SFWR 4G06B - Goals & Requirements Rev 1

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Revision History

Revision	Date	Author(s)	Description
0.0	10/28/2019	GK, IB, YS, SW, LS	Initial revision of the System Requirements document
1.0	02/26/2020	GK, IB, YS, SW, LS	Functional and Non-Functional Requirements, Scope, Context Diagram, Controlled and Monitored Variables, the Functional Decomposition Diagram, Use Cases, Use Case Diagram, Normal Operation, Undesired Event Handling, and the List of Requirements Likely or not Likely to Change updated.

1 Purpose

This project will involve developing and designing a mobile application that is capable of retrieving and effectively visualizing nutritional information of food to the user, enabling the user to make more health conscious decisions regarding their food selection. This information shall be used to construct a food diary which the user will use in order to track their food intake on a day-to-day basis. The application will provide a high level visualization of a user's fitness and nutritional habits through an interactive timeline. The application will also enable fitness goals and allows a user to track their progress for their goals. Ultimately, the overall objective is to help the user lead a healthier lifestyle.

2 Scope

This project shall primarily be centered on enabling the user to understand the nutritional content of the food that they are eating. The system shall be able to figure out the nutritional information of the food that the user captures with their picture, or scans with a bar-code. It shall be able to summarize a day's nutritional intake and visualize that information to the user. It also shall be able to allow users to track their fitness goals, along with their nutritional goals.

In-scope items of functionality for the system include the following:

- Account system with various settings that can be personalised.
- Daily food diary which tracks nutritional information.
- Camera feature which takes pictures of a single food item.
- Ability to display nutritional content of the food from a picture.
- Transference of nutritional information from picture/bar-code to diary.
- Visualization of the fitness progress of a user.
- Visualization of the nutritional progress of a user.
- Game system that enables the user to compete with others.
- Camera feature that detects bar-code of food or drink.
- A manual user entry to track the calories they burned in the day from their physical activity.
- A goal tracking feature which allows users to set personal fitness and nutritional goals.

Additionally, the following items are deemed to be out of scope:

- Determining nutritional contents of a drink through a picture of the item.
- Viewing Fitness Scores of users outside their immediate group.
- Determining nutritional value of multiple food items.
- Determining the volume of a food item.

