Design Document

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Index

Purpose

Working out and dieting are difficult and time-consuming tasks, where newcomers and frequenters alike struggle to accomplish their goals efficiently and effectively. The idea of our mobile workout app is to make this process easier, helping you plan workouts and diets, stay on schedule for specific goals, and facilitate communication with others to see how your journeys overlap. Current fitness and nutrition apps, like *MyFitnessPal* and *Hevy*, are often overly complex or focused on only one aspect of health, forcing users to use multiple platforms and making it more challenging to achieve the desired benefits. Our app addresses this gap by combining workout logging, diet tracking, and personalized fitness guidance in one streamlined platform tailored to individual goals, habits, and progress.

Forge is designed to consolidate all of the important features that are important to gym features and those who care about their fitness. An app that can track workouts and diets, give you advice on those things, and keep you motivated to improve your health is a valuable feature to the community. Our app's goal is to create an accessible and quality program that will make it much simpler for gym users to keep track of everything that is important to continuing a healthy life.

Functional Requirements

1. User Account

   <u>As a user,</u>

   - I will partake in an onboarding process that will consist of age, height, weight, goals, and experience
   - I would like to be able to create and manage an account for the app, such as creating and changing a username or bio.
   - I would like to be able to reset my password.
   - I would like to be able to easily navigate to the workout, diet, and social tabs through the use of a menu.
   - I would like to be able to read and agree to a TOC.
   - I would like to be able to delete my account.
   - I would like to be able to set up notifications for workouts, meals, etc.

- I would like to be able to enable certain accessibility features (dark mode, large text).
- I would like to be able to maintain a week-by-week workout.
- I would like to be able to maintain diet streaks.
- I would like to be easily able to convert recipe and weight amounts between metric and imperial.
- As a user, I would like to be able to select a location, so I can see gyms and people near me.

2. Workout Tracking

   <u>As a gym user</u>,

   - I would like to be able to track my workouts by logging the workout, reps, weight, and sets.
   - I would like to be able to have cardio machines suggested to me for targeted fat loss.
   - I would be able to upload and save my prior gym routines.
   - I would like to be able to upload my workouts to a community space.
   - I would like to be able to add tags to my workouts to make them easier to find.
   - I would like to be able to search for different workouts based on the tags assigned to them.
   - I would like to be able to view shared workouts and do them myself.
   - I would like to be able to schedule my workouts on a calendar.
   - I would like to know where to get started in my fitness journey and make consistent progress.
   - I would be able to identify key techniques and strategies to improve that I otherwise wouldn't have noticed.

3. Diet Tracking

   <u>As a dieter,</u>

   - I would be able to view the macros of different meals from national restaurants.
     - This can be provided through a large database such as MenuStat.
   - I would like to be able to chart my daily macro and water intake.
   - I would like to be able to set macro and water goals to hit daily.
   - I would like to be able to set certain junk foods to avoid.
   - I would like to have the app automatically adjust my caloric goals based on previous days.

- I would like to be able to upload custom meals to a community space.
- I would like to be able to save meals from the community space.
- I would like to be able to apply certain tags to my meals to make them easier to find.
- I would like to be able to search for different meals using the tags assigned to them.
- I would like to be able to filter community meals based on servings, calories, protein, cuisine, complexity, or other important components.
- I would like to be able to react to different meals using a like feature, emojis, or comments.
- I would like to select ingredients that I currently own to get meals based on those ingredients.
- I would like help settling into a diet with less strict requirements initially, or a cheat day to allow myself an easier transition initially.
- I would like to know what national chain meals fit into my diet.

4. Social Features

   <u>As a social user,</u>

   - I would like to find other weightlifters nearby.
   - I would like to be able to “friend” other users.
   - I would like to be able to message other users in the app.
   - I would like to be able to view the progress of my friends in the app.
   - I would like to be able to “unfriend” any users.
   - I would like to be able to block any users who harass me.
   - I would like to be able to report any users who violate the app TOC.
   - I would like to be able to share or show off my progress to my friends.
   - I would like to be able to decide whether my progress is public or available only to specific users.
   - I would like to be able to view my friends’ streaks.
   - I would like to be able to “like”, react with emojis, and comment on different shared workouts and meals.
   - I would like to be able to make collaborative goals with my friends, where we all try to complete a similar goal and hold each other accountable.

5. AI Features

   <u>As a user,</u>

   - I would like to be able to have weekly and monthly diet and workout reports generated.

As a gym user,

- I would like to be able to have weekly and monthly diet and workout reports generated.
- I would like to be able to have alternative options suggested if a machine or exercise isn't available or is undesirable.
- I would like to have workouts change based on the inability to do certain workouts, such as due to injury.
- I would like to be able to get a natural weight progression based on how often I work on a specific workout.
- I would like advice on how to recover from an injury.
- I would be able to take a video of my lifts and harness AI to correct my form if need be.
    - Due to the large scale of this story, this will take significantly longer than other stories, approximately 30 hours. This was discussed with the coordinator.
    - The primary challenges in this story come from being able to analyze form using AI, as it would require a large dataset of exercise videos to train on to compare an arbitrary video. It would not only have to recognize the technique but compare it to a "perfect" technique as well, and pass the results to an LLM to formulate feedback.
- I would like exercises recommended to me based on my experience level, which I have stated in my onboarding.
- I would like to be able to generate a gym routine based on the muscle group to train.
- I would like tips or advice on how to do a specific exercise for the first time, embedded as a help button.

As a dieter,

- I would be able to have recipes suggested to me for various goals related to weight loss or muscle gain.

Non-Functional Requirements

1. Server

   As a developer,

   - I would like 20-40 users to concurrently be able to use the app initially
   - I would like to be able to deploy cloud or deployment services if our user base is larger than our initial estimate
   - I would like the server to allow for real-time user communication
   - I would like the server to collaborate with the database to store or retrieve data

2. Appearance

   As a developer,

   - I would like the UI to be easily accessible for all users
     - Allow for dark, colorblind, or greyscale modes
   - I would like all displayed features on the app to be easy to understand for the average user
   - I would like switching between features to be seamless from an appearance standpoint
   - I would like the UI to look visually appealing, drawing the user's attention

3. Performance

   As a developer,

   - I would like AI prompting to produce a response in 5-10 seconds
   - I would like to add new data, which is efficiently processed and quickly displayed
   - I would like the screen to update extremely quickly on inputs or changes

4. Usability

   As a developer,

   - I would like the app to be easy to navigate
   - I would like to have a multitude of well-made features
   - I would like different screen sizes to be able to use the app seamlessly
   - I would like the space of the app to be efficiently used, where it is not empty nor crowded
   - I would like old data to be easily accessible
   - I would like data to be modified or added efficiently

