A Major Project Proposal on

FOOD SNAP

Submitted in partial fulfillment of the requirements for the Degree of Bachelor of Engineering in Software Engineering at Pokhara University

By

AIYANA KOIRALA

BINOD ADHIKARI

PRATIGYA DHAKAL

Department of Research and Development

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Lamachaur, Kaski, Nepal

January 2023

A Major Project Proposal on

FOOD SNAP

Submitted in partial fulfillment of the requirements for the Degree of Bachelor of Engineering in Software Engineering at Pokhara University

By

AIYANA KOIRALA

BINOD ADHIKARI

PRATIGYA DHAKAL

Supervisor

ER. KRISHNA KHADKA

Department of Research and Development

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Lamachaur, Kaski, Nepal

January 2023

APPROVAL CERTIFICATE

This project entitled **FOOD SNAP** prepared and submitted by **Aiyana Koirala, Binod Adhikari** and **Pratigya Dhakal** under the supervision of **Er. Krishna Khadka** in partial fulfillment of the requirements for the Degree of Bachelor of Engineering in Software Engineering has been examined and is recommended for approval and acceptance.

Date of Evaluation: January 18, 2023

……

Er. Krishna Khadka

(Project Supervisor)

……

Er. Rajendra Bahadur Thapa

(Acting Coordinator)

Research Management Committee

Gandaki College of Engineering and Science

ABSTRACT

A "FOOD SNAP" app is a mobile application that utilizes computer vision and machine learning techniques to analyze images of food and estimate their nutritional content. The app allows users to take a picture of their food, and using image recognition algorithms, it identifies the food in the image, and then estimates its nutritional content. We use state-of-the-art deep learning techniques to recognize dishes, making instant nutrition estimates from the user's meals. It allows users by allowing them to find recipes that match the ingredients they already have on hand. The app uses a database of recipes and allows users to search for recipes by ingredient, dietary restriction, and other parameters. This app aims to save time for users and aid in meal planning and analyze the nutritional content of the food for diabetics.

TABLE OF CONTENTS

LISTS OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

1.1. BACKGROUND

As in the context of Nepal, there is at least one person in a family that has been suffering from diabetes. By consuming a meal that will affect their health more will be dangerous to their health directly and may lead to the serious one. In recent years, there has been an increasing interest in developing computer vision models that can recognize and classify food images. These models have been trained on large datasets of food images and have been used for tasks such as food image classification, ingredient recognition, and recipe generation.Managing nutrition is essential for maintaining overall health and preventing chronic diseases.With the rise of mobile technology, people have become increasingly reliant on their smartphones for information and services, making it important to have a mobile app that can help them with managing their nutrition.

Food Snap is an Artificial Intelligence based mobile application to assist individuals in convenient ways to understand the nutritional content of the food they eat. The idea behind this app is to address the difficulty that many people have in accurately tracking and understanding the nutritional content of the food they eat. By using computer vision and machine learning techniques, the app can quickly and accurately recognize the food in an image and estimate its nutritional content.The app uses computer vision and machine learning techniques to analyze images of food and estimate their nutritional content, this technology can reduce human error and make the process of tracking and understanding the nutritional content of food more accurate.

1.2. PROBLEM STATEMENT

We do not have any knowledge of what we are consuming day to day that may directly or indirectly have been affecting our life. It is difficult for individuals to accurately track and understand the nutritional content of the food they eat. The fact is that most people are not experts in nutrition ,manually looking up nutritional information are prone to errors and are not easily accessible. As a result, many individuals struggle to manage their nutrition and maintain a healthy diet, leading to increased risk of chronic diseases such as diabetes.

1.3. OBJECTIVE

The objective of our application is:

- To provide nutritional content of the food for consumers and suggest diabetes patients using Convolutional Neural Networks.

1.4. IMPLICATION

Food plays an important role in daily life; everybody needs a balanced diet to maintain a healthy body. Nowadays there is a growing list of foods, some of them are natural others are artificial. Moreover, they are reengineered and emerged every day, so choosing healthy food is becoming a more and more complex task. "FOOD SNAP" helps to analyze images of food and estimate their nutritional content. The proposed system is cost effective due to the reduction of consumption of time, reduces operational cost, and maintains records easily. With the app, individuals can track and understand the nutritional content of the food they eat from anywhere, at any time, using just their smartphone.

Chapter 2

LITERATURE REVIEW

Similar software is already manufactured but unlike them, “FOOD SNAP” also has some advantages and features which don't exist in their application.

Table 2.1 : Comparison Table

SYSTEM FEATURES	FOOD SNAP	Cookpad (*Cookpad*, 2023)	Yummly (*Yummly*, 2022)	Paprika Recipe Manager (*Paprika*, 2023)	Super Cook (*Super Cook*, 2023)	Fridge Pal (*Fridge Pal*, 2013)	Allrecipes (*Allrecipes*, 2013)	Calorie Mama (*Calorie Mama*, 2017)
Recipe Sharing	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nutrient analyze from Food Recognition	Yes	No	No	No	No	No	No	Yes
Search Recipe	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Virtual cookbook.	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Analyze food for diabetic patients	Yes	No	No	No	No	No	No	No

- Cookpad (*Cookpad*, 2023): Cookpad is a recipe sharing platform that allows users to search for recipes by ingredient. It also allows users to save their favorite recipes and create a virtual cookbook.

- Yummly (*Yummly*, 2022): Yummly is a recipe discovery platform that allows users to search for recipes by ingredient and dietary restriction. It also allows users to save their favorite recipes and create a virtual cookbook.

- Paprika Recipe Manager (*Paprika*, 2023): Paprika Recipe Manager is a recipe management app that allows users to search for recipes by ingredient and dietary restriction. It also allows users to save their favorite recipes and create a virtual cookbook.