3 Context Diagrams Showing Boundaries

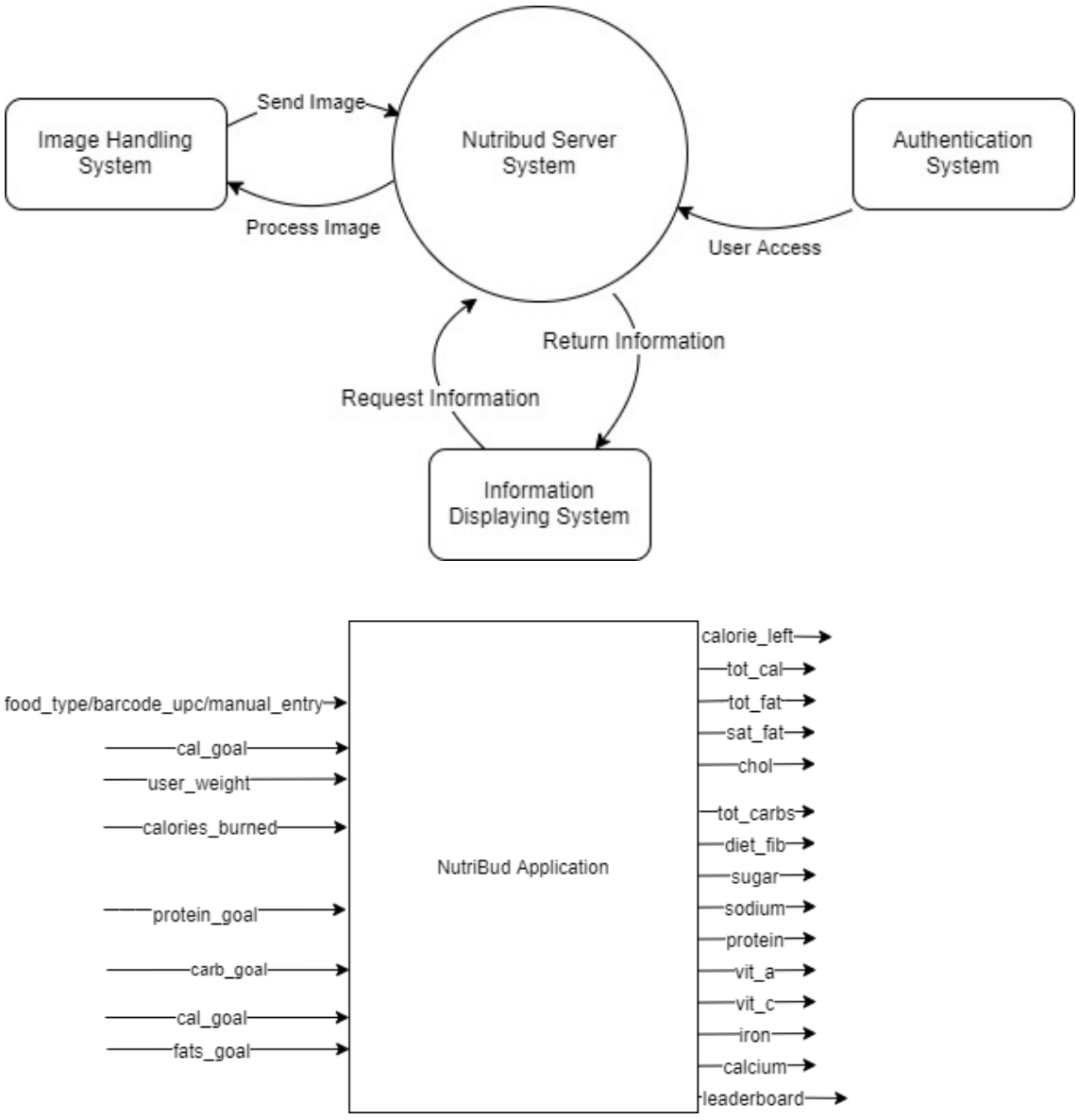

Figure 1: Context Diagrams

4 Monitored and Controlled Variables

4.1 Monitored Variables

Requirement	Variable	Unit	Description
FR1	food_type	N/A	The food type that is being placed on the plate.
FR5	barcode_upc	integer	The UPC barcode of the food product.
FR14	manual_entry	word	The worded user input for the food type.
FR15	user_weight	lbs/kgs/st	The recorded weight of the user.
FR12	cal_goal	Calories (kcal)	The recorded number of calories necessary for the user to achieve nutrition projections, as documented by the user.
FR12	protein_goal	g	The recorded number of protein necessary for the user to achieve nutrition projections, as documented by the user.
FR12	carb_goal	g	The recorded number of carbohydrates necessary for the user to achieve nutrition projections, as documented by the user.
FR12	fats_goal	g	The recorded number of fat necessary for the user to achieve nutrition projections, as documented by the user.
FR13	calories_burned	Calories (kcal)	The amount of calories a user burns through their physical activity in a day.
FR4	calories_left	Calories (kcal)	The amount of calories the user has left to eat, or has over consumed relative to their calorie goal.
FR10	leaderboard	List	A leader board which is created from a user's score, which is presented on GainRivals.

Table 2: NutriBud Monitored Variables Table

4.2 Controlled Variables

Requirement	Variable	Unit	Description
FR4	tot_cal	Calories (kcal)	Defined as the amount of energy needed to raise the temperature of 1 kilogram of water by 1 degree Celsius. Provided as an energy measurement for food.
FR4	tot_fat	g	The total amount of fat that can be found within the serving size of the dish.
FR4	sat_fat	g	The amount of saturated fats contained within the serving size of food.
FR4	trans_fat	g	The amount of trans fat in the food serving size.
FR4	chol	mg	The amount of cholesterol within the food serving size.
FR4	tot_carbs	g	The total amount of carbohydrates found in grams.
FR4	diet_fib	g	The amount of dietary fiber found in the serving size, in grams.
FR4	sugar	g	The total amount of sugars found in the serving size, in grams.
FR4	sodium	g	The amount of sodium found in the serving size, in grams.
FR4	protien	g	The amount of protein found in the serving size, in grams.
FR4	vit_a	%	The percentage of Daily Value the serving size offers Vitamin A to the user.
FR4	vit_c	%	The Daily Value percentage of Vitamin C to the user according to their restrictions.
FR4	calcium	%	The Daily Value of Calcium held within the serving size to the user.
FR4	iron	%	The Daily Value of Iron according to the user, in percentage.