5. Scalability

As a developer,

- I would like the server to be able to be duplicated for a larger user base
- I would like the database to be able to be fragmented to allow for a larger user base

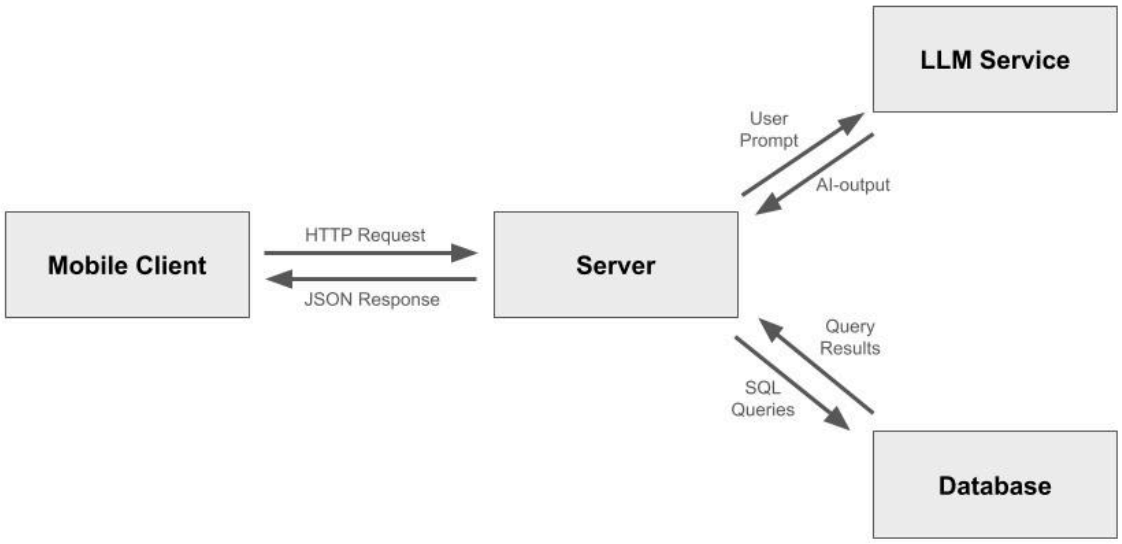
Design Outline

This project is a mobile application that integrates workout tracking, diet management, social features, and AI-based fitness guidance into a single platform. The system follows a client–server architecture where a React Native mobile client communicates with a FastAPI backend server through HTTP requests and receives JSON responses. The backend manages application logic and user profile data stored in a SQL database, and it will also leverage Pinecone vector databases to build prompts for an LLM agent through the API.

High-Level Overview

1. Client
    a. Serves as the main interface for the user
    b. Allows users to complete onboarding, log workouts and meals, track progress, and interact socially.
    c. Sends inputted information as HTTP requests to the server and receives responses in JSON format.
    d. Parses the data received from the server and displays the information to the user.
2. Server
    a. Serves as the central coordinator between the client and the database.
    b. Receives and processes HTTP requests from the client.
    c. Validates requests and queries the database to retrieve or update data.
    d. If data is requested, the server returns the required information to the user.
    e. Pulls profile information from the database and prompts it as a vector database to the LLM wrapper API, keeping it off the device
    f. Updates profiles in the database as health goals are met, and status is changed
3. Database
    a. PostgreSQL relational database management system stores and maintains user profiles (age, weight, height, gender, health status, health goals), as well as a static populated bank of meals, ingredients, exercises, workouts, and splits.

b. Responds to queries from the server, updates profile information as needed



Design Issues

Functional Issues:

1. What information is required of users when they create an account for the first time?
    - Option 1: Created username and password
    - Option 2: Username, password, and email for two-factor authentication
    - Option 3: Username, password, then a thorough onboarding process

    Choice: Option 3

    Justification: For a workout and diet tracker as thorough as *Forge* will be, there is a lot of information that we could use to create the perfect workout and dieting routine for an individual. This is what the onboarding process is designed to do: ask for information such as age, weight, height, gym experience, maximum lifts, gym goals, and how often they can attend the gym. This will allow us to tailor a routine to a specific individual instead of making a general template that may be difficult to follow based on an individual's life.

2. What features should be offered by *Forge*?
    - Option 1: Workout & Diet Tracker with personalized advice, and social features to encourage collaboration in the gym community
    - Option 2: An AI chatbot to help with workouts
    - Option 3: A comprehensive space where you can learn how to do each exercise in the gym

    Choice: Option 1

    Justification: There are many workout trackers and diet trackers on the market already, with very similar features to each other. However, *Forge* aims to make a centralized app for all the fitness-related features, alongside LLM-assisted personalized advice. Along with that, *Forge* offers social features such as friends, posting, and sharing workouts/diets to encourage an inviting workout community. This option best aligns with the vision for *Forge* and sets it apart from its competitors.

3. How are we going to push users to reach their desired workout/diet goals?
    - Option 1: Tell them whenever they open the app
    - Option 2: Create weekly checkups, showing how much a user missed a goal by, or how well they did in achieving it
    - Option 3: Provide push notifications, in-app reminders, and incentives such as a streak system

    Choice: Option 3

    Justification: Push notifications are frequently used in other apps, such as *Duolingo* and *MyFitnessPal,* to incentivize users to use the app daily. Combining this with reminders in the app itself, alongside dopamine systems such as streaks, will further make users want to and remind them to use the app and meet their goals.

4. How can users interact/collaborate socially to create a more motivating and engaging workout platform?
    - Option 1: Message friends on the app about working out
    - Option 2: Share posts, follow friends, and be able to like and comment on posts
    - Option 3: Participate in a leaderboard to compare maxes between individuals

    Choice: Option 2

    Justification: Not just being able to post about your progress, but being able to interact with the posts will create a much more engaging environment. Being able to follow and contact people will allow people to stay connected and engage with each other, while supporting each other along the way.

5. What features do we want our AI chatbot to be able to assist with?
    - Option 1: Diet & Workouts
    - Option 2: Guidance to other workout applications for assistance
    - Option 3: General questions, such as how to solve a math problem or cook a steak

    Choice: Option 1

    Justification: Having an AI assist with the individual features of the app is a necessity, and if it can interact with the individual features, it

should help with all the features. Creating diet and workout advice should be easy for an LLM, as there are tons of training data online about workouts and dieting advice.

