

Project Track1 Proposal: “NutriCheck” – A Smart Solution for Food Information Search and Nutrition Tracking

Team008

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1 Project Summary

NutriCheck is a web-based application focusing on providing users with detailed nutritional information for a vast array of food items and a personalized intake tracking system. Utilizing the official dataset from USDA’s FoodData Central, NutriCheck simplifies the process of understanding food contents and monitoring daily nutritional intake, catering to the specific dietary requirements of users.

2 Application Description

NutriCheck addresses the challenges of maintaining a balanced diet in a fast-paced lifestyle by offering two key functionalities: a detailed food information search engine and a user-friendly intake tracking system. The platform aims to simplify the nutrition management process by allowing users to:

- Quickly search and access reliable and detailed nutritional information of a wide array of food items.
- Log and track daily food intake efficiently, helping users adhere to their dietary goals and maintain a healthier lifestyle.

3 Creative Component: Intuitive Intake Tracker

The “**Intuitive Intake Tracker**” is a core feature of NutriCheck, designed to provide users with a seamless and interactive experience for logging their daily food intake. This feature stands out by offering an exceptionally user-friendly interface and personalized tracking options that cater to the diverse preferences and lifestyles of users. Key features of this enhanced tracker include:

1. Easy-to-Use Logging Interface:

- The tracker provides a simplified and intuitive interface for users to quickly log their meals, featuring a clean, user-friendly dashboard that minimizes the time spent entering data.
- Features include auto-complete suggestions for food items based on the keyword users enter and the ability to save favorite or frequent meals for faster logging, enhancing the overall user experience with efficient data entry.

2. Detailed Food Categories and Customized Notes for Each Diet Item:

- Users can know how much food is consumed in different food categories (e.g., Dairy and Egg Products, Fats and Oils, Beef Products, Vegetables and Vegetable Products) to understand their eating habits and preferences. This data is presented through pie charts and bar graphs, offering a clear visual breakdown of dietary consumption.
- The ability to add notes or custom tags to each entry, allowing users to track specific details like mood, location, or social setting, with these annotations being searchable.

3. Visual Daily Summary:

- A daily summary provides a visual representation of the user’s food intake, offering a quick overview of meal distribution and portion sizes throughout the day via interactive charts and graphs that users can hover over to see specific details.

- This feature helps users stay aware of their eating patterns without overwhelming them with detailed nutritional data. It includes a color-coded heatmap of calorie intake over the week, enabling users to easily spot days with higher or lower food consumption.

4. Personalized Intake History:

- Users can easily access their intake history to review past meals and track their consistency over time. The history is presented as a scrollable timeline with thumbnails of meals, and clicking on a thumbnail opens a detailed view with nutritional breakdown and custom notes.
- The tracker includes a calendar view to navigate through past entries, making it simple to reflect on and understand long-term eating habits. Each day in the calendar is represented by a mini pie chart showing the macro-nutrient distribution, allowing users to get an instant visual summary without needing to open each entry.

By focusing on the user experience and providing a set of features tailored to personal preferences and ease of use, the **"Intuitive Intake Tracker"** elevates the basic functionality of logging food intake into a standout component of the NutriCheck application. This approach ensures that the tracker is not only practical but also engaging and tailored to the unique needs of each user.

4 Usefulness

NutriCheck effectively bridges the gap between the aspiration for a healthy diet and the practicality of achieving it by offering the following functionalities:

- **Quick Nutritional Lookup:** Users can swiftly search for and access comprehensive nutritional information of a wide array of food items, making informed food choices easier than ever.
- **Intuitive Intake Tracking:** With a user-friendly interface, users can efficiently log and monitor their daily food intake, ensuring adherence to their dietary goals and facilitating a healthier lifestyle.

Our project NutriCheck distinguishes itself from popular dietary tracking platforms like MyFitnessPal and Yazio through several key features and focuses. While all three applications offer tools designed to assist users in managing their diet and tracking their food intake, NutriCheck emphasizes simplicity, efficiency, and the reliability of the data it provides. Here's a more detailed comparison to highlight the differences:

1. User Interface and Experience :

- **NutriCheck:** Designed with a strong emphasis on user experience, featuring a clean and intuitive interface that simplifies the process of navigating nutritional information and logging dietary intake. This design philosophy makes it especially useful in scenarios where quick and easy access to information is paramount, such as choosing food in a supermarket or planning meals at home.
- **MyFitnessPal and Yazio:** Both platforms are well-regarded for their comprehensive features, including food tracking, nutritional analysis, and fitness integration. However, they might present a steeper learning curve due to the breadth of functionalities and the more complex interface that accommodates these features.