- Super Cook (*Super Cook*, 2023): Super Cook is an app that allows users to search for recipes based on the ingredients they have on hand, it also helps users to plan their meals and generate shopping lists.

- Fridge Pal (*Fridge Pal*, 2013): Fridge Pal is an app that allows users to search for recipes based on the ingredients they have in their fridge, it also helps users to plan their meals and generate shopping lists.

- Allrecipes:Released over ten years ago, Allrecipes is loved by many. While the app is free, it includes non-intrusive ads. It's community-driven, so you'll see recipes from contributors worldwide and can read public reviews. You'll often find helpful tips in the review section, such as recommended substitutions or measurement tweaks. While not needed, an account is recommended, so you can receive personalized recommendations on the main feed based on recipes you've favorited.

- Calorie Mama (*Calorie Mama*, 2017):Calorie Mama App is powered by our Food AI API. Food AI API is based on the latest innovations in deep learning and image classification technology to quickly and accurately identify food items.

Chapter 3

TOOLS AND METHODOLOGY

3.1. REQUIRED TOOLS

To develop the application, we will require various tools essential for the project. Our project will use the following tools:

Table 3.1.1 : Required tools to be used

TOOLS	USE
Flutter	For Frontend
Figma (*Figma*, 2016)	For Design UI/UX
Django	For Backend
Draw.io (*Draw.io*, n.d.)	For UML Diagram
GitHub	For version control
VS Code	For IDE
Google Docs	For Documentation
Google Slide	For Presentation

3.2. METHODOLOGY

We will follow the core principles of the agile methodology.While adjusting with the time frame of our project and the size of our project.

We will use Scrum framework as Scrum is an agile framework that is widely used for managing software development projects. It includes roles such as product owner, scrum master, and development team, daily stand-up meetings, sprint planning, and retrospectives.

- Prioritize user stories: User stories are short, simple descriptions of a feature or functionality that the app should have. Prioritize the most important user stories and work on them first.
- Use sprints: Break the project into smaller, manageable chunks of work, called sprints. Each sprint should have a specific goal and a set of deliverables that need to be completed.
- Hold daily stand-up meetings: Hold short, daily meetings to keep everyone on the team informed of the progress, any issues that have arisen, and what needs to be done next.
- Use continuous integration and delivery: Integrate the code regularly and deliver working software frequently. This allows for early testing, feedback, and adjustments to be made.
- Encourage collaboration and communication: Agile methodology places a strong emphasis on collaboration and communication among team members. Encourage team members to share ideas, offer suggestions, and help each other out.
- Use retrospectives: At the end of each sprint, hold a retrospective meeting to review what went well and what could be improved for the next sprint.