Nonfunctional Issues:

1. What frontend language/framework do we want to use for this mobile app?
    - Option 1: Swift
    - Option 2: React Native
    - Option 3: JavaScript

    Choice: React Native
    Justification: Using a mobile application, we wanted to use a framework that would work well to create UIs on phones. When choosing a framework, Swift was an early option, but React Native can work on both iPhones and Androids,
    compared to Swift being only available on iOS, allowing for a larger potential user base. Since React Native is an extension of JavaScript specifically made for mobile development, it made sense to choose it over just basic JavaScript.

2. What backend language/framework do we want to use for this mobile app?
    - Option 1: Java
    - Option 2: Python
    - Option 3: C++

    Choice: Python
    Justification: Python is extremely flexible and fast to implement, while also still allowing for lots of customizability in the API infrastructure. Python has plenty of libraries allowing for support between databases, web servers, etc.

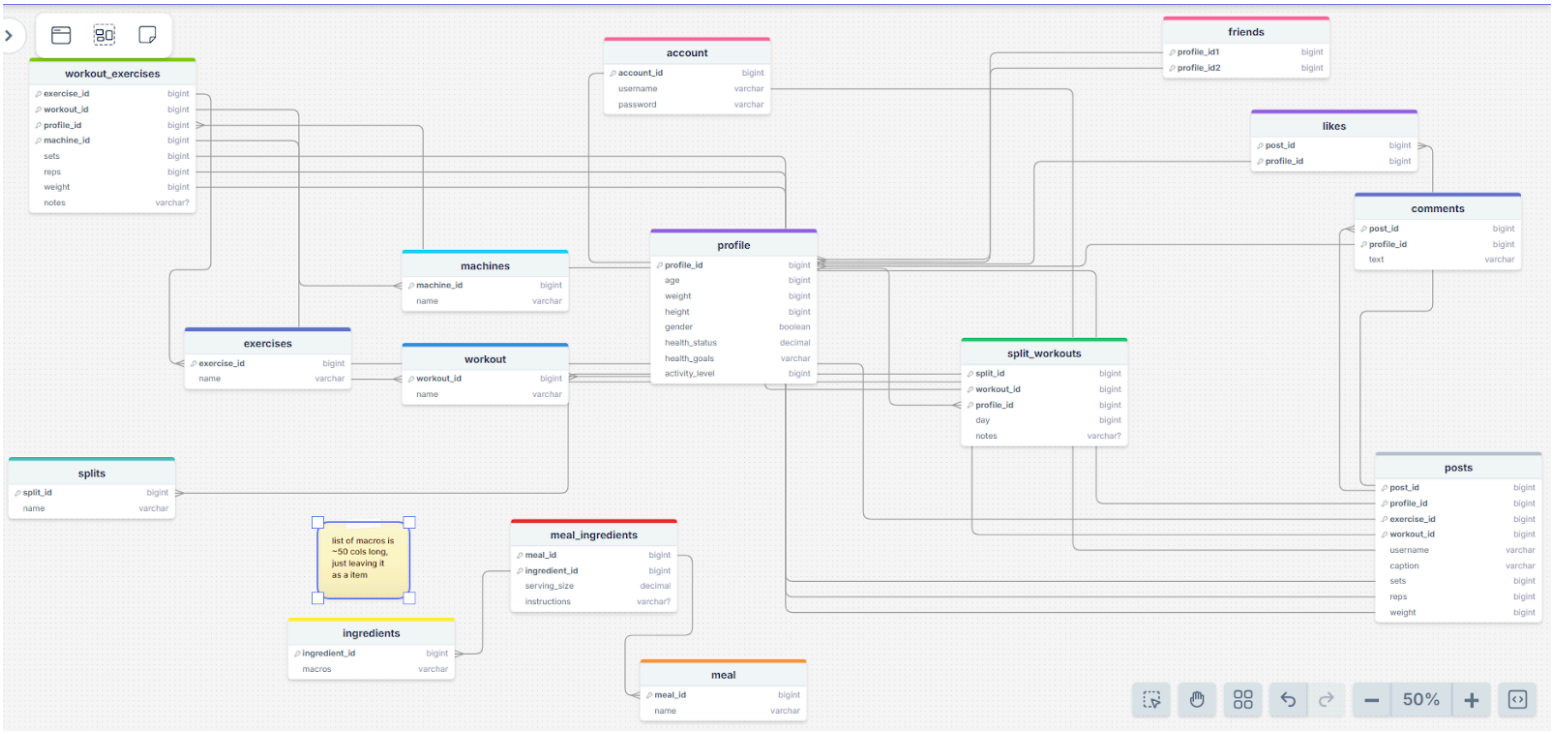
3. What database do we want to use?
    - Option 1: SQL
    - Option 2: Designed with SQL, implemented with FastAPI and Pinecone
    - Option 3: MongoDB

Choice: Option 2
Justification:
SQL as the primary database and Pinecone as a vector database, exposed through a FastAPI service.

- SQL is best for structured app data such as accounts, profiles, workouts, meals, exercise logs, friends, posts, likes, and comments. It enforces relationships, reduces duplication, supports reliable transactions, and makes analytics queries straightforward.
- Pinecone is best for the chatbot because it enables semantic search (vector similarity) over unstructured text. This lets the assistant retrieve the most relevant nutrition/workout guidance, FAQs, and user-specific summaries and then generate accurate, context-aware responses.
- FastAPI is a strong fit for this architecture because it is lightweight and modern: it supports async endpoints for calling the LLM + Pinecone efficiently, provides automatic API documentation, and encourages clean request/response schemas using type hints

