8020FIT Web Application

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Abstract— **Maintaining a balanced fitness routine and diet is essential for good health and well-being. Many people struggle with this due to many factors such as knowledge of fitness and nutrition, and lack of time to exercise. This paper presents 8020Fit, a fitness webapp that takes users data such as body type, fitness goals, equipment available, ingredients available, time constraints, and goals to create a tailored fitness and meal plan for the user. The application also provides an adaptive environment, by adjusting the plan based on progress and personal changes. This is aiming to make fitness programs, meal plans, and personal training more accessible to a wider audience. The webapp uses data-driven recommendations and other interactive features to improve user experiences. This document explains the system's designs, technology stacks, and frameworks.**

Keywords— **web application, fitness tracking, workout recommendations, nutrition, meal plan, AI**

I. INTRODUCTION

Poet Leigh Hunt once said, "The groundwork for all happiness is good health". Us at Fit Force believe this to be very true. Fitness is a crucial part of our health and well-being. It offers a number of benefits from heart health to brain function and of course stronger muscles and bones. Studies show how physical activity can even impact mental health. The study demonstrated that endorphins released during workouts improves depressive symptoms and overall mood in people of all ages. [4] Even little steps can go a long way. Working out for at least 30 minutes a day can reduce the risk of health problems.

Proper nutrition alongside physical activity is important for maintaining overall health and well-being. Nutrition provides the body with necessary vitamins and minerals needed for daily functions. Not a lot needs to be said to stress how important a balanced diet is for the body. It provides proteins, healthy fats and carbohydrates that result in an improvement in immunity, physical strength, and cognitive function. Together, good nutrition goes hand in hand with exercise to create the healthier lifestyle we deserve; however, it is not as easy as it seems.

In today's fast-paced world, maintaining this kind of physical health can be a challenge. People typically strive consistency regarding the gym but many struggle to find stay on the right path. Having no clear plan or guidance, financial constraints and/or lack of time or motivation are leading causes for gym goers to quit their memberships. According to a study, while many people start gym memberships, a significant portion doesn't maintain consistent attendance. [3] Our webapp bridges this gap by providing workout plans designed to help users improve their physical health with the convenience of your phone or computer. With routines tailored to your personal needs, our app makes fitness accessible to everyone regardless of experience.

II. LITERATURE REVIEW

For the development of our webapp 8020FIT, the focus was to help any end user seamlessly optimize their nutrition and fitness tracking. We felt that not enough applications provided nutrition recommendations alongside fitness advice. To give a comprehensive overview of technological integrations regarding fitness and nutrition tracking, a summary of health outcomes for the end users along with the technological advancements that aid functionality needs to be outlined.

1. The Effectiveness Of Digital Health Interventions

Recent studies have shown the benefits of the slightest digital health interventions, like wearable activity trackers, when it comes to encouraging physical activity as well as improving health outcomes [1]. The review reported improvements in physical activity levels with SMD (standardized

mean differences) ranging from 0.3 to 0.6, this translated into 1800 extra steps per day and 40 minutes more walking [1] just with the implementation of something like a wearable activity tracker. From the result of the study from Lancet Digit Health, the more gamification is implemented into fitness and nutrition tracker, the better for overall health [1].

2. Integrated Approach To Fitness And Nutrition

Integrating fitness and physical activity for proper health outcomes has been well documented in major studies. Lancet Digital Health conducted a meta-analysis that spanned over seven major databases (Embase, MEDLINE, Ovid Emcare, Scopus, SPORTDiscus, the Cochran Library, and Web Of Science). This study documented the effects of tracking fitness and nutrition metrics using wearable devices. The meta-analysis along with 39 systematic reviews, resulted in 163 out 992 participants (from healthy and non-healthy populations) improving their body composition from SMD 0.7 to 2.0 as well as reductions in bodyweight of precisely 1 kg [1]. This integrated approach aligns with the design of 8020FIT, which combines the workout recommendations with nutritional guidance to emphasize to the end user how easy tracking can be when integrating simple technology.