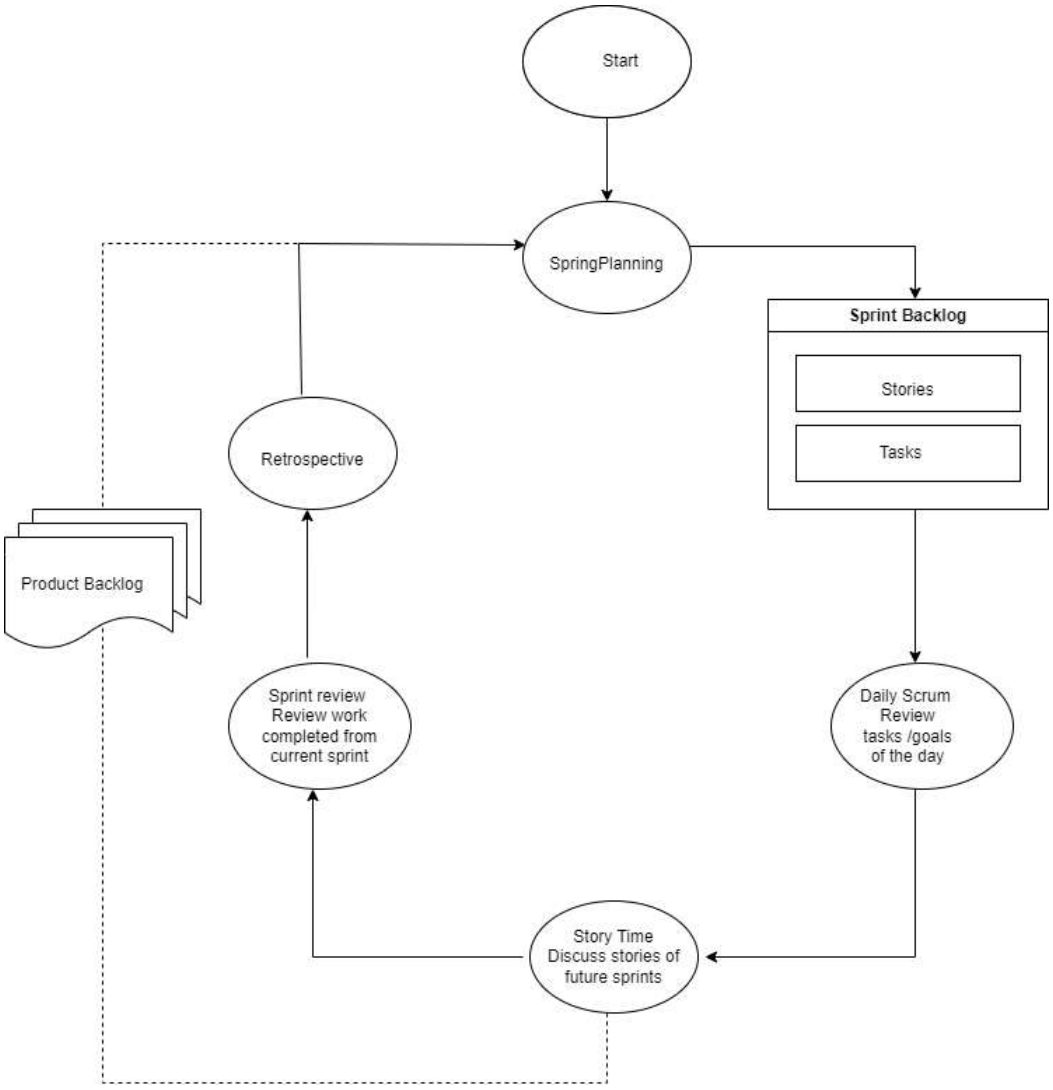

Figure 3.2.1: Sprint Planning

DATASETS

It deals with the acquisition of data from reliable sources to maintain the standard and stability so that it can be compared or extended for future studies.

The food dataset was obtained from different sources in Kaggle (*Kaggle*, 2010):

FOOD 101:

The Food-101 dataset, which contains 1000 photos for each kind of food, was utilized to create a total of 101,000 images. A total of 75,750 training photos and 25,250 test images made up the 1000 images for each class. Of these, 250 were manually inspected test images and 750 were purposefully noisy training images.

The Food-101 dataset poses a few more difficulties than the 10-class ImageNet food image dataset.

Image Net food image:

ImageNet food image dataset contains relatively distinct and few food categories (apple, banana, broccoli, burger, egg, french fries, hot dog, pizza, rice, and strawberry), while Food-101 contains some food items that are similar in both content and presentation (e.g. pho vs. ramen). In order to encourage models to be resilient to labeling anomalies, the training dataset images also comprised mislabeled photos and had very different lighting, color, and size characteristics.

Table 3.2.1 :DataSet

FOOD 101 datasets (*Food-101*, 2018)	1000 images of 101 food each
Nutrients datasets (*Nutrients*, 2016)	8,790 rows, 53 columns
ImageNet food image dataset	Few food categories
Datafiniti	10000 different food listings and includes the ingredient list for each one.

3.3. ALGORITHM

Convolutional Neural Networks (CNNs) can be used for food nutrition recognition by training them on a dataset of food images and their associated nutritional information. This process can be broken down into several steps:

- Data Collection: A dataset of food images and their associated nutritional information is collected and labeled. The dataset should be diverse and include a variety of different foods and different angles, lighting conditions, and resolutions.
- Preprocessing: The images in the dataset are preprocessed to ensure that they are in the same format and size. This may include resizing, cropping, and normalizing the images.
- Model Training: A CNN model is trained on the dataset using a supervised learning approach. The model learns to recognize specific foods and their nutritional values based on the images and labels in the dataset.
- Model Evaluation: The trained model is evaluated on a separate test dataset to measure its performance in recognizing foods and their nutritional values.
- Model Deployment: Once the model has been trained and evaluated, it can be deployed in a real-world application such as a mobile application or website to recognize foods and their nutritional values from images.

It's worth noting that the accuracy of food nutrition recognition from images using CNNs can be affected by factors such as the quality and diversity of the dataset, the architecture of the CNN model, and the amount of training data.

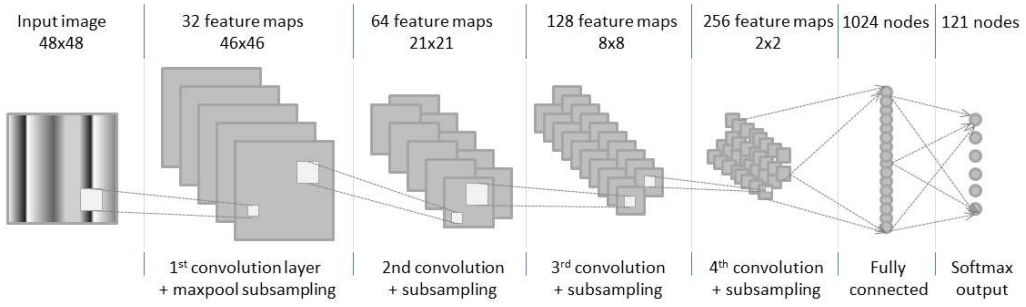

Figure 3.3.1:Image Classification with Convolutional Neural Networks (*CNN*, 2019)