2. Nutritional Information and Database Reliability:

- **NutriCheck:** Stands out by integrating reputable food databases USDA's FoodData Central, ensuring users access the most comprehensive, accurate, and up-to-date nutritional information. This focus on data integrity means users can trust the information provided to make informed dietary choices.
- **MyFitnessPal and Yazio:** While both platforms also offer extensive food databases, the quality and reliability of their data can vary. Users may encounter more user-generated entries, which can sometimes lead to inconsistencies or inaccuracies in nutritional information.

3. Target Audience :

- **NutriCheck:** Appeals to users who prioritize ease of use, speed, and data accuracy over a broad range of features. It is ideal for individuals who want a straightforward and reliable dietary tracking tool.
- **MyFitnessPal and Yazio:** Cater to a broader audience, including those who seek an integrated approach to managing both diet and exercise. Their extensive features make them suitable for users who appreciate having all their health and fitness data in one place.

In summary, while MyFitnessPal and Yazio offer comprehensive solutions for diet and fitness tracking, NutriCheck differentiates itself by focusing on simplicity, efficiency, and the reliability of its nutritional data. This makes NutriCheck an attractive option for individuals who value a streamlined approach to dietary tracking and want to make informed food choices quickly and confidently.

5 Realness

NutriCheck will utilize USDA's FoodData Central, an extremely official and reliable data source to offer a wide range of food information.

USDA's FoodData Central is a folder with multiple CSVs amounting up to 23 CSVs and has been taken from fdc.nal.usda.gov. Data and metadata on individual samples of commodity/commodity-derived minimally processed foods with insights into variability. The data source is USDA: based on analytically derived values.

Specifically, we will utilize only the foundation food data within the dataset because it provides the most reliable and accurate data on individual samples of commodity or commodity-derived minimally processed foods, based on analytically derived values from USDA. This ensures that users receive the most truthful and precise nutritional content information.

In contrast, we will filter out other parts of data in the dataset, including Branded Foods, Experimental Foods, Food and Nutrient Database for Dietary Studies and SR Legacy for the following reasons. Nutrition facts provided by commercial product labels, which may be subject to inaccuracies, as well as Experimental Foods sourced from various scientific publications, due to potential errors from non-standardized experimental conditions. Additionally, we will exclude the SR Legacy data as its final release was in April 2018, making it outdated for our current application purposes.

Descriptions of CSVs in the dataset are described below:

- **agricultural_acquisition:** Non-processed foods obtained directly from the location where they are produced. Fields: `fdc_id`, `acquisition_date`, `market_class`, `treatment`, `state`.
- **acquisition_sample:** Acquisitions may be blended with other acquisitions to create a sample food, and acquisition can be used to create more than one sample food. This file stores which acquisitions and sample foods are related to each other. Fields: `fdc_id_of_sample_food`, `fdc_id_of_acquisition_food`.
- **branded_food:** Foods whose nutrient values are typically obtained from food label data provided by food brand owners. Fields: `fdc_id`, `brand_owner`, `gtin_upc`, `ingredients`, `serving_size`, `serving_size_unit`, `household_serving_fulltext`, `branded_food_category`, `data_source`, `modified_date`, `available_date`, `discontinued_date`, `market_country`.
- **food:** Any substance consumed by humans for nutrition, taste, and/or aroma. Fields: `fdc_id`, `food-Class`, `data_type`, `description`, `food_category_id`, `publication_date`, `scientific_name`, `food_key`.
- **food_attribute:** The value for a generic property of a food. Fields: `id`, `fdc_id`, `seq_num`, `food_attribute_type_id`, `name`, `value`.
- **food_attribute_type:** The list of supported attributes associated with a food. Fields: `id`, `name`, `description`.

