

IBM – NALAIYA THIRAN PROJECT

NUTRITION ASSISTANT APPLICATION

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TABLE OF CONTENT

CHAPTER	CONTENTS	PAGE NO
1	INTRODUCTION 1.1 PROJECT OVERVIEW 1.2 PURPOSE	04
2	LITERATURE SURVEY 2.1 EXISTING PROBLEM 2.2 REFERENCES 2.3 PROBLEM STATEMENT DEFINITION	05
3	IDEATION & PROPOSED SOLUTION 3.1 EMPATHY MAP CANVAS 3.2 IDEATION & BRAINSTROMING 3.3 PROPOSED SOLUTION 3.4 PROBLEM SOLUTION FIT	08
4	REQUIREMENT ANALYSIS 4.1 FUNCTIONAL REQUIREMENT 4.2 NON-FUNCTIONAL REQUIREMENTS	12
5	PROJECT DESIGN 5.1 DATA FLOW DIAGRAMS 5.2 SOLUTION & TECHNICAL ARCHITECTURE 5.3 USER STORIES	13
6	PROJECT PLANNING & SCHEDULING 6.1 SPRINT PLANNING & ESTIMATION 6.2 SPRINT DELIVERY SCHEDULE 6.3 REPORTS FROM JIRA	18

7	CODING & SOLUTIONING 7.1 FEATURE 1 7.2 FEATURE 2 7.3 DATABASE SCHEMA	20
8	TESTING 8.1 TEST CASES 8.2 USER ACCEPTANCE TESTING	23
9	RESULTS 9.1 PERFORMANCE METRICS	24
10	ADVANTAGES & DISADVANTAGES	25
11	CONCLUSION AND FUTURE SCOPE	25
	APPENDIX SOURCE CODE PROJECT DEMO LINK	26

INTRODUCTION

Chronic diseases such as diabetes, obesity, and cardiovascular diseases are becoming the dominant sources of mortality and morbidity worldwide and recently an epidemic in many Asia Pacific countries. Unhealthy diet is one of the key common modifiable risk factors in preventing and managing chronic diseases. Personalized dietary intake intervention showed significant impact on influencing people's choice and promoting their health. The feedback on nutrition intake is substantial and behavioural changing when patients track their dietary intake for a considerable length of time. However, the burden of logging food makes compliance a challenge. Clinical studies rely on patients to recall dietary intake, which is time-consuming and prone to underestimation

PROJECT OVERVIEW

Tracking dietary intake is an important task for health management especially for chronic diseases such as obesity, diabetes, and cardiovascular diseases. Given the popularity of personal handheld devices, mobile applications provide a promising low-cost solution to tackle the key risk factor by diet monitoring. In this work, we propose a photo based dietary tracking system that employs deep-based image recognition algorithms to recognize food and analyze nutrition. The system is beneficial for patients to manage their dietary and nutrition intake, and for the medical institutions to intervene and treat the chronic diseases. To the best of our knowledge, there are no popular applications in the market that provide a high-performance food photo recognition like ours, which is more convenient and intuitive to enter food than textual typing.

PURPOSE

Experiments on evaluating the recognition accuracy on laboratory data and real user data on food, which shed light on uplifting lab trained image recognition models in real applications. We have also conducted user study to verify that our proposed method has the potential to foster higher user engagement rate as compared to existing apps based dietary tracking approaches.

LITERATURE SURVEY

EXISTING PROBLEM

With the rapid development of smart computing and Internet of Things (IoT), now we have a huge amount of data from social networks and mobile networks everyday. People keep uploading, sharing and recording what they do everyday in case of missing the chance of using them to improve our daily life. Food images, recipes and food diaries become the most popular information to be shared, we can learn the implication to build an automatic nutrition analysis system by taking the advantage of such large-scale datasets. With the help of food recognition and analysis systems, users are able to record their daily meals and assess dietary habits, as well as promote their health.

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PROBLEM STATEMENT DEFINITION

Due to the ignorance of healthy food habits, obesity rates are increasing at an alarming speed, and this is reflective of the risks to people’s health. People need to control their daily calorie intake by eating healthier foods, which is the most basic method to avoid obesity.