Table 3: NutriBud Controlled Variables Table

5 Constants

Due to the dynamic nature of the application, it has been determined that there will be no constants for the system.

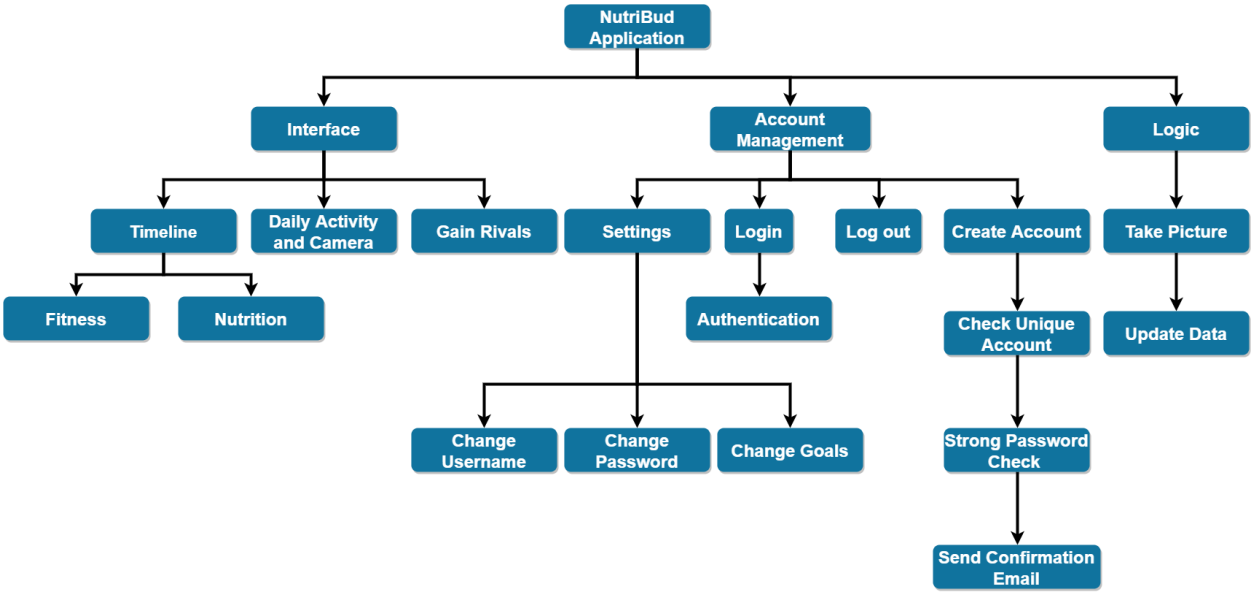

Figure 2: NutriBud Functional Decomposition Diagram

6 Diagrams Showing Functional Decomposition

NutriBud Application: The overall goal is to create an application to determine and record the nutrition of meals had by the user

Interface: The user interface for interacting with the camera and viewing past statistics

Timeline: Interface to select between past fitness data or past nutrition data

Fitness: Graphical interface displaying fitness history (eg. Weight)

Nutrition: Graphical interface displaying nutrition history (eg. Calories, Fat, Protein, Carbohydrates)

Daily Activity and Camera: Interface where you see the nutrition statistics calculated for the current day and the ability to select the camera

Gain Rivals: Interface to show competing data between friends that are in the same group

Logic: Where the back-end functions will be run

Take Picture: After picture is taken calculations are run on food to determine characteristics

