

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSP: PROJECT WORK

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Software Requirements Specification

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**Under the guidance of
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1. Introduction

1.1 Purpose

The purpose of this document is to specify the SRS required to build a project that aims to quantize the consumption of essential nutrients in an efficient format such that it leads to a healthy and balanced lifestyle.

1.2 Document Conventions

NM	Nutrient Management
NP	Nutritional Profile
SAPI	Spoonacular Application Programming Interface
UL	Unsupervised Learning
KMC	K-Means Clustering
GUI	Graphical User Interface

1.3 Intended Audience and Reading Suggestions

The project's main goal is to create an intelligent recipe recommender that would aid in the development of a diet that allows all users to make healthy choices in their daily lives while still enjoying food and keeping healthy. The project's main intended audience will be researchers or casual users who need to understand or use such an intelligent system for nutrition management.

1.4 Project Scope

Nutrient management in the context of this project aims to quantize the consumption of essential nutrients in an efficient format such that it leads to a healthy and balanced lifestyle. Several recent studies have shown the importance of quality-based consumption of nutrients which could otherwise lead to serious health issues that could even be fatal at times.

The emergence of advanced scientific methods to determine the presence of various nutrients or lack thereof has led to widespread awareness amongst individuals to keep a track of their nutrient consumption. Increased consciousness towards one's health has recently been in the limelight which creates the need for an intelligent system specially customized for the individual that can analyse your consumption's quality and suggest options that could essentially fulfil your body's need to lead a healthy lifestyle.

1.5 References

- [1] spoonacular.com/food-api
- [2] fdc.nal.usda.gov/download-datasets.html
- [3] math.le.ac.uk/people/ag153/homepage/KmeansKmedoids/Kmeans_Kmedoids.html
- [4] eatforhealth.gov.au/node/1813927/done?sid=1241508&token=e45247c1c33a1236034b917b6724105e
- [5] kaggle.com/datasets/trolukovich/nutritional-values-for-common-foods-and-products

2. Overall description

2.1 Product perspective

The product is designed to be open source, under the MIT public license. It is a browser or mobile application system implementing a client-server model. It enables users to input their nutritional profile into an interactive user interface, which then takes in the values and passes it on to our backend. An algorithm maps the required nutrients tailored for every user to the information put in by them like age, gender, activity levels, diseases and allergies and personal health goals. At the backend, we make use of a classification model that can classify and output food groups that are rich in specific groups of nutritional values. A ranking system maps the user inputs explaining their preferences and scrapes the web for recipes for the right diet.

1. **User Account:** The system allows the users to create their accounts. The users have an option to input their health-related values and store it with us on the database which can be modified at any point, triggering the suggestion retrieval from the recommendation system with state change.
2. **Ranking of Recipes:** The user profile will be processed, and a list of food ingredients will be generated such that they cover the nutritional requirements of the user. They can then scan their available ingredients with the help of their mobile camera, which will act as another input to our recommender system which will be used to rank videos shown to them.
3. **Application Output:** The user gets to view selected recipe videos from the internet recommended by our app as a list of hyperlinked videos based on our ranking system on an interactive UI.

2.2 Product features

The salient features of the product are :-

- The product utilizes more data points than the just a general set of inputs that are used on the existing applications like the user's micro and macro nutrition profile.
- The application gives the user a feature where they can input the food ingredients they already have in their home or one's that are preferred because of their dietary restrictions so that the application can suggest recipes matching those ingredients.
- The SAPI being used to get the Food Products by passing the set of ingredients is highly used and hence contains a vast range of products of many cuisines and is constantly maintained updated which helps the application in giving the user a wide variety of options in results.
- The application crawls the web for the recipe of food products suggested by SAPI and the one preferred by the user to show the videos of recipe on the phone right then.