3.4. WIREFRAMES

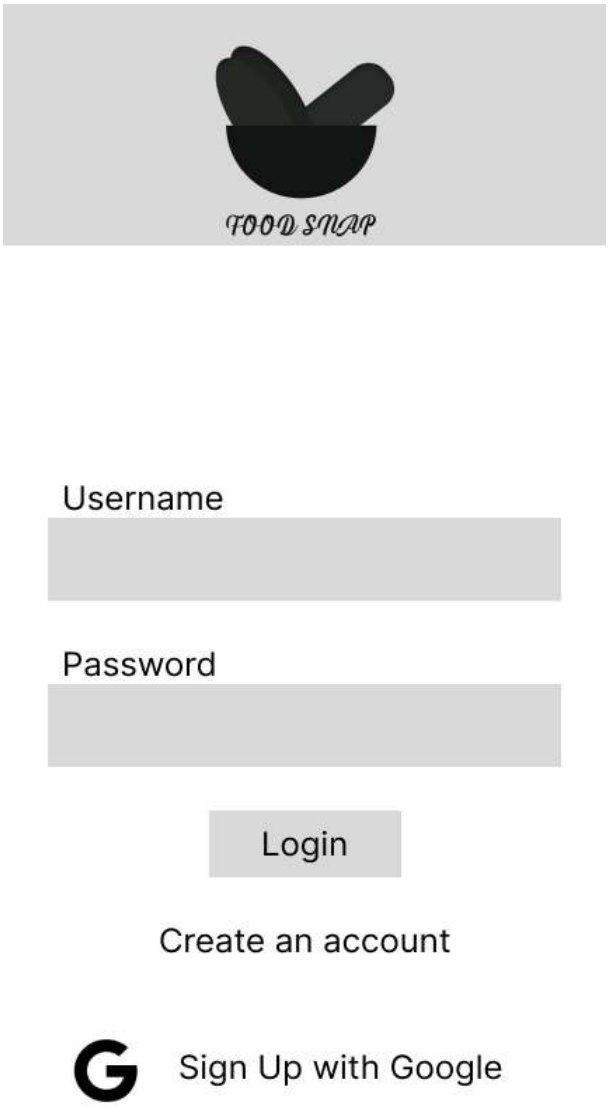

Figure 3.4.1: Login Page

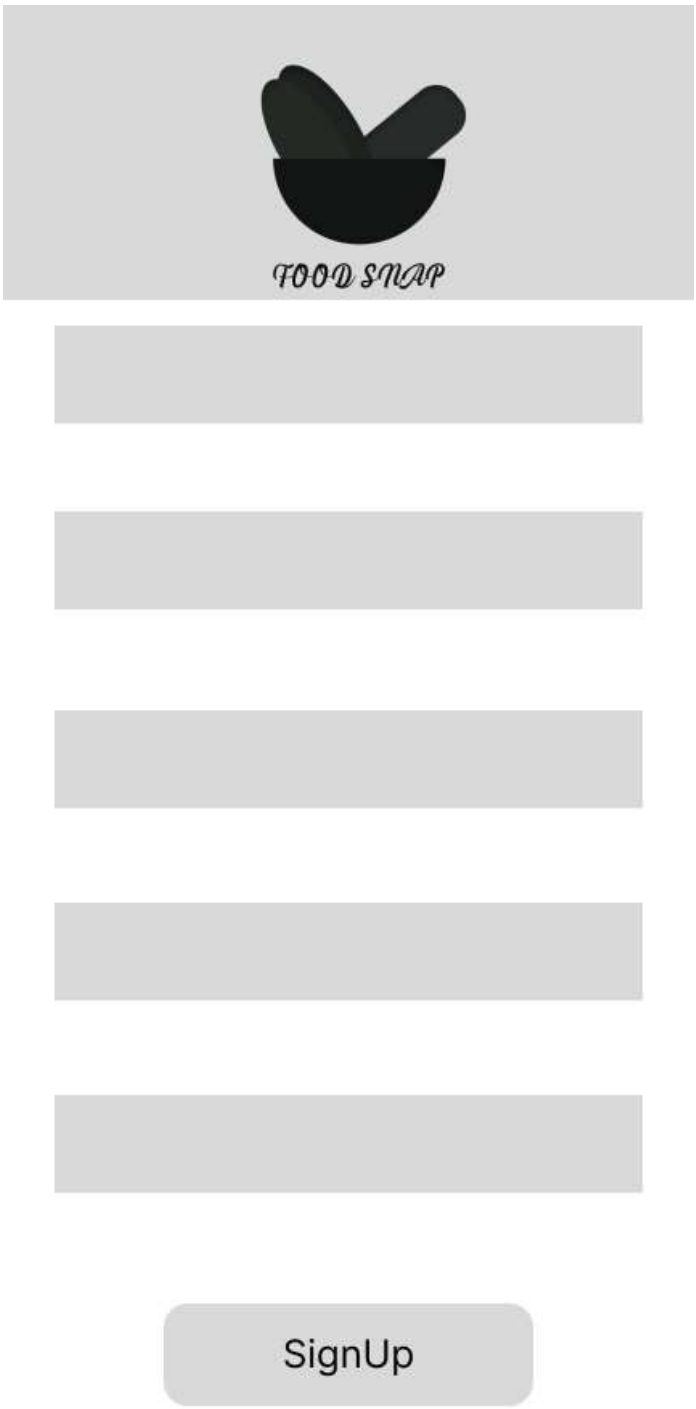

Figure 3.4.2 :Sign Up page