Update Data: Saves picture data from previous calculation into database

7 Functional Requirements with Rationale

Requirement ID	Functional Requirement	Rationale
FR1	The application shall enable the user to take a picture of a single food item that will be processed by the application	Allows the user to input a food item in a time efficient manner.
FR2	The system shall predict food items with a degree of certainty that shall be revealed to the user after image processing.	Allows the application to determine the food item captured by the user.
FR3	The application shall retrieve corresponding nutritional information to the most likely food items predicted, ranked from 1 to 5.	Provides critical nutritional data for the application and the user.
FR4	The application shall keep a daily record of the nutritional information of meals consumed by the user	Provides a daily view of a user's food intake to help them make more informed nutritional decisions throughout their day.
FR5	The application shall recognize bar code images and retrieve corresponding food item nutritional data.	Provides nutritional data to the user for given product serving size.
FR6	The application shall allow the user to visualize their fitness progress on a timeline over user determined date ranges.	Allows the user to track fitness history.
FR7	The application shall allow the user to visualize their dietary progress on a timeline over user determined date ranges.	Allows the user to track food consumption history.
FR8	The application shall allow the user to create a NutriBud account using an email address and created password.	Provides a more personal user experience and enables storage of data on the cloud.
FR9	The application shall enable a user to select a picture from their phone's photo gallery. The picture will be processed by the NutriBud system and the predicted food items and corresponding nutritional information will be provided to the user.	The application must allow the user to provide a picture and predict corresponding nutritional information. If the user has taken a picture beforehand, they should be allowed to upload it for processing
FR10	The system shall offer users to create a leader-board with a private friend group called GainRivals. The scoring metrics for GainRivals shall be based off a user's percentage toward their own fitness and nutritional goals.	Provides an engaging, competitive aspect to the application for the user's benefit
FR11	The application shall allow a user to manually add a food along with its nutritional information.	Allows the user be more flexible with their food intakes, enabling customization.
FR12	The application shall allow a user to create and track fitness and nutritional goals.	Provides a more engaging user experience, and allows the user to better achieve results which will entice the user to use the application often.
FR13	The application shall allow a user to track the amount of calories they burn in a day through physical activity.	Provides a more accurate measure of a user's nutritional and fitness goals as it adjusts how many calories the user should intake.
FR14	The application shall allow a user to search and add a food item to their diary.	Provides more options for the user to successfully add a food item to their diary.

Requirement ID	Functional Requirement	Rationale
FR15	The application shall allow a user create and modify account settings, including first name, last name, age, height, weight, etc.	Gathers useful information about the user which is used throughout the application to provide a more custom experience.
FR16	The application shall allow a user to modify the quantity of food that they add.	Provides accurate data entries for food items which are added by the user, allows the user more efficient food item additions with less repetition.
FR17	The system shall show "N/A" for Food Diaries' Calorie Goal progression when the user has no active Fitness Goal.	Ensures that NutriBud does not misguide the user with an incorrect metric.
FR18	The system shall update a user's percentage of progress towards achieving an active Calorie Goal whenever the user changes their age, gender, most recently added weight, calories burned for Food Diary, and when a Food is added to/deleted from a Food Diary.	Guarantees that the percentage to achieving a Calorie Goal for a day is up-to-date and accurate according to health standards.

Table 4: Functional Requirements Table

8 Non-Functional Requirements

8.1 Performance Requirements

8.1.1 Speed and Latency Requirements

Requirement ID	Speed and Latency Requirement	Rationale
NFR1	The time to return the predictions list and scores of a food item and nutritional data given a picture shall take less than 8 seconds for 90% of cases	Provides a time-efficient method of retrieving nutritional information for food items.
NFR2	Program start-up shall take less than 5 seconds	Allows users to begin their user experience in a timely manner.
NFR3	Buttons/options shall respond in under half a second	This allows users flow of thoughts to remain uninterrupted

Table 5: Speed and Latency Requirements Table

The above requirements are set to ensure the application will run and do tasks within reasonable speed. This is important because the user needs to be able to input and log data without issue. Having to use an application that is slow will degrade the user experience.

8.1.2 Scalability or Extensibility Requirements

Requirement ID	Scalability or Extensibility Requirement	Rationale
NFR4	New features/ideas shall be easy to incorporate into the existing application	Allows the application to adhere to customer's expectations and desires for rapid change and response.
NFR5	The program shall be modular with the separation of concerns, allowing seamless addition of new modules	Allows the architecture to be well-defined and properly segmented according to functional necessities.
NFR6	Software updates and new versions shall preserve the integrity of user data	Provides a maintainable structure of data while introducing patch updates.

Table 6: Scalability or Extensibility Requirements Table

The above requirements are implemented to ensure the future of the application is stable. Having an application that is easy to update and one that is modular will help in updating, patching, and overall upgrading the application to improve the user experience.

8.1.3 Workload Requirements

Requirement ID	Workload Requirement	Rationale
NFR7	The system's database shall be able to accommodate the data of 50 unique users	To ensure that budget constraints are adhered to while providing simultaneous user support.
NFR8	In standard workload, the CPU usage of the mobile device should be less than 25%	Ensures there are available resources for other background tasks.