- **food_calorie_conversion_factor:** The multiplication factors to be used when calculating energy from macronutrients for a specific food. Fields: food_nutrient_conversion_factor_id, protein_value, fat_value, carbohydrate_value.
- **food_category:** Foods of defined similarity. Fields: id, code, description.
- **food_component:** A constituent part of a food (e.g., bone is a component of meat). Fields: id, fdc_id, name, pct_weight, is_refuse, gram_weight, data_points, min_year_acquired.
- **food_fat_conversion_factor:** Factor to calculate total lipid fat (204). Fields: food_nutrient_conversion_factor_id, fat_nlea_value.
- **food_nutrient:** A nutrient value for a food. Fields include id, fdc_id, nutrient_id, amount, and others.
- **food_nutrient_conversion_factor:** Top level type for all types of nutrient conversion factors.
- **food_nutrient_derivation:** Procedure indicating how a food nutrient value was obtained.
- **food_nutrient_source:** An information source for obtaining food nutrient values.
- **food_portion:** Discrete amount of food.
- **food_protein_conversion_factor:** Specific fields related to protein conversion factors.
- **food_update_log_entry:** Historical record of an update of food data.
- **foundation_food:** Foods whose nutrient and food component values are derived primarily by chemical analysis.
- **input_food:** A food that is an ingredient or a source food to another food.
- **lab_method:** A chemical procedure used to measure nutrients in a food.
- **lab_method_code:** A sequence of characters used to identify a lab method.
- **lab_method_nutrient:** A nutrient measurable by a lab method.
- **market_acquisition:** A food obtained for chemical analysis.
- **measure_unit:** Units for measuring quantities of foods.
- **nutrient:** The chemical constituent of a food.
- **nutrient_analysis_details:** Information for the nutrient source info.
- **nutrient_incoming_name:** A nutrient name used in incoming data.
- **sample_food:** A food acquired as a representative sample of the food supply.
- **sr_legacy_food:** Foods from the USDA National Nutrient Database for Standard Reference.
- **sub_sample_food:** A portion of a sample food used for specific analysis.
- **Sub_sample_result:** The result of chemical analysis for a particular nutrient.
- **survey_fndds_food:** Foods measured by the What We Eat In America dietary survey.
- **wweia_food_category:** Food categories for FNDDES.

6 Website Functionality

NutriCheck users will be able to engage in two main functionalities, designed to be intuitive yet powerful, catering to the everyday needs of individuals aiming to maintain a balanced diet:

- **Search:**
 - Users can find detailed nutritional information for a vast array of food items.
 - The search functionality is backed by a keyword search system that allows users to input search terms and receive relevant results efficiently.
 - Behind the scenes, the search mechanism is supported by advanced queries to fetch accurate and relevant data from the integrated database USDA’s FoodData Central.
- **Track Intake:**
 - Users can log their daily food intake, monitoring their progress towards nutritional goals.
 - The tracker allows for CRUD (Create, Read, Update, Delete) operations, enabling users to add new entries, view past entries, modify existing entries, or remove entries as needed.
 - To enhance user experience and data integrity, the tracking functionality is supported by database transactions ensuring that all intake logging operations are processed reliably and without data loss.

To meet the advanced database functions requirement, NutriCheck incorporates:

- **Stored Procedures:** Utilized in handling complex queries and operations in the backend, improving performance and security.
- **Triggers:** Employed to automatically perform data validation, maintain data integrity, and update related entries across the databases upon certain operations in the intake tracker.
- **Constraints:** Defined within the database schema to ensure data accuracy and consistency, including primary keys, foreign keys, and custom constraints based on application logic.

7 Low-Fidelity UI Mockup

Detailed descriptions of our UI design are shown as follows:

1. Easy-to-Use Logging Interface:

- The tracker’s UI features a streamlined input form where users can log their meals by entering the name and quantity of the food. This form is equipped with auto-complete functionality, enhancing the user’s efficiency in recording their meals.
- The UI features a keyword search functionality where users can type in terms and receive auto-suggested food items. This is visually facilitated through an intuitive search bar, complemented by suggestive icons, ensuring a swift and smooth user experience.

2. Nutritional Tracking Goals Interface:

- The UI design displays a dedicated section for tracking different nutritional goals, such as calorie, protein, and fat intake. Users can input their target amounts, and these are represented in the UI with distinct text boxes for clarity.