However, although food packaging comes with nutrition (and calorie) labels, it’s still not very convenient for people to refer to App-based nutrient dashboard systems which can analyse real-time images of a meal and analyse it for nutritional content which can be very handy and improves the dietary habits, and therefore, helps in maintaining a healthy lifestyle.

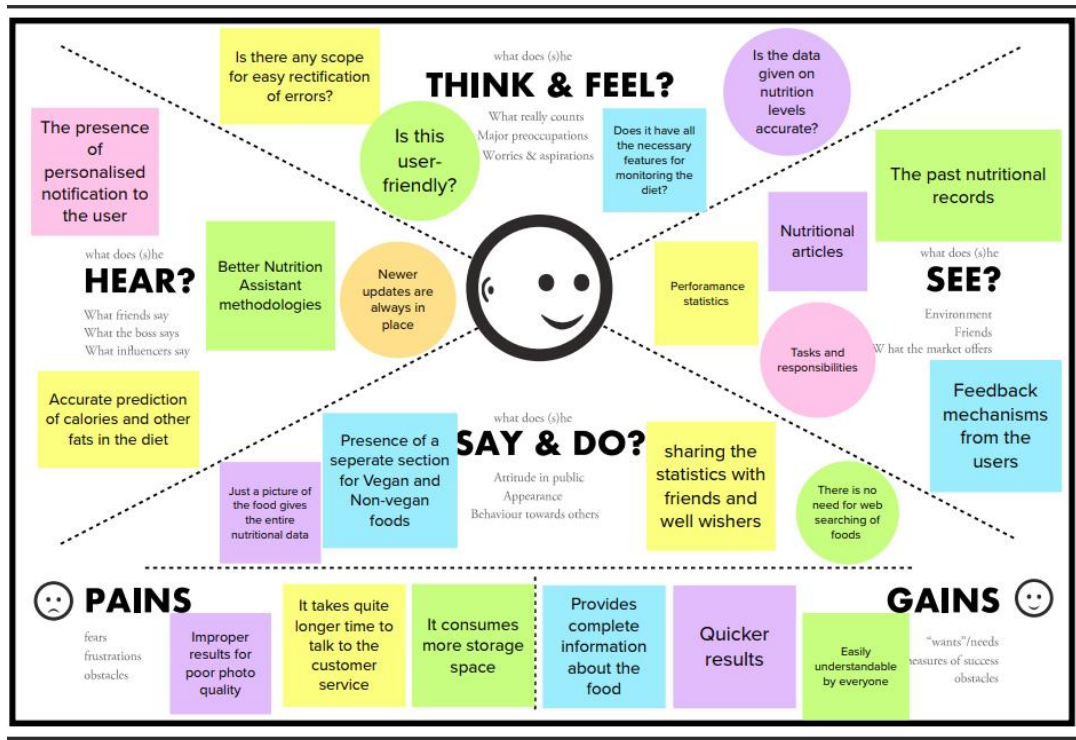
The main objective of this project is to building a web App that automatically estimates food attributes such as ingredients and nutritional value by classifying the input image of food.

Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Fitness freak	Finding a perfect pre workout plan for maintaining fitness	I can't choose a correct plan	It is Confusing	A perfect daily pre workout plan suggestion
PS-2	Student	Find a balanced nutrition diet to loss weight	There is no balanced diet available without workout	I have no time to do workout	A best nutritional based diet plan with less workout
PS-3	Body Builder	Choose a best plan for whole body workout.	It is hard to select a best workout plan	A wrong workout plan will lead to a change in the shape of my body	Perfect diet and workout plan for bodybuilding