Table 7: Workload Requirements Table

The above requirements are set in order to ensure that multiple users can use the application and the system will be able to accommodate all of them with relative ease.

8.1.4 Platform Requirements

Requirement ID	Platform Requirement	Rationale
NFR9	This application shall run on mobile devices with Android OS and a minimal version of 6.0	Allows for an inclusive community within the Android device ecosystem to maximize potential customers.

Table 8: Platform Requirements Table

This is to ensure users with older phones can also use the application, in the future this application may also be migrated to iOS.

8.2 Security Requirements

This will keep personal data safe and provide restricted access to user-specific data. To comply with privacy laws, the user data will need to be stored securely.

Requirement ID	Security Requirement	Rationale
NFR10	The application will store user submitted pictures in a secure setting.	Provides a level of safety and security for a user's identity.
NFR11	The application shall keep user information private and maintain data security rules.	Provides a level of privacy for a user's data.
NFR12	The application shall check if a user's email has been used before when registering a new account.	Ensures data integrity for existing users.
NFR13	The application shall validate if a user's inputted password on the Sign In screen is correct and notify the user of password mismatch.	Ensures account security and accessibility.
NFR14	The application shall validate on the Sign In page if the email is recognized.	Provides feedback regarding the correctness of a user's input.

Table 9: Security Requirements Table

8.3 Look and Feel Requirements

8.3.1 Appearance Requirements

Requirement ID	Platform Requirement	Rationale
NFR15	The function of buttons/options in the application must be obvious.	Ensures the user knows how to interact with the application seamlessly.
NFR16	The application must have a simple GUI such that a new, inexperienced user to NutriBud can submit a single food item's nutritional contents to a food diary within 3 minutes.	To ensure that the application's overall integration is seamless.
NFR17	The application must be intuitive and easy to learn.	Ensures that the user can become accustomed to the application quickly, allowing the user to use the application efficiently. This prevents frustration and improves user experience.
NFR18	The application shall direct newly registered users to an onboarding screen to submit user settings.	Informs the user of the available settings that they can customize according to their account screen.

Table 10: Appearance Requirements Table

This is to ensure the user can easily learn to use the application and finds using the application to be a pleasant experience.

9 Normal Operation

9.1 Description/Behaviour

The system must be able to, upon taking a picture of a food item on a plate, predict the particular type of food that is on the plate. Afterwards, the system must use this data to accurately deliver the nutritional contents of the food item to the user on an haptic input screen that allows for the user to input the serving size. These nutritional contents are outlined through the context diagram on Figure 2.

Alternatively, the system must either allow the user to scan a UPC barcode through the phone's camera hardware or allow the user to interact with the phone's haptic touch screen to manually search for food products.

Additionally, the system will allow the user to track and visualize their fitness and nutritional progress. They shall be able to plot their progress over a timeline, which they can modify the size of in order to fit the view they wish to look at it with.

Finally, the system must offer users the ability to create an account through their email address. The system will allow users to create private Friend Groups to play a game called GainRivals, a customizable leaderboard setup. This leaderboard will be composed of user's scores that will be ranked to create a competitive atmosphere.

As a whole, the system must perform all of these behaviours accordingly.

9.2 Notation

GainRivals = The game feature of the application, consisting of a leaderboard with a custom score options. Macros = Macro nutritional content which the application will be tracking, including fats, proteins and carbohydrates.

9.3 Normal Use Cases/Scenarios

9.3.1 User Logs into NutriBud Account

The application is logged onto by the user, and will subsequently display the current food diary for the given day they log on.

9.3.2 Scan Food Barcode

The system will detect if a barcode in the camera view appears within a centered box boundary. Afterwards, the system will transfer the user to the logging screen for the daily food diary after retrieving the nutritional information according to the food.

9.3.3 Set Up GainRivals Friend Group

The system will have the ability to let users add friends to their account. Upon doing this, the system shall also allow users to create custom lobbies for the GameRivals game, which promotes competitive play by displaying a leaderboard for how closely they meet a user predefined scoring regimen.

9.3.4 View GainRivals Friend Leaderboard

The system will allow the user to proceed to GainRivals by pressing a button from the main menu. The system will allow users to select which friend group they want to view for leaderboard statistics.