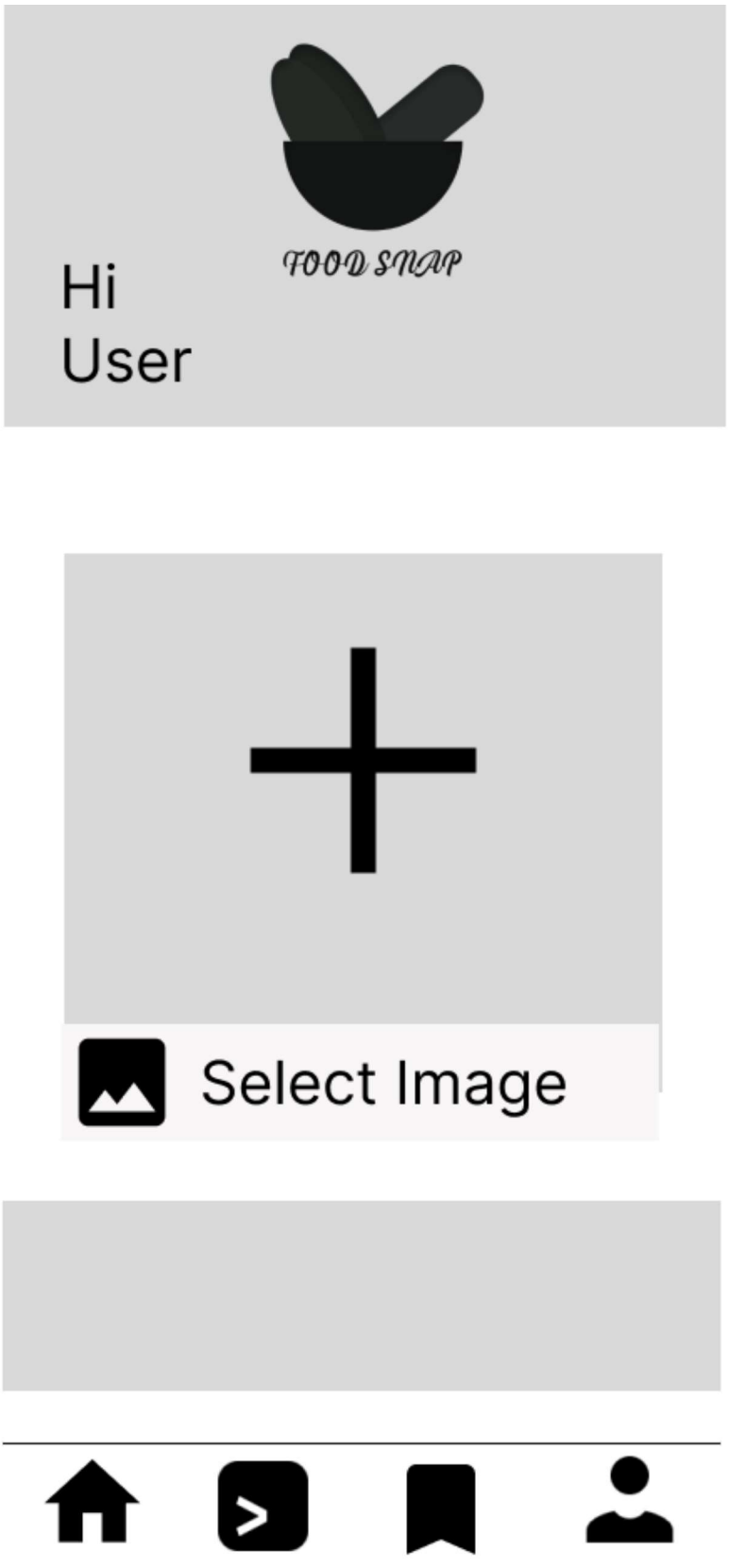

Figure 3.4.3 : Homepage1

Figure 3.4.4 :HomePage2

Figure 3.4.5 :HomePage3(ResultPage)