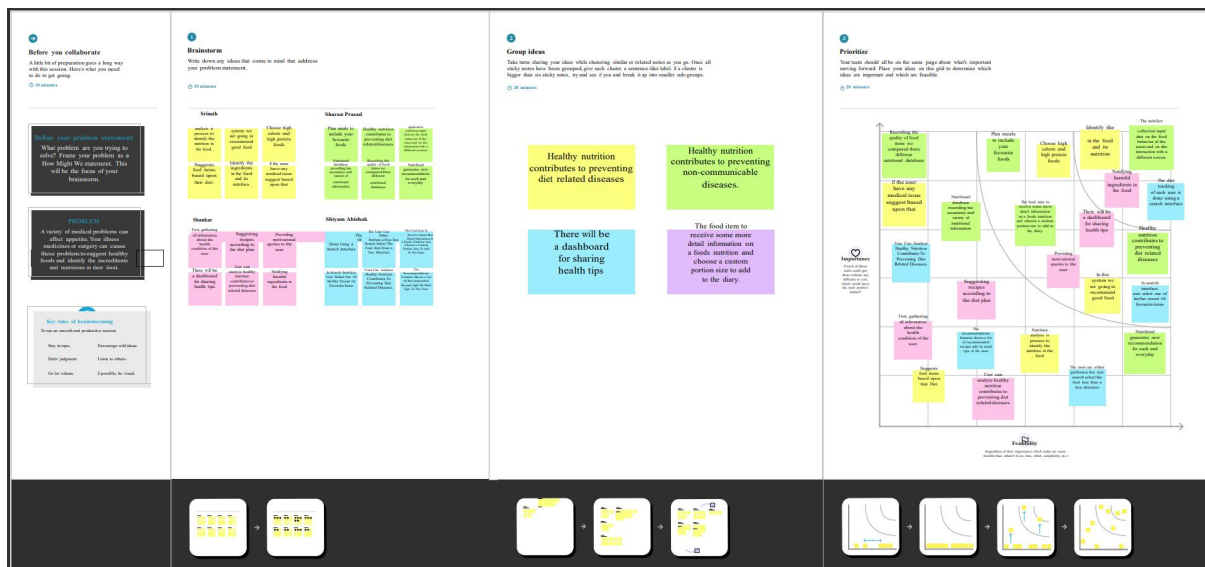
PS-4	Athlete	Choose a best nutrition plan and workout technique. to increase my sprinting speed	Confused with many techniques.	I want to increase my sprinting speed very much before than ever	Perfect suggestions
PS-5	Pregnant woman	Choose a yoga and healthy nutrition diet for the normal pregnancy delivery	I am not familiar with yoga and diet	I don't have idea about the yoga and exercise	User friendly application to choose the beginner based type of yoga, exercises and nutrition base diet plan

IDEATION AND PROPOSED SYSTEM

EMPATHY MAP CANVAS



IDEATION AND BRAINSTORMING



PROPOSED SOLUTION

PROBLEM STATEMENT (PROBLEM TO BE SOLVED)

Due to the ignorance of healthy food habits, obesity rates are increasing at an alarming speed, and this is reflective of the risks to people's health. People need to control their daily calorie intake by eating healthier foods, which is the most basic method to avoid obesity. However, although food packaging comes with nutrition (and calorie) labels, it's still not very convenient for people to refer to App-based nutrient dashboard systems which can analyze real-time images of a meal and analyze it for nutritional content which can be very handy and improves the dietary habits, and therefore, helps in maintaining a healthy lifestyle.

IDEA / SOLUTION DESCRIPTION

This project aims at building a web App that automatically estimates food attributes such as ingredients and nutritional value by classifying the input image of food. Our method employs Clarifai's AI-Driven Food Detection Model for accurate food identification and Food API's to give the nutritional value of the identified food

NOVELTY / UNIQUENESS

In this project, User interacts with the Web App to Load an image. The image is passed to the server application, which uses Clarifai's AI-Driven Food Detection Model Service to analyze the images and Nutrition API to provide nutritional information about the analyzed Image. Nutritional information of the analyzed image is returned to the app for display.

SOCIAL IMPACT / CUSTOMER SATISFACTION

Due to the ignorance of healthy food habits, obesity rates are increasing at an alarming speed, and this is reflective of the risks to people's health. People need to control their daily calorie intake by eating healthier foods, which is the most basic method to avoid obesity. However, although food packaging comes with nutrition (and calorie) labels, it's still not very convenient for people to refer to App-based nutrient dashboard systems which can analyze real-time images of a meal and analyze it for nutritional content which can be very handy and improves the dietary habits, and therefore, helps in maintaining a healthy life.

BUSINESS MODEL (REVENUE MODEL)

A revenue model means understanding how a startup can make money. Our major revenue sources consist of sales, government funds, and public donations.