9.3.5 Manual Lookup Food Item

The system will be able to, upon the user selecting a search button, to produce a list of food items according to a filter that is provided by the user and described by the control variable manual_entry.

9.3.6 Take Picture of Food

The system must be able to open the phone's camera and allow the user to take a picture of the food for the system to recognize and process for nutritional content display.

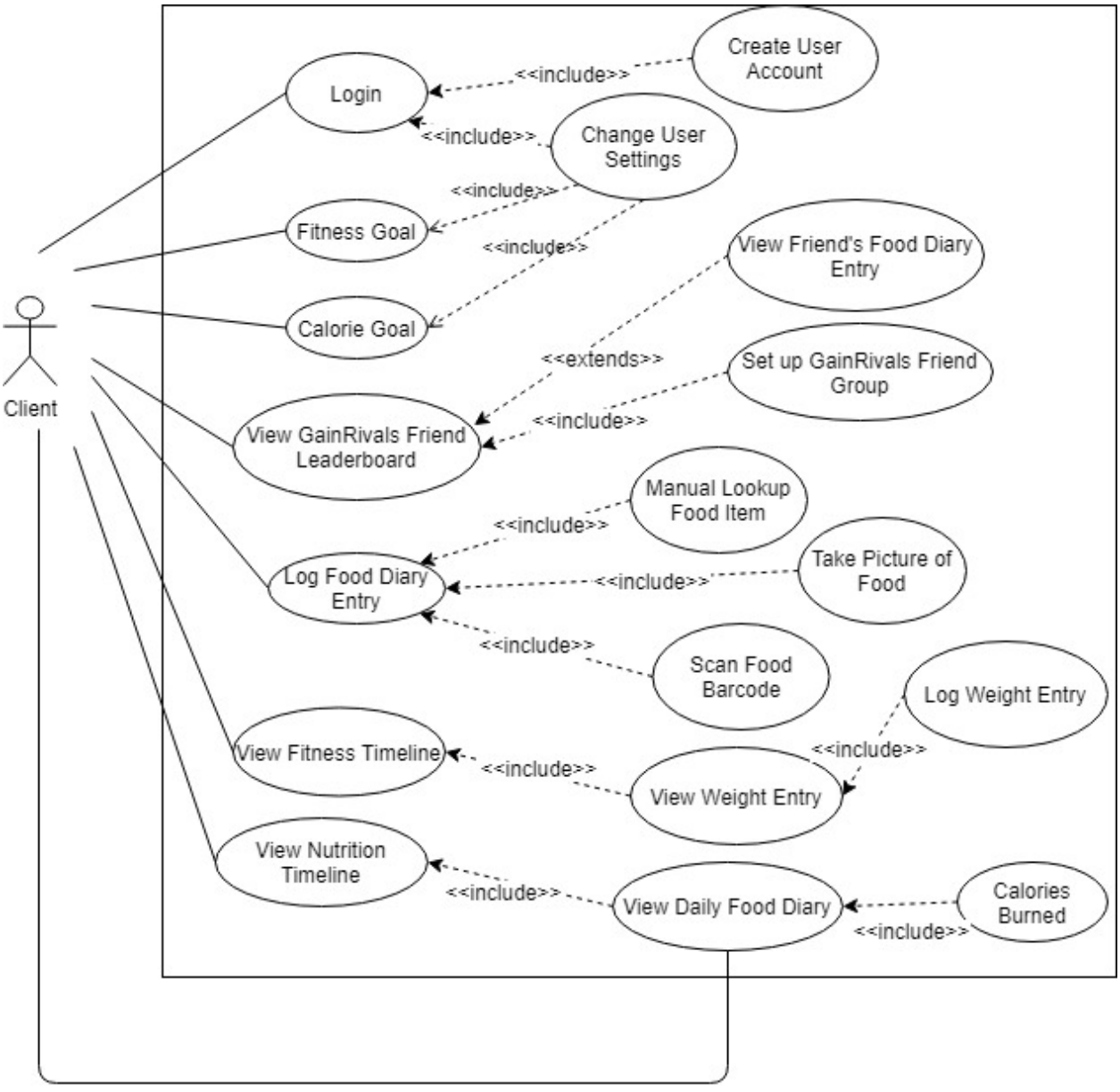

Figure 3: NutriBud Use Case Diagram

9.3.7 Create User Account

The system must allow for the user to create a NutriBud account using an email address and password combination.