3. User Experience And Engagement

User engagement and experience is crucial when it comes to the success of digital health interventions. Translational Behavorial Medicine did a systematic review regarding DBCIs (digital health behaviour change interventions) and concluded that important factors that effected the success of implementing DCBIs consisted of personal relevance, ease of use, and interactive features [2]. For 8020FIT, we wanted to emphasize user friendly interface, custom tailored fitness and nutrition plans, and interactive elements like the AI chatbot feature. Our web-app emphasized on a custom-tailored approach with our quiz feature, which asks questions that gauge the lifestyle, fitness, and nutritional aspects of the end user. This data is then inputted into DynamoDB, and the workout and meal plan are generated from the API.

III. PROJECT REQUIREMENTS

The goal of our project is to develop a web application that coalesces information about maintaining a healthy lifestyle through individualized workout routines and unique nutrition plans based on user input. The 8020FIT application must meet a variety of functional and non-functional requirements to ensure its usability and effectiveness for both fitness users and administrators.

1) Functional Requirements

The functional requirements for the 8020FIT web-app are as follows:

1. User Registration: The application must permit users to access register for an account using email address, name, age, and date of birth. Following registration, users will be able to sign in and out of the web-app.
2. Onboarding Quiz: After account creation, fitness users need to complete an onboarding quiz. The quiz obtains pertinent information about the fitness goals, available equipment, and preferences from users. Results are used in specific workout recommendations and meal plans.
3. Workout and Meal Plan Generation: The web-app will provide a unique fitness and meal plan based on the quiz information entered. AI-enhanced APIs and data storage allow for this feature to be updated regularly.
4. Progress Tracking: The fitness users can indicate which exercises have been completed and view their progress periodically.
5. Profile Management: Web-app users can edit profile information to update fitness goals, weight, available equipment, and more. Respective changes will take effect in workout and meal recommendations.
6. Account Deletion and Password Reset: Users will have the option to regain access to the web-app if credentials are lost. Additionally, they can remove access to the account and delete data permanently.
7. Admin Management: Administrators will have access to dashboard where they view,

delete, and management accounts and access to the fitness platform.

8. AI Chatbot: The web application will include an interactive AI chatbot that will answer fitness related questions, explain aspects of their plan recommendations, and provide suggestions using natural language processing.

2) Non-functional Requirements

These additional nonfunctional requirements need to be met alongside the functional criteria:

1. Usability: The platform should be maintained to allow for easy navigation, intuitive routing, and user-friendly interface.
2. Performance: The web application should be able to display workout/meal information accurately in real time.
3. Maintainability: The code must be readable, modular, documented for easy updates.

3) Constraints

The following are constraints for the 8020FIT web-application:

1. The application should use React and TypeScript for the front end and AWS Amplify for backend.
2. The application should be developed, maintained, and integrated to meet the deadlines.

IV. TECHNOLOGIES

The 8020FIT web app is built using different serverless web technologies. For frontend development we used React.js, and we utilized TypeScript for both front and backend. The development environment used by the team is Visual Studio Code because of the cross-platform availability and the relative ease of use. The team went with AWS Amplify to build the product, because it simplifies many steps like setting up the infrastructure, handling authentication and keeping the data updated in real time [5]. To handle authentication, we are using AWS Cognito to manage signup, sign-in, and sessions [6]. AWS DynamoDB, a NoSQL database is used to store user data like quiz answers and workout routines [7]. To get the exercise data, ExerciseDB is the API that is we are using, it is a public REST API that provides categorized exercises along with their descriptions and GIFs. The user-specific data like fitness type and equipment availability, is handled by AWS Amplify API, which is a GraphQL API. Amplify sets GraphQL endpoints to facilitate interactions with DynamoDB. We want to provide our users with more ways to learn about fitness and healthcare, so we included a chatbot for our program.

V. ALGORITHMS AND METHODS

The 8020FIT web application uses various algorithms and techniques to provide personalized workout recommendations based on the user's input in the onboarding quiz.

A. *Rule-Based Mapping*

Our web application uses multiple functions like mapGoalToMuscles, mapFitnessTypeToMuscles, and mapEquipmentToName to map the user's answers in the quiz to the correspondent exercises and equipments.

B. RESTFUL API DATA FETCHING

This is used to connect the 8020FIT web application to the ExerciseDB API and the Spooncular API by integrating the users quiz data in order to make personalized API calls [8] [9].

C. RANDOM SAMPLING

After testing the application multiple times we noticed that the generated workouts are displayed in the same order every time and we felt that this look gets boring for some users after a while so we implemented a random sampling line of code to make the exercises vary in order each time the user opens the workout page.

