
Design Document

for
TrackMate

Version 1.0

Prepared by

Group : 4

Ayush Mangal	240242
Nideesh H	240690
Abubakar Siddique	240043
Aman Gupta	240100
Chandradip Karmakar	240296
Krishna Agrawal	240563
Ankit Kumar Jha	240137
Aditi	240048
Sahil Agarwal	240902
Rushali Vijayakumar Myageri	240894

Group Name: Earth's Mightiest Dozens -2

ayushn24@iitk.ac.in
nideesh24@iitk.ac.in
abubakars24@iitk.ac.in
amanu24@iitk.ac.in
chandradip24@iitk.ac.in
krishnaa24@iitk.ac.in
ankitkj24@iitk.ac.in
aditij24@iitk.ac.in
sahilag24@iitk.ac.in
rushali24@iitk.ac.in

Course: CS253

Mentor TA: George TL

Date: 07/02/2026

TABLE OF CONTENTS

1 Context Design.....	5
1.1 Context Model.....	5
1.2 Human Interface Design.....	7
1.2.1 User.....	7
1.2.1.1 Login and Sign-Up Page.....	7
1.2.1.2 User details setup.....	8
1.2.1.3 Dashboard.....	9
1.2.1.4 Food Logging Interface.....	10
1.2.1.5 Exercise and Timer.....	12
1.2.1.6 Activity Statistics and Progress Visualisation.....	13
1.2.1.7 Calendar.....	14
1.2.1.8 Friends and Trainers.....	15
1.2.2 - Trainer.....	18
1.2.2.1 -Login and Sign Up Page.....	18
1.2.2.2 Trainer Dashboard.....	19
1.2.2.3 Student Management.....	20
1.2.2.4 Student Requests.....	22
1.2.3 - Admin.....	24
1.2.3.1 - Login and Sign Up Page.....	24
1.2.3.2 Admin Dashboard.....	25
1.2.3.3 Manage Reports.....	26
1.2.3.4 Manage Trainers.....	27
2 Architecture Design.....	28
2.1 Overview.....	28
2.2 Role-Based Access Control and Role-ID Based Architecture.....	31
3 Object Oriented Design.....	32
3.1 Use Case Diagrams.....	32
3.1.1 User Authentication & Role Setup (U1).....	32
3.1.2 Nutrition, Hydration & Medication Tracking (U2).....	34
3.1.3 Workout Session Management (U3).....	35
3.1.4 Passive Step Tracking and gamification.....	36

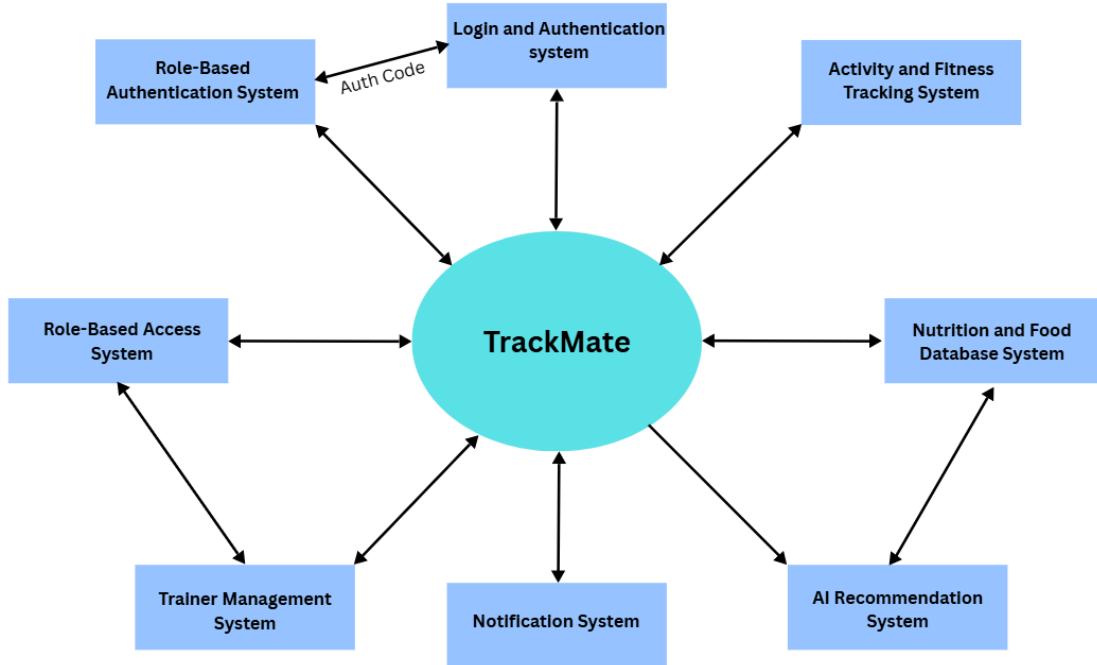
3.1.5 Trainer-Student Feedback & Social Interaction (U5).....	37
3.1.6 Data Archiving & System Maintenance (U6).....	38
3.1.7 AI-Powered Performance Analysis (U7).....	39
3.1.8 Sensor Calibration (U8).....	40
3.2 Class Diagrams.....	41
3.2.1 Class Diagram 1.....	41
3.2.2 Class Diagram 2.....	42
3.2.3 Class Diagram 3.....	43
3.2.4 Class Diagram 4.....	44
3.2.5 Class Diagram 5.....	45
3.2.6 Class Diagram 6.....	46
3.2.7 Class Diagram 7.....	47
3.2.8 Class Diagram 8.....	47
3.3 Sequence Diagrams.....	53
3.3.1 Login.....	53
3.3.2 Trainer Student Feedback.....	54
3.3.3 Workout Session.....	55
3.3.4 Meal Logging.....	56
3.3.5 Step Tracking.....	57
3.3.6 Weekly Summary.....	58
3.4 State Diagrams.....	59
3.4.1 User Login and Dashboard.....	59
3.4.2 Trainer Dashboard and Feedback.....	60
3.4.3 Admin Management and Content Modification.....	61
3.4.4 Nutrition And Meal Logging.....	62
3.4.5 Workout Session Management.....	63
3.4.6 Passive Step Tracking.....	63
4 Project Plan.....	65
5 Appendix A - Group Log.....	66

Revisions

Version	Primary Author(s)	Description of Version	Date Completed
First Draft 1.0	Group 4	Initial Draft of the document was created	06/02/26
Final Draft 1.1	Group 4	Final Draft was completed	07/02/26

1 Context Design

1.1 Context Model



- **Login and Authentication System:**

This system manages user registration, secure login, and password recovery. It also redirects users to appropriate interfaces based on their assigned roles within TrackMate.

- **Role-Based Access Control (RBAC) System:**

The RBAC system assigns and enforces access permissions for different user roles such as Trainee, Trainer, and Administrator, ensuring secure and controlled access to system features.

- **Database System:**

This system stores all persistent data including user profiles, workout and activity logs, nutrition records, trainer feedback, and role or group associations.

- **Activity and Fitness Tracking System:**

This subsystem handles the tracking of workouts, step counts, exercise durations,

and physical activity data collected from user inputs or device sensors.

- **Nutrition and Food Database System:**

It provides nutritional and calorie information, including a comprehensive database of Indian food items, to support accurate calorie tracking.

- **AI Recommendation System:**

This system analyzes user activity and nutrition data to generate personalized fitness recommendations and weekly progress summaries.

- **Notification and Reminder System:**

It is responsible for sending reminders and alerts related to workouts, hydration, medication schedules, and trainer communications.

- **Trainer Management System:**

This system allows trainers to view trainee performance data, assign workout plans, and provide personalized feedback through the platform.

1.2 Human Interface Design

1.2.1 User

1.2.1.1 Login and Sign-Up Page

The image shows the login and sign-up page for the TRACKMATE app. At the top is a blue circular logo with a stylized 'T' and 'M'. Below it, the word 'TRACKMATE' is written in blue capital letters. Underneath is the word 'Login' in bold black text. A sub-instruction 'Sign in to continue your fitness journey' is displayed in smaller text. A 'Select Role' section contains three buttons: 'User' (highlighted with a blue border), 'Trainer', and 'Admin', each with a corresponding icon. Below this are input fields for 'Email' (containing 'your.email@example.com') and 'Password' (containing '*****'). A large blue 'Login' button is centered below the password field. Below the button is a horizontal line with the text 'Or continue with' in the center. Two social login options are shown: 'Login with Google' (with a Google icon) and 'Login with Apple' (with an Apple icon). At the bottom, a link 'Don't have an account? [Sign up](#)' is provided.

1.2.1.2 User details setup

TRACKMATE

Step 1 of 3

Let's get started
Tell us about your body metrics

Gender
Male

Height (cm)
170 cm

Weight (kg)
70 kg

< Back Next > ?

TRACKMATE

Step 2 of 3

What's your age?
This helps us personalize your plan

Age
25 years

25
Years Old

< Back Next > ?

TRACKMATE

Step 3 of 3

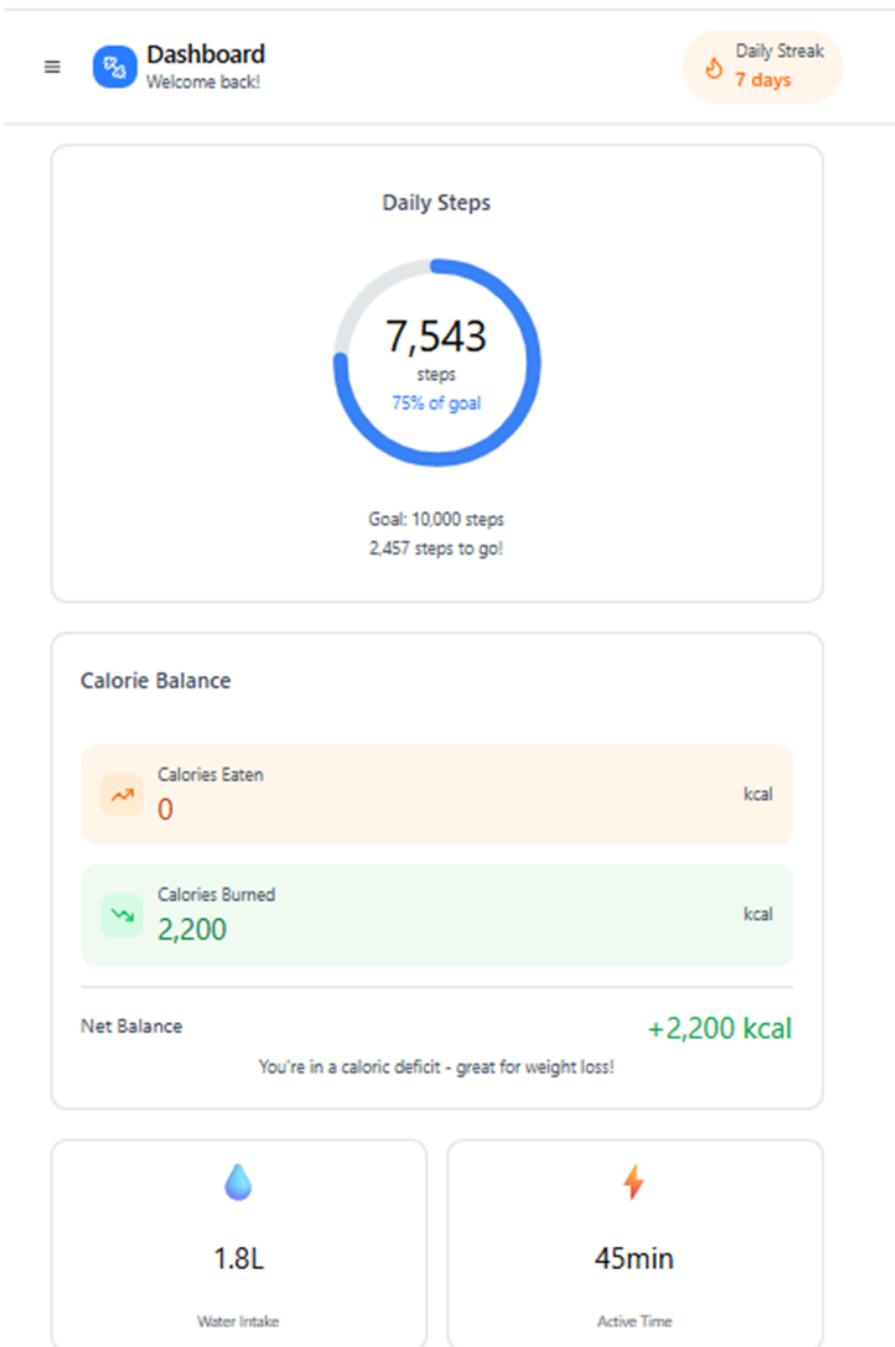
What's your goal?
Choose your primary fitness objective

Lose Weight Gain Muscle

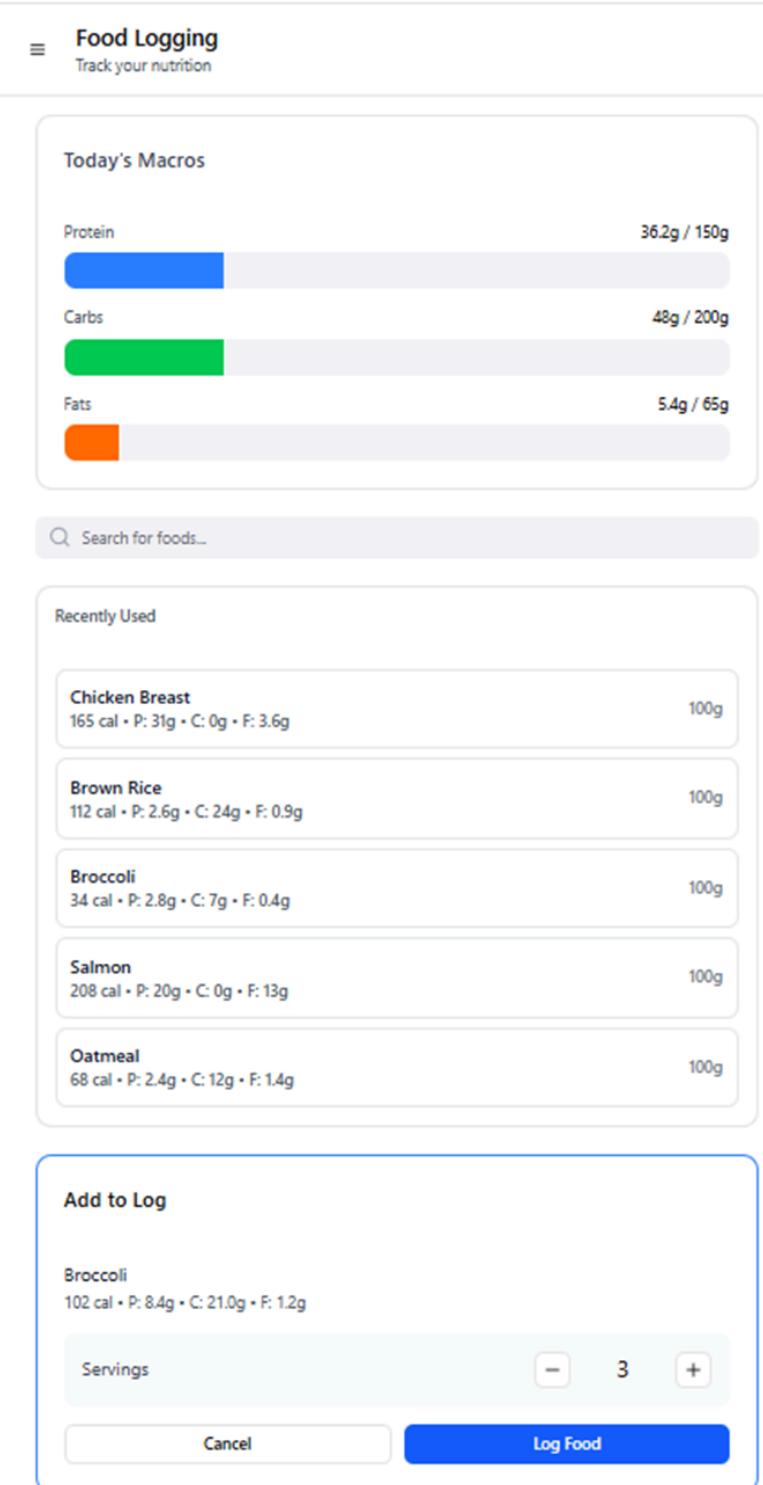
Stay Fit Build Endurance

< Back Complete ?

1.2.1.3 Dashboard



1.2.1.4 Food Logging Interface



Brown Rice	34 cal • P: 2.8g • C: 7g • F: 0.4g	100g
Salmon	208 cal • P: 20g • C: 0g • F: 13g	100g
Oatmeal	68 cal • P: 2.4g • C: 12g • F: 1.4g	100g

Foods Eaten Today

Brown Rice	224 cal • P: 5.2g • C: 48.0g • F: 1.8g	2 × 100g
Chicken Breast	330 cal • P: 62.0g • C: 0.0g • F: 7.2g	2 × 100g
Oatmeal	68 cal • P: 2.4g • C: 12.0g • F: 1.4g	1 × 100g
Salmon	624 cal • P: 60.0g • C: 0.0g • F: 39.0g	3 × 100g
Chicken Breast	165 cal • P: 31.0g • C: 0.0g • F: 3.6g	1 × 100g
Oatmeal	68 cal • P: 2.4g • C: 12.0g • F: 1.4g	1 × 100g
Total Calories		1479 cal

1.2.1.5 Exercise and Timer

≡ **Exercise & Timer**
Track your workouts


Running
Track your cardio session


Gym
Log sets, reps, and weight


Yoga
Track your practice time

≡ **Exercise & Timer**
Track your workouts

Gym Session
00:00:13

[|| Pause] [□ End Session]

Log New Set

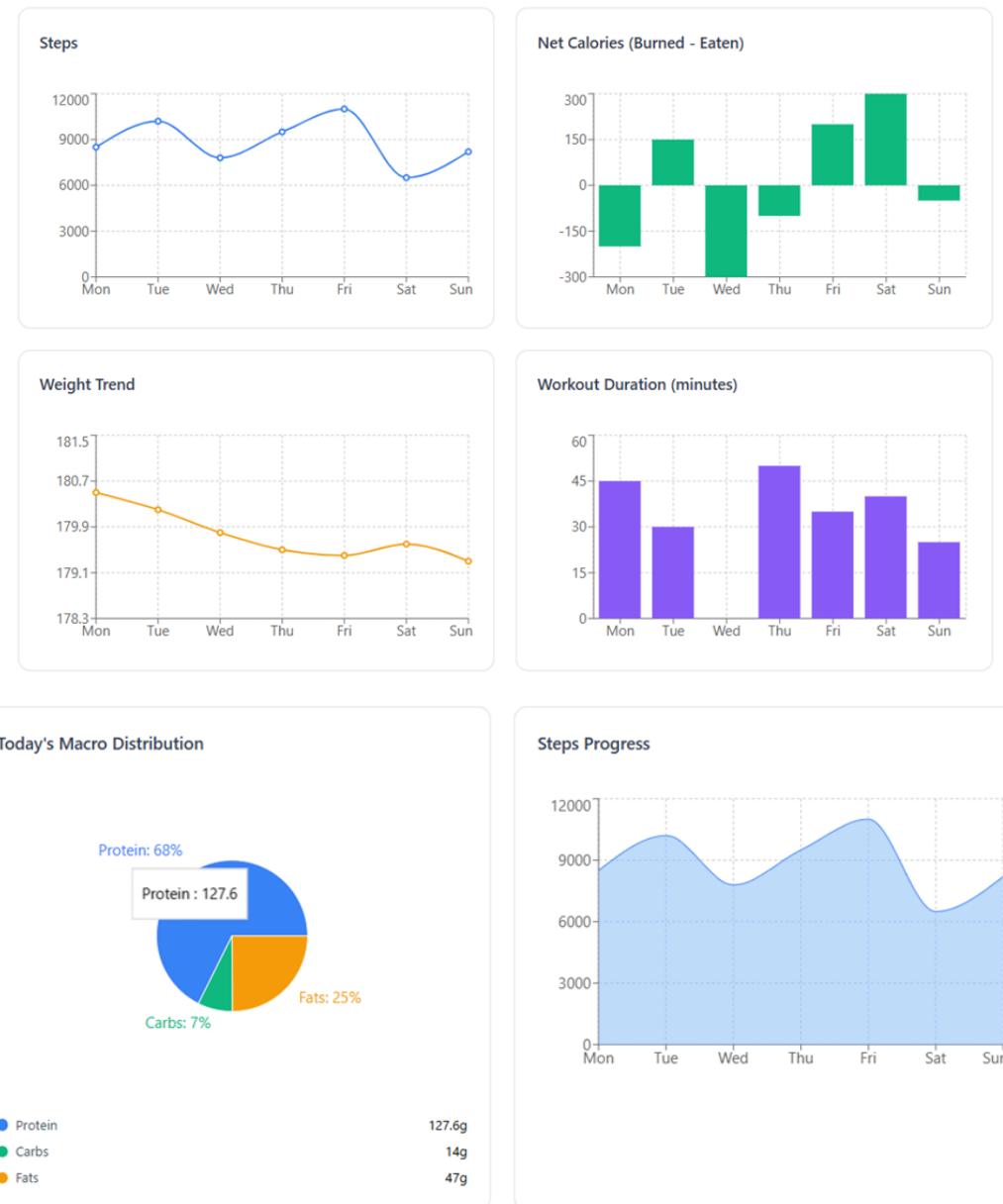
Reps	Weight (lbs)				
<input type="text" value="0"/>	<input type="text" value="0"/>				
Reps Keypad					
1	2	3	1	2	3
4	5	6	4	5	6
7	8	9	7	8	9
Clear	0		Clear	0	.
+ Add Set					