2.3 Use Cases and Characteristics

1. Use Case Name: Signing up for an account

User Class: Users

Characteristics :-

- **Purpose:** To register users on the platform/application.
- **Overview:** The use case is initiated when the user selects the option to sign up for an account on the application. They are required to enter their username, email and password. Upon completion, the user is notified of a successful registration and is prompted to log in. Their credentials are added to the database.
- **Precondition:** User must navigate to the platform and select the sign-up option.
- **Exception:** Internet connection fails in the middle of the signup process, or the user does not provide a secure password, or the third-party authenticator fails to function, causing the use case to terminate.
- **Policies:** Correct username and password intended to be used must be provided.
- **Frequency:** Once, upon arrival to the application, and if the user wants to establish an account.
- **Cross Reference:** This is exclusive with every other use case and cannot occur with the others.

2. Use Case Name: Logging in to account

User Class: Users

Characteristics :-

- **Purpose:** To enable users to access their account and set up profile.
- **Overview:** The use case is initiated when the user attempts to access their account by selecting the login option. They are required to enter their username or email, and their password. Or they could choose to login via a third-party authentication service. Upon completion, the user is taken to their dashboard is the dashboard.
- **Precondition:** User must navigate to the platform and select the login option.
- **Exception:** Internet connection fails in the middle of the login process, or the user does not provide the correct password, or the third-party authenticator fails to function, causing the use case to terminate.
- **Policies:** Correct username and password must be provided, as it is verified with credentials stored in the database.
- **Frequency:** Once, upon arrival to the application, can login multiple times after logging out each successive time.
- **Cross reference:** This is exclusive with every other use case and cannot occur with the others.

3. Use Case Name: Create a Nutritional Profile

User Class: Users

Characteristics:

- **Purpose:** For users who want to get benefits of all features of the app and chose to create a profile for the same.
- **Overview:** The use case is initiated when a user attempts to create a profile on the application. They are supposed to enter the inputs related to their health in the input fields as indicated in the form. This form would take in information like name, age, gender, dietary restrictions, deficiencies, nutrition goals for macro and micronutrients etc. All this information is editable and gets saved on the database.
- **Precondition:** The user must be logged in before creating a profile.
- **Exception:** The profile creation fails if the user session is invalid or if the internet connection was not stable during the process of uploading.

- **Policies:** User should input correct values best to their knowledge for accurate profile generation.
- **Frequency:** When the user wants to create or update his profile information.

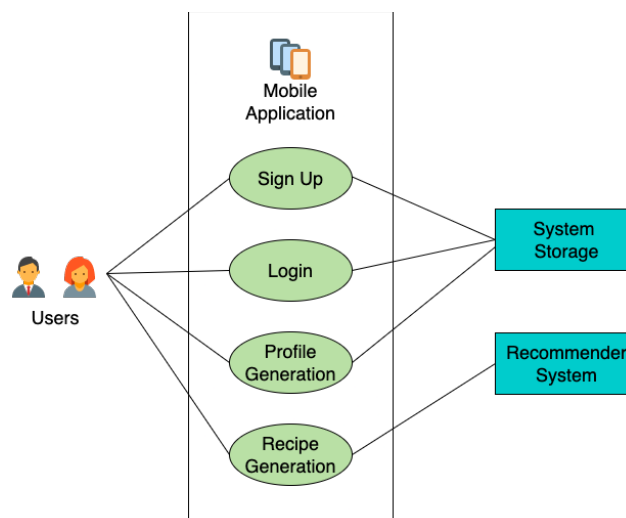
4. Use Case Name: Viewing the recipes on the platform

User Class: Users

Characteristics :-

- **Purpose:** To view videos based on the nutritional requirement and available ingredients.
- **Overview:** The use case is initiated when a user logs in to the platform and starts viewing the recipe videos through the platform by inputting the available/preferred ingredients.
- **Precondition:** The user must be logged in to the platform and the nutritional profile must be setup.
- **Exception:** The user would not be able to view the videos if the internet connection is not stable or if the user session has expired.
- **Policies:** The user can view only one video at a time that they choose from the list shown to them.
- **Frequency:** As many times as, the user tries to view a recipe and clicks on the video to view it on the application.

