Project Track1 Final Report

Team008
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1 Please list out changes in the directions of your project if the final project is different from your original proposal (based on your stage 1 proposal submission).

The name of our application is changed from "NutriCheck" to "HealthTrack", because we not only offer advanced food search and nutrient intake tracking, but also offer sport search and calories tracking where users can get vivid summary for calories they intake and burn.

2 Discuss what you think your application achieved or failed to achieve regarding its usefulness.

2.1 What we achieved

Our application enables users to search for food and sport information, log and track their intake and sport data, and get vivid summary for selected time duration. Details are shown as follows:

- As is shown in Figure 1, our food search functionality allows users to enter keywords, select food category, select nutrient metric and use slider to filter foods with specific nutrient amount range.

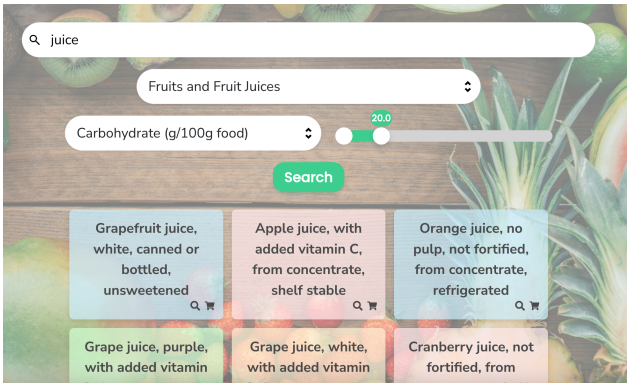

Figure 1: Food Search

- As is shown in Figure 2, each food card has icons of nutrition search and cart. When users click on magnifying glass, they can get food nutrition details; When users click on the cart, then they can enter intake date and amount, and add it to the food cart. In the navigation bar, users can enter food cart page, where they can click on submit to confirm and log their intake.

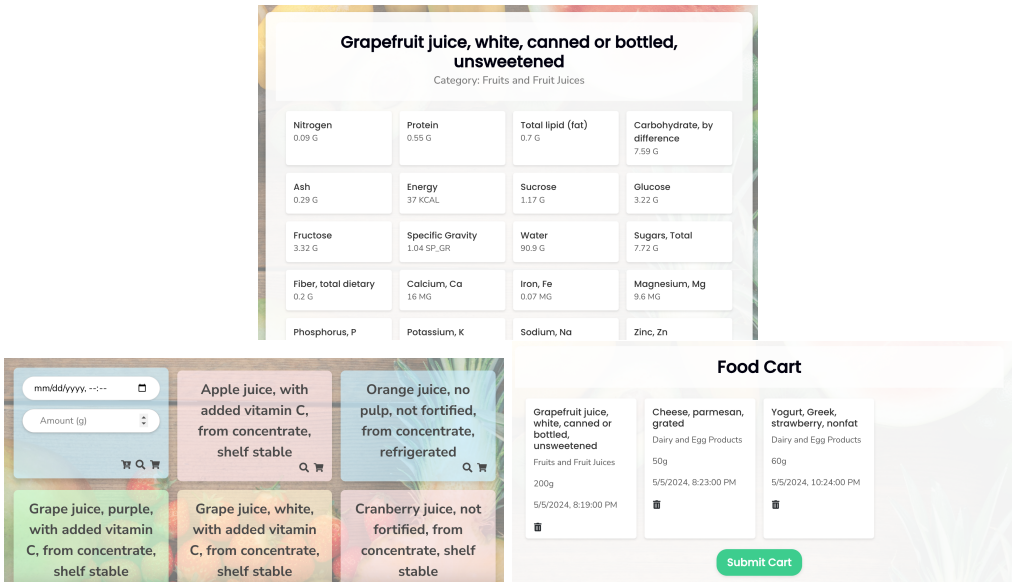

Figure 2: Food Nutrition Search and Intake Logging

- As is shown in Figure 3, our Nutrient Track page enables users to select a specific time duration to get intake summary. Then our application will offer average daily nutrient intake, including protein, fat, carbohydrate and energy. Moreover, it will visualize a dynamic pie chart to offer vivid summary for amounts of each category's food that the user intakes in this duration.