The introduction of novel ideas increases revenue streams, such as special dietary needs, Clarifai's AI-Driven Food Detection Model, Food API's to give the nutritional value etc..

SCALABILITY OF THE SOLUTION

Making use of cloud-native techniques is one way to automatically estimates food attributes such as ingredients and nutritional value by classifying the input image of food. IBM Cloud, for instance, is one of the cloud-based AI scalability options. Run and manage AI models, as well as optimise decisions at scale across any cloud, with the aid of IBM Cloud Build. The benefit of using the cloud to scale solutions is that we can install our AI programme there. the specific cloud environment that best supports our business needs. We can take advantage of built-in security capabilities and AI model monitoring. we can drive better business outcomes by optimizing our decisions and also make our solution scalable using cloud.

PROBLEM SOLUTION FIT

The Problem solution aims at building a web App that automaticall estimates food attributes such as ingredients and nutritional value by classifying the input image of food. Our method employs Clarifai's AI-Driven Food Detection Model for accurate food identification and Food API's to give the nutritional value of the identified food..

PURPOSE:

- ☐ Solve complex problems in a way that fits the state of your customers.
- ☐ Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- ☐ Sharpen your communication and marketing strategy with the right triggers and messaging.
- ☐ Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
- ☐ Understand the existing situation in order to improve it for your target group.

Problem-Solution Fit canvas

Purpose / Vision:

Creating a Nutrition Tracker Application

Version:

Define CS, fit into CL	1. CUSTOMER SEGMENT(S) CS <p>This is a health nutrition application so our application can be almost used by everyone especially people above the age 50 .</p>	6. CUSTOMER LIMITATIONS CL <small>EG. BUDGET, DEVICES</small> <p>Available of proper nutrition foods, should intake suggested foods at appropriate times, stable internet connection.</p>	5. AVAILABLE SOLUTIONS AS <small>PLUSSES & MINUSES</small> <p>Based on the BMI , our application suggests the food that the customer needs to intake in their daily diet.</p>	Explore AS, differentiate
	2. PROBLEMS / PAINS + ITS FREQUENCY PR <p>Our application helps the customer to detect the amount of nutrients present in their food which gives them an idea on how much of food they want to eat to avoid being malnutrient.</p>	9. PROBLEM ROOT / CAUSE RC <p>Avoiding intake of foods at regular times and eating a lot of oily and junk foods makes the person unhealthy and malnutrient.</p>	7. BEHAVIOR + ITS INTENSITY BE <p>Directly related: Consulting a dietitian regarding their health.</p> <p>Indirectly related: Following the advice given by family members and friends.</p>	
Focus on PR, tap into BE, understand RC	3. TRIGGERS TO ACT TR <p>Seeing friends maintaining their health and fitness by using online health related applications.</p>	10. YOUR SOLUTION SL <p>The solution is a responsive web page that can be used in both mobile and computers.</p> <p>Cumulative results of pictures of food as input and provide nutritional information of food are used to achieve accurate prediction.</p> <p>A detailed report of the concerned person's health will be generated. This will help the person to determine the type of food they want to eat.</p>	8. CHANNELS of BEHAVIOR CH <p>ONLINE</p> <p>Searching nutritionists advices and analyzing the calories contain of food.</p> <p>OFFLINE</p> <p>Reading books related to health and nutrition</p>	Extract online & offline CH of BE
	4. EMOTIONS <small>BEFORE / AFTER</small> EM <p>People may feel tiredness and less energetic. After having proper nutrition guidance given in our application they may feel a slight boost in their both physical and mental health.</p>			

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENTS

- Users have to register their personal details.
- User has to upload the image of the food
- The nutritional values of the food will be displayed

NON-FUNCTIONAL REQUIREMENTS

PERFORMANCE

Performance is measured in terms of the output provided by the application. Requirement specification plays an important part in the analysis of a system. Only when the requirement specifications are properly given, it is possible to design an application, which will fit into the required environment. The load for the user interface screens shall take no longer than 2 seconds. The login information shall be verified within 5 seconds. Queries shall return results within 5 seconds.

