2, 'serving_size_g': 100.0, 'sodium_mg': 1, 'name':  
'orange', 'potassium_mg': 23, 'fat_saturated_g': 0.0, 'fat_total_g': 0.1, 'calories':  
50.4, 'cholesterol_mg': 0, 'protein_g': 0.9, 'carbohydrates_total_g': 12.4}]
```



## **CHAPTER 10**

### **ADVANTAGES AND DISADVANTAGES**

#### **10.1 ADVANTAGES**

- These surveys are often nationally representative, frequently collected every few years, and useful for examining consumption trends as well as issues relating to food security and nutrition.
- They also take into account other elements including socioeconomic standing and education.
- It evaluates the nutrient content of food items.

#### **10.2 DISADVANTAGES**

- These data quantify perceived consumption but not real consumption.
- They do not allow for individual-level measurements; instead, they are based on data at the household level.
- Food consumed outside the home is frequently excluded.

## **CHAPTER 11**

### **CONCLUSION**

In this thesis, we explore the issue of food identification and nutritional analysis. We specifically examine various identification approaches in existing food-related datasets and create our own new dataset. Additionally, we developed an autonomous method that can obtain a nutrition information table for a picture of food. In order to better understand why a food recognition and analysis system is necessary, we first discuss the history of obesity in society and the three most popular ways to evaluate dietary consumption. These three methods all have glaring flaws, which inspires us to create an automatic food recognition and dietary assessment system. Utilizing an object detection technique, one can create a food recognition system. Plays a significant part in it. To give you a quick taste of how objects can be detected using computer vision techniques, we first introduce three different types of object detection streams: geometry-based approach, color-based approach, and region-based approach. A number of cutting-edge food recognition and dietary assessment systems and models are also summarized.

## **CHAPTER 12**

### **FUTURE SCOPE**

There are many avenues we can pursue in the future as future works. We distinguish two primary trajectories for the future. The first involves investigating the potential of object detection algorithms, and the second involves investigating the potential of food analysis systems. The learning or detection of objects in previously unknown classes, or the incremental learning of subclass distinctions after the "main" class has been learned, is an interesting and useful direction for object detection algorithms.. The amount of work necessary to learn new object classes will be significantly reduced if the model is able to learn new classifiers based on existing ones. Using unsupervised learning techniques is one option that might be used to achieve this. 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. The food industry is intricate, and the path to innovation in this industry is long, spanning concept development and commercialization.



## **CHAPTER 13**

### **APPENDIX**

#### **13.2 GITHUB & PROJECT DEMO LINK**

##### **13.2.1 GITHUB LINK:**

<https://github.com/IBM-EPBL/IBM-Project-1119-1658375774>

##### **13.2.2 PROJECT LINK:**

**PROJECT NAME: AI-POWERED NUTRITION ANALYZER FOR FITNESS  
ENTHUSIASTS**

##### **13.2.3.PROJECT DEMO LINK**

<https://youtu.be/-EVzFLMfZ7o>