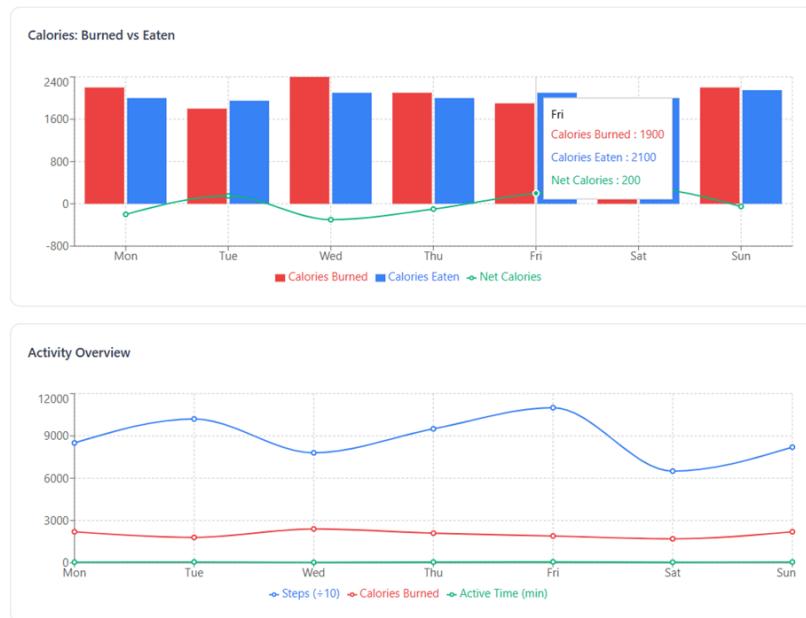
Today's Sets

Set	Reps	Weight
1	50	2 lbs

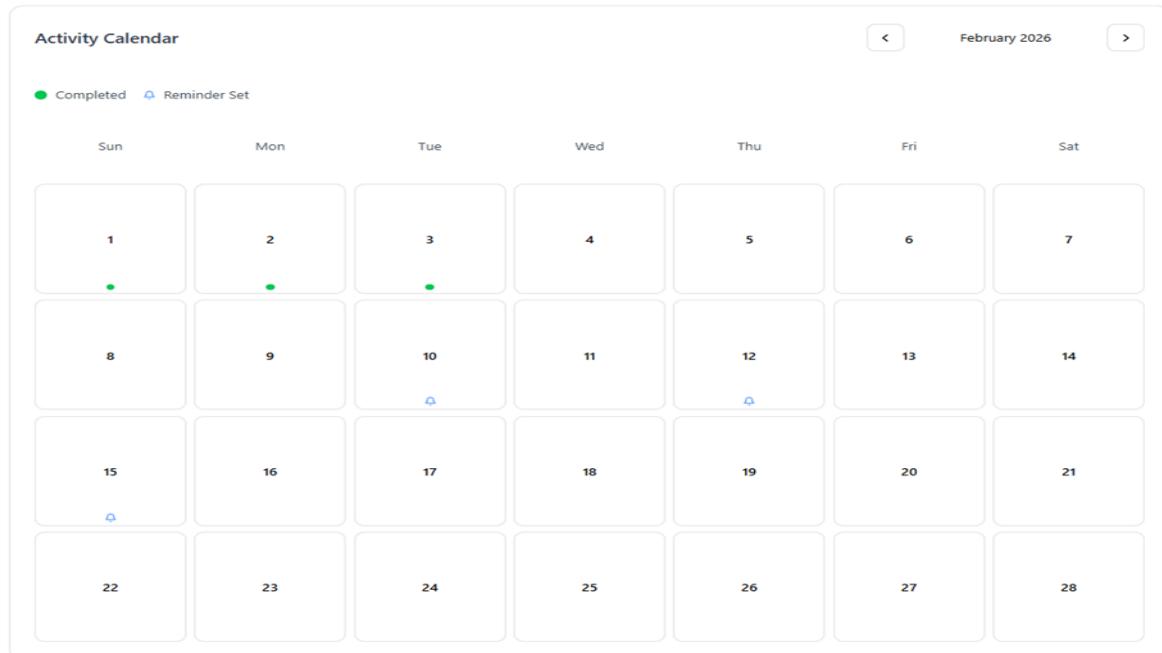
Total Sets: 1
Total Reps: 50
Total Volume: 100.0 lbs

1.2.1.6 Activity Statistics and Progress Visualisation



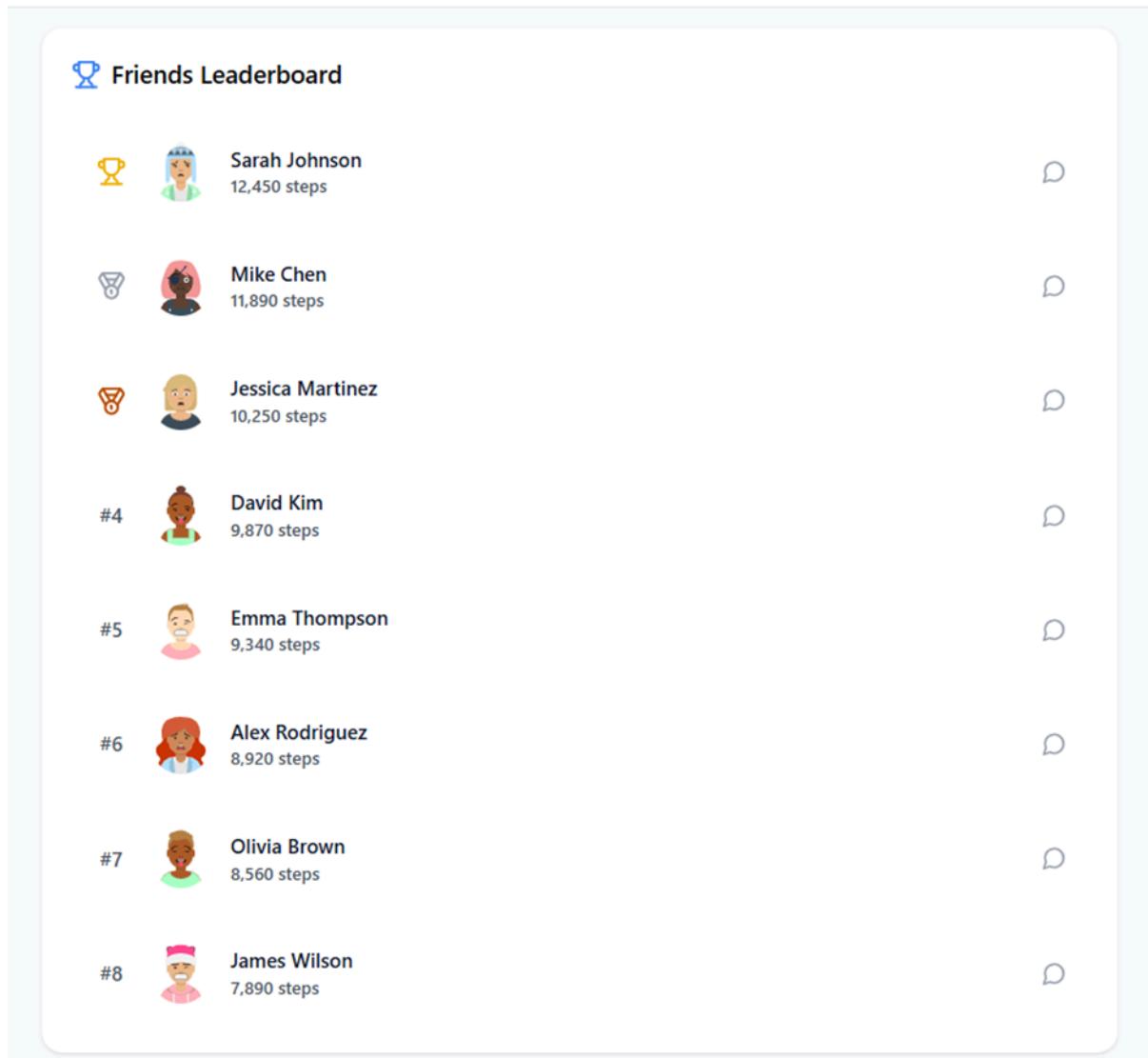


1.2.1.7 Calendar



1.2.1.8 Friends and Trainers

Social & Trainers



The image shows a mobile application interface for a fitness tracking app. At the top, there is a navigation bar with the text "Social & Trainers". Below the navigation bar, there is a section titled "Friends Leaderboard" with a trophy icon.

Rank	User	Name	Steps
1	Gold Medal	Sarah Johnson	12,450 steps
2	Silver Medal	Mike Chen	11,890 steps
3	Bronze Medal	Jessica Martinez	10,250 steps
#4	David Kim	David Kim	9,870 steps
#5	Emma Thompson	Emma Thompson	9,340 steps
#6	Alex Rodriguez	Alex Rodriguez	8,920 steps
#7	Olivia Brown	Olivia Brown	8,560 steps
#8	James Wilson	James Wilson	7,890 steps

Each row in the table contains a small profile picture of the user, their name, and their step count. To the right of each row is a small speech bubble icon.

Find a Trainer



Marcus Johnson
★ 4.9 (127 reviews)
Strength Training / HIIT +1
\$85/hr 10+ years



Sophia Rivera
★ 5 (203 reviews)
Weight Loss / Nutrition +1
\$95/hr 8 years



Lily Anderson
★ 4.8 (89 reviews)
Yoga / Meditation +1
\$70/hr 6 years



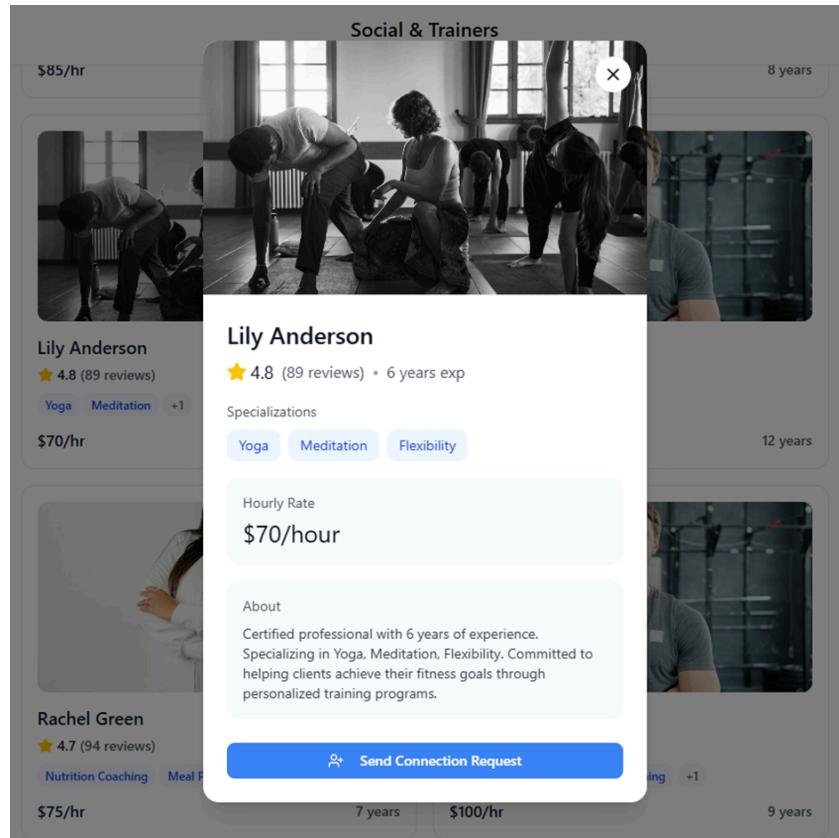
Derek Thompson
★ 4.9 (156 reviews)
CrossFit / Olympic Lifting +1
\$90/hr 12 years



Rachel Green
★ 4.7 (94 reviews)
Nutrition Coaching / Meal Planning +1
\$75/hr 7 years



Tyler Brooks
★ 4.8 (112 reviews)
Sports Performance / Agility Training +1
\$100/hr 9 years



☰ Social & Trainers

 **Marcus Johnson**
Personal Trainer

Hi! Thanks for connecting with me. I'm excited to help you achieve your fitness goals!

02:30 PM ⚡ Report

Thank you! I'm looking forward to working with you. What should we start with?

02:35 PM

Let's start by understanding your current fitness level and goals. Can you tell me about your exercise history?

02:40 PM ⚡ Report

I've been working out casually for about 6 months, mostly cardio. I want to build more strength.

02:45 PM

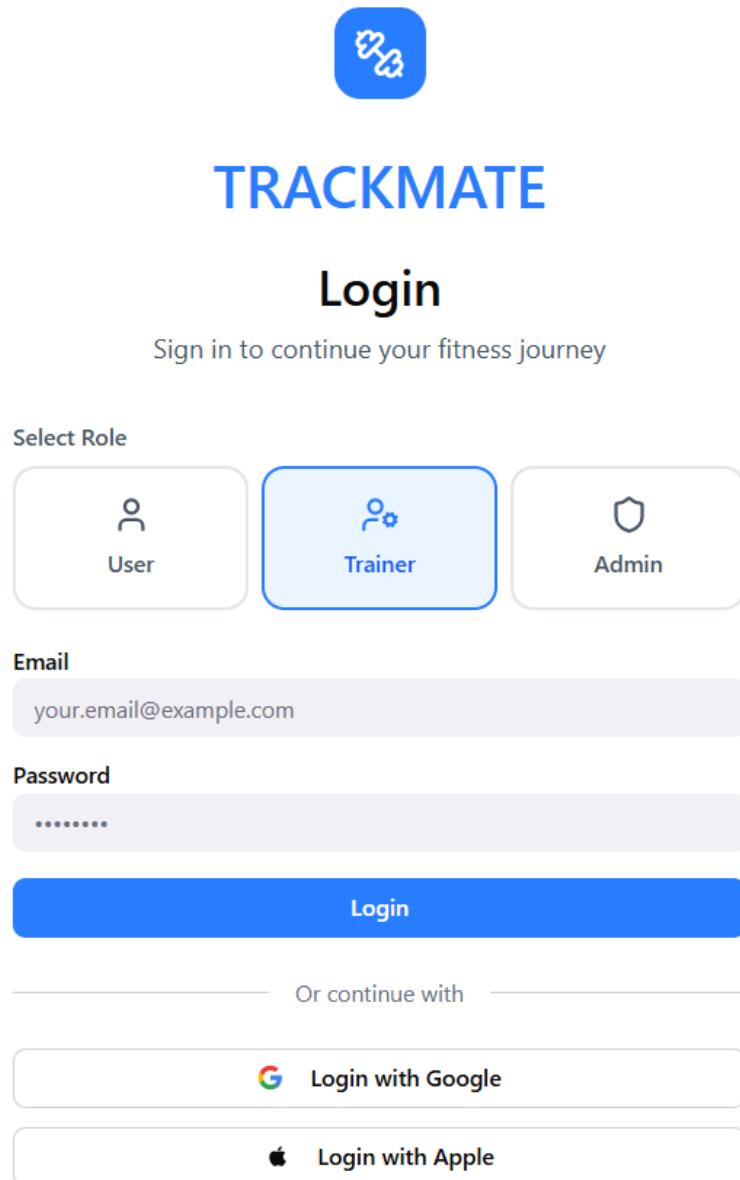
Perfect! I'll create a strength training program for you. We'll start with 3 sessions per week focusing on compound movements.

02:50 PM ⚡ Report

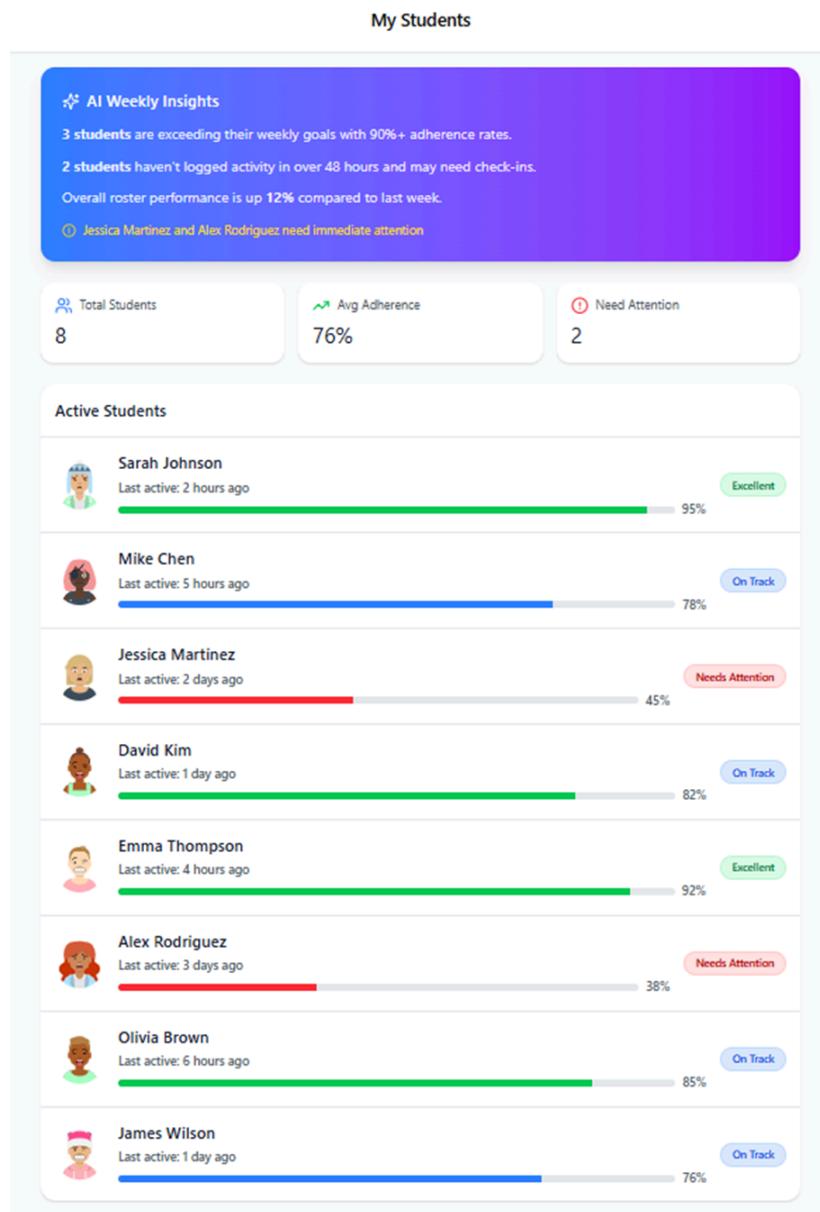
?