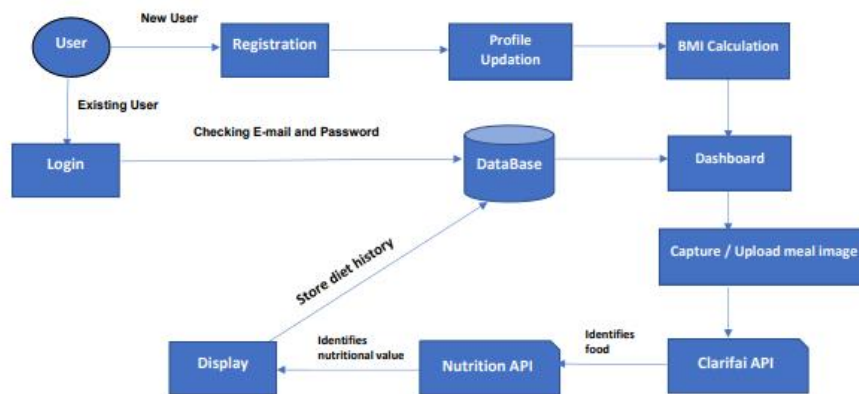
SAFETY AND SECURITY REQUIREMENTS

- User Identification:
The system requires the user to identify himself/herself User
- Login ID:
Any user who uses the system shall have a Login.
- Modification:
Any modification (insert, delete (or) update) for the Database shall be synchronized and done only by the admin in the ward.
- Admin Rights:
Admin shall be able to view and modify the information.

PROJECT DESIGN

DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

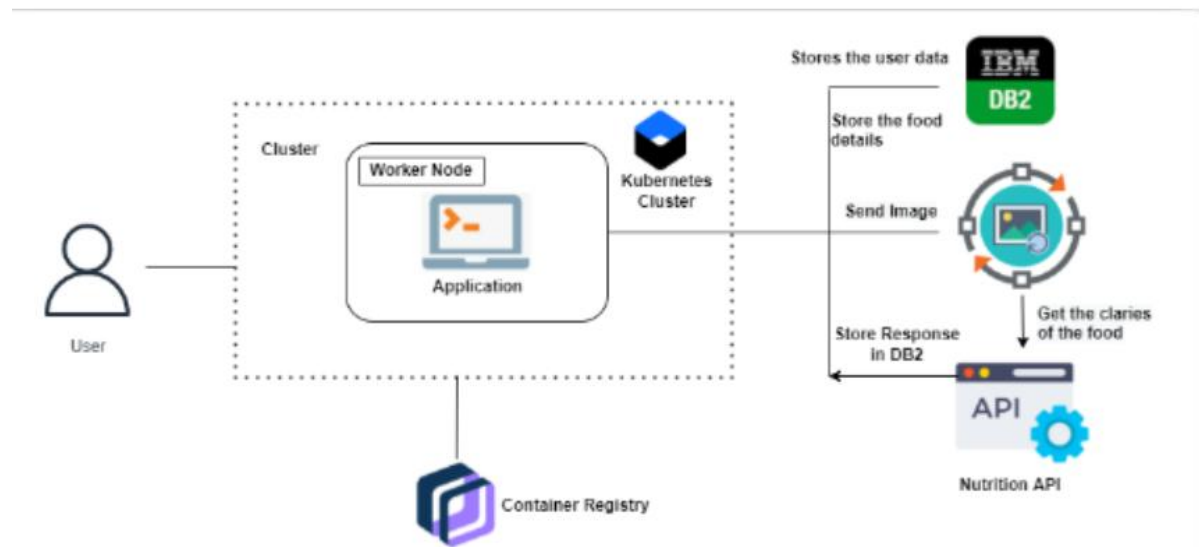


SOLUTION AND TECHNICAL ARCHITECTURE

PROJECT DESCRIPTION:

Due to the ignorance of healthy food habits, obesity rates are increasing at an alarming speed, and this is reflective of the risks to people's health. People need to control their daily calorie intake by eating healthier foods, which is the most basic method to avoid obesity. However, although food packaging comes with nutrition (and calorie) labels, it's still not very convenient for people to refer to App-based nutrient dashboard systems which can analyze real-time images of a meal and analyze it for nutritional content which can be very handy and improves the dietary habits, and therefore, helps in maintaining a healthy lifestyle. This project aims at building a web App that automatically estimates food attributes such as ingredients and nutritional value by classifying the input image of food. Our method employs Clarifai's AI-Driven Food Detection Model for accurate food identification and Food API's to give the nutritional value of the identified food.