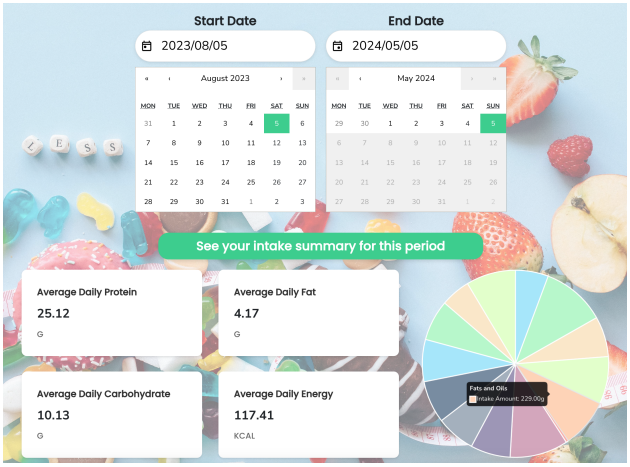

Figure 3: Nutrient Track

- As is shown in Figure 4, our sport search functionality allows users to enter keywords and use slider to filter sports with specific burnt calories range. For each sport card, it allows user to select sport start time and end time, then add it to the sport cart, where they can confirm and log their sports.

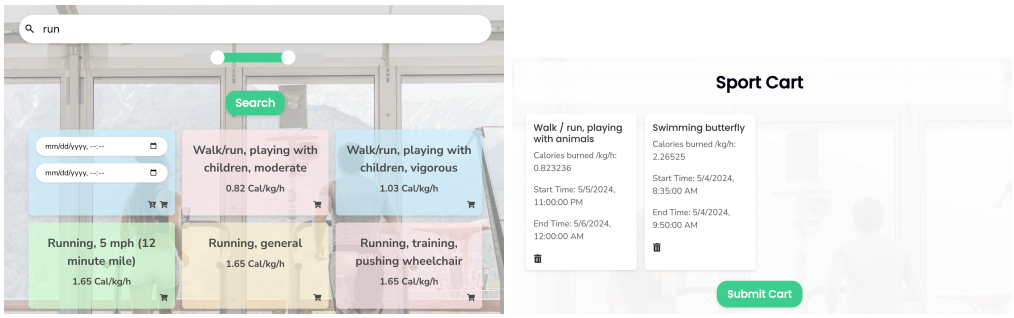

Figure 4: Sport Search and Sport Cart

- As is shown in Figure 5, out Calories Track page enables users to select a specific time duration to get calories summary. Then our application will offer daily average calories the user intakes and burns in the duration. Moreover, it will visualize a dynamic line chart to track the change trend of user's calories.

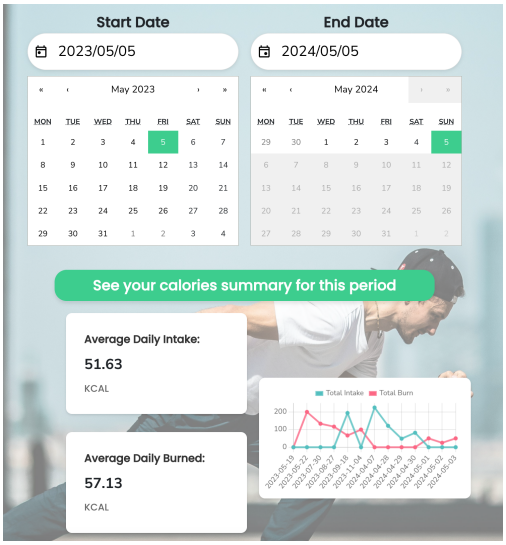

Figure 5: Calories Track

- We use JWT token based log-in to enhance application safety. Specifically, after a user successfully logs in, our backend will generate a token with 30 minutes' validity period and send it to frontend. Then everytime the frontend sends request to the backend, the backend will only trust the userId decoded from the token in request header. In this way, we ensure that each user only has access to his own data in the database. Our sign-up and log-in pages are shown in Figure 6, which have input error handling.