1.2.2 - Trainer

1.2.2.1 -Login and Sign Up Page



1.2.2.2 Trainer Dashboard



1.2.2.3 Student Management

Adherence
95%

Workouts
47

Streak
12 days

Coaching Notes

Add a coaching note or feedback...

Coach Marcus 2/1/2026 at 12:00 AM

Great progress this week! Keep up the excellent work on your strength training.

Coach Marcus 1/28/2026 at 12:00 AM

Remember to focus on form over weight. Let's work on proper squat technique next session.

 Nutrition Logs

 Workouts

 History

 Completed Upper Body Strength
2 hours ago

 Logged dinner - 680 calories
5 hours ago

 Achieved 12-day streak!
1 day ago

 Completed HIIT Cardio
1 day ago

 Met daily protein goal
1 day ago

Coaching Notes

Keep going! I will suggest some important workouts soon, so stay tuned!

Coach Marcus 2/1/2026 at 12:00 AM

Great progress this week! Keep up the excellent work on your strength training.

Coach Marcus 1/28/2026 at 12:00 AM

Remember to focus on form over weight. Let's work on proper squat technique next session.

Coaching Notes

Add a coaching note or feedback...

Send Note

Coach Marcus 2/4/2026 at 09:29 PM
Keep going! I will suggest some important workouts soon, so stay tuned!

Coach Marcus 2/1/2026 at 12:00 AM
Great progress this week! Keep up the excellent work on your strength training.

Coach Marcus 1/28/2026 at 12:00 AM
Remember to focus on form over weight. Let's work on proper squat technique next session.

1.2.2.4 Student Requests

The image displays two screenshots of the Trainer Portal application.

Screenshot 1: My Students Insights

This screenshot shows the 'My Students' dashboard. At the top, it displays a purple banner with insights: "Exceeding their weekly goals with 90%+ adherence rates.", "No logged activity in over 48 hours and may need check-ins.", and "Performance is up 12% compared to last week." Below the banner, there are two summary cards: "Avg Adherence" at 76% and "Need Attention" at 2. A list of students is shown below, with the first entry being Michael Johnson (Excellent adherence, 95%) and the second being Emily Chen (On Track).

Screenshot 2: Requests & Calendar

This screenshot shows the 'Requests & Calendar' page. It displays a list of pending requests:

- Michael Torres** (Weight Loss & Strength): "Hi I'm looking for help with weight loss and building muscle. Can you take me on as a new student?" Requested 2/3/2026. Buttons: **Accept** (green) and **Decline** (red).
- Emily Parker** (Marathon Training): "I'd like to work on marathon training and need a coach with running experience." Requested 2/4/2026. Buttons: **Accept** (green) and **Decline** (red).
- Daniel Lee** (Nutrition & Fitness): "Looking for nutrition guidance and workout plans for busy professionals." Requested 2/4/2026. Buttons: **Accept** (green) and **Decline** (red).

Requests & Calendar

Requested 2/4/2026

✓ Accept × Decline

February 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

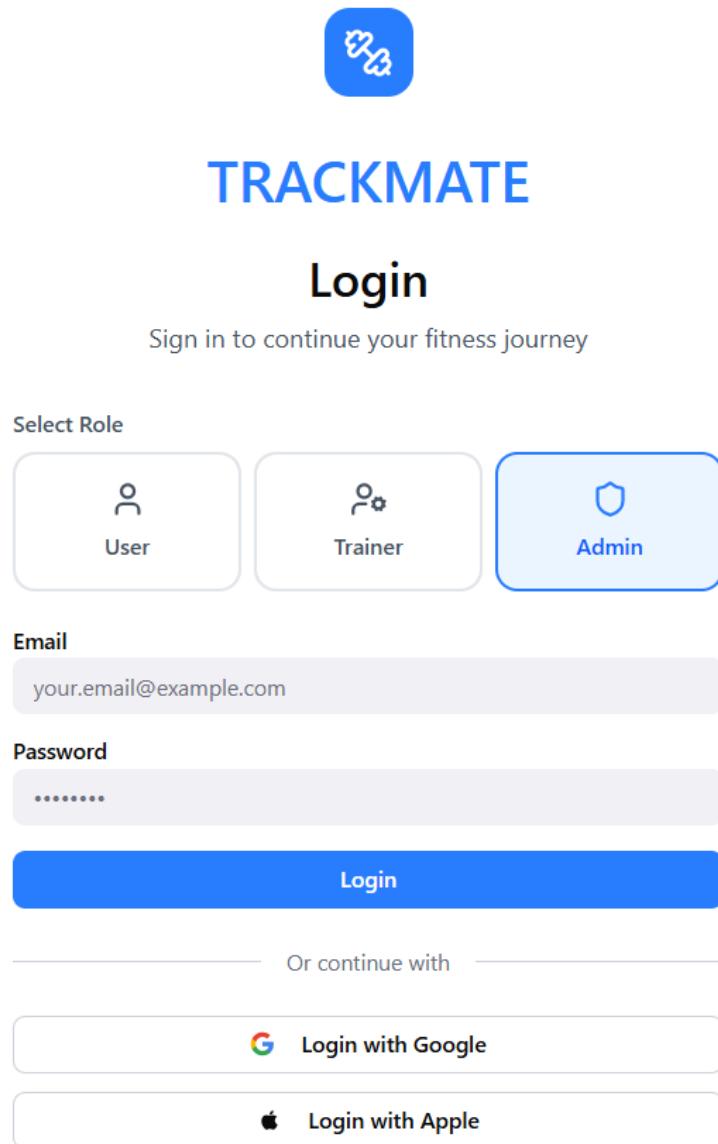
● Check-in ● Training Session ● Milestone

Upcoming Events

Event	Date	Time
Sarah Johnson Check In	2/5/2026	10:00 AM
Mike Chen Session	2/6/2026	2:00 PM
Emma Thompson Milestone	2/8/2026	All Day
Jessica Martinez Check In	2/10/2026	9:00 AM
David Kim Session	2/11/2026	3:30 PM

1.2.3 - Admin

1.2.3.1 - Login and Sign Up Page



1.2.3.2 Admin Dashboard

≡ TRACKMATE Admin Dashboard

Welcome, Admin
Manage users, trainers, and system settings

Total Users: 2,847 (↑ 12% from last month)

Active Trainers: 124 (↑ 8% from last month)

Active Sessions: 1,523 (Today)

Growth Rate: 23% (This quarter)

Admin Portal System Administrator

Dashboard

Manage Trainers

Manage Reports

Admin Dashboard

The image displays two versions of the Admin Dashboard interface. Both versions have a header with the TRACKMATE logo and 'Admin Dashboard'. Below the header is a purple section containing a welcome message ('Welcome, Admin') and a link to manage users, trainers, and system settings. The main content area contains four cards: 'Total Users' (2,847, with a 12% growth note), 'Active Trainers' (124, with an 8% growth note), 'Active Sessions' (1,523, showing data for 'Today'), and 'Growth Rate' (23%, for 'This quarter'). At the bottom of each version are navigation links: 'Admin Portal' (with 'System Administrator' role), 'Dashboard', 'Manage Trainers', and 'Manage Reports'. The top version has a light blue header and footer, while the bottom version has a dark grey header and footer.

1.2.3.3 Manage Reports

Manage Reports

⚠ Pending 2	Resolved 1	Total 3
----------------	---------------	------------

User Reports

- ⚠ Inappropriate Language**
 Reported by Sarah Johnson against Marcus Johnson
 The trainer used unprofessional language and made me feel uncomfortable during our conversation.
 2/3/2026 at 12:00 AM
- ⚠ Harassment**
 Reported by Emily Parker against Derek Thompson
 The trainer kept messaging me outside of scheduled sessions and made unwanted personal comments.
 2/4/2026 at 12:00 AM
- ⚠ Spam/Solicitation**
 Reported by Michael Torres against Sophia Rivera
 The trainer tried to sell me supplements and other products not related to the training service.
 2/1/2026 at 12:00 AM

Manage Reports

⚠ Pending 2	Resolved 1	Pending 1
----------------	---------------	--------------

User Reports

- ⚠ Inappropriate L**
 Reported by Sarah Johnson against Marcus Johnson
 The trainer used unprofessional language and made me feel uncomfortable during our conversation.
 2/3/2026 at 12:00 AM
- ⚠ Harassment**
 Reported by Emily Parker against Derek Thompson
 The trainer kept messaging me outside of scheduled sessions and made unwanted personal comments.
 2/4/2026 at 12:00 AM
- ⚠ Spam/Solicitat**
 Reported by Michael Torres against Sophia Rivera
 The trainer tried to sell me supplements and other products not related to the training service.
 2/1/2026 at 12:00 AM

⚠ Report Details

Spam/Solicitation

The trainer tried to sell me supplements and other products not related to the training service.

Reported on 2/1/2026 at 12:00 AM

Reporter (User) Michael Torres ID: u3	Reported Trainer Sophia Rivera ID: t3
----------------------------------------------------	----------------------------------------------------

Chat History

Sophia Rivera 03:00 PM
 I have a great supplement line that can really boost your results!
⚠ Flagged message

Michael Torres 03:10 PM
 I'm not interested in supplements right now.

Sophia Rivera 03:15 PM
 You should really consider it, I can give you a special discount.
⚠ Flagged message

✓ Report Resolved - Trainer has been warned

1.2.3.4 Manage Trainers

Manage Trainers

Pending 3	Approved 1	Total 4
--------------	---------------	------------

Trainer Applications

 Marcus Johnson marcus.j@email.com Strength Training HIIT Bodybuilding	Pending 2/1/2026
 Sophia Rivera sophia.r@email.com Weight Loss Nutrition Cardio	Pending 2/2/2026
 Lily Anderson lily.a@email.com Yoga Meditation Flexibility	Pending 2/3/2026
 Derek Thompson derek.t@email.com CrossFit Olympic Lifting Conditioning	Approved 2/4/2026

Manage Trainers

Pending 3	 Pending 2/1/2026
 Sophia Rivera sophia.r@email.com +1 (555) 234-5678 8 years of experience	Pending 2/2/2026
 Lily Anderson lily.a@email.com Yoga Meditation	Pending 2/3/2026
 Derek Thompson derek.t@email.com CrossFit Olympic	Approved 2/4/2026

Sophia Rivera

 sophia.r@email.com
+1 (555) 234-5678
8 years of experience

About
Results-driven trainer focusing on holistic wellness. I combine nutrition coaching with personalized training to help clients lose weight and develop healthier habits for life.

Specializations
Weight Loss | Nutrition | Cardio

Certifications

- ACE-CPT
- Certified Nutritionist
- Behavioral Change Specialist

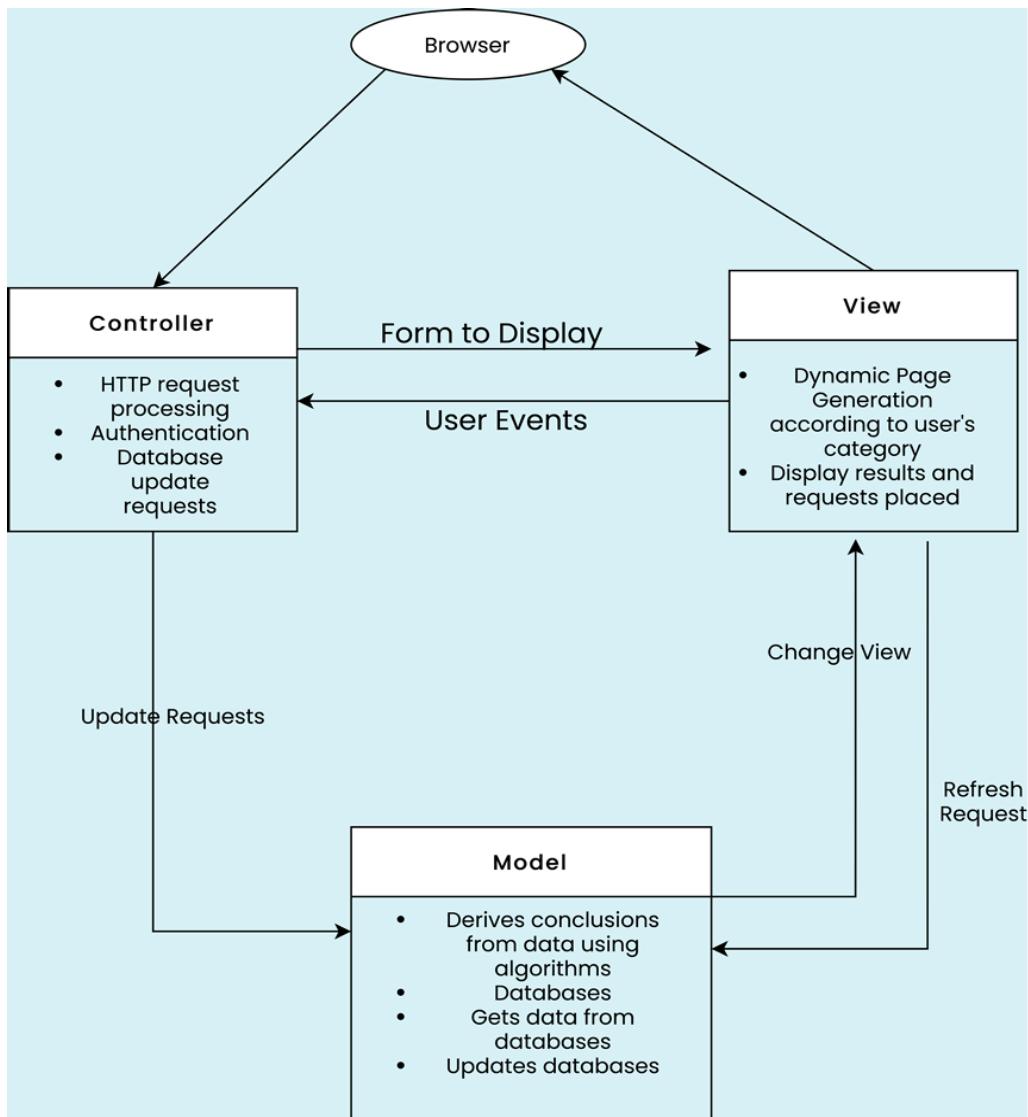
Requested Hourly Rate
\$95/hour

✓ Approve Application
✗ Reject

2 Architecture Design

2.1 Overview

The Gym Buddy system follows the **Model–View–Controller (MVC)** architectural design pattern. This architecture is suitable for the system as it involves frequent user interaction, role-based access (users and trainers), and handling of diverse data such as fitness activities, nutrition logs, reminders, and AI-generated summaries ensures a clear separation between the user interface, business logic, and data storage, thereby improving maintainability, scalability, and ease of future enhancements.



Model:

The Model represents the core data and business logic of the Gym Buddy system. It is responsible for managing application data and interacting with the database and external services.

The Model includes:

- User and trainer profiles
- Authentication and authorization data
- Workout, exercise, and step tracking data
- Calorie and nutrition data (Indian food database)
- Trainer feedback records
- AI-generated weekly summaries
- Reminder, calendar, and gamification data

The Model handles data persistence and communicates with external services such as fitness sensors and LLM-based recommendation engines.

Controller:

The Controller acts as an intermediary between the View and the Model. It processes user inputs, applies business logic, and coordinates updates between the user interface and the data layer.

Controller responsibilities include:

- Handling login and registration requests
- Processing workout, calorie, and step submissions
- Managing trainer feedback actions
- Triggering AI-based summary generation
- Scheduling reminders and notifications
- Enforcing role-based access control

View:

Different views are employed on the basis of the roles of users and the functionality the user wishes to access. These are broadly classified as:

Views include:

- Login Pages
- Trainee Views
 - Dashboard
 - Profile
 - Food
 - Exercise
 - Stats
 - History
 - Trainer
 - Friends
 - Calendar
 - Weekly Summary
 - Settings
- Trainer Views
 - Dashboard
 - Student Finder
 - Request
 - calendar
 - Posts
 - Student Analytics
- Admin Views
 - Trainer
 - Accept/Reject
 - User Management
 - Food
 - Content Moderation

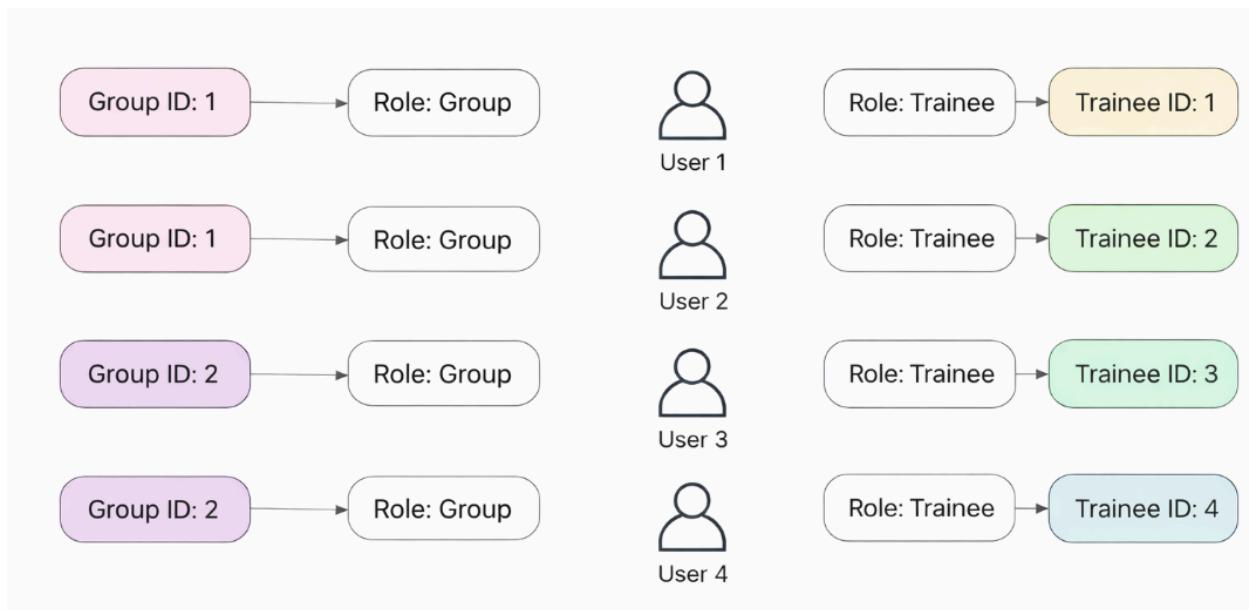
The views actively refresh by using data from the databases, either due to requests from the user, or due to the server wanting to connect and refresh.

2.2 Role-Based Access Control and Role-ID Based Architecture

Role-Based Access Control (RBAC) is used in TrackMate to grant users different levels of access based on their assigned roles. This approach simplifies access management and ensures that users can only view or modify data relevant to their responsibilities. TrackMate supports multiple roles such as Trainees, Trainers, and Administrators, each with distinct permissions. For example, trainees can log workouts and view progress, trainers can monitor trainee performance and provide feedback, and administrators can manage users and system-level content.

To further support collaborative features, TrackMate adopts a **Role-ID Based Architecture**, which extends RBAC by associating users with unique role IDs and shared group role IDs. Individual users are assigned personal role IDs, while users belonging to the same trainer group or fitness group share a common group role ID. Data linked to a shared role ID—such as group challenges, shared calendars, or trainer-assigned workout plans—is synchronized and visible to all associated users.