TECHNICAL ARCHITECTURE



SOLUTION

- User interacts with the Web App to Load an image.
- The image is passed to the server application, which uses Clarifai's AI-Driven Food Detection.
- Model Service to analyze the images and Nutrition API to provide nutritional information about the analyzed Image.
- Nutritional information of the analyzed image is returned to the app for display.

PROCEDURE

1. IMPLEMENTING WEB APPLICATION

- Registration (Push the registration data into the database)
- Login (Fetch the data upon login)
- Upload the food image and get the prediction
- Get Calories from the food items
- Add food data to the database

2. CREATE UI TO INTERACT WITH THE APPLICATION

- Registration Page
- Login Page
- Upload Image page

- Prediction results page for food items
 - View history of items
3. CREATE IBM DB2 AND CONNECT WITH PYTHON
 - Create the IBM Db2 service in the IBM cloud and connect the python code with DB.
 4. INTEGRATE NUTRITION API
 - Integrate the Nutrition API to the flask with API call.

APPROACH:

Nutrition assistant application is designed to compress the broad knowledge that exists in nutrition, Many people will be attracted to Nutrition because they have special dietary needs. Some had food allergies or sensitivities; others were vegan or vegetarian; many were pregnant. A number of pregnant women reached out to us asking for more detailed information and guidance.

KUBERNETES CLUSTERS - Kubernetes clusters allow containers to run across multiple machines and cloud based application.

IBM DB2- Used for Backup & recovery. Comprehensive data resilience for physical and virtual servers. Cloud hosting. Dedicated, virtual private, and bare metal server options

CONTAINER REGISTRY - Container Registry is a single place for your team to manage Docker images, perform vulnerability analysis, and decide who can access what with fine-grained access control

NUTRITION API - A nutrition API acts as a container for information from thousands of products. When an application sends a GET request to the API, it returns the nutrition information about a given product.

RESULT:

Despite processing, we do not believe that our outcomes are flawless. There is always opportunity for improvement in your procedure because cloud computing is a topic that is constantly developing. Additionally, there will always be new approaches that offer better results for the same problems. It has been done, the application. Clarifai's AI-Driven Food Detection Model Service, Nutrition API.

USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	As a user, I can register for the application by entering my Name, Age, Gender, E-mail, 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 have to enter my height, weight and daily activity details.	I can update these information on Dashboard.	Low	Sprint-1
	Login	USN-4	As a user, I can login to the application by entering E-mail and password.	I can access my account/ dashboard.	Low	Sprint-1
	Dashboard	USN-5	As a user, I can upload or capture live image of the meal	I can get the nutritional value of that particular meal.	High	Sprint-1

		USN-6	As a user,I can get the nutritional value of that particular meal.	I can get the nutritional value of that particular meal.	High	Sprint-2
Administrator	Maintain the Application	USN-7	Maintaining details for users.	I can access database	High	Sprint-3
		USN-8	As a user, I want to be able to upload a picture of the recipe	I can upload the recipe's picture	High	Sprint-3
		USN-9	As a user, I want to be able to view the nutrition profile of the meal in my saved recipes	I can view my profile Account / save recipes to my profile	Low	Sprint-3
		USN-10	As a user, when i click on the nutrition profile i want it easily readable with most relevant information at the top.	I want to study the profile with readable information	Medium	Sprint-4
		USN-11	As a user, when i view my weekly totals I want averages and other pertinent information	I can manage the average of information in weekly basis	High	Sprint-1

PROJECT PLANNING & SCHEDULING

SPRINT PLANNING & ESTIMATION PRODUCT BACKLOG, SPRINT SCHEDULE, AND ESTIMATION

Sprint	Functional Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User Panel	USN-1	The user will login into the website and go through the products available on the website.	20	High	Sharan Prasad Shankar Srinath Shiyam Abhisak
Sprint-2	Admin Panel	USN-2	The role of the admin is to check out the database about the stock and have a truck of all the things that the users are purchasing.	20	High	Sharan Prasad Shankar Srinath Shiyam Abhisak
Sprint-3	Chat Bot	USN-3	The user can directly talk to Chatbot regarding the products. Get the recommendations based on information provided by the user	20	High	Sharan Prasad Shankar Srinath Shiyam Abhisak
Sprint-4	Final Delivery	USN-4	Container of applications using docker Kubernetes and development the application. Create the documentation and final submit the application	20	High	Sharan Prasad Shankar Srinath Shiyam Abhisak