9.3.8 Log Weight Entry

The system must allow for the user to log their weight on any day and store this data.

9.3.9 Log Food Diary Entry

The system must allow for the user to log their nutritional consumption on any day and store this data.

9.3.10 View Weight Entry

The system must allow the user to view a logged weight entry from the fitness timeline by selecting a day.

9.3.11 View Daily Food Diary

The system must allow the user to view a logged food diary on any current or past date showcasing a breakdown of nutrient consumption from meals.

9.3.12 View Fitness Timeline

The system must create a fitness timeline to be shown for the user to view a history of all logged weight entries. This can be viewed on a custom time scale to be selected by the user.

9.3.13 View Nutrition Timeline

The system must create a nutrition timeline that showcases all logged food diary entries by the user. Upon touch input from the user, the system will then display the food diary entry for that day

9.3.14 Change User Settings

The system must provide the user with the ability to change and update their relative user settings. Upon tapping on the change setting icon for each user setting, the system will provide a dialog box for the user to change the relative setting.

9.3.15 Fitness Goals

The system will provide a functionality that allows the user to create and update a fitness goal. The fitness goal will allow the user to set a target weight to aim for, they will also be able to view the timeline that is based on their fitness goal.

9.3.16 Calorie Goals

The system will provide a functionality that will allow the user to create and update a calorie goal. The calorie goal will allow the user to set a target calorie intake for a day according to macronutrients. There will also be a calorie intake timeline for the user to view.

9.3.17 Calories Burned

The system will allow the user to input the amount of calories they burned in a certain day. The Food Diary home page will provide the user with a button that will create a dialog box to input the amount of calories burned that will change the daily calorie goal respectively

10 Undesired Event Handling

The application should fail elegantly under critical software failure and handle errors or exceptions encountered during application use.

10.1 Barcode not Detected in Camera's Boundary Box

- Camera is too close to the barcode to detect the full barcode
- Camera is too far from the barcode to recognize the barcode
- Visual conditions too poor for the barcode to be recognized by the camera.

If the barcode cannot be detected in the camera's boundary box, the system will instruct the user to reposition the camera. In the case that it cannot be detected at all, they will be redirected to the manual search.

10.2 Barcode not Recognized

- Barcode is damaged
- Picture quality of barcode is too low
- Barcode is not valid
- Barcode is not able to be resolved
- Barcode cannot be found in database

If the barcode cannot be determined by the system, the system will create a dialog box that is displayed to the user. This will ask the user whether they wish to continue using the camera functionality or provide an alternate solution of manually looking up the food item they wish to detect.

10.3 Failure to Detect Food Item

- Food items are too close or too far from the camera
- Lighting conditions are too poor for the camera to detect the food item

If the application cannot detect the food item upon a user's request, the application shall prompt the user to retake their picture with the food at a further distance of 3 feet away. In the case that it cannot be detected at all, they will be redirected to the manual search.

10.4 Failure to Identify Food Item

- Distorted food items are present and cause application to misidentify
- Image recognition model fails to accurately identify the food item type

If the NutriBud system misidentifies a food item, then the percentage in confidence should be given to the user in order to highlight the inaccurate nature of the prediction. The system should advise the user to manually enter the name of the food item to ensure the item is properly logged. In the case the food item may not be detected at all, they will be redirected to the manual entry.

10.5 System Failure

- A bug/glitch causes the NutriBud application to crash and shut down
- A bug/glitch that distorts the computed nutritional values
- The application does not complete a task correctly

The application will save any completed tasks and/or data it can. During the next time the application is launched, it will resume the same task it was performing before the crash if possible.

11 List of Requirements that are Likely to Change

NFR1-3, NFR 7-9 (Refer to Section 7) NFR 1-3, NFR 7 and NFR8 are likely to be changes as they relate to how our application performs. With more time and money, our application will become more optimized, which will lead our development team to improve the standards that was set in these requirements. For NFR 9, with more time and money, our application will be made available on IOS as flutter provides cross platform functionality.

12 List of Requirements that are not Likely to Change

FR 1-18, NFR 4-6, NFR 10-18 (Refer to Section 7 and 8) The remaining requirements are all requirements that we have deemed to be viable and meaningful for our application.