3. Data Visualization in Food Tracking:

- The interface showcases a pie chart, providing a visual breakdown of food consumption by categories. Each segment is labeled with a percentage, giving users an immediate understanding of their dietary balance.

- A line graph is also featured, which presents changes in nutrient intake over time, allowing users to visualize their progress toward nutritional goals.

4. Search Functionality:

- The UI includes a search bar at the top of the interface, enabling users to quickly find food items or nutritional facts. The search results are neatly displayed in a box below the search bar, categorized under food, nutrition, and fact for organized access to information.

As seen in Figures 1a and 1b, the interface is designed to be user-friendly and intuitive, providing easy access to the application's key features, Search and Track Intake.

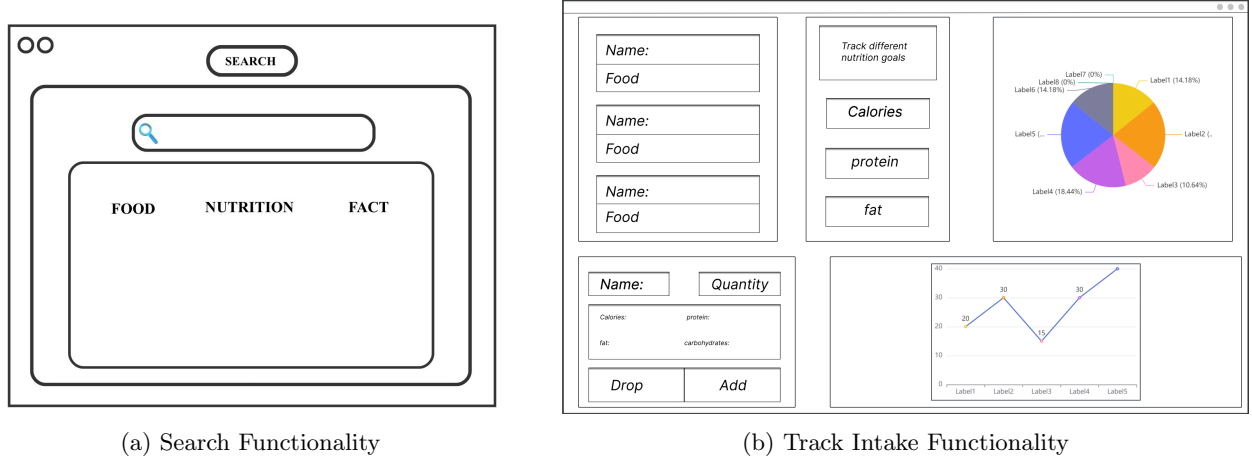


Figure 1: UI Design Sketches for Search and Track Intake Functionalities

8 Project Work Distribution

In the NutriCheck project, each team member will take on the role of a coordinator for a specific part of the project, ensuring focused attention and expertise in that area. However, to foster learning and collaboration, all members will actively contribute ideas and code to each part of the project, and also contribute to testing the application for quality assurance. The distribution of roles is as follows:

- **Frontend Coordination (Zhuofan Zeng):** Leading the UI/UX design and frontend logic development, while collaborating with the team to integrate frontend with backend services.
- **Backend Coordination (Weilong Li and Muzi Peng):** Steering server operations, API integration, and ensuring efficient communication between frontend and backend systems.
- **Database Coordination (Rutuja Narwade):** Overseeing data management, ensuring the quality and integrity of data, and aligning database operations with application requirements.

For the backend system development of NutriCheck, our team members will each have a primary focus area. The backend development will be divided into the following key areas, with each team member taking the lead on one of the areas:

1. **Database Schema Design and Optimization:** One member will be primarily responsible for designing a robust and scalable database schema. This role involves defining tables, relationships, indexes, and optimizing database performance.
2. **API Development and Integration:** Another team member will focus on the development and integration of various APIs required for the application. This includes creating endpoints, ensuring secure data exchange, and integrating frontend with backend services.

3. **Advanced Database Features Implementation:** This area involves implementing advanced database features such as stored procedures, triggers, and transactions. The responsible member will ensure these features enhance the application's functionality and data consistency.
4. **Backend Logic and Security Measures:** This role includes developing server-side logic, implementing robust authentication and authorization mechanisms, and ensuring the overall security of the application.