PROJECT TRACKER, VELOCITY & BURNDOWN CHART

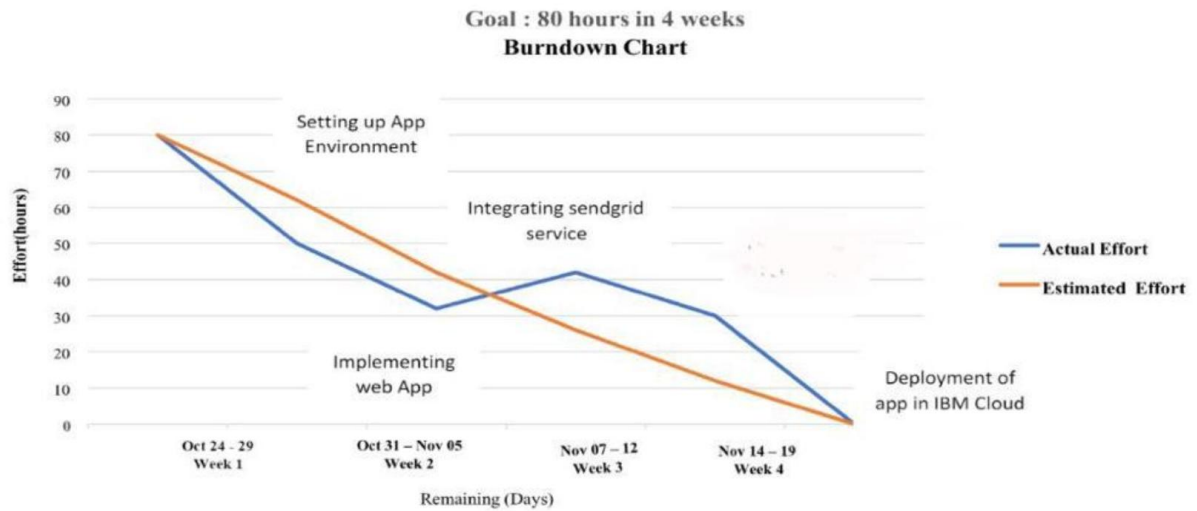
Sprint	Total points	Story	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed (as on planned end date)	Sprint Release Date(actual)
Sprint-1	20		6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20		6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20		6 Days	07 Nov 2022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

VELOCITY:

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

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

SPRINT DELIVERY SCHEDULE REPORT FROM JIRA



CODING & SOLUTION

FEATURE 1 : LOGIN

Algorithm :

1. Enter the credentials and hit enter (email and password).
2. If already logged in user is taken to home page
3. Else , check for validity of credentials entered using query to cloudant db.
4. If wrong credentials entered , notification displayed to user and user stays in login page.
5. On correct credentials , user is taken to home page.

Login checker :

```
div
class="container">

    <div class="row">
        <div class="col-lg-12">
            <h1>Log In</h1>
            <p>You don't have a password? Then please <a
class="white" href="sign-up.html">Sign Up</a></p>
            <!-- Sign Up Form -->
            <div class="form-container">
                <form id="logInForm" data
toggle="validator" data-focus="false">
                    <div class="form-group">
                        <input type="email" class="form
control-input" id="lemail" required>
                        <label class="label-control"
for="lemail">Email</label>
                        <div class="help-block with
errors"></div>
                    </div>
```

```

<div class="form-group">
    <input type="text" class="form
control-input" id="lpassword" required>
    <label class="label-control"
for="lpassword">Password</label>
    <div class="help-block with
errors"></div>
</div>

<div class="form-group">
    <button type="submit" class="form
control-submit-button">LOG IN</button>
</div>

<div class="form-message">
    <div id="lmsgSubmit" class="h3
text-center hidden"></div>
</div>
</form>
</div> <!-- end of form container -->

```

FEATURE 2 : SIGNUP

Algorithm :

1. Enter the signup form fields (name , email , password , re-enter password , date of birth) and hit enter.
2. All credentials are validated at client side.
3. Email is checked if already registered or not in the database.
4. If already registered , notification displayed. Or else, the user is taken to the successful signup page.