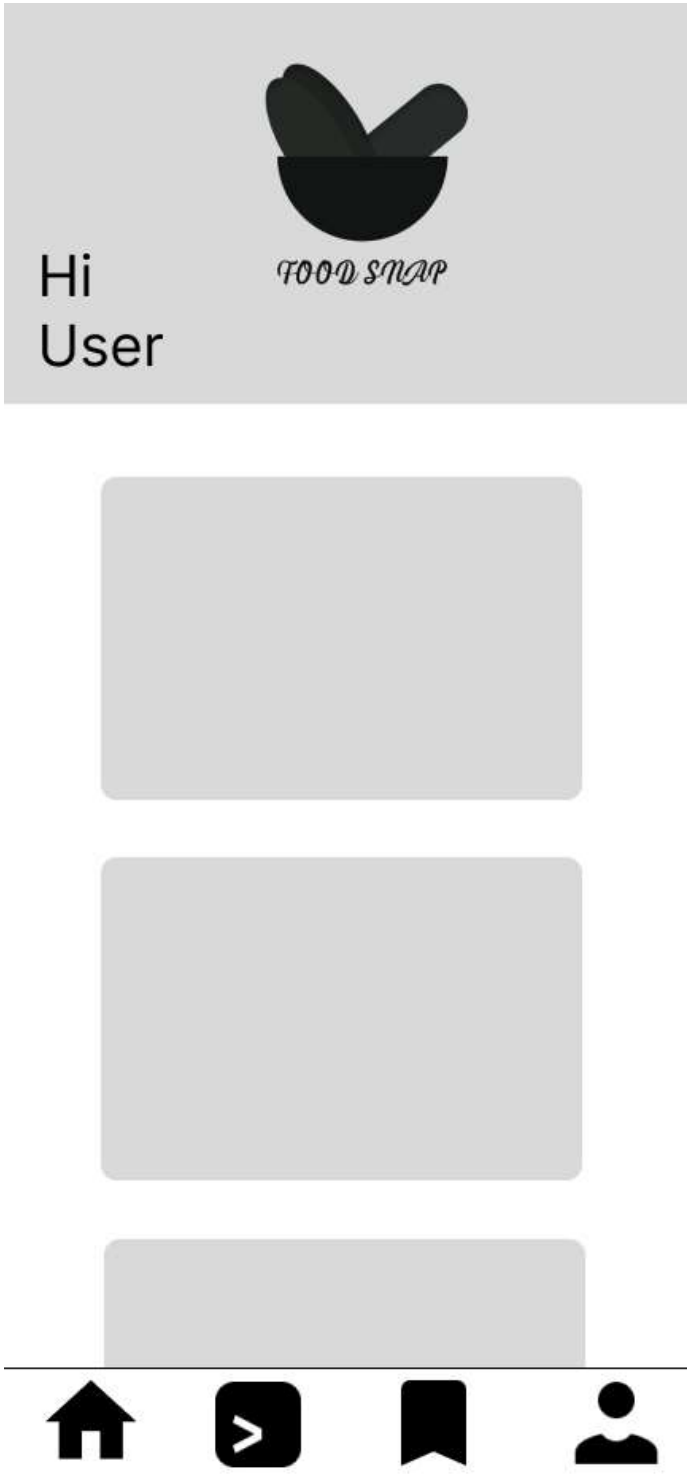

Figure 3.4.6 : Bookmark Page

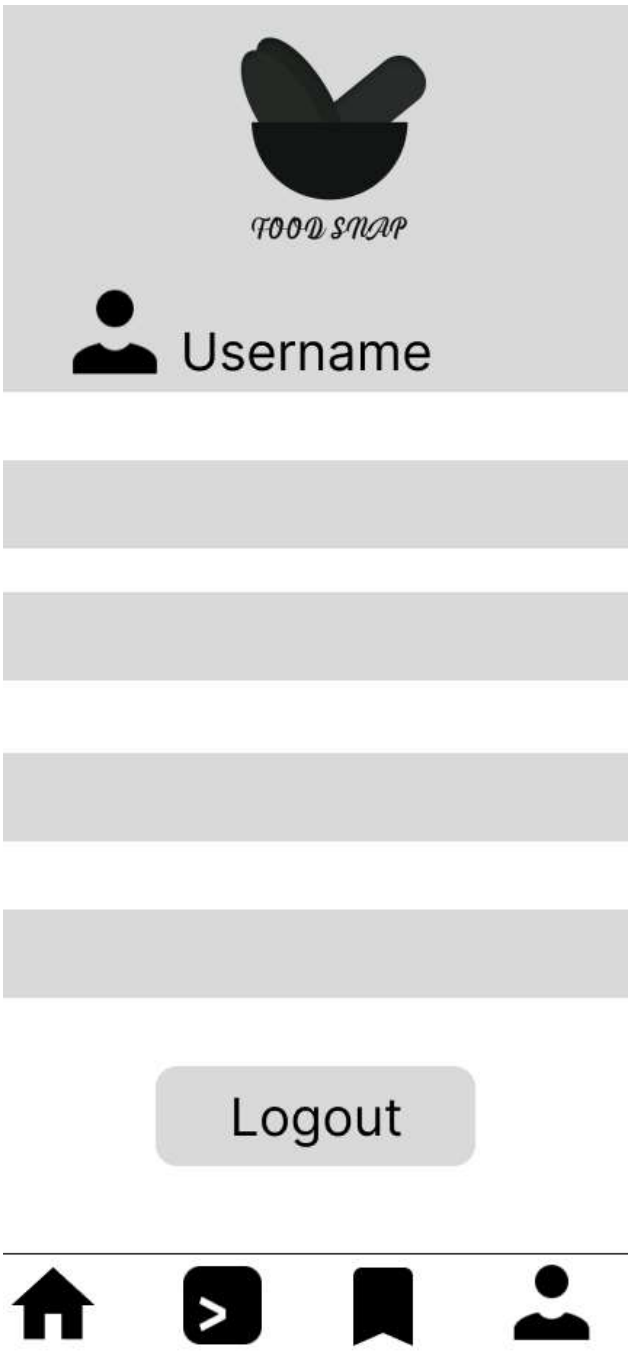

Figure 3.4.7: Setting Page

3.5.USE CASES

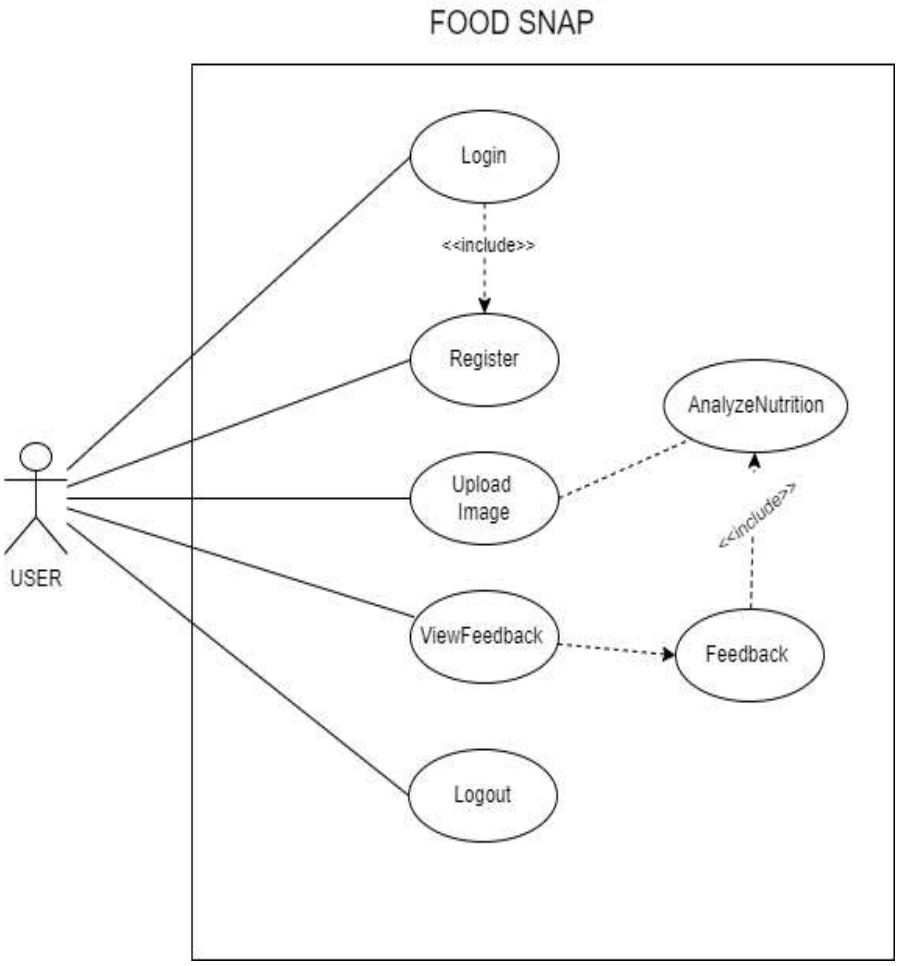

Figure 3.5 : Use Case Diagram

USE CASE UC1: REGISTER USER

Primary Actor: User

Secondary Actor: System

Precondition: The signup screen has been displayed.