D. AUTHENTICATION / ACCESS CONTROL

This is done by Amplify Cognito to secure API and data access with role-based access control. getCurrentUSER is used authenticate and connect the user with their specific data [6].

E. SET DEDUPLICATION AND SAMPLING

To avoid redundancies, our web app uses Set-based merging. It combines the results from different muscle groups, and then it shuffles the results

randomly and slices them up into a mix of 10 to 15 exercises. This way, the user gets a variety of exercises that target different muscle groups.

F. *Onboarding Data Retrieval*

For Spooncular API, the system retrieves data from AWS Cognito using the fetchUserAttributes() to get the user ID (userAttributes.sub). The user profile data is fetched from DynamoDB using Amplify's Data API. And then the previously saved diet preferences are also retrieved from DynamoBD.

G. *Demographic-Based Personalization*

Adjusts workout targeting based on, BMI (adds cardio or strength), age (adds mobility for 40+), gender (focuses on glutes or chest), body type (tailors based on ecto/meso/endomorph).

H. FILTERING AND NUTRITIONAL BALANCE

The focus will be on making the meal plan generation using Spooncular API user friendly. Implementation of a filtering algorithm will allow for post processing to ensure meals meet additional criteria. Meals are filtered on the server side by Spooncular API based on diet type, intolerances, and target calories. Target distribution for macronutrient intake are spread as such: breakfast (25% of daily calories), lunch (35% of daily calories), dinner (40% of daily calories). The macronutrient calculation are spread as such: Weight Loss (lbs * 12), Muscle Gain (lbs * 16), Maintenance (lbs *15), Protein (lbs * 0.82 grams).

I. LOCAL STORAGE MANAGEMENT

For moving the workouts selected to the tracker page, we implemented a local storage. When selecting the desired workout to add to your routine, it uses a unique key to store and then retrieve on the tracker page. Also able to dynamically change with delete functions and add. The storage is also used to check if the workout was already added to throw an error to the user that it's already on the user's routine.

J. *Workout History Sorting*

For the tracker the workout history was being saved by the type, being Cardio workouts first and then Strength workouts after, and then most recent workout submitted. We needed to sort it by date as it makes the most sense to have the newer workouts appear first and then the older ones after. We retrieve the history from the backend then using the built-in sort() function, we compared the dates of two workouts and returned the sorted workout.

K. HORIZONTAL SCROLLING

On the workout history list, it was outputting a centered list going top to down. This wasn't very space efficient on the page as it would increasingly get bigger and make scrolling tedious and make it harder to reach your workout routines. Using flexbox style, we're able to create a more user-friendly list.

L. *AI Chatbot*

We wanted to cover all bases for our users and thought that a chatbot will do that the best. We wanted to implement a chatbot that can answer any user questions relating to health and fitness using reputable sources, and that's exactly what we did. Using the program BotPress, we were able to create and train AI to answer questions quickly within the app. The chatbot takes its knowledge from sites such as the National Institutes of Health (www.nih.gov), or the Exercise and Fitness section on the nutrition website. (https://www.nutrition.gov/topics/exercise-and-fitness). Artificial intelligence has been a great help with providing users information from hundreds of sites that we as programmers are not able to answer. However, we decided to not use AI for the whole web app as it is not always accurate. We wanted to provided information from trusted API's so that workout plans and meal plans are more realistic. Located on the bottom right side of the web app, the chatbot allows users to get answers to their questions with ease.

V. CONCLUSION

Our web app, 8020Fit, aims to be a complete platform that has personalized fitness and nutrition all in one single stop. By using technologies such as AWS Amplify, Dynamo DB, and APIs like Spoonacular and ExerciseDB, we are able to deliver customised workout regiments and meal plans that can also adapt to user's needs and changes. The users will receive an experience that is not only dynamic, but engaging as well, with AI-driven interaction, intuitive UI design, and recommendations that are based on logged data. 8020Fit overcomes some barriers to fitness, such as lack of time, guidance, or consistency. With its personalized questionnaire,

8020Fit can tailor practical solutions and small changes that will fit into daily life. This project proves how the thoughtful use of technology can allow users to personalize their experience, take control of their health and wellness, and achieve their goals. Fitness and nutrition can be more accessible and inclusive to everyone's wants, needs, and means.

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