Query to check if email is registered or not :

```

<div
class="form
container">

    <form id="logInForm" data-toggle="validator" data-
focus="false">
        <div class="form-group">
            <input type="email" class="form-control input"
id="lemail" required>
                <label class="label-control"
for="lemail">Email</label>

```

```

        <div class="help-block with
errors"></div>
    </div>
    <div class="form-group">
        <input type="text" class="form-control input"
id="lpassword" required>
        <label class="label-control"
for="lpassword">Password</label>
        <div class="help-block with
errors"></div>
    </div>
    <div class="form-group">
        <button type="submit" class="form control-
submit-button">LOG IN</button>
    </div>
    <div class="form-message">
    <div id="lmsgSubmit" class="h3 text center
hidden"></div>
    </div>
</form>
</div> <!-- end of form container -->

```

FEATURE 3 : HOME

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. Home page buttons are displayed (Live tracker , Recent emergency notifications , Location history , Change password , Logout)
3. If buttons are clicked , the user is taken to the requested page.

TESTING

TEST CASES

1. Login button click with wrong credentials entered.
2. Signup with already registered mail ID.
3. Signup with wrong form data entered.
4. Entering home page with logged out session.
5. Clicking home page buttons with logged out session.
6. Invalid data entered in change password page and requested for change in password.

8.2 USER ACCEPTANCE TESTING

S.NO	TEST CASE	REQUIRED OUTPUT	RESULT OUTPUT	STATUS
1	Login button click with wrong credentials	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
2	Signup with already registered mail ID.	Email already registered notification	Email already registered notification	ACCEPTED
3	Signup with wrong form data entered.	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
4	Entering home page with logged out session.	Take user to login page	Take user to login page	ACCEPTED
5	Clicking home page buttons with logged out session.	Take user to login page	Take user to login page	ACCEPTED
6	Invalid data entered in change password page and requested for change in password.	Wrong form data entered notification	Wrong form data entered notification	ACCEPTED

RESULTS

PERFORMANCE METRICS

1. Planned value : Rs.4000
2. Actual value : Rs.1300
3. Hours worked : 50 hours
4. Stick to Timelines : 100%
5. Stay within budget : 100%
6. Consistency of the product : 75%
7. Efficiency of the product : 80%
8. Quality of the product : 80%

ADVANTAGES AND DISADVANTAGES

ADVANTAGES :

1. Low cost.
2. Simple UI.
3. Faster response due to single page web page.
4. Capability of adding many features with ease and less cost.

DISADVANTAGES :

1. Lack of efficiency . Efficiency of the product needs to be improved.
2. Consistency of the product is not 100%.
3. Not a compact sized product. Size needs to be decreased.

CONCLUSION

Dietary tracking is an essential task in chronic disease management and intervention. Food photo taking and image recognition significantly reduce the burden of food entering on personal mobile devices. In this work, we have developed a dietary tracking system that applies the deep-based image recognition to accurately and efficiently log food and nutrition intake. Through real user food photo testing and user study, we found that laboratory models form the foundation of the solution but miss out some of the key challenges. The diversity of real food photos is higher than the lab trained model. An ingredient based recognition is a promising way of tracking the free style and homemade food recognition problems in which training data is sparse and not representative. Moreover, the proposed photo based portion selection method is shown to be more accurate and engages the users better than the existing 25 methods.

FUTURE SCOPE

In future we'll be adding more features which will benefit the users. The ui/ux of the web application will be improved. Scaling the project for more use cases and customers. Implementing distributed computing for efficient processing. Making encryption standard for cloud storage.

SOURCE CODE LINK:

<https://github.com/IBM-EPBL/IBM-Project-19922-1659709070>

DEMO VIDEO LINK:

https://drive.google.com/file/d/1D8Y4QQ_C4lRX_WIHZnqPQKrFMFEGfsEm/view?usp=drivesdk