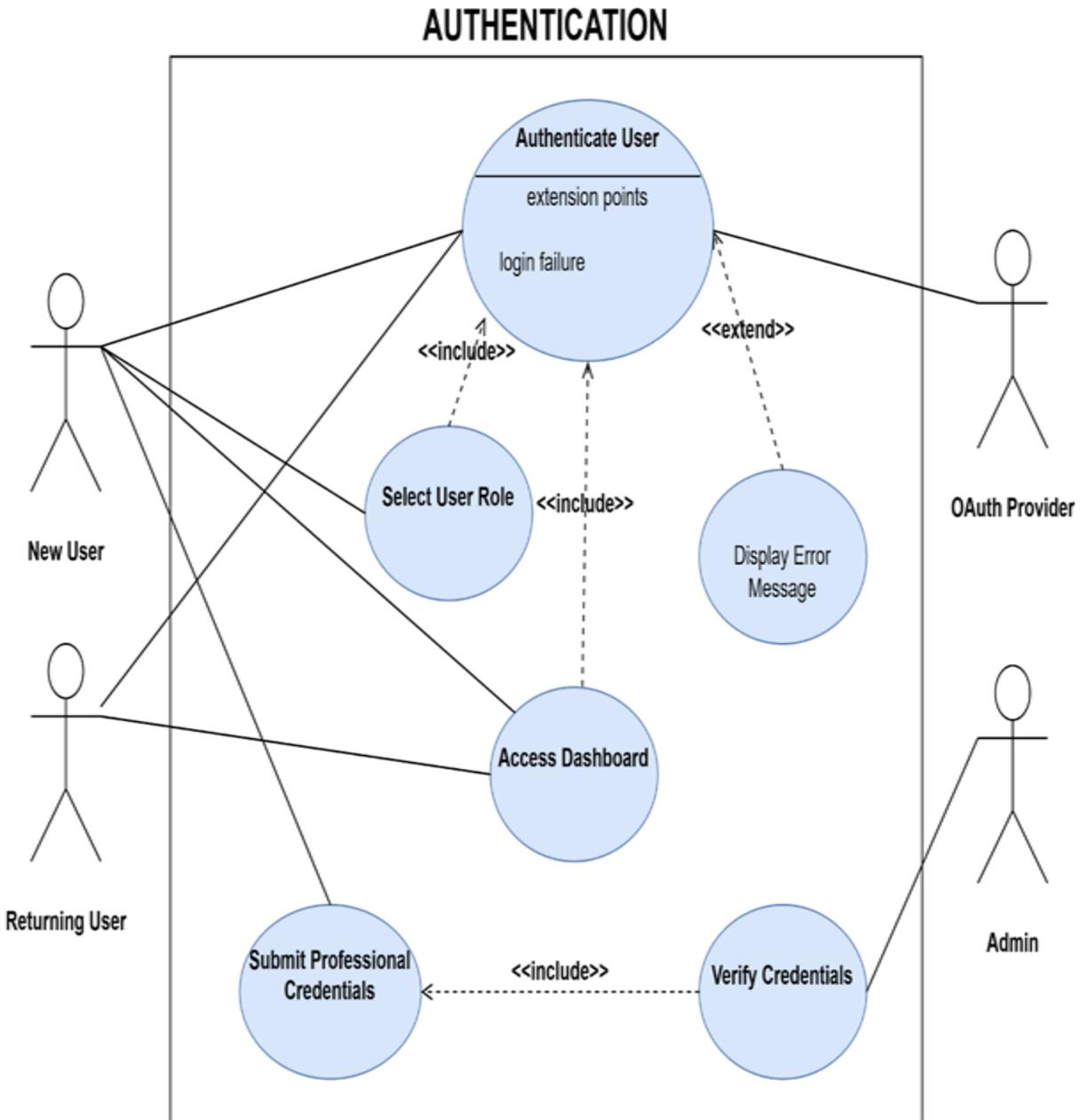
This architecture enables efficient implementation of social and group-based features such as shared fitness goals, group challenges, trainer-managed workout plans, and common reminder schedules. Updates made under a shared role ID are reflected across all related users, allowing TrackMate to support both personalized and collaborative fitness tracking in a scalable manner.



3 Object Oriented Design

3.1 Use Case Diagrams

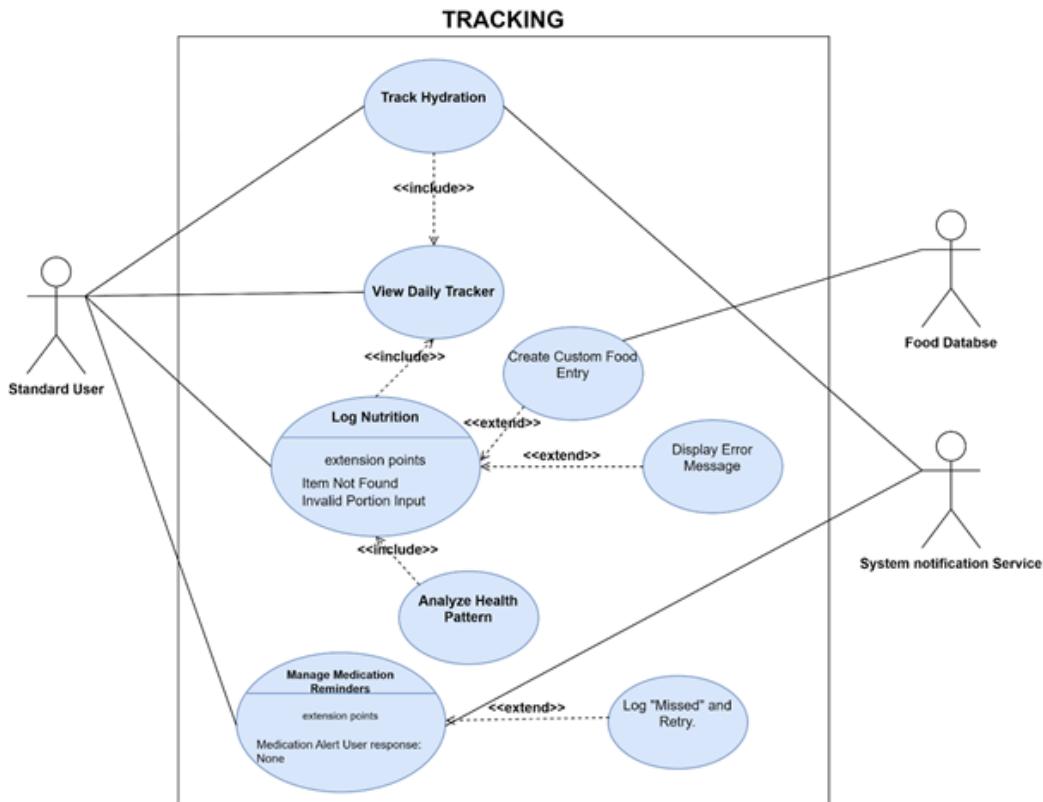
3.1.1 User Authentication & Role Setup (U1)



- Purpose:** To allow users to securely access the system and establish their identity as either a Standard User or a Certified Trainer.

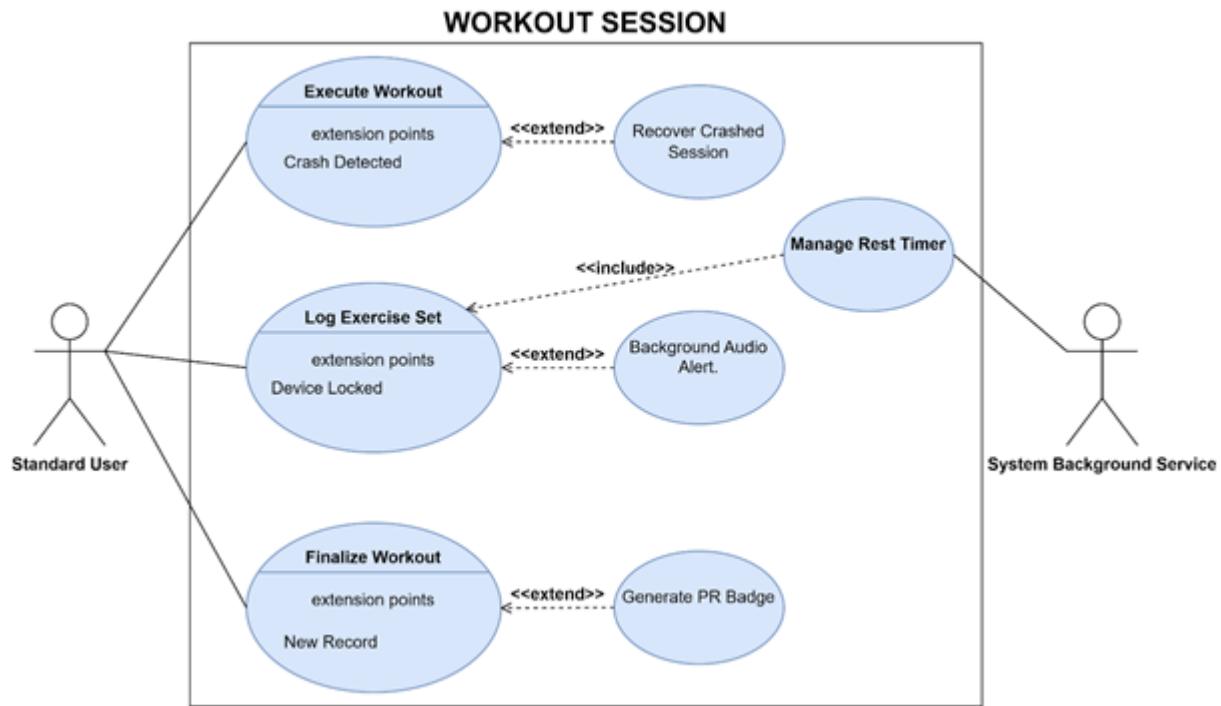
- **Requirements Traceability:** Maps to the requirement for secure, role-based access. It ensures that the "Standard User" and "Trainer" actors are correctly identified before accessing private health data.
 - **Priority:** High
 - **Preconditions:** The application is installed and the device has an active internet connection.
 - **Post conditions:** The user is authenticated, assigned a role, and granted access to the specific dashboard associated with that role.
 - **Actors:** New User, Returning User, OAuth Provider (Google/Apple), Admin.
-

3.1.2 Nutrition, Hydration & Medication Tracking (U2)



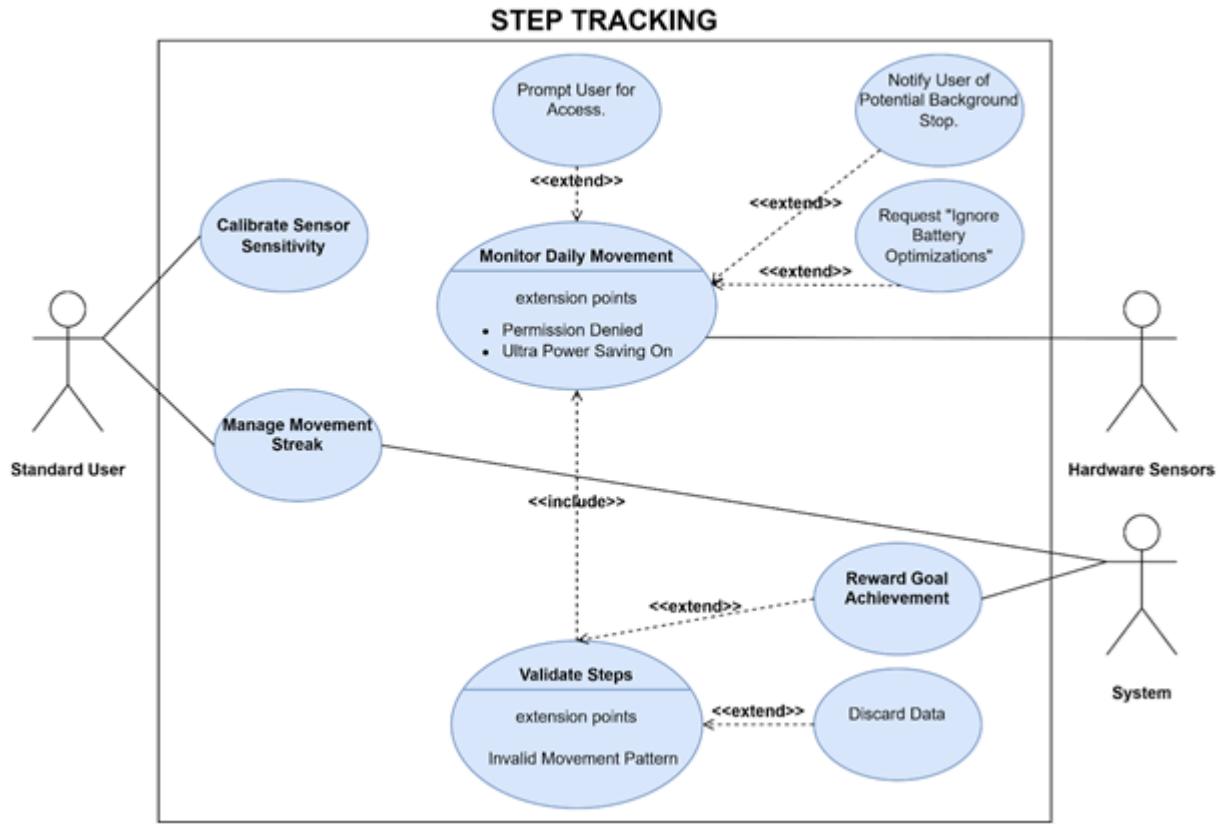
- Purpose:** To enable users to calculate their TDEE and log daily food intake against a specific calorie/macro target, while assisting users in maintaining auxiliary health habits like water intake and timely consumption of supplements or medicine.
- Requirements Traceability:** Traces to requirements for manual data entry (Nutrition, Hydration, Meds). This justifies the interface for calculating TDEE and setting reminders.
- Priority:** High
- Preconditions:** User is logged in, has completed their physical profile (height, weight, age), and notification permissions must be enabled on the user's device.
- Post conditions:** Daily remaining calories are updated; the meal is saved to the history log; reminder logs are updated; user receives push notifications at set intervals.
- Actors:** Standard User, Food Database, System Notification Service.

3.1.3 Workout Session Management (U3)



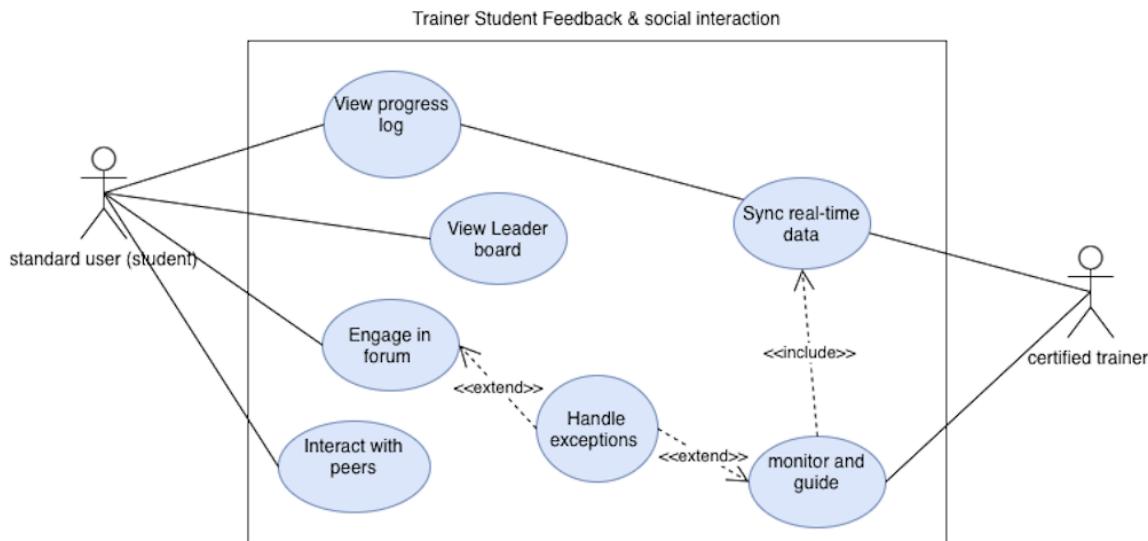
- **Purpose:** To provide tools for users to execute, time, and record their physical exercise routines.
- **Requirements Traceability:** Realizes the requirement for session-based exercise logging. It ties the "Timer" and "Log" bubbles to the functional need for tracking physical performance.
- **Priority:** High
- **Preconditions:** User has selected a routine template or started a blank session.
- **Post conditions:** Workout volume is calculated; any new PRs are flagged in the user profile.
- **Actors:** Standard User and System Background Service.

3.1.4 Passive Step Tracking and gamification



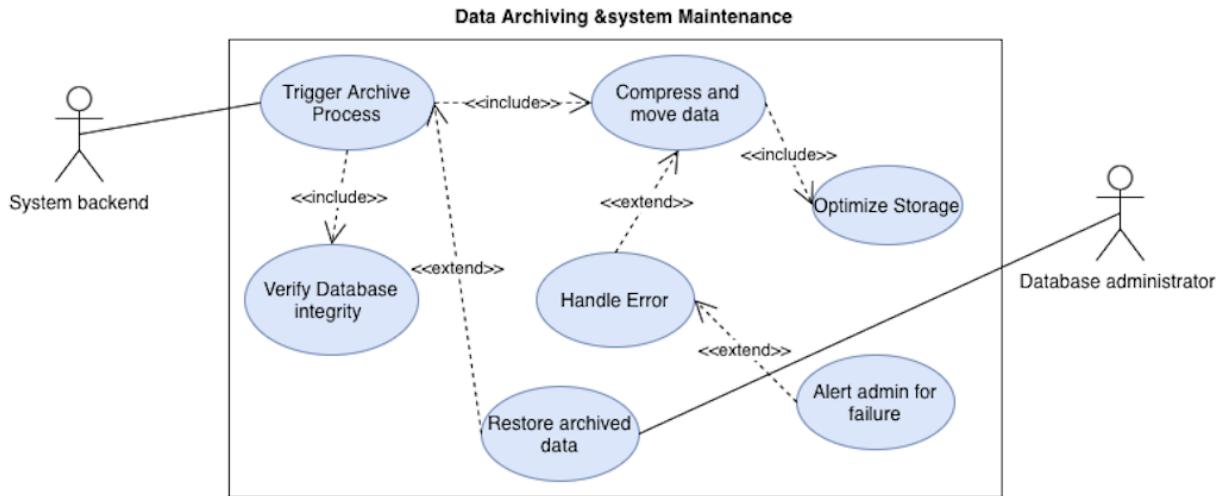
- **Purpose:** To monitor the user's movement throughout the day using hardware sensors and provide rewards for consistency.
- **Requirements Traceability:** Traces to the background sensing requirement. It bridges the "Mobile Sensors" system actor with the user's need for automated, low-latency movement monitoring.
- **Priority:** Low
- **Preconditions:** System has been granted permission to access "Physical Activity" or "Motion" sensors.
- **Post conditions:** Step count is updated in the database; "Streak" status is updated.
- **Actors:** Standard User, Hardware Sensors and System.

3.1.5 Trainer-Student Feedback & Social Interaction (U5)



- **Purpose:** To allow trainers to monitor student progress and provide professional guidance directly through the app, while fostering user engagement and retention through peer support, competitive leaderboards, and discussion forums.
- **Requirements Traceability:** This requirement supports trainer-led progress monitoring and in-app guidance for students. It links trainers and users through feedback, notifications, and role-based access. Social features like leaderboards and discussions reinforce engagement and retention.
- **Priority:** Medium
- **Preconditions:** A "Standard User" has accepted a link request from a "Certified Trainer," created a profile, and established a network connection.
- **Post conditions:** Trainer feedback is visible on the student's log; student receives a notification; user interactions (likes/posts) are saved; leaderboard rankings are recalculated based on new data.
- **Actors:** Certified Trainer, Standard User (Student).