Post condition: The landing page has been displayed.

Basic Flow:

- Profiles are created in the system.

Alternative Flow:

- If the desired criteria are not fulfilled, an error message is displayed and the user is redirected to the signup page.
- At any time, if the system fails, then the system is restarted

USE CASE UC2: LOGIN

Primary Actor: User

Secondary Actor: System

Precondition: The respective profiles have been created already.

Post Condition: The users are now inside the system.

Basic Flow:

- Business owners are shown their respective pages.

Alternative Flow:

- If the login fails, an error message is displayed and the users are redirected to the login page.

USE CASE UC3: ANALYZE NUTRITION

Actor: User

Stakeholder:

- **User:** upload image
- **System:** Analyze nutrition

Preconditions: User upload image

Postconditions: User get feedback for his image

Basic Flow:

- User inserts his/her image
- System analyze the image and provide feedback

3.6. SYSTEM SEQUENCE DIAGRAM

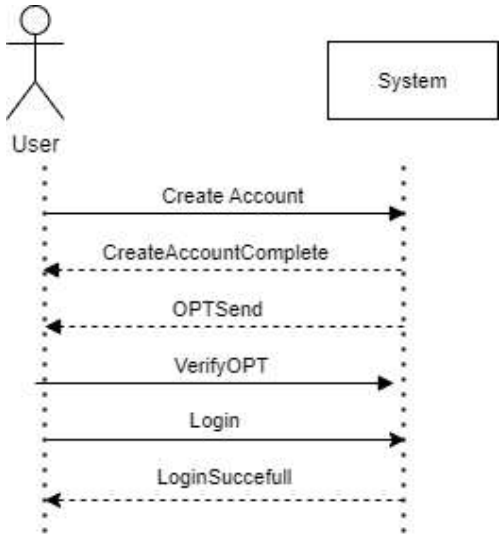

Figure 3.6.1 :System Sequence Diagram for Login/Signup

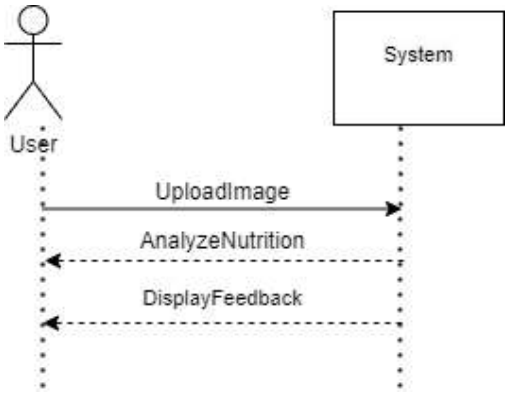

Figure 3.6.2 :System sequence diagram for Nutrition Analyze

3.7. TEST CASES

Software testing is the process of executing a program or application with the intent of finding the software bugs. It is also the process of validating and verifying a software program or application or product.

3.7.1 TEST OBJECTIVES

The main objectives of testing the application are:

- Verify that requirements are complete and accurate.
- Prepare and document test scenarios and test cases.
- To test the reliability and accuracy of the application

3.7.2 WHAT IS TO BE TESTED?

We will be testing the following features of our application:

Business Logic Check

- Comparison with the source text.

Pages

- How effective are the pages of the app in terms of uses?
- Is every page handled correctly in terms of error handling?

Performance Check

- How accurate and reliable is the whole application?

Chapter 4

EXPECTED OUTCOMES

After researching the problems of the domain and coming up with objectives for the project, we have some form of roadmap that will be followed as precisely as possible and we have some expected outcomes from the project. Some of the major outcomes that we expect from our project are as follows:

- Users can upload images and get feedback of nutritional analyze
- User can view nutritional content of the food
- System recommended food for diabetics patients.
- The proposed system will be able to give feedback of nutritional analyze

Chapter 5

TIMELINE CHART FOR FOOD SNAP

The project events are scheduled as follows:

Table 5.1: Project Timeline

SN	Task name	Duration	Start	End
1	Project identification	7 days	Jan 8	Jan 14
2	Requirement Analysis	18 days	Jan 14	Feb 2
3	System Design	28 days	Feb 2	Feb 26
4	Coding	145 days	Feb 26	June 20
5	Testing	28 days	June 20	Jul 18
6	Implementation	12 days	Jul 18	Aug 1
7	Documentation	240 days	Jan 1	Aug 1