Design Details

Class Design



Descriptions of Classes and Interactions

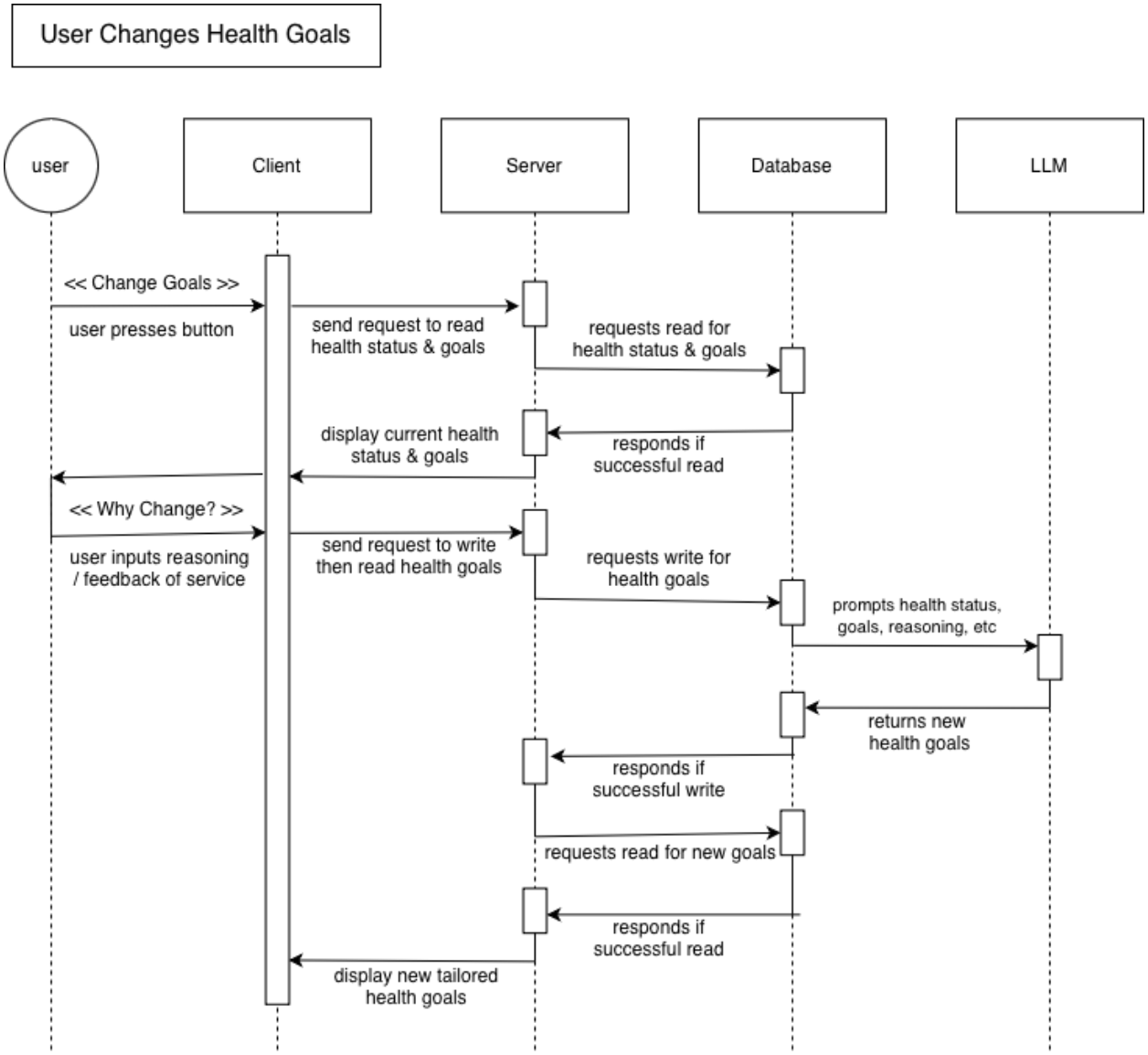
- **Account**
    - An account object will be created when a user decides to sign up with our app
    - Each account is given a unique user id
    - Each account will use a username and password to log in to their specific account
    - Each account will correspond to a certain profile
- **Profile**
    - A profile id is associated with a specific account id
    - Profiles contain data that is input during onboarding when an account is created
    - Profiles will contain age, weight, height, gender, health status, health goals, and activity level
    - Profiles will be used in almost every other aspect of the app
        - Workouts/Splits
        - Posts
        - Likes
        - Comments
        - Friends
    - If an account is deleted, the profile is also deleted
- **Exercises**
    - Each exercise will be given a unique exercise id
    - An exercise will be given a name, such as “bicep curl.”
    - Each exercise will be associated with a specific workout or muscle group
- **Workouts**
    - Each workout will be given a unique workout id
    - Each workout is given a specific name for user comprehension, such as “bicep.”
- **Splits**
    - Each split will be given a unique split id
    - Each split will be given a specific name so users know what each

split will be, such as “upper-lower-legs.”

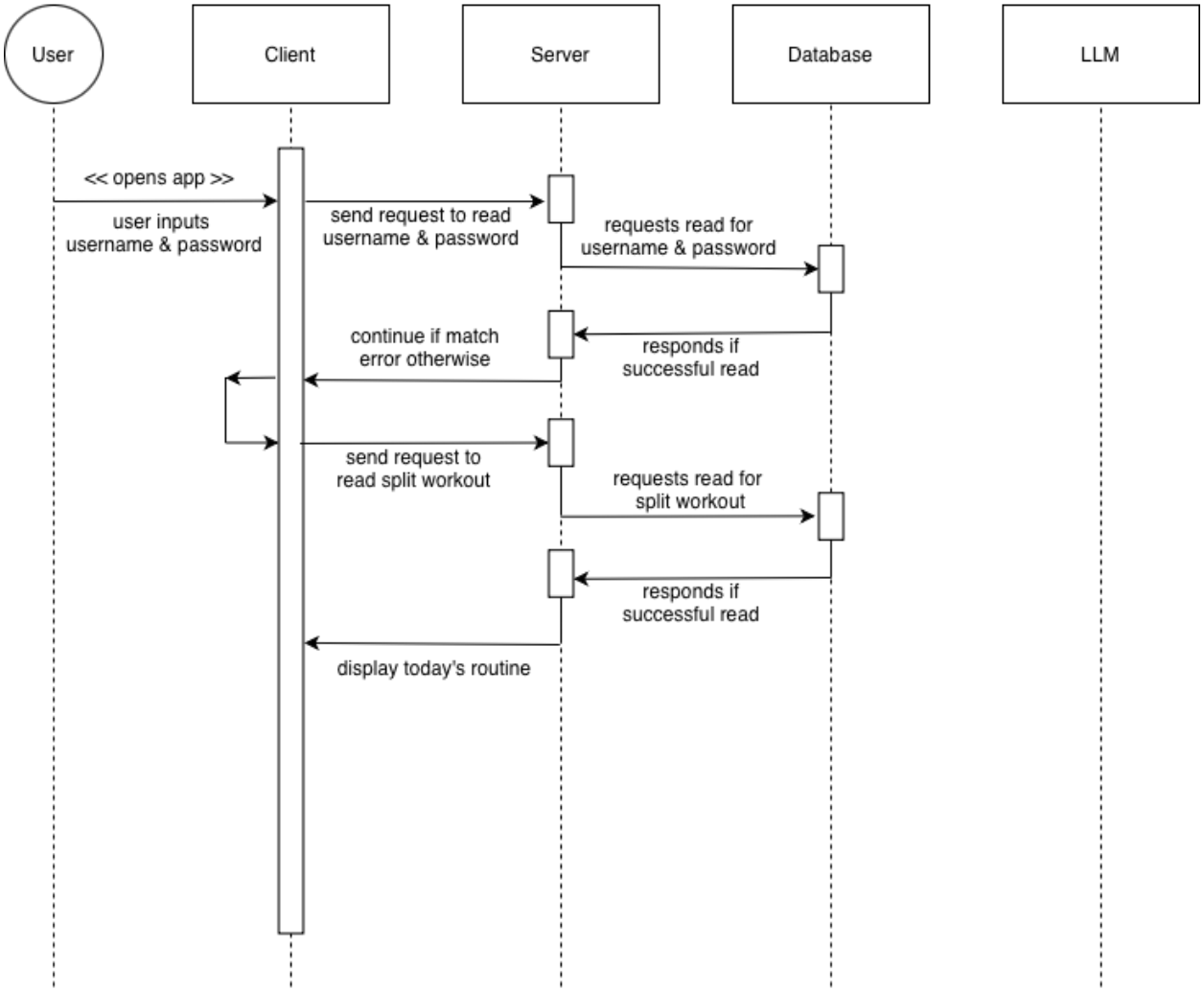
- **Machines**
  - Each machine will be given a unique machine id
  - Each machine will be given a corresponding name for easy identification by users
- **Workout Exercises**
  - Workout exercises are what make up a workout
  - Workout exercises use workout ids, exercise ids, and profile ids to connect the given exercise to a profile’s workout
  - Machine ids are sometimes used with workout exercises if a machine is applicable
  - The number of sets, reps, and the amount of weight are stored as numbers for each exercise in a workout
  - Notes are available for each workout exercise, explaining how to do the exercise
- **Split Workouts**
  - Split workouts are what make up a split
  - Split workouts use workout ids, a split id, and a profile id to connect the given workout to a profile’s split
  - The day of each split is also stored in a split workout
  - Notes for each split workout are included, explaining what each workout corresponds to in the given split
- **Friends**
  - Friending is a relationship between two users, profile1 and profile2
  - Profile1 and Profile 2 will gain a friend as a result of this interaction
  - Friends can like or share posts with other friends
- **Posts**
  - Each post will be given a unique post id
  - A profile id, a workout id, and an exercise ID correspond to each post
  - The username associated with the profile and the caption provided are displayed in each post
  - The sets, reps, and weight that are found in workout exercises