3.1.6 Data Archiving & System Maintenance (U6)



Purpose: To maintain system performance by managing the volume of historical data and ensuring database integrity.

Requirements Traceability: This requirement ensures long-term system performance through controlled management of historical data. It connects backend processes with data protection and backup needs to preserve database integrity. Periodic archiving optimizes storage without affecting active system operations.

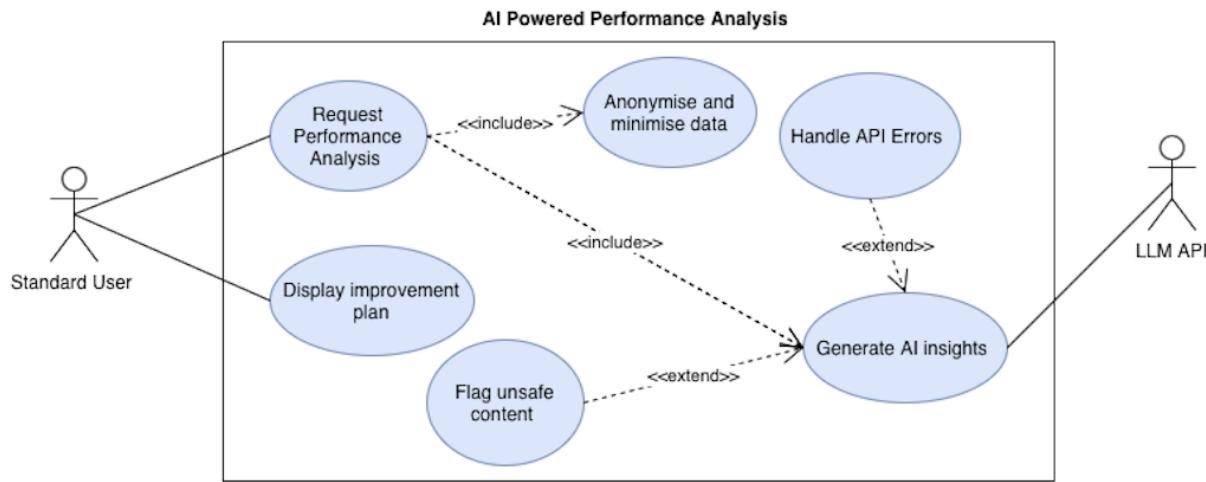
Priority: Medium

Preconditions: System background worker is triggered (e.g., once a month or when data exceeds 1 year).

Post conditions: Old data is compressed or moved to an archive table; system storage is optimized.

Actors: System Backend, Database Administrator.

3.1.7 AI-Powered Performance Analysis (U7)



Purpose: To leverage LLMs to analyze user data and provide personalized health insights and summaries.

Requirements Traceability: This requirement enables AI-driven analysis of user activity to generate personalized health insights. It links user data with LLM processing while accounting for performance, cost, and data exposure constraints. The output is a concise summary and improvement plan presented directly to the user.

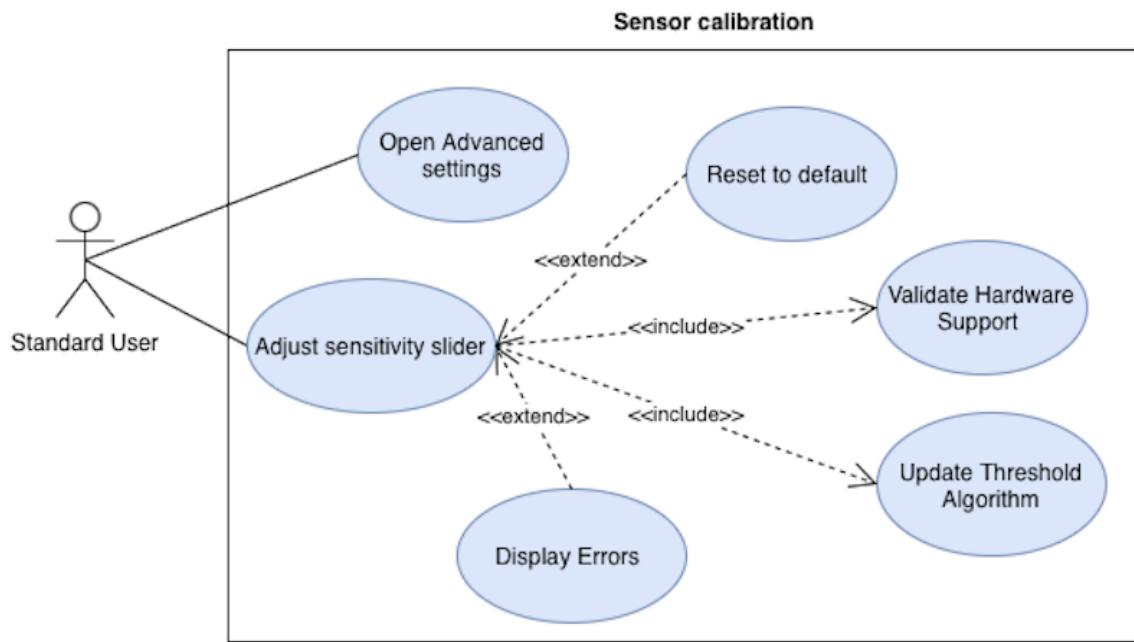
Priority: Low

Preconditions: User has at least 7 days of nutrition and workout logs.

Post conditions: A text-based summary and improvement plan are generated and displayed to the user.

Actors: Standard User, LLM API (GPT/Llama).

3.1.8 Sensor Calibration (U8)



Purpose: To allow users to adjust the sensitivity of the step counter to match their specific hardware or walking style.

Requirements Traceability: This requirement supports accurate step tracking by allowing users to calibrate sensitivity to their device or walking style. It links user control with usability and configurability needs of the tracking system. Adjustments directly influence the step-counting algorithm for improved accuracy.

Priority: Low

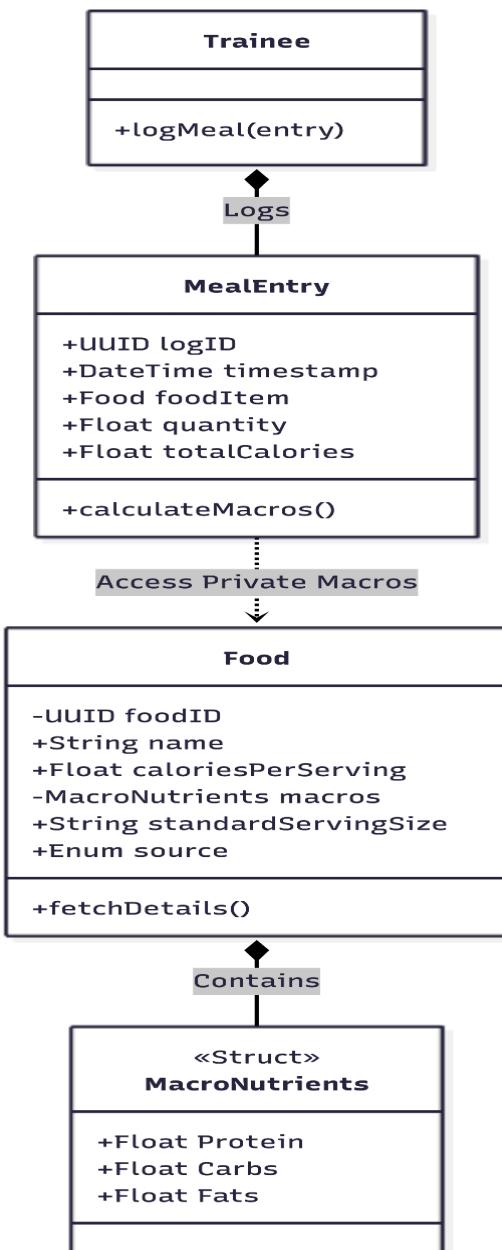
Preconditions: Access to device accelerometer.

Post conditions: The step-counting algorithm's threshold is adjusted based on the calibration slider value.

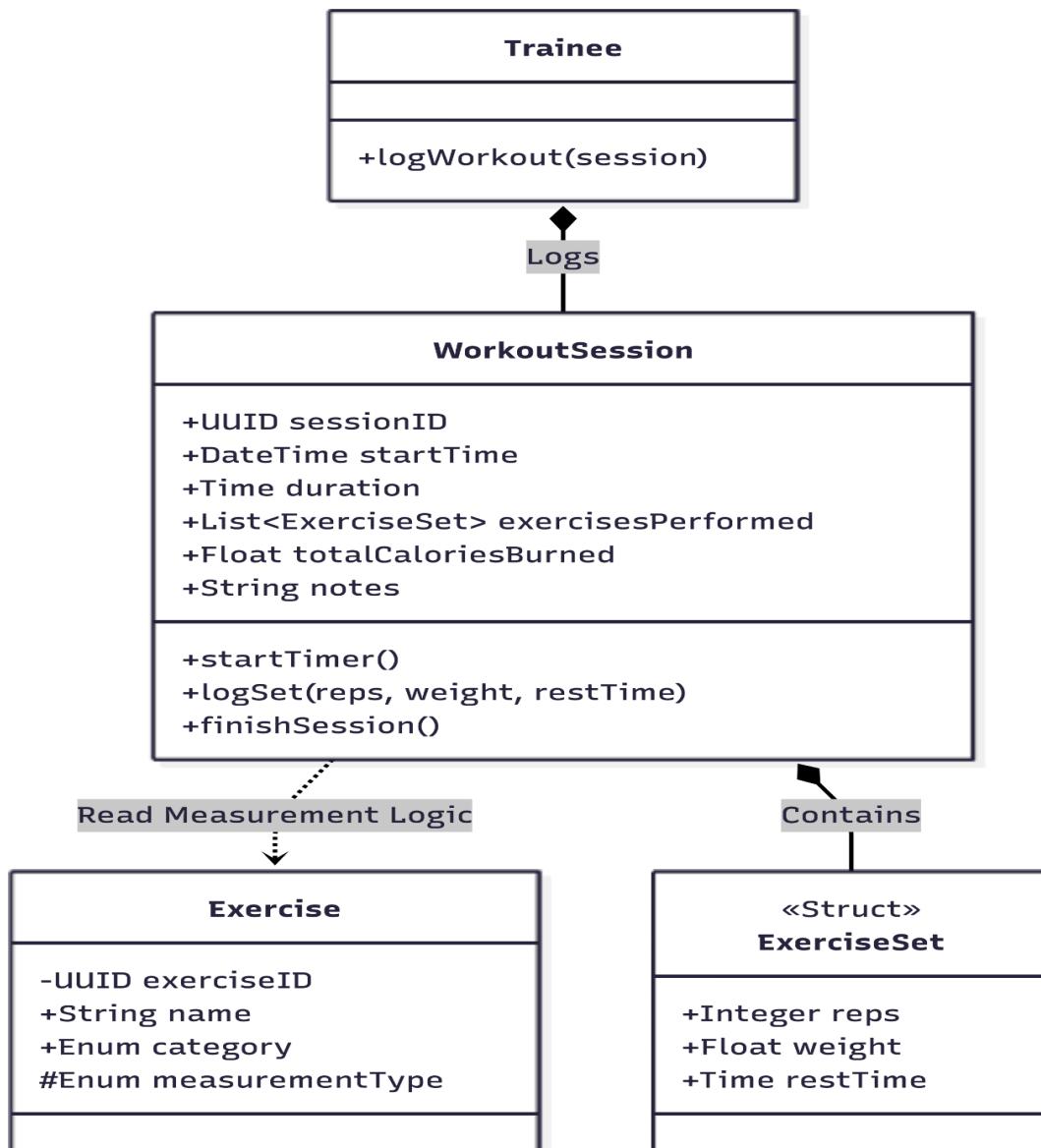
Actors: Standard User.