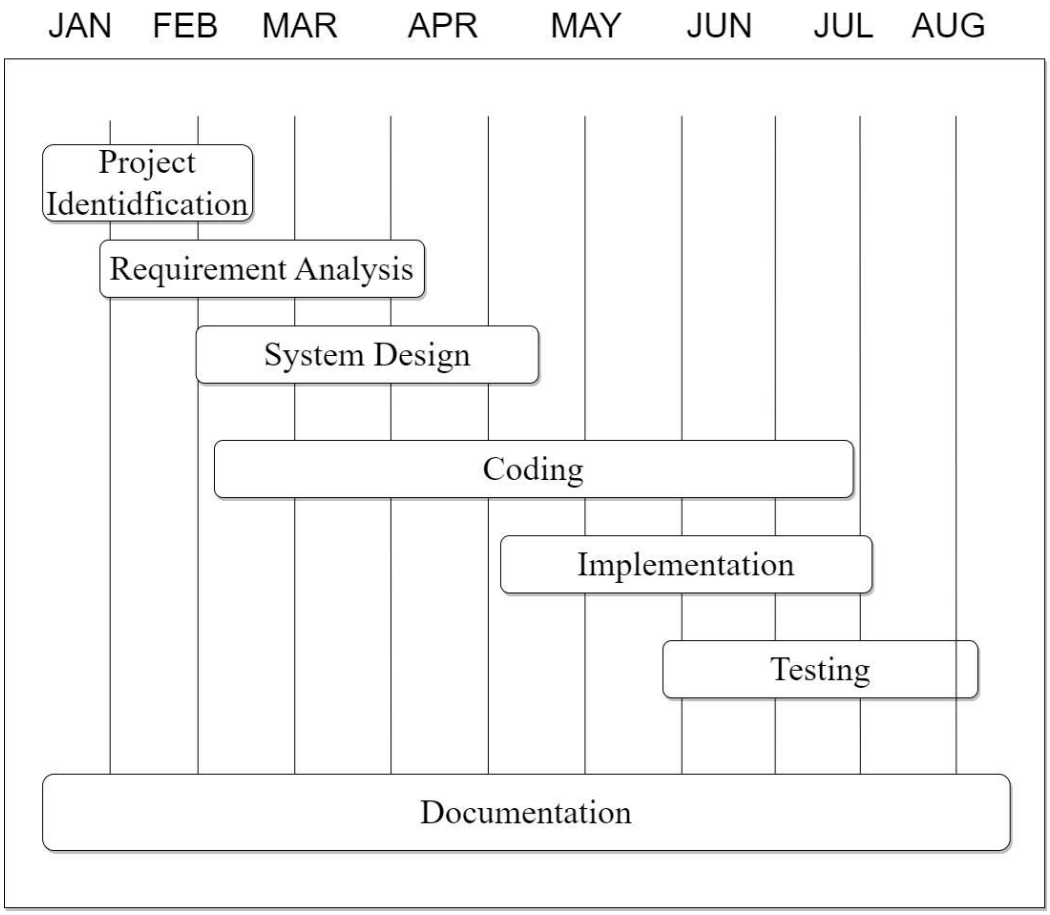

Figure 5.1: GANTT chart

BIBLIOGRAPHY

Allrecipes. (2013). Allrecipes | Recipes, How-Tos, Videos and More. Retrieved January 18, 2023, from https://www.allrecipes.com/

Calorie Mama. (2017). Calorie Mama Food AI - Food Image Recognition and Calorie Counter using Deep Learning. Retrieved January 18, 2023, from https://www.caloriemama.ai/

CNN. (2019, September 26). CNN. Retrieved January 17, 2023, from https://www.google.com/url?sa=i&url=https%3A%2F%2Fblogs.sap.com%2F2015%2F01%2F14%2Fimage-classification-with-convolutional-neural-networks-my-attempt-at-the-ndsb-kaggle-competition%2F&psig=AOvVaw1uCbwe_5TgkifSz6mRfrSw&ust=1674062164172000&source=images&cd=

cookpad. (2023, January 6). cookpad. Retrieved January 18, 2023, from https://docs.google.com/document/d/1aKCPFroW_FVv-BqvXpN3o4zeoxOHNBbT/edit?disco=AAAAnfcNDtc

Draw.io. (n.d.). diagrams.net. Retrieved January 17, 2023, from http://draw.io

Figma. (2016, 09 27). Figma: the collaborative interface design tool. Retrieved January 17, 2023, from https://www.figma.com/

Food-101. (2018). YouTube. Retrieved January 22, 2023, from https://www.kaggle.com/datasets/dansbecker/food-101?select=food-101.zip

Food Recommender. (2019). Food Recommender. R. Yera Toledo, A. A. Alzahrani and L. Martínez, "A Food Recommender System Considering Nutritional Information and User Preferences," in IEEE Access, vol. 7, pp. 96695-96711, 2019, doi: 10.1109/ACCESS.2019.2929413.

A Food Recommender System Considering Nutritional Information and User Preferences. (2019, 06). 17.

https://www.researchgate.net/publication/334529528_A_Food_Recommender_System_Considering_Nutritional_Information_and_User_Preferences

Fridge Pal. (2013). AppRecs. Retrieved January 18, 2023, from https://apprecs.com/ios/496451091/fridge-pal

Kaggle. (2010). Kaggle. Retrieved January 17, 2023, from https://www.kaggle.com/

Nutrients. (2016). Nutrients datasets. Retrieved January 22, 2023, from https://data.world/awram/food-nutritional-values?fbclid=IwAR3j16DUbepMpo_13LtQc49KHRij3fjGxkc1ZH6EHVElyzliT2KcMaPNhxc

paprika. (2023, January 6). paprika. Retrieved January 18, 2023, from https://docs.google.com/document/d/1aKCPFroW_FVv-BqvXpN3o4zeoxOHNBbT/edit?disco=AAAAnfcNDtg

Super Cook. (2023, January 6). Super Cook. Retrieved January 18, 2023, from https://docs.google.com/document/d/1aKCPFroW_FVv-BqvXpN3o4zeoxOHNBbT/edit?disco=AAAAnfcNDtk

Yummly. (2022). Yummly: Personalized Recipe Recommendations and Search. Retrieved January 18, 2023, from https://www.yummly.com/

Zhang W, Yu Q, Siddiquie B, Divakaran A, Sawhney H. (2015). Snap-n-Eat. *Food Recognition and Nutrition Estimation on a Smartphone*.