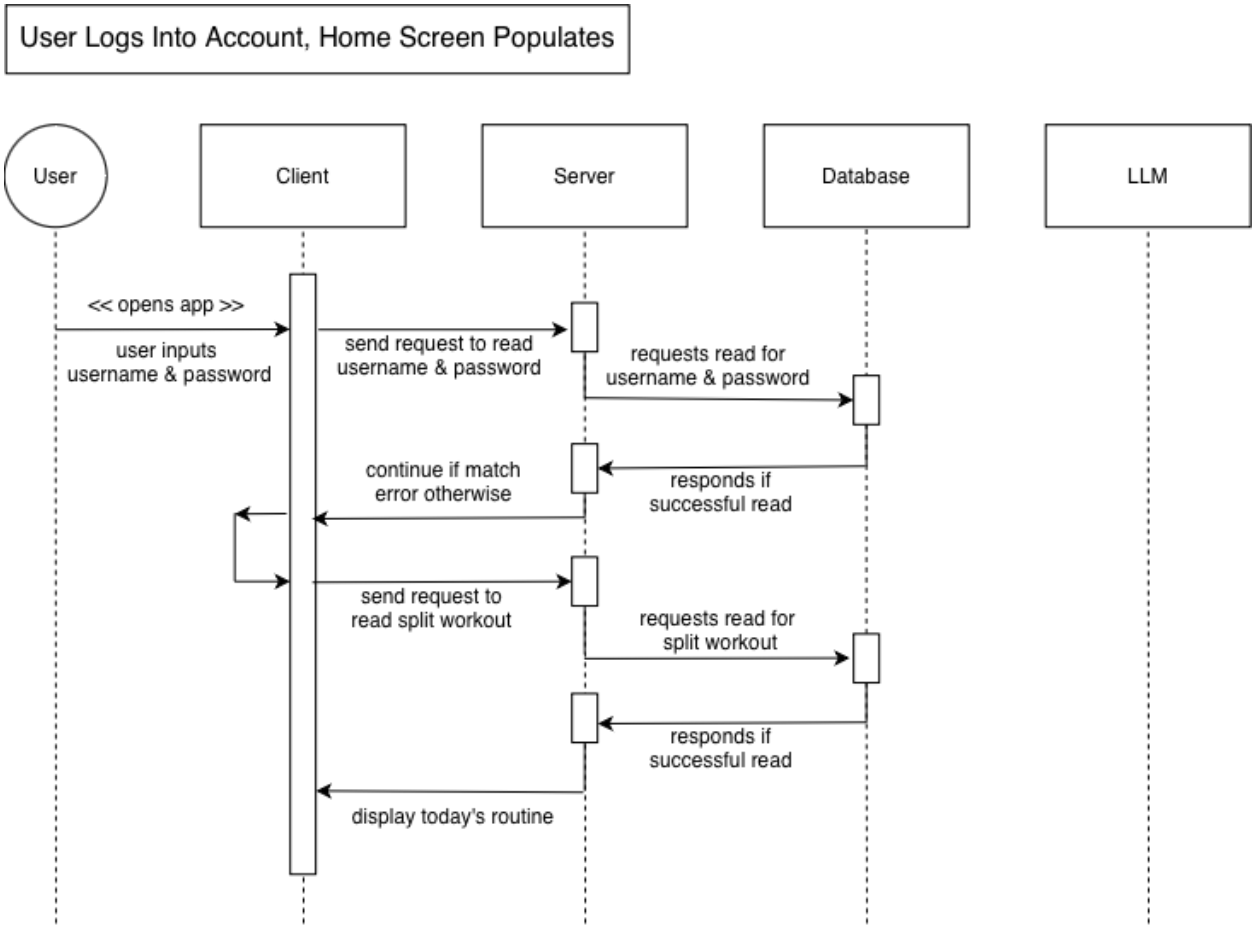
are displayed in the post
    - Posts can be shared with all workout information to friends and other users
- **Likes**
    - Liking is a relationship between a profile and a post
    - A user liking a post will show on their end, as them changing the post to be liked
    - A user having a post be liked will show as the post gaining a like from a specific profile in the app
- **Comments**
    - Commenting is a relationship between a profile and a post, very similar to a like
    - Unlike liking, commenting has a block of text that will become a part of the post
    - The original post will stay the same, but a subset of text called “comments” will host all comments made by separate profiles
- **Ingredients**
    - Each ingredient will be given a unique id
    - Each ingredient will be given a corresponding name for user identification
- **Meal**
    - Each meal will be given a unique id
    - Each meal will be given a corresponding name for user identification
- **Meal Ingredients**
    - A specific meal id and several ingredient ids are found in a meal ingredients object
    - Meal ingredients have a certain serving size or quantity that should be used for each one
    - Instructions for how to make the meal are also included in this object