3.2 Class Diagrams

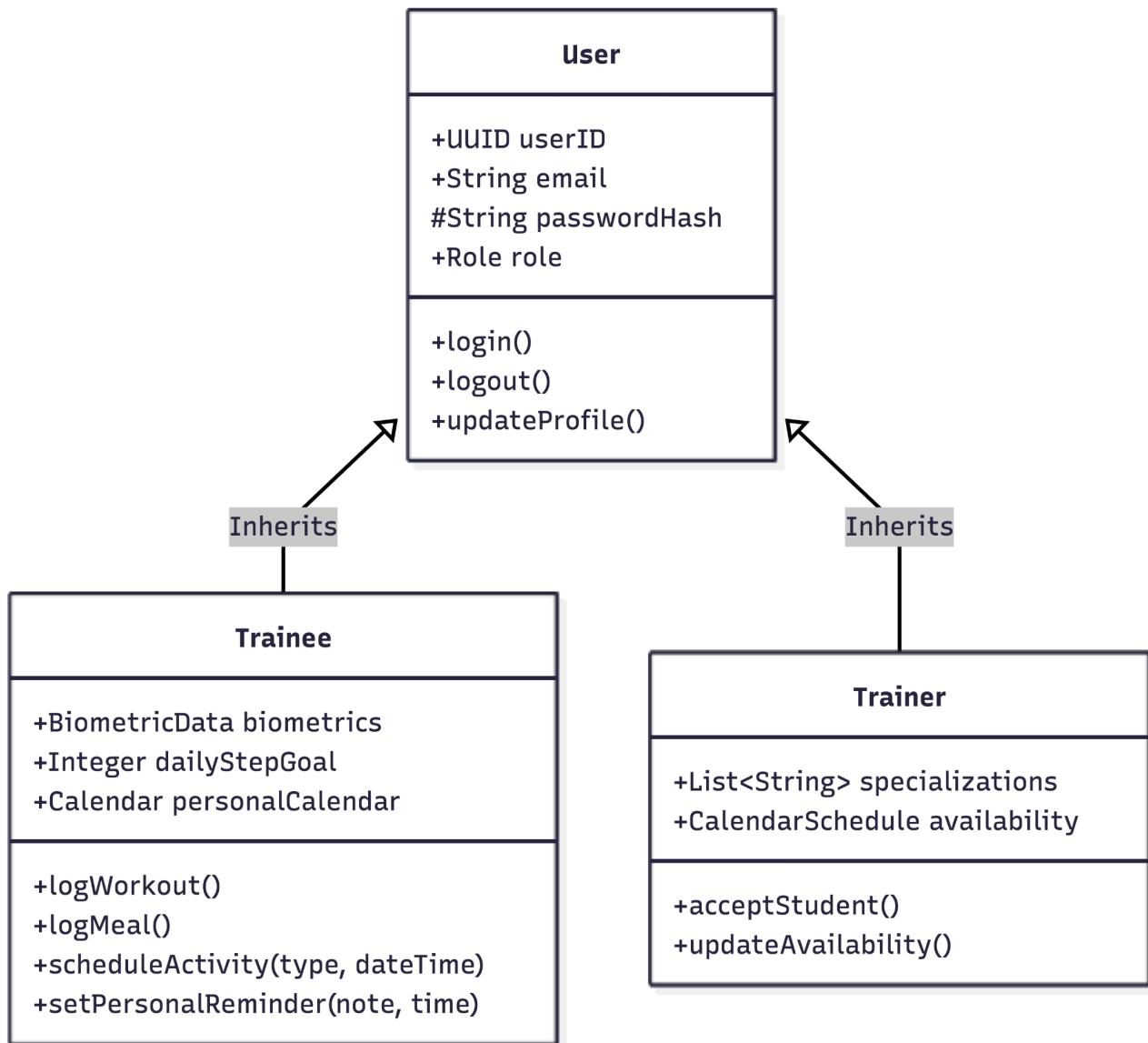
3.2.1 Class Diagram 1



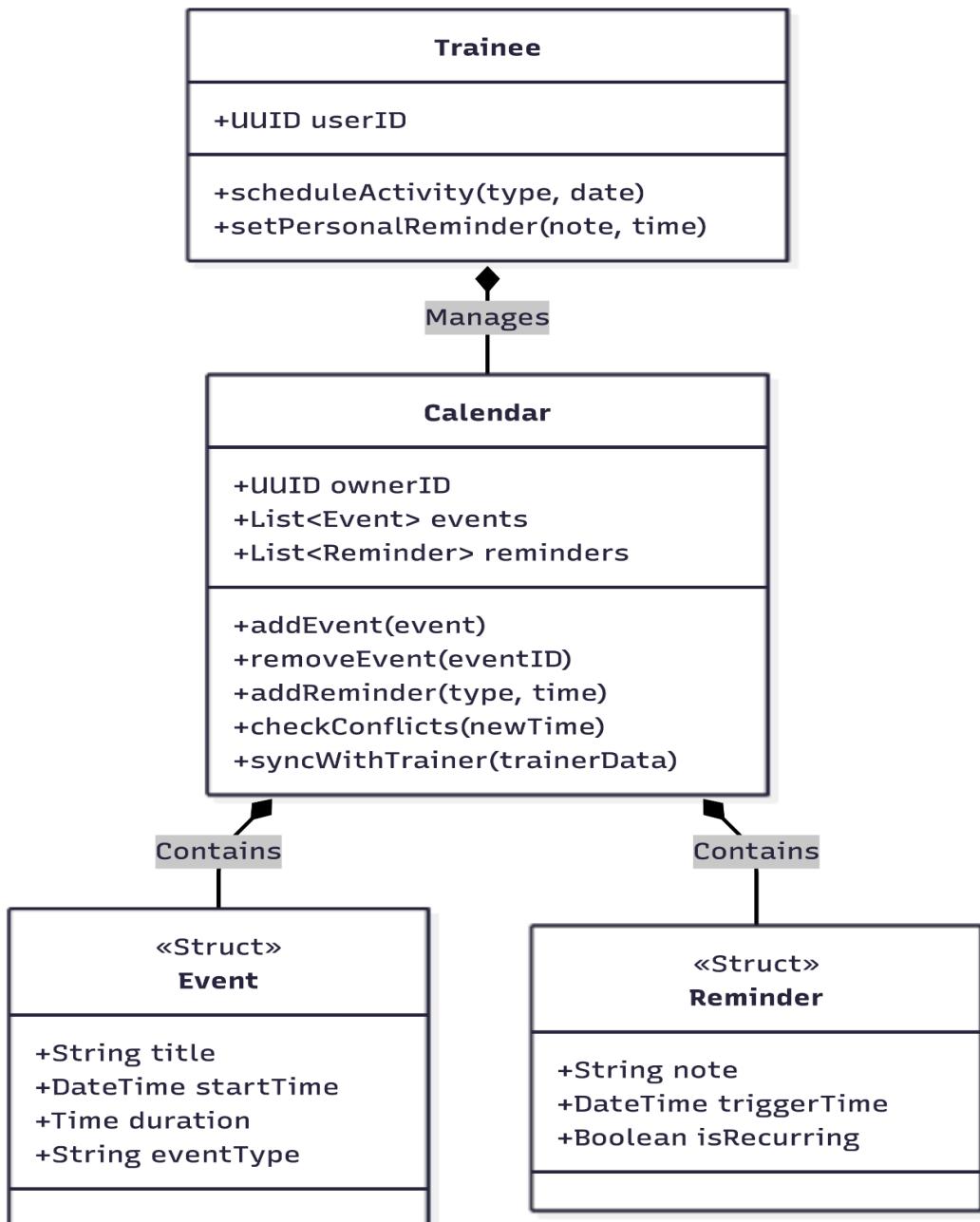
3.2.2 Class Diagram 2



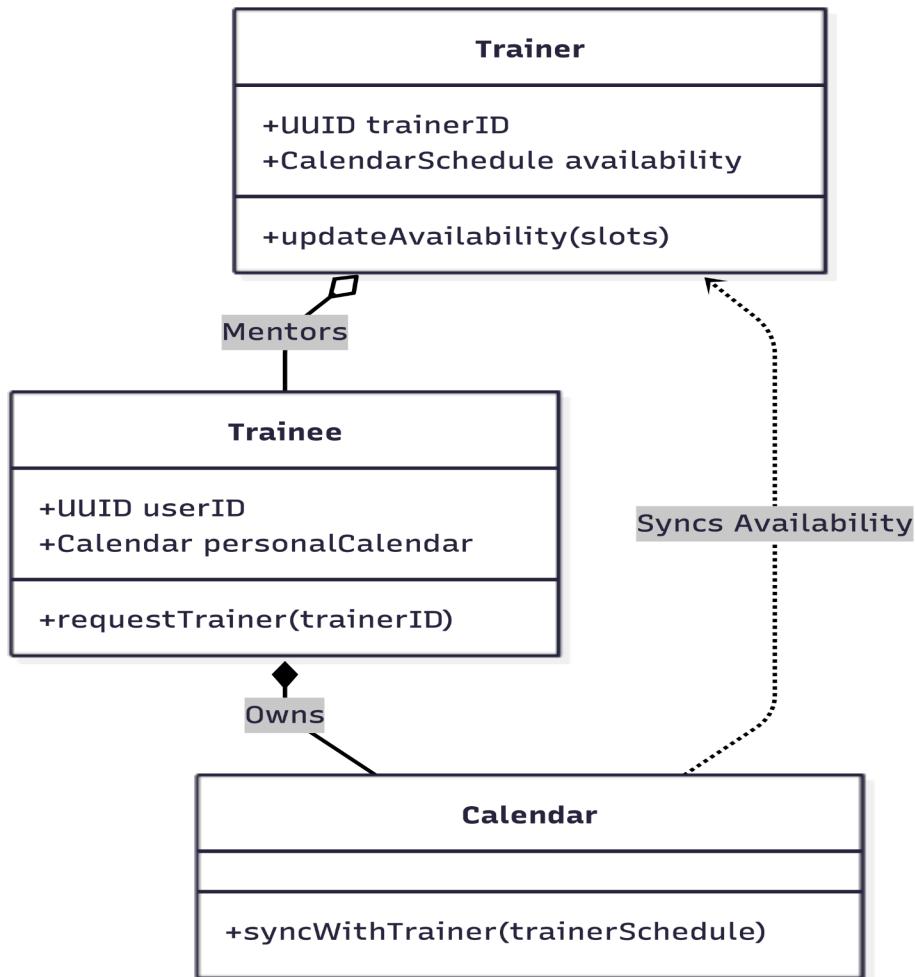
3.2.3 Class Diagram 3



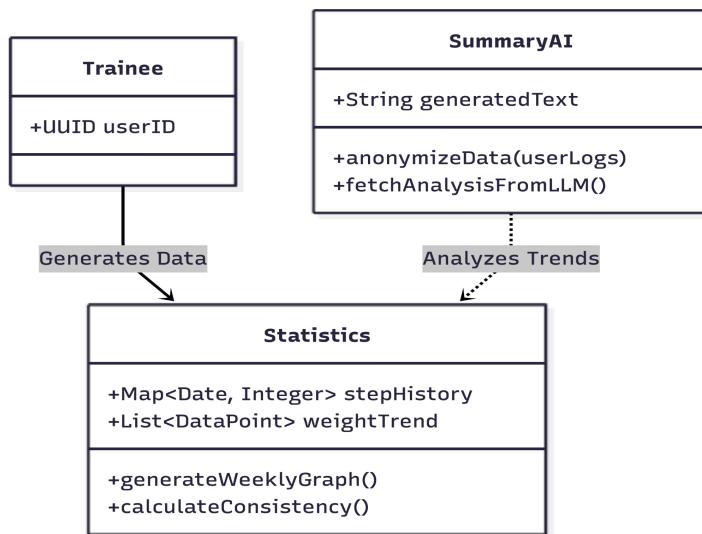
3.2.4 Class Diagram 4



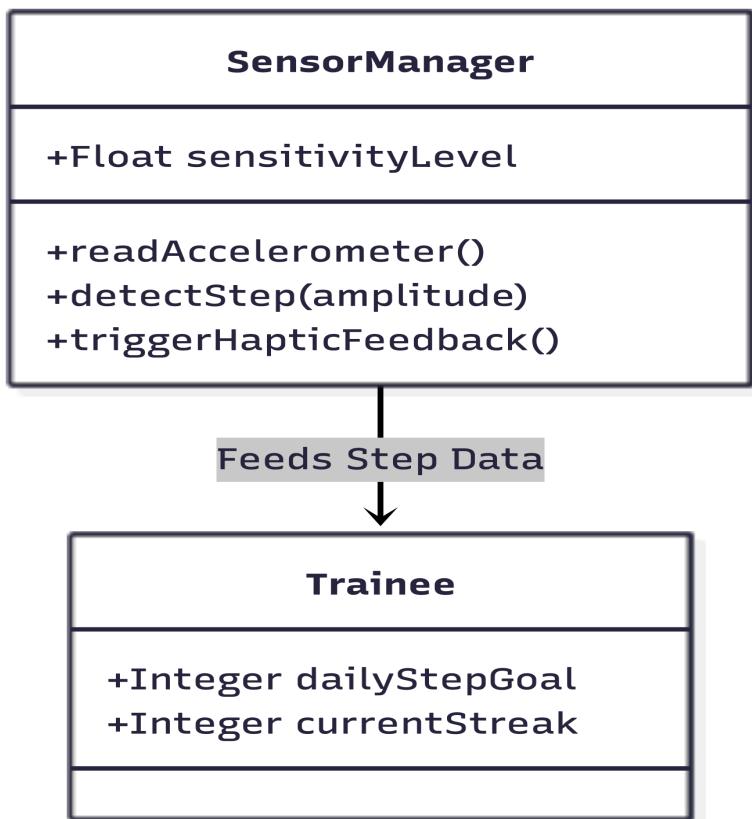
3.2.5 Class Diagram 5



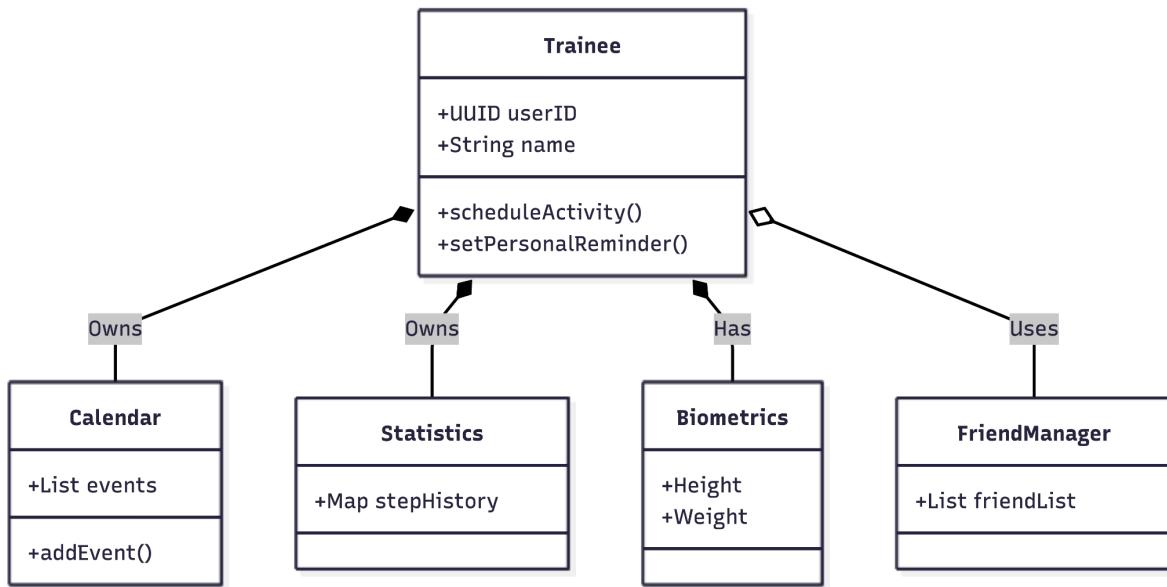
3.2.6 Class Diagram 6



3.2.7 Class Diagram 7



3.2.8 Class Diagram 8



Class: User

The base class for all actors in the system.

- **Attributes:**

- userID: UUID (Unique Identifier).
- name: String.
- email: String.
- passwordHash: String (bcrypt encryption).
- role: Enum {TRAINEE, TRAINER, ADMIN}.
- profileImage: String (URL).
- isVerified: Boolean (Auth status for Trainers).

- **Methods:**

- login(email, password): Authenticates credentials.
- logout(): Terminates the session.
- resetPassword(email): Initiates OTP recovery.
- updateProfile(data): Updates personal details.

Class: Trainee (extends User)

The standard fitness user who logs activities and manages their own schedule.

- **Attributes:**

- biometrics: BiometricData (Struct containing Height, Weight, Age, Gender).

- daily Step Goal: Integer (e.g., 10,000).
 - currentStreak: Integer (Days).
 - tdee: Float (Total Daily Energy Expenditure).
 - assignedTrainerID: UUID (Nullable).
 - personalCalendar: Calendar (Object managing the user's schedule).
- **Methods:**
 - logWorkout(session): Saves an exercise routine.
 - logMeal(entry): Saves food intake.
 - requestTrainer(trainerID): Sends a coaching request.
 - viewDashboard(): Loads visualization of step circles/calories.
 - scheduleActivity(type, dateTime): Creates a planned event on the personal calendar.
 - setPersonalReminder(note, time): Creates a custom notification.

Class: Trainer (extends User)

A professional user who monitors students and manages availability.

- **Attributes:**
 - trainerID: UUID.
 - specializations: List<String> (e.g., Yoga, HIIT).
 - rating: Float (0.0 - 5.0).
 - certifications: List<String> (File paths).
 - studentList: List<Trainee>.
 - availability: CalendarSchedule.
- **Methods:**
 - acceptStudent(requestID): Adds a trainee to the roster.
 - viewStudentLog(studentID): Read-only access to a student's history.
 - postFeedback(studentID, note): Writes advice to a student's profile.
 - updateAvailability(slots): Manages open coaching slots.

Class: Calendar

Manages the user's specific events, reminders, and trainer synchronization.

- **Attributes:**
 - ownerID: UUID.
 - events: List<Event>.
 - reminders: List<Reminder>.

- **Methods:**

- addEvent(event): Adds a workout or meeting to the schedule.
- removeEvent(eventID): Deletes an existing event.
- addReminder(type, time): Sets a push notification alarm.
- checkConflicts(newTime): Validates if a slot is free before booking.
- syncWithTrainer(trainerData): Overlays trainer availability to find meeting slots.

Struct: Event

- title: String.
- startTime: DateTime.
- duration: Time.
- eventType: String.

Struct: Reminder

- note: String.
 - triggerTime: DateTime.
 - isRecurring: Boolean.
-

Class: Food

Represents a database item from the nutrition library.

- **Attributes:**

- foodID: UUID.
- name: String.
- caloriesPerServing: Float.
- macros: MacroNutrients (Struct: Protein, Carbs, Fats).
- standardServingSize: String.
- source: Enum {API, USER_CUSTOM}.

- **Methods:**

- fetchDetails(): Queries the third-party food database API.

Class: MealEntry

Friend Class Relation: Has privileged access to Food.macros.

1. **Attributes:**

- a. logID: UUID.
- b. timestamp: DateTime.
- c. foodItem: Food.
- d. quantity: Float (Number of servings).

- e. totalCalories: Float.

2. Methods:

- a. calculateMacros(): Accesses private Food data to compute total P/C/F based on quantity.
-

Class: Exercise

Defines a type of activity.

- **Attributes:**

- exerciseID: UUID.
- name: String.
- category: Enum {CARDIO, STRENGTH, FLEXIBILITY}.
- measurementType: Enum {TIME_BASED, REP_BASED} (Protected).

Class: WorkoutSession

Friend Class Relation: Has privileged access to Exercise.measurementType.

- **Attributes:**

- sessionID: UUID.
- startTime: DateTime.
- duration: Time.
- exercisesPerformed: List<ExerciseSet>.
- totalCaloriesBurned: Float.
- notes: String.

- **Methods:**

- startTimer(): Initiates the workout timer.
- logSet(reps, weight, restTime): Records gym data.
- finishSession(): Saves data and calculates total volume.

Class: Statistics

Handles aggregation of historical data.

- **Attributes:**

- userID: UUID.
- stepHistory: Map<Date, Integer>.
- weightTrend: List<DataPoint>.
- calorieBalance: Map<Date, ConsumedVsBurned>.

- **Methods:**

- generateWeeklyGraph(): Returns data for charts.
- calculateConsistency(): Determines if "Streak" should be active.

Class: SummaryAI

Manages LLM-generated insights.

- **Attributes:**

- generatedText: String.
- weekStartDate: Date.
- adherenceTrend: Enum {POSITIVE, NEGATIVE, STABLE}.
- improvementPlan: String.

- **Methods:**

- anonymizeData(userLogs): Strips PII before sending to AI.
- fetchAnalysisFromLLM(): Calls the LLM API with minified JSON.

Class: SensorManager

- **Attributes:**

- sensitivityLevel: Float.
- isTracking: Boolean.

- **Methods:**

- readAccelerometer(): Captures raw motion data.
- detectStep(amplitude): Algorithmic step detection.
- triggerHapticFeedback(): Vibrates device on goal/timer completion.

Class: FriendManager

- **Attributes:**

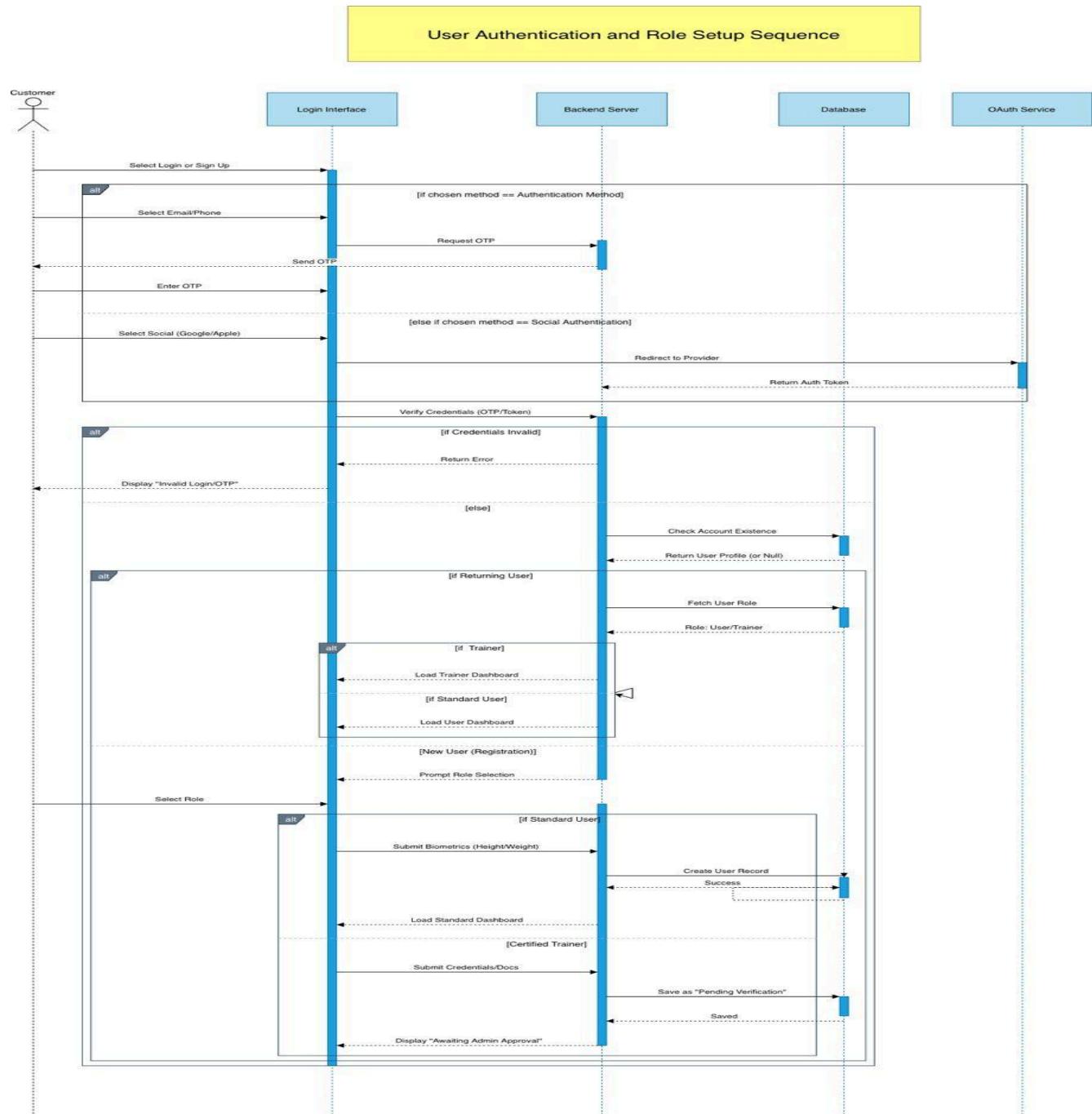
- friendList: List<User>.
- pendingRequests: List<Request>.
-

- **Methods:**

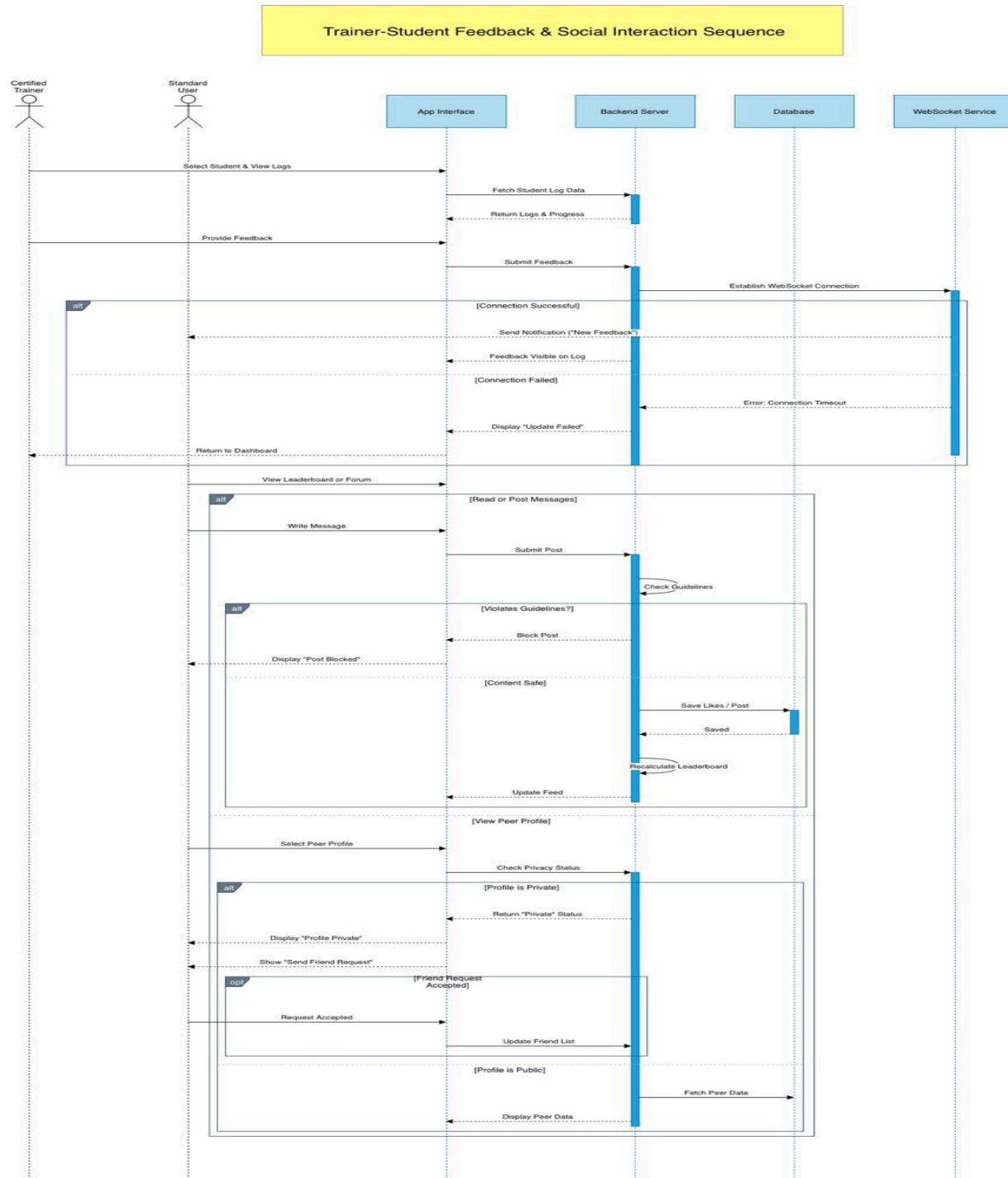
- sendRequest(targetUserID): Initiates connection.
 - acceptRequest(requesterID): Establishes link.
 - viewLeaderboard(): Ranks friends.
-