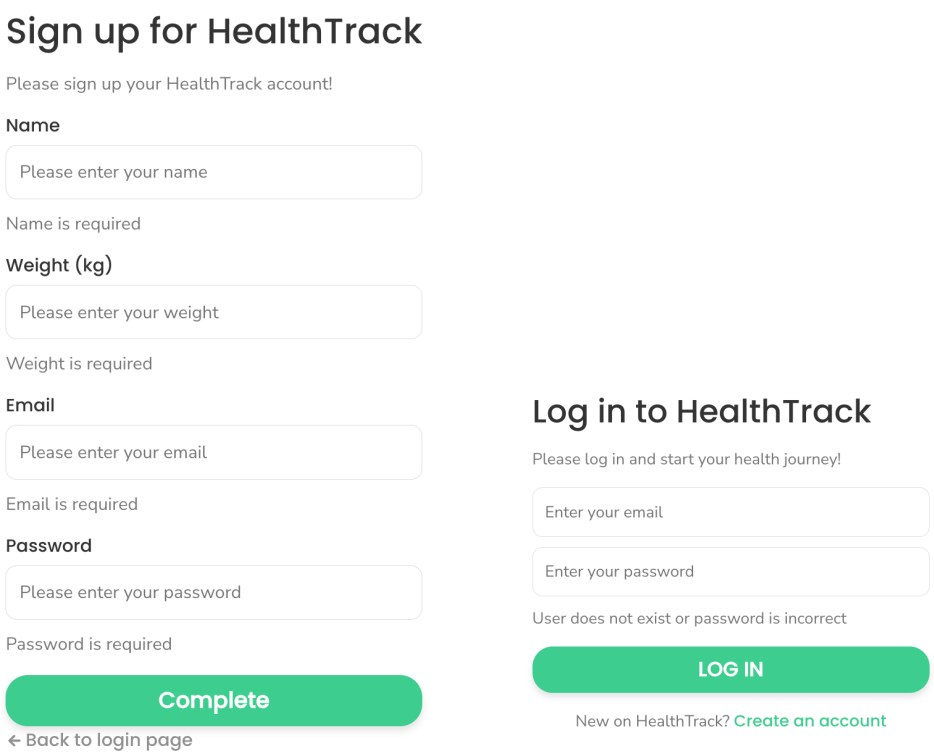

Figure 6: Log-in and Sign-up

2.2 What we have not achieved

In terms of user experience in adding sport records, it will be more user-friendly if the application can automatically capture the start and end times of activities, along with cardiopulmonary data like heart rate and breathing rates. This enhancement would streamline the process by reducing manual input and provide deeper insights into the user's health progress. This is particularly feasible on mobile devices. We will further explore the development of the mobile version of the HealthTrack to leverage these capabilities.

3 Discuss if you changed the schema or source of the data for your application.

As we add sport search and sport track functionalities, apart from USDA's FoodData Central described in our proposal, we add Calories Burned During Exercise and Activities.

4 Discuss what you change to your ER diagram and/or your table implementations. What are some differences between the original design and the final design? Why? What do you think is a more suitable design?

We use the same ER diagram design in our application as is shown in our stage2 (updated) and stage3.

5 Discuss what functionalities you added or removed. Why?

- **CaloriesTrack Added**: This feature integrates our creative components to dynamically calculate and summarize the user's calories and energy consumption, thus helping the user to visualize his/her own exercise and consumption, and thus linking with the three functions of SportSearch, FoodSearch and NutrientTrack to form a complete chain of applications that can help the user to track both intake and consumption.

- **scheduleTrack Removed**: One of the first features we designed was scheduleTrack, but after careful consideration, we decided to remove it. While we provide a great schedule for users to help them plan their nutrition, exercise, and routine, adherence was an issue and we couldn't have a direct impact on users through this feature alone. We also decided to remove this feature for the time being because it was causing users to feel stressed and uncomfortable when using our product.

6 Explain how you think your advanced database programs complement your application.

Apart from SEARCH queries for food search and sport search, we have advanced database programs as is shown in Figure 7, which satisfy all detailed feature requirements of stage4.

`AddDoSports(userId)` is a transaction for INSERT user's new sport records, which ensures that sport records in the sport cart are either completely added to the database or not added at all, thus maintaining data integrity. In transaction `AddDoSports(userId)`, procedure `UpdateDailyCalories()` will be called to update user's daily intake and burnt calories amount if INSERT operations are successful, which ensures that summaries in Sport Track are always based on latest data. Moreover, trigger `triggerAddDoSports` works before INSERT to ensure that sportTrack items inserted don't have time overlap. This makes sense because a person cannot swim and run at the same time, even if these two sportTrack items have different entries.

`AddFoodIntake(userId)` is a transaction for INSERT user's new intake records, which ensures that user intake records in the food cart are either completely added to the database or not added at all, thus maintaining data integrity. In transaction `AddFoodIntake(userId)`, procedure `UpdateDailyNutritionIntake()` will be called to update user's daily intake for each amount and for each food category.