Sequence Diagrams

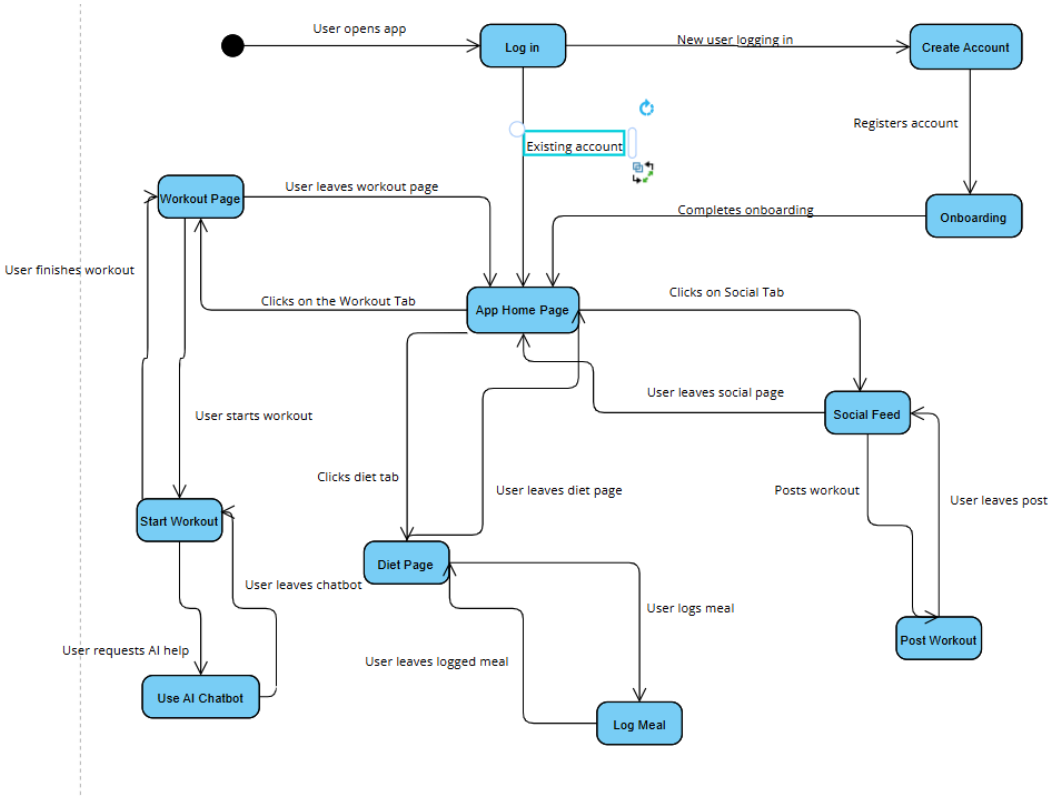


User Logs Into Account, Home Screen Populates



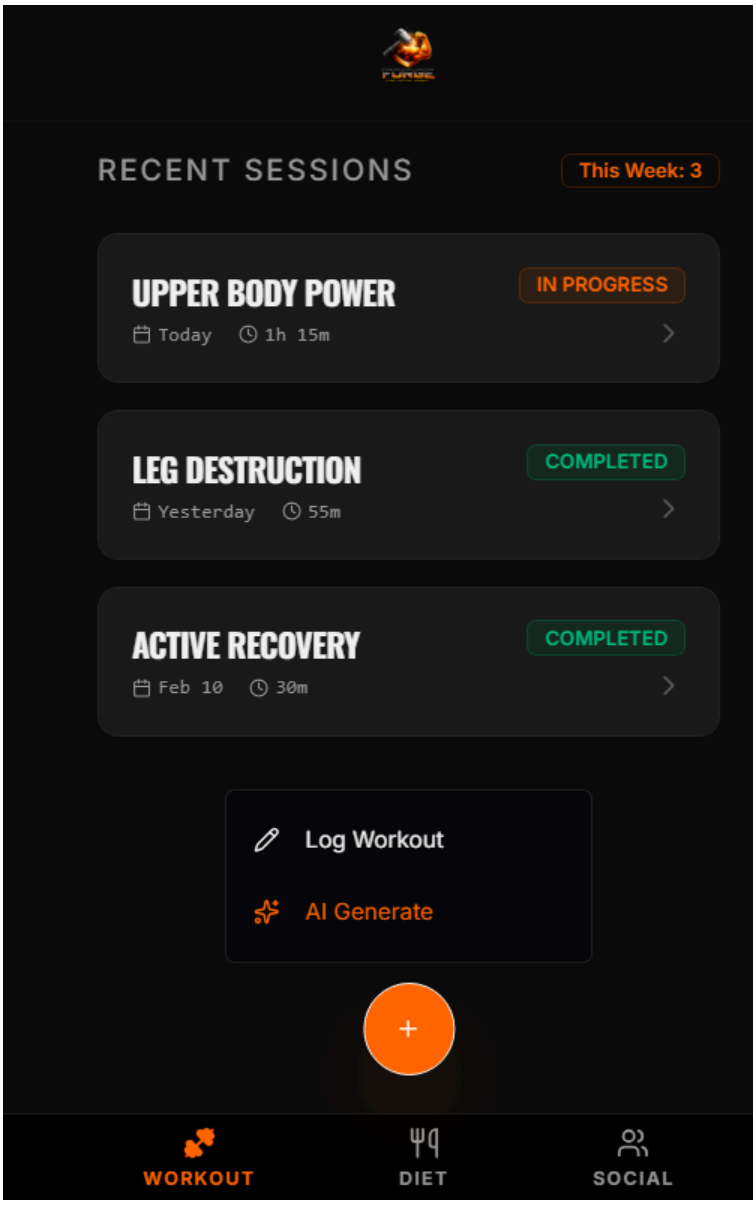


State/Activity Diagrams

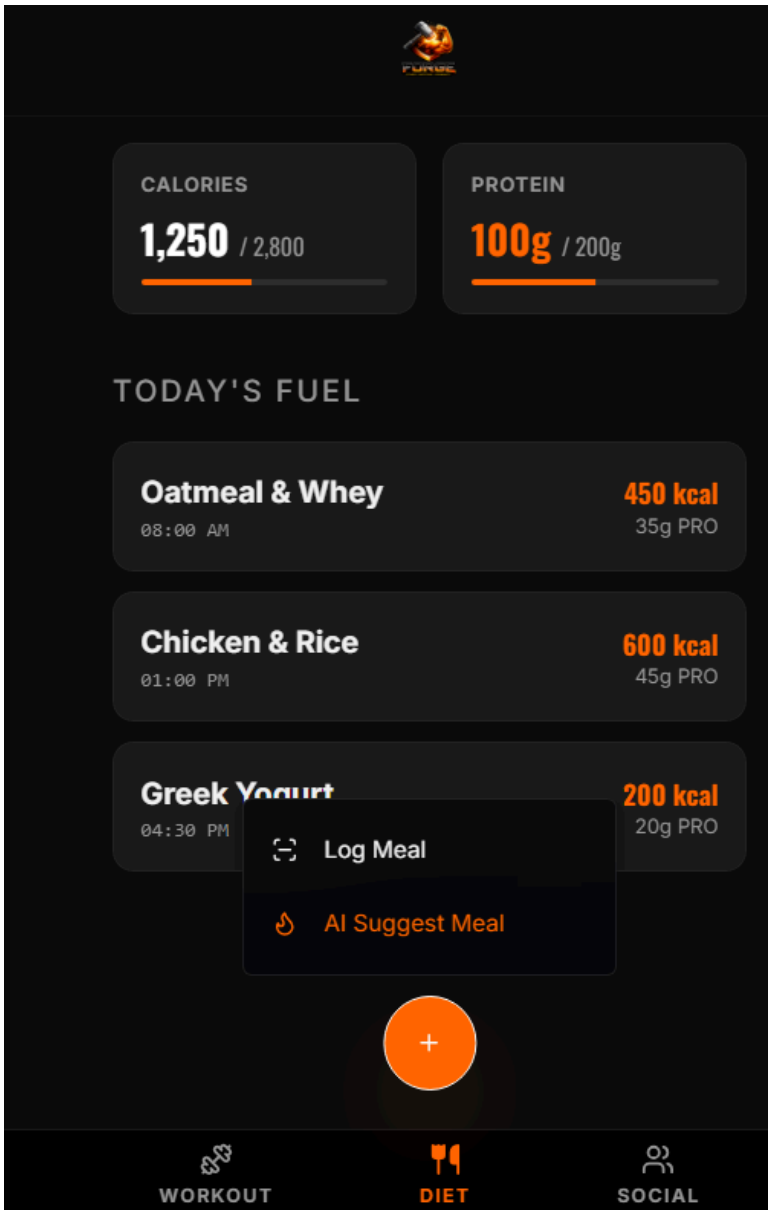


This diagram shows that although there are a large number of features in this app, the app is very condensed into a few subsets for its structure: workouts, diets, and social feed. For all of our features, it only takes a few steps to get any specific feature, and only a few more to get to any other feature.