3.3 Sequence Diagrams

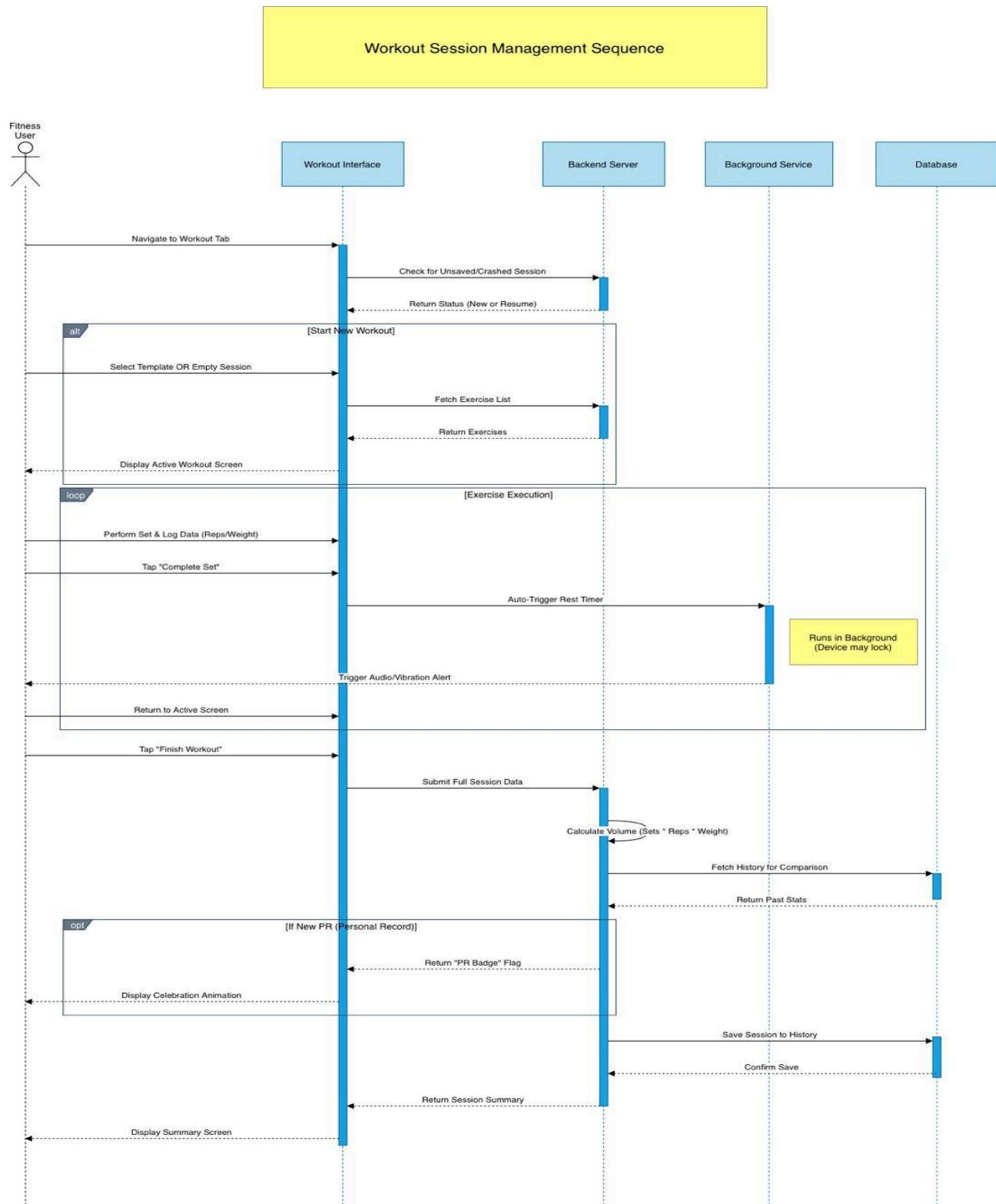
3.3.1 Login



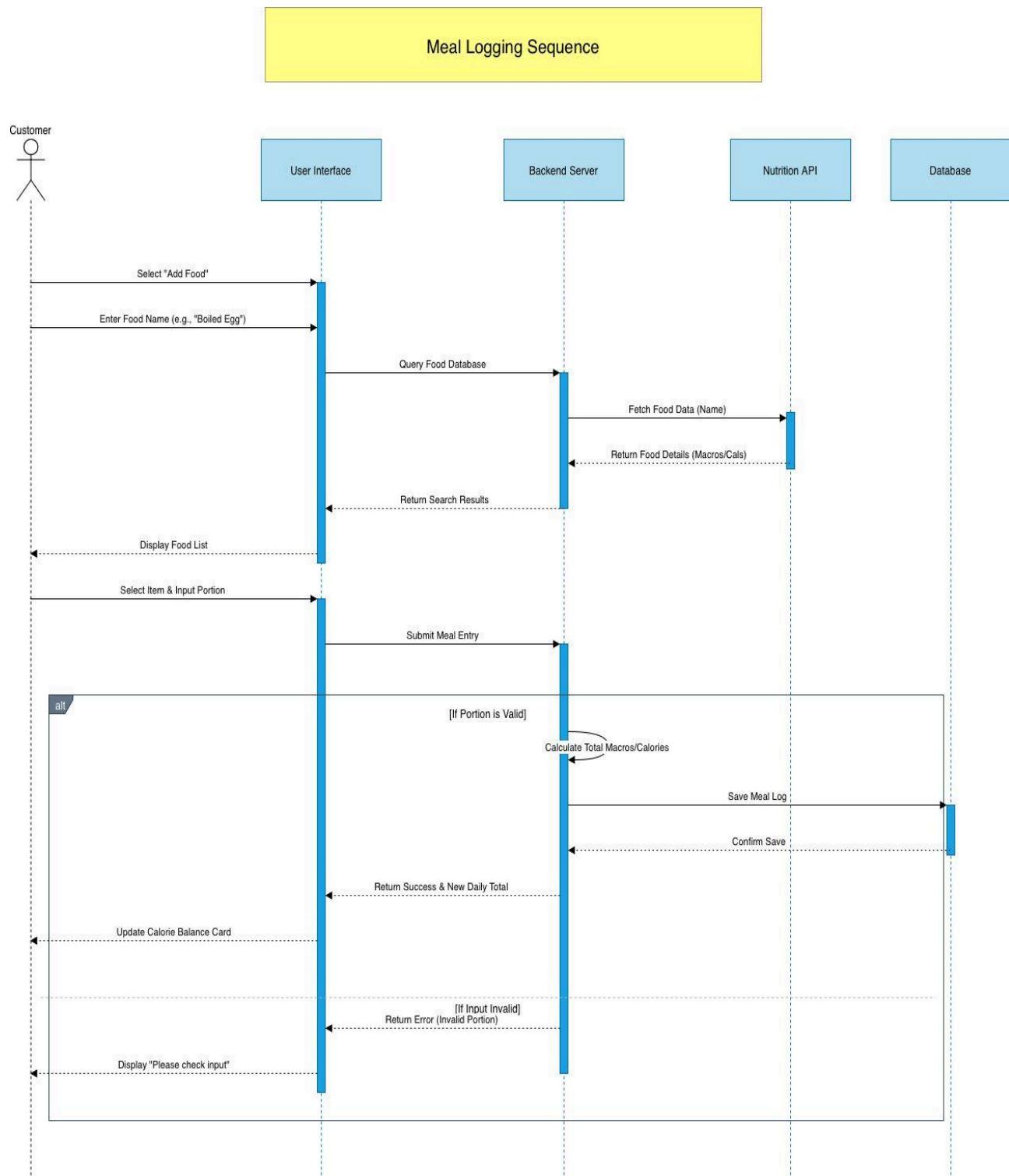
3.3.2 Trainer Student Feedback



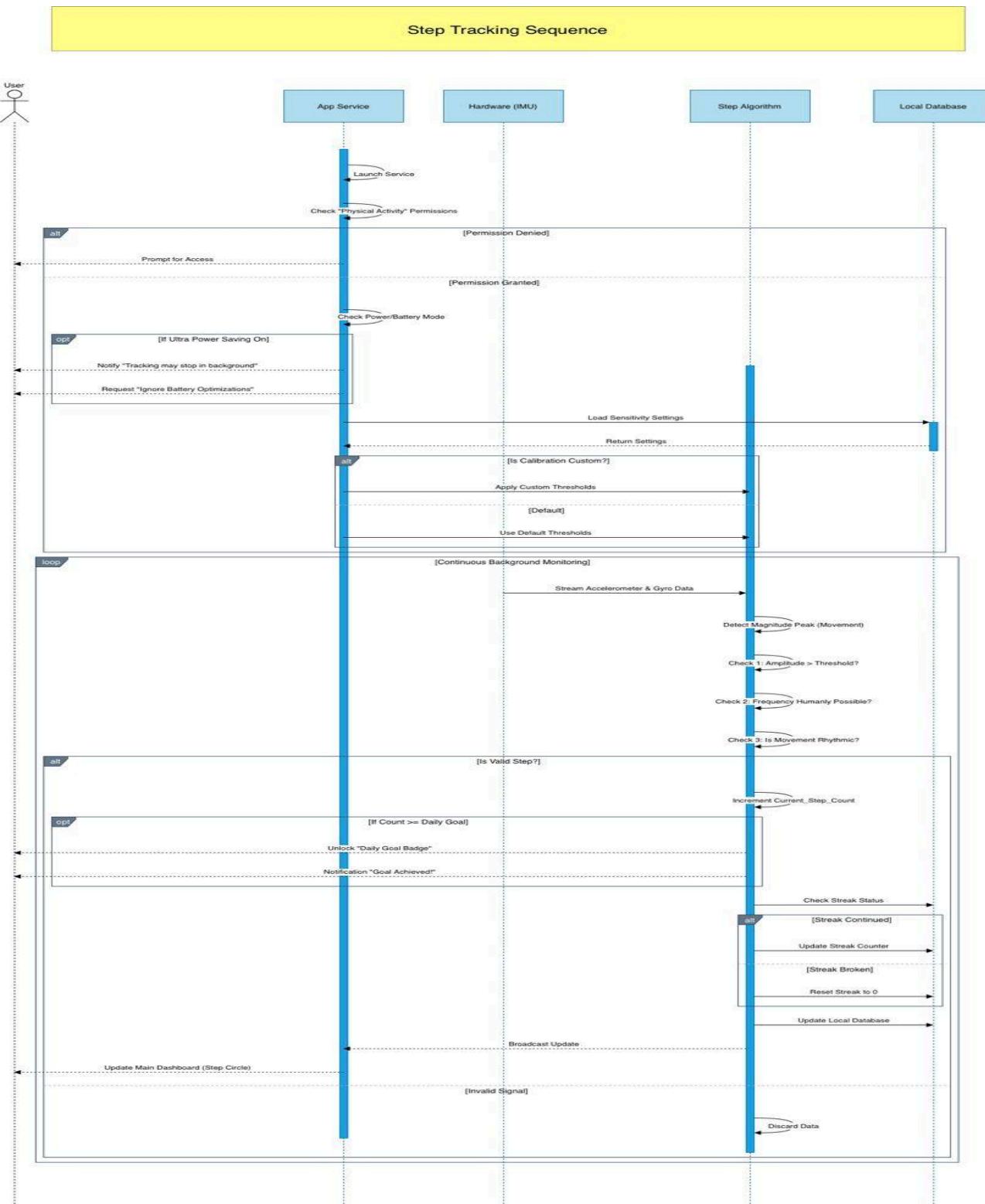
3.3.3 Workout Session



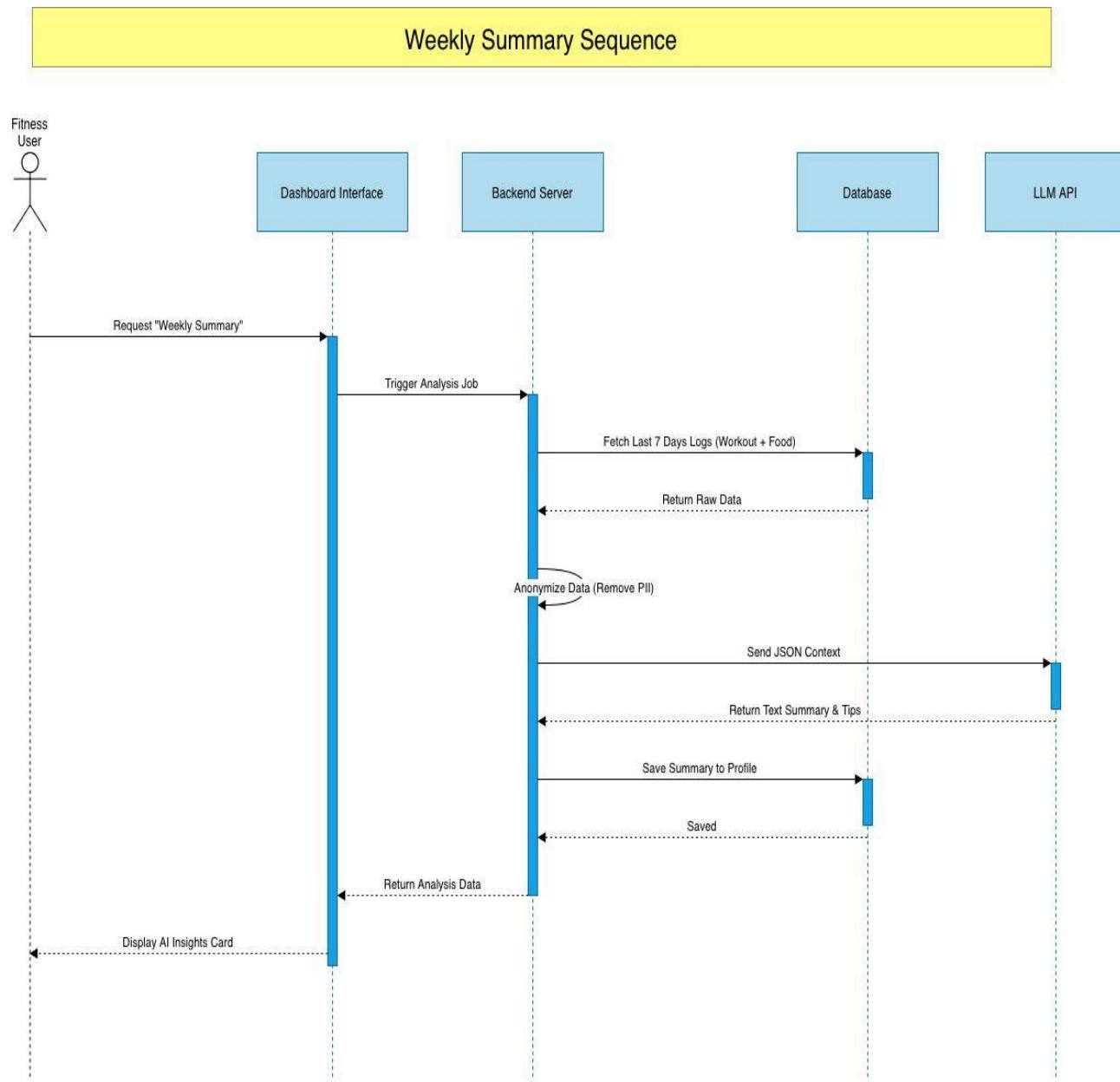
3.3.4 Meal Logging



3.3.5 Step Tracking

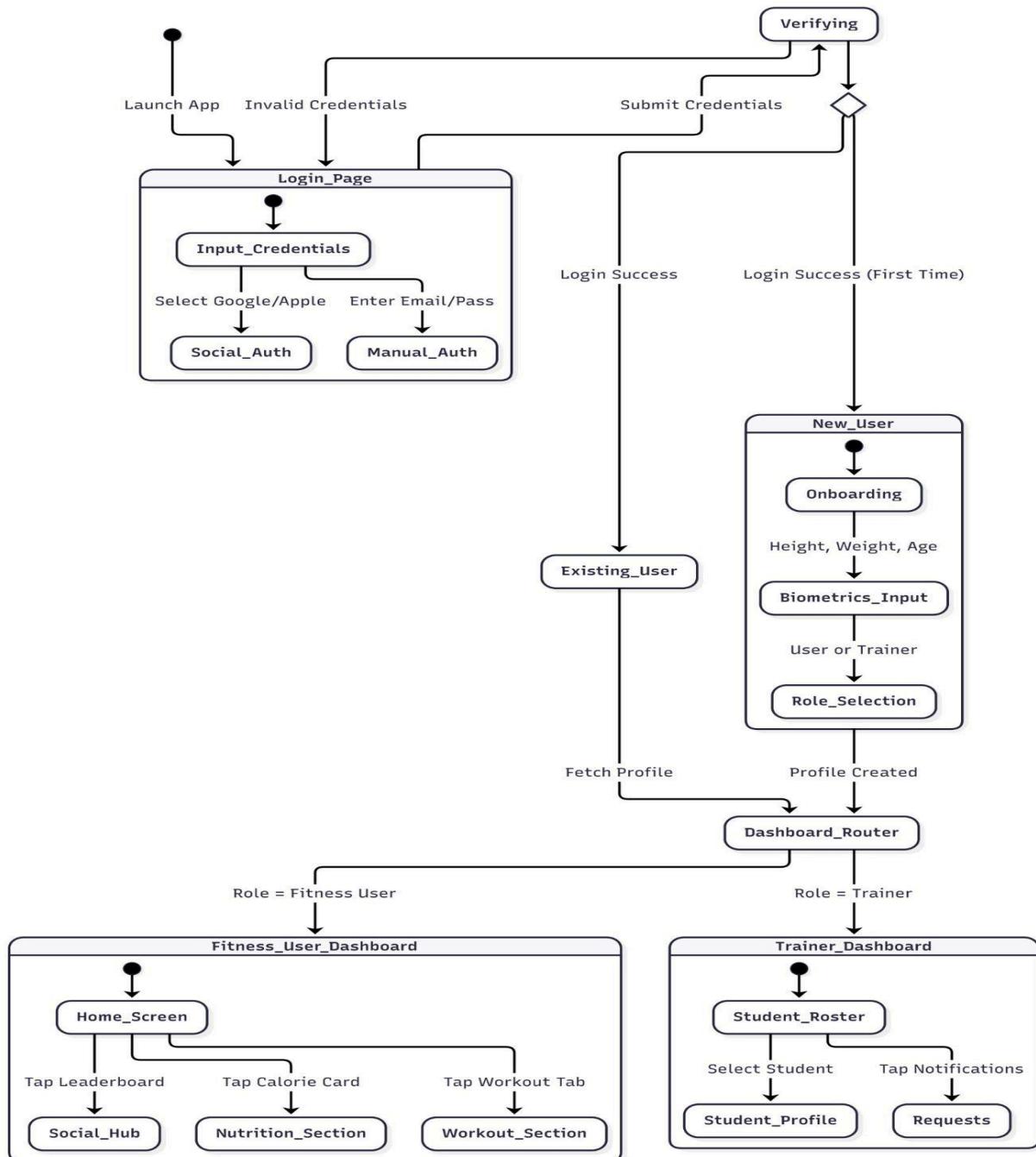


3.3.6 Weekly Summary

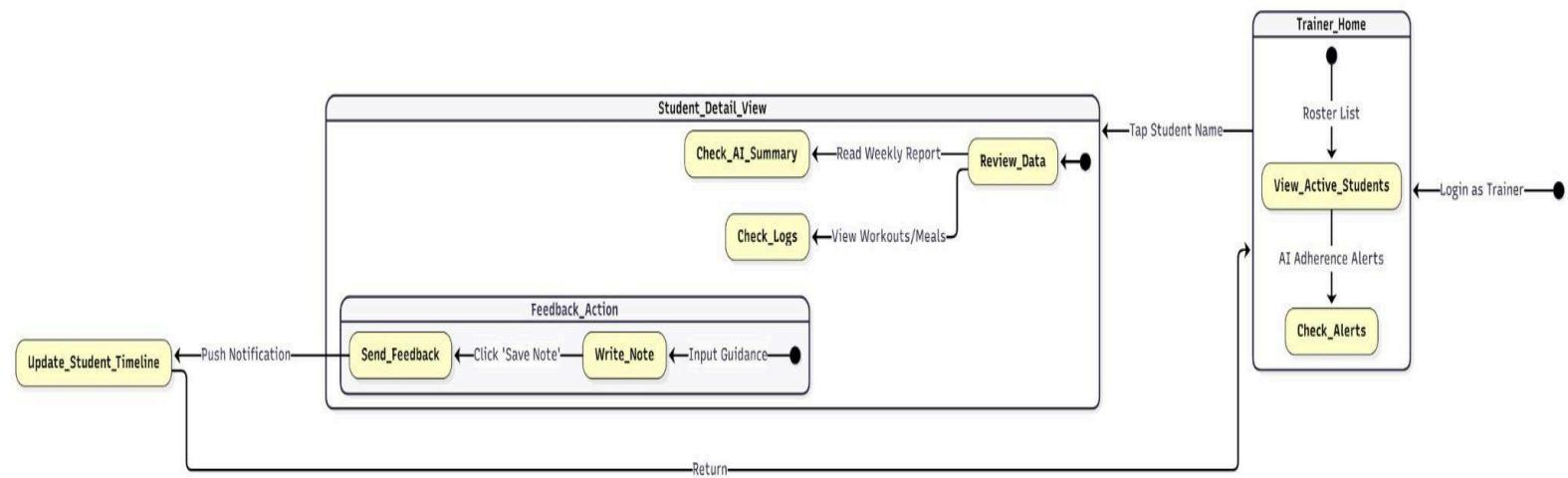


3.4 State Diagrams

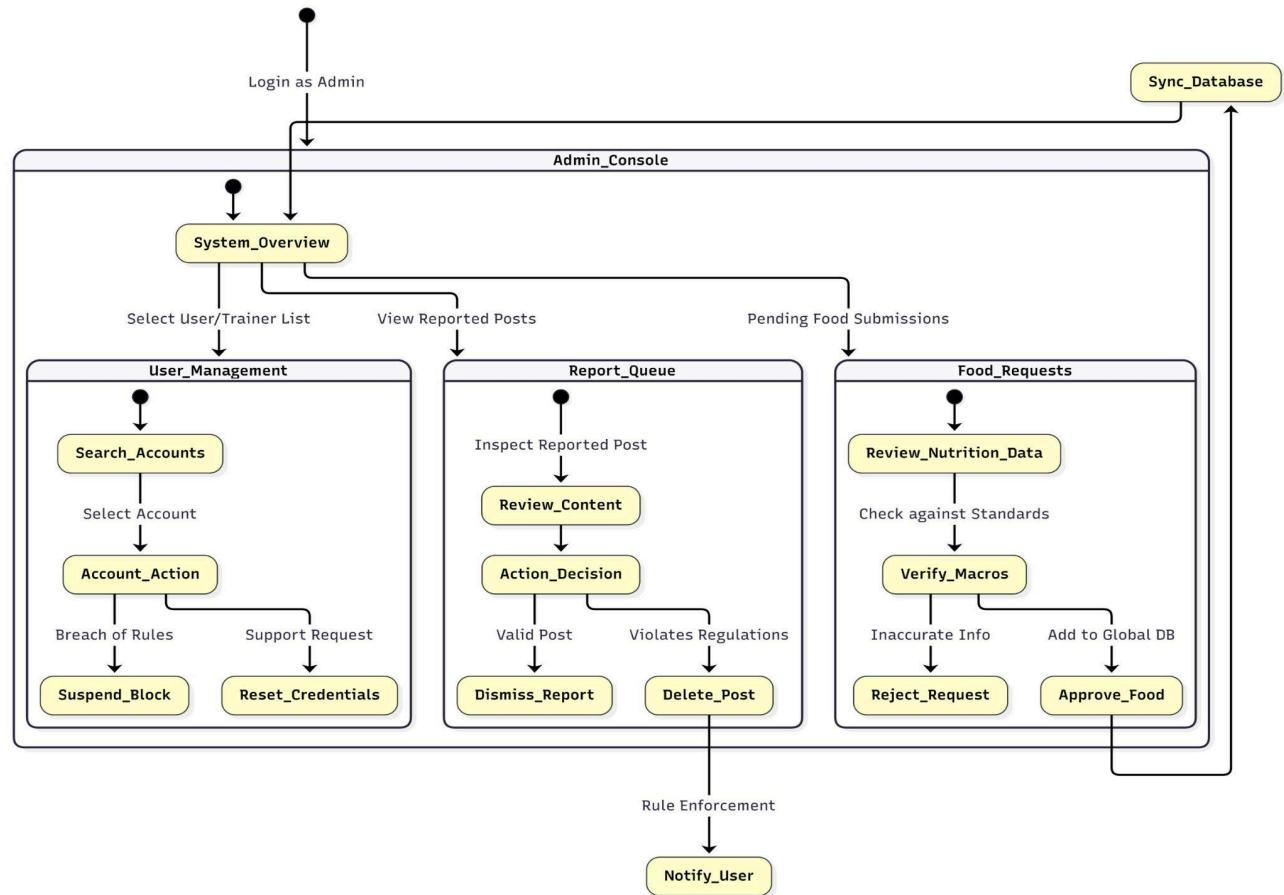
3.4.1 User Login and Dashboard



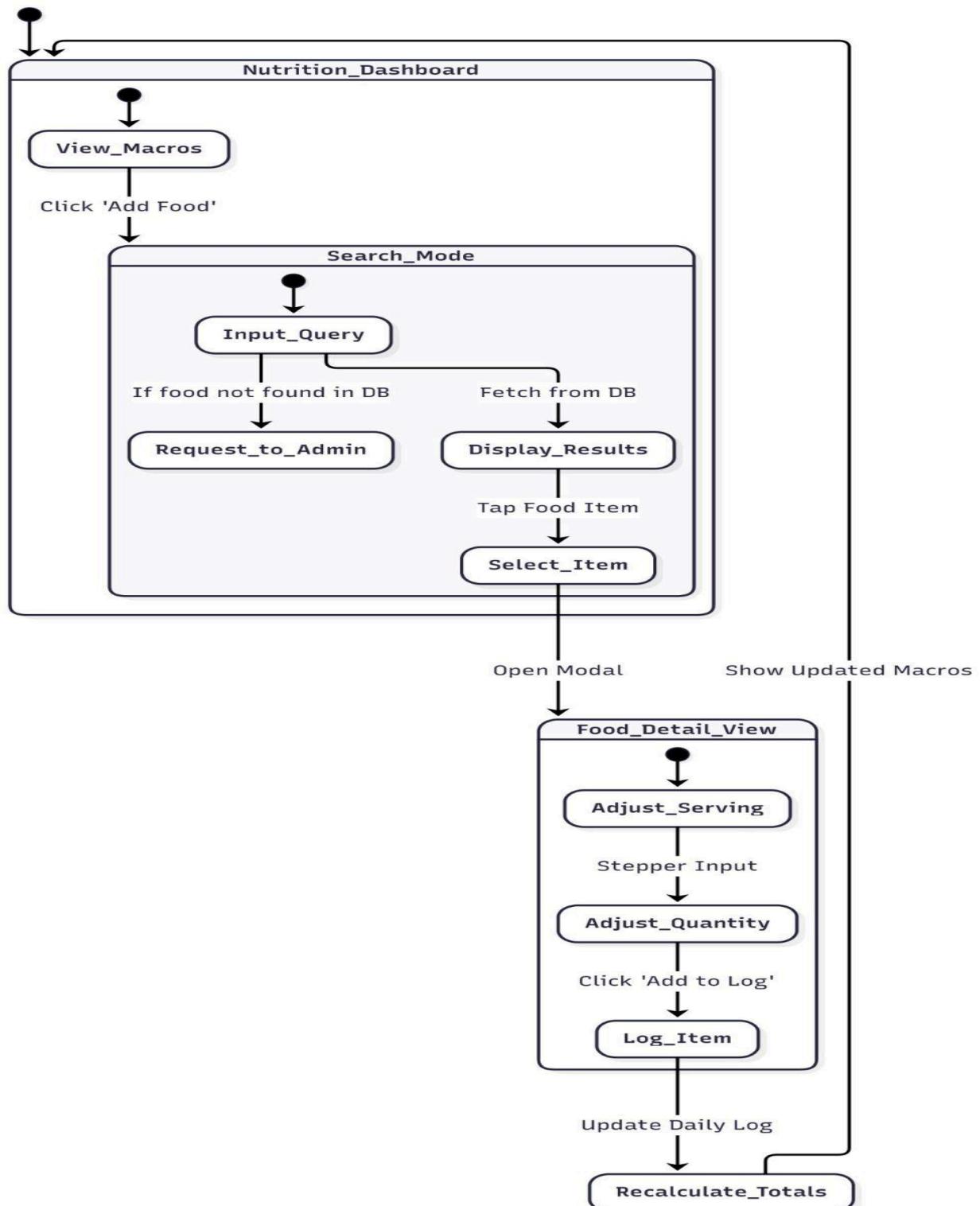
3.4.2 Trainer Dashboard and Feedback



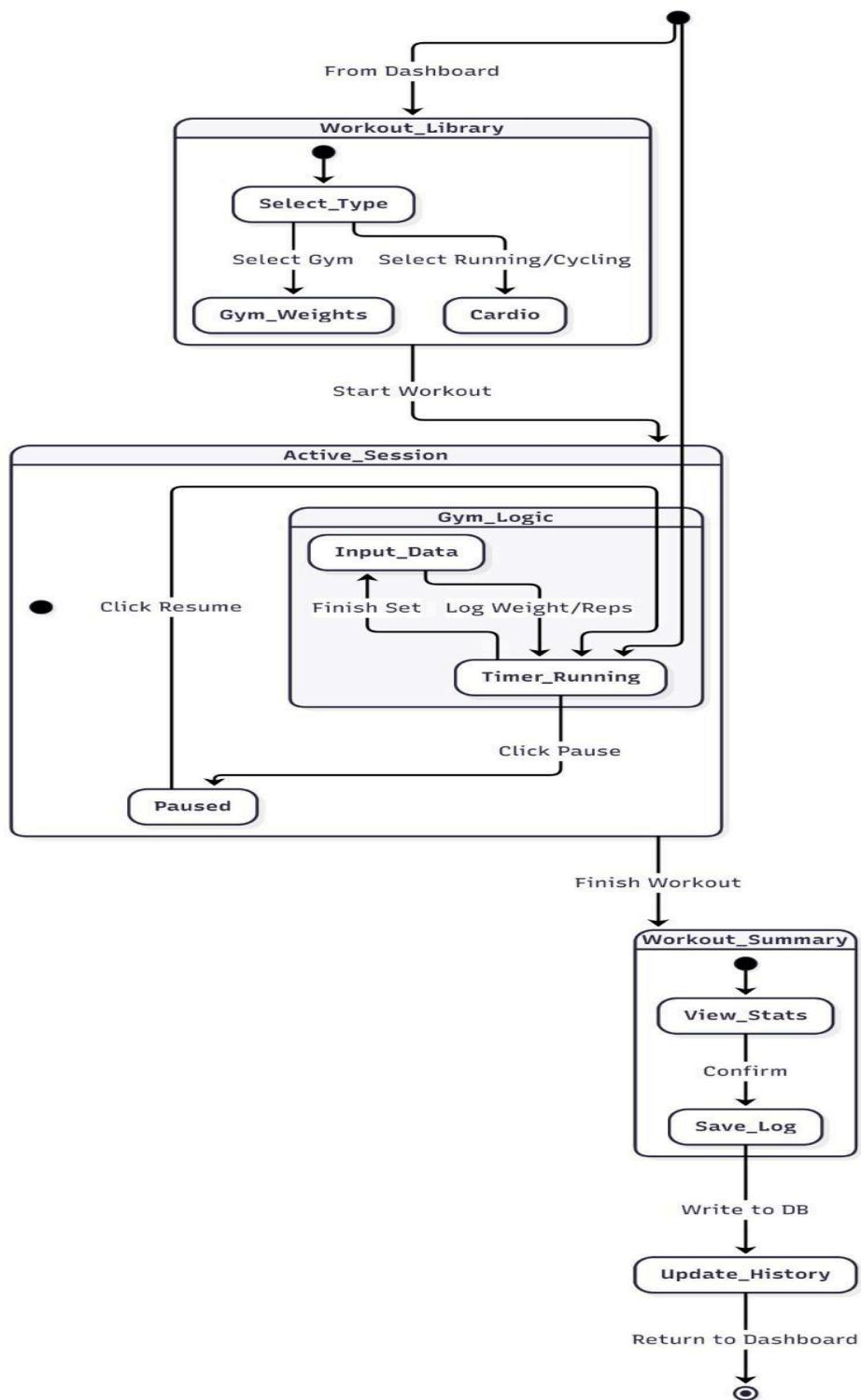
3.4.3 Admin Management and Content Modification



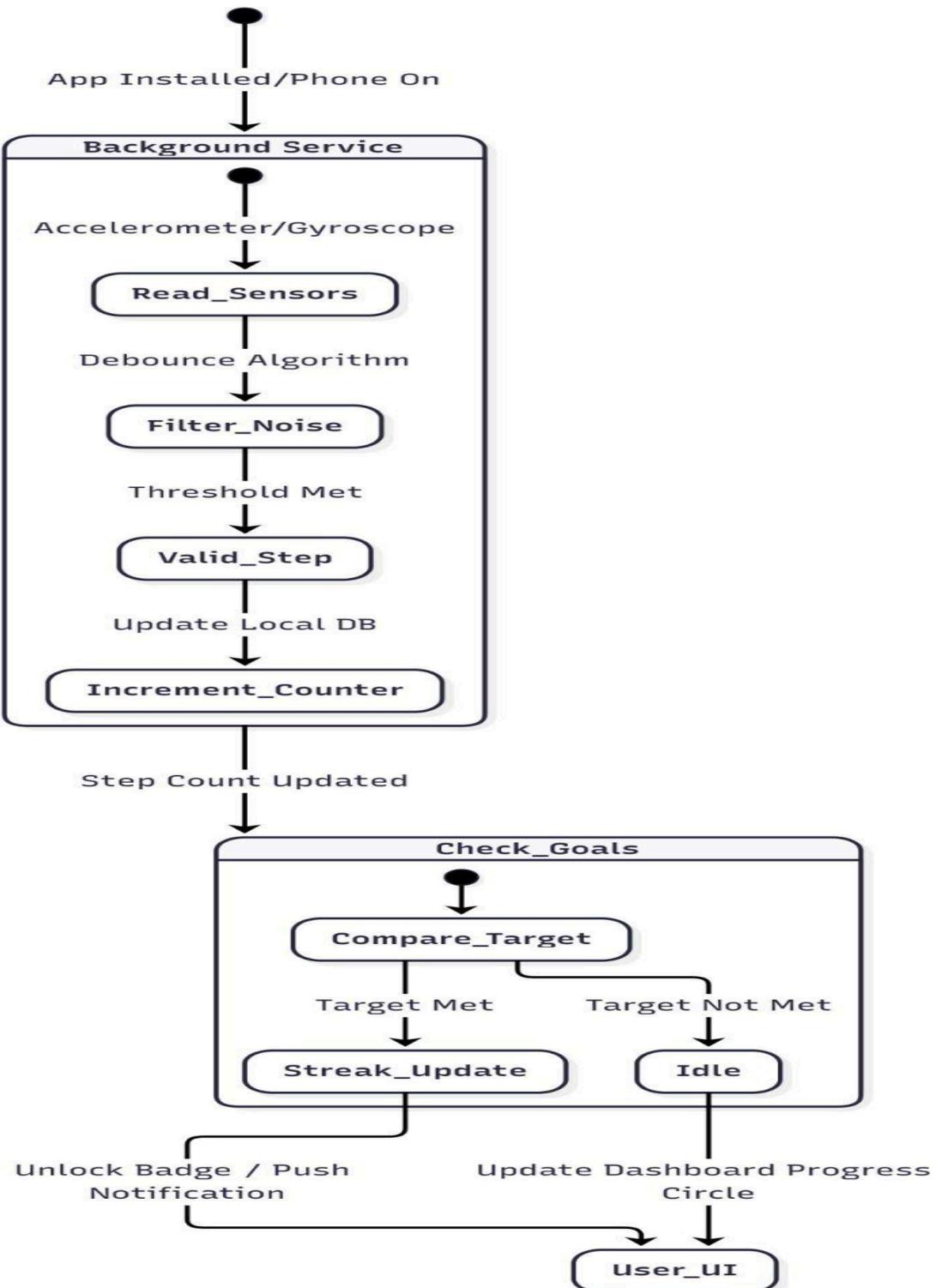
3.4.4 Nutrition And Meal Logging



3.4.5 Workout Session Management



3.4.6 Passive Step Tracking



4 Project Plan



MEMBERS	DESCRIPTION OF WORK
Krishna Agrawal	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT , ALPHA TESTING
Ayush Mangal	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT , UNIT TESTING