UML Diagram :-



2.4 Operating environment

- This is a Web/Mobile application-based system and hence will require the operating environment for a client and server GUI. This will be operating in the following operating environment:
- It is dependent on the version of the browser, i.e., the browser needs to support HTML5.
- The system is provisioned to function on the Vue framework for the web frontend, Flask framework for the server. Both technologies are very flexible and have extensive support and documentation.
- Database to be used has been decided after because the data being exchanged or stored is large, and unstructured. For this reason, we have chosen to use MongoDB due to it being a NoSQL database that does not require strict tabular structure.
- We also intend to cache the repeated videos that the user has watched, their reviews on the recipe for faster use in the future.

2.5 Design and Implementation Constraints

- False inputs can lead to wrong diets and so it's always better to get the second opinion from a specialist.
- It takes time to see results as the users' nutritional values won't change immediately. And so, while we can implement some sort of reinforcement learning, it will take before we can adjust the parameters.
- We require information from multiple blood tests over a span of time as recommended by a specialist to implement reinforcement learning basically.
- The application currently supports only English language.
- The initial prototype is built to handle a small number of users, their sizes, and a small number of concurrent operations. The architecture is Monolithic at this point, which does not scale well. Microservices transitioning is needed in the future to scale well.

2.6 Assumptions and Dependencies

- The nutritional information put in by the users during profile creation is correct and can be relied on while recommending recipes.
- We assume that the SAPI gives correct and reliable results when mapping ingredients with food items.
- We assume a reasonable processing time for profile and recipe suggestion, enough to make the system viable in a proof-of-concept stage.

3. System Features

3.1 Functional requirements

- The functional requirements for our product are as follows:
- Authentication of a user when they login on the web/mobile portal.
- A fully functional system capable of suggesting recipes based on users' nutritional requirements and preferences.
- Attractive and simple UI/UX for interaction.
- Inputs from the user about their nutritional profile and their preferences.
- User systems capable of handling and running complex mathematical tasks on-premises.
- Making the right API calls in the backend for running the model and CRUD operations

4. External Interface Requirements

4.1 User Interfaces

The user should be able to create an account on the platform and input their nutritional information with ease. They should be able to view their data and modify it when necessary.

4.2 Hardware Interfaces

In terms of hardware, the user's device must have an active strong internet connection. A high-resolution camera would also be recommended for detection of food ingredients.

4.3 Software Interfaces

It is recommended for the user to have the latest Operating System installed along with a modern browser with HTML5 compatibility.

4.4 Communication Interfaces

The communication standard in the model mostly includes the use of HTTP. The HTML5 video player is used concurrently with the HLS (HTTP Live Streaming) streaming protocol to fetch and stream videos, both the uploaded ones and the ad clips.

5. Non-functional requirement

5.1 Performance Requirements

- The product must have reasonable processing times.
 - Since we are using an external API (SAPI), the result set produced by the API should be provided with a quick response time.
- The product must be scalable.
 - Since the database used is the Firebase Firestore database, which does not have relations in it, it is scalable.
- The product must be maintainable
 - The product is maintainable since every component can be updated at any point of time. Depending on traffic, the hosting solutions can be upgraded for each individual component, such as the frontend website or the backend server. Additional cloud GPU can also be purchased as and when required.

5.2 Safety Requirements

- If configured to use a login technique, the database should store the user credentials in an encrypted format in order to avoid any breach of data associated with the user. This is achievable by using a third-party authentication service like Firebase Authentication.
- Care must be taken to not overload the database where user data is stored, in order to prevent incurring additional costs of storage or potential lapse in security to a larger repository.

5.3 Security Requirements

- Every unsuccessful attempt to login by the user should be logged in the backend.
- Videos must be checked to ensure they do not contain explicit content or derogatory materials of any nature.
- The audio within the video must be checked to ensure that there are no derogatory comments being made
- The object detection model and speech recognition model must be immune to corruption by excessive false data.

5.4 Software Quality Attributes

- **Availability:** The recommendation engine must be available whenever the user uploads/updates a nutritional profile for processing or requests for recipe videos.
- **Accuracy:** The recommendation engine must be able to recommend recipes with great accuracy matching the user's nutritional requirements.
- **Maintainability & scalability:** The engine and its components must be easy to maintain and update, if necessary, as well as scale well with increasing load levels.
- **Accessibility:** The website/mobile application housing the engine must be accessible and have an intuitive UI that is usable by a large audience, much like popular platforms today.