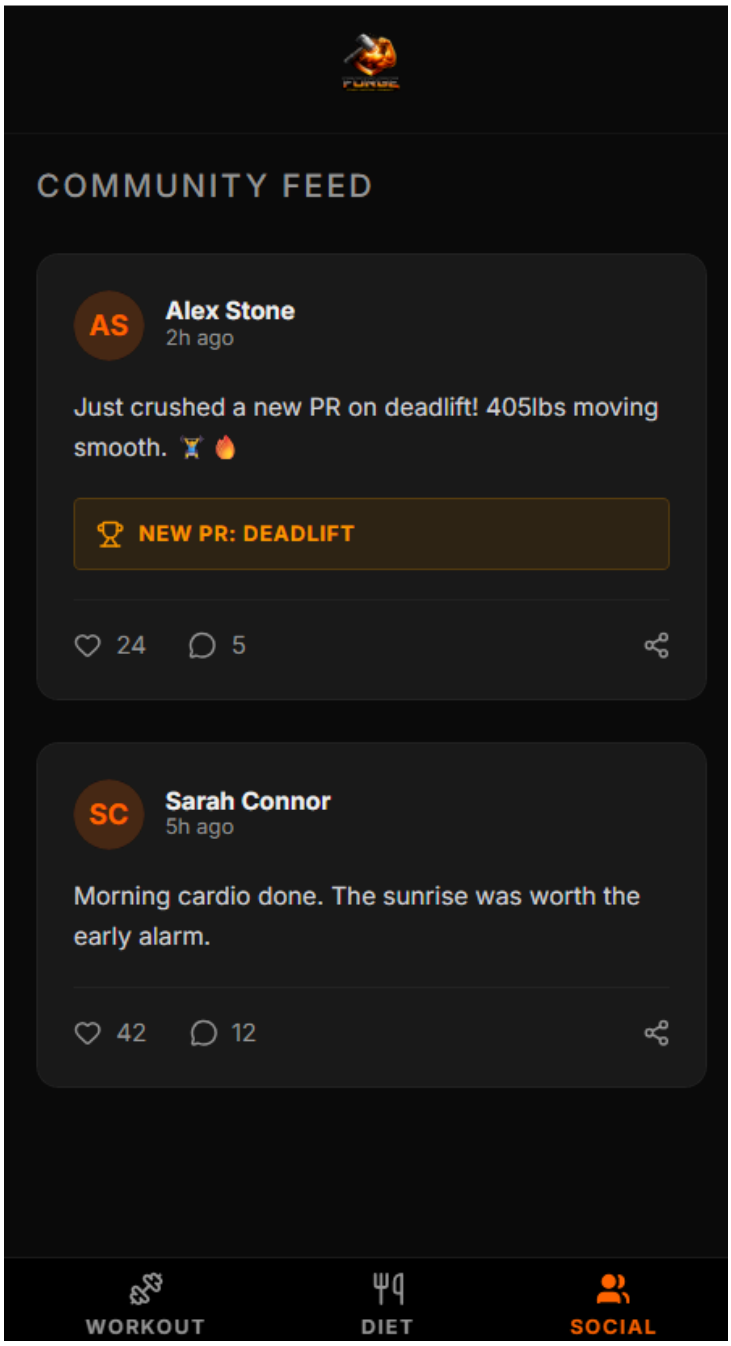
UI Mockup



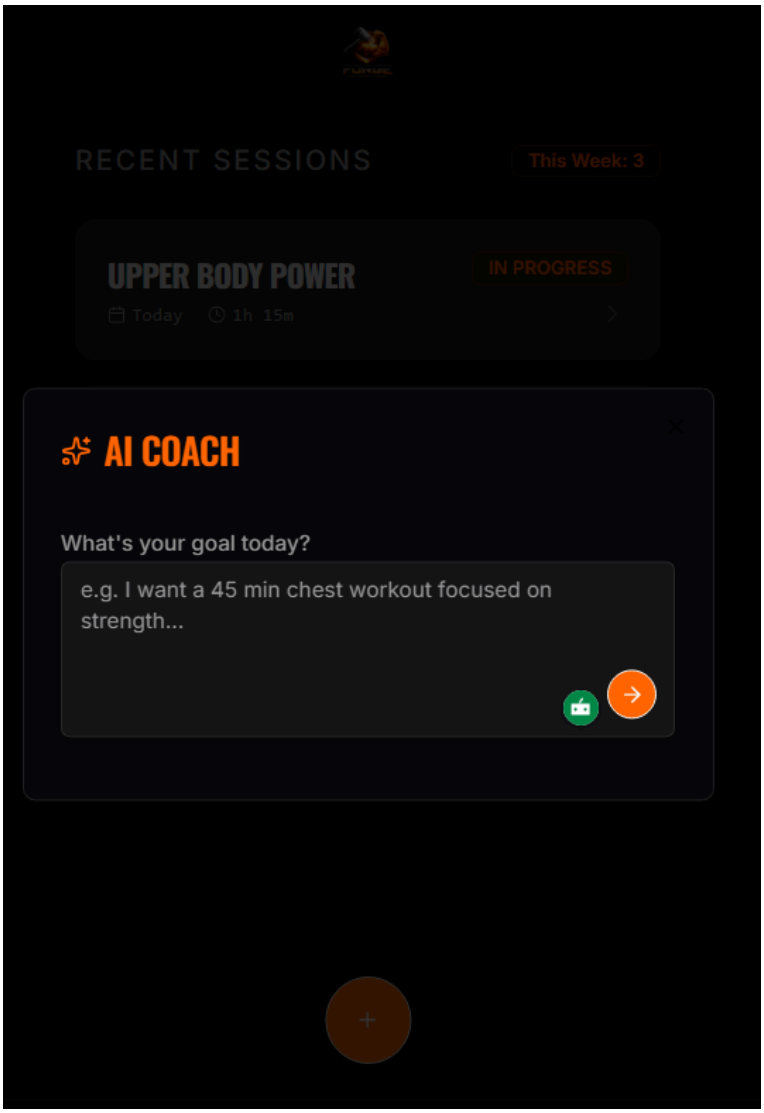
View current or completed workouts in the current week in the workout tab. Also, the capability to log a new workout or have AI assist you in generating a new workout is available in this tab.



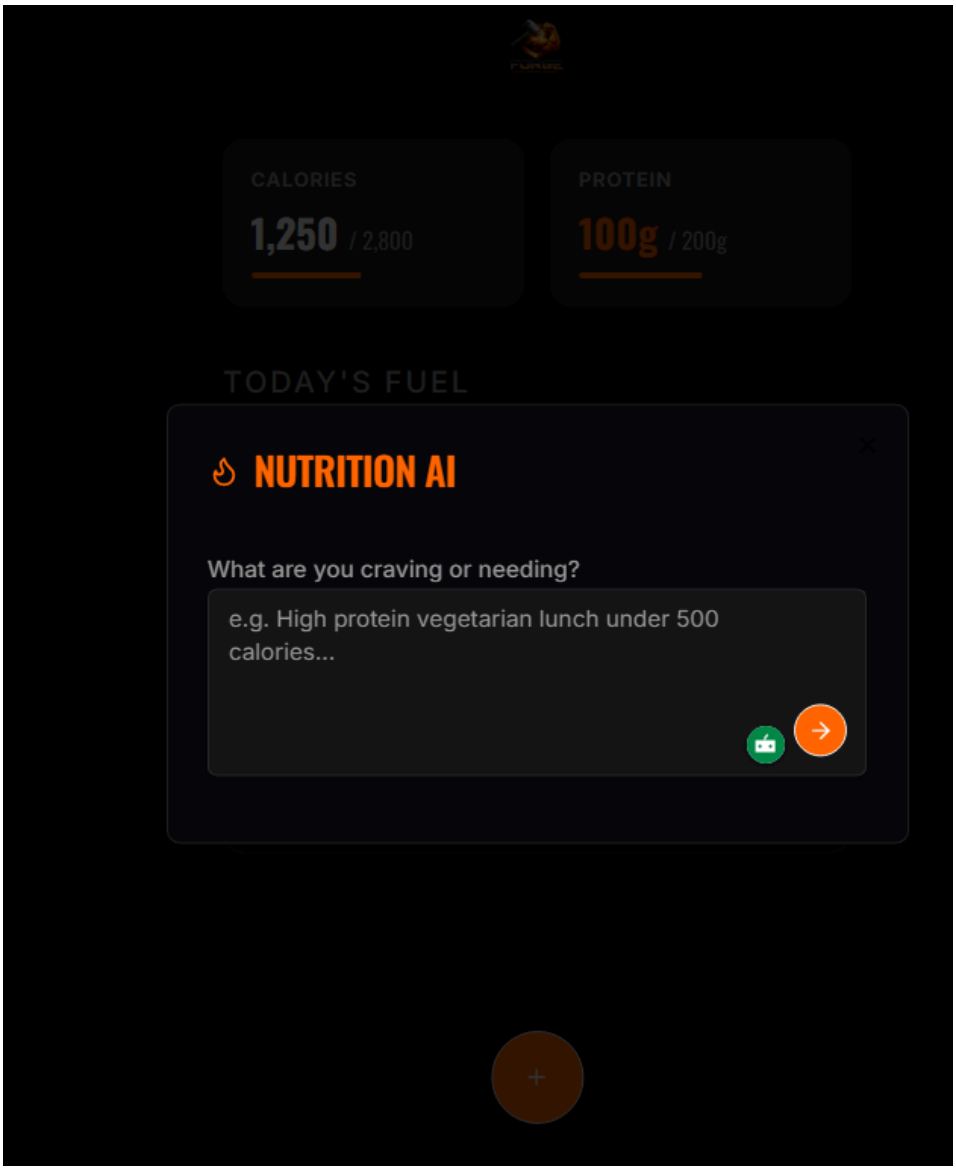
View saved meals for the day and log a new meal, or get an AI-suggested meal. See the amount of calories and protein already consumed in the diet tab



In the social tab, see posts by your friends in the app, displaying new PRs, comments, or updates on their workout. Share, like, or comment on these posts as you feel fit.



Prompt the AI workout coach to help you reach the goal that you have for the day. The AI will help you in hitting a certain muscle group, split, or overall getting started for the day.



Prompt the AI to help you plan a meal based on what you need or crave. Meet macro, caloric, or taste goals with the help of *Forge's* chatbot.