Sahil Agarwal	BACKEND DEVELOPMENT, CODE IMPROVEMENT , ALPHA TESTING
Abubakar Siddique	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT , UNIT TESTING
Nideesh H	FULL STACK IMPLEMENTATION, SYSTEM TESTING , BETA TESTING
Aman Gupta	BACKEND DEVELOPMENT, INTEGRATION TESTING , ALPHA TESTING
Ankit Kumar Jha	FRONTEND DEVELOPMENT, UNIT TESTING , ADDRESSING FEEDBACK
Chandradip Karmakar	FULL STACK IMPLEMENTATION , CODE IMPROVEMENT , SYSTEM TESTING
Rushali Myageri	FULL STACK IMPLEMENTATION, CODE IMPROVEMENT , UNIT TESTING
Aditi	FRONTEND DEVELOPMENT, MANUAL FOR BETA TESTING , BETA TESTING

5 Appendix A - Group Log

Date	Timings	Duration	Minutes
22nd Jan	21:00-23:30	2 hrs 30 mins	<ul style="list-style-type: none"> The team developed a work breakdown structure for the e design document and distributed initial tasks equitably.
25th Jan	19:00-23:30	4 hrs 30 mins	<ul style="list-style-type: none"> Meeting to discuss inputs received from the professor after the first design document meeting.
27th Jan	20:00-23:00	3 hrs	<ul style="list-style-type