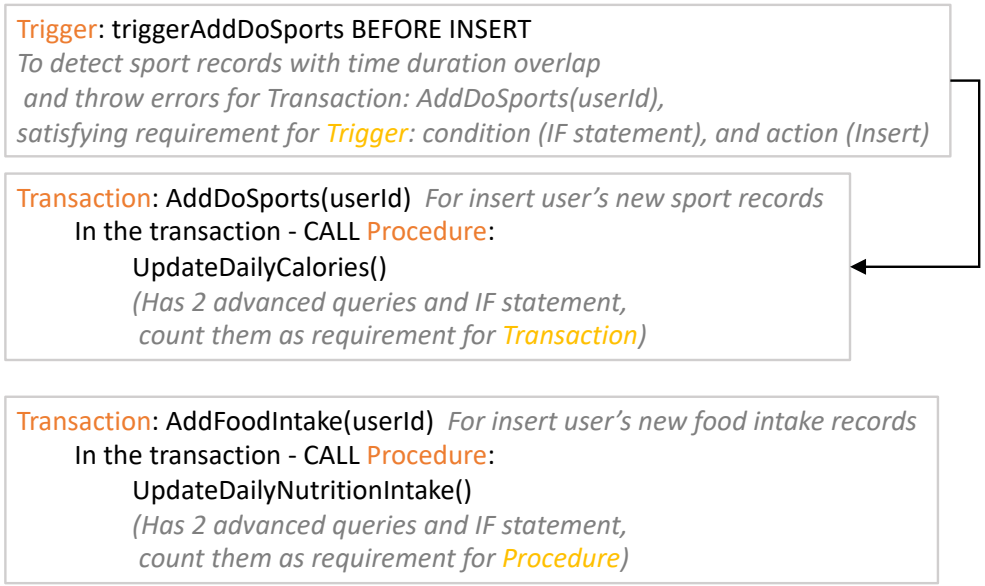

Figure 7: Outlines of our trigger, transactions and procedures, which satisfy all detailed feature requirements.

7 Each team member should describe one technical challenge that the team encountered.

- It is a challenge to develop procedures `UpdateDailyCalories()` and `UpdateDailyNutritionIntake()`, where we cover cursor, advanced queries, temporary tables, INSERT, UPDATE, and need to combine results of advanced queries. It takes us quite a long time to make these two procedures bug-free.
- It is a challenge to properly connect backend APIs with frontend. We frequently meet bugs of backend cannot receive or parse values from frontend, or the frontend cannot get response from the backend.

- It is challenging and important to ensure all user requests can be properly processed, so we add format validation to date and number input, and add comprehensive input error handling to login and signup.
- Food cart and sport cart functionalities are also very challenging, where the frontend needs to make use of local storage, and frequently interact with the backend to show food information, do INSERT transaction, and show database errors when insert transaction fails.

8 Describe future work that you think, other than the interface, that the application can improve on

- **SportSearch Optimization**: The current exercise search function has been relatively perfect, but there are still some problems, such as the way of recording exercise is cumbersome, exercise for different body types, different age consumption is different, we need to get more data to help different people to find the right kind of exercise for their consumption. It would be better if we can integrate these exercises as a program and then recommend a summary to give the user an exercise plan for specific needs. In addition, Ideally, the app should be able to automatically detect when a user is exercising and then record the time to make it easier for the user to use the app.
- **Database Optimization**: Integrating NoSQL solutions into our HealthTrack database could offer significant flexibility and performance advantages, particularly for handling semi-structured or unstructured data, and for scenarios where read and write speeds are critical.

  For example, Document Stores for User and Activity Data: A NoSQL document store like MongoDB could be used to manage user, sportTrack, and nutriTrack data. These document stores excel in handling varied and complex data structures which can evolve over time. For instance, each user document could embed the details of sports activities and nutritional intake directly, simplifying queries related to a user's daily or historical activities.

9 Describe the final division of labor and how well you managed teamwork.

Our collaboration is basically good, the division of our application development labor is shown as follows:

- Muzi Peng(muzip2): Backend; Frontend's creative components; Database construction & optimization
- Weilong Li(weilong3): Backend; GCP deployment; Database construction & optimization
- Rutuja Narwade(narwade2): Frontend
- Zhuofan Zeng(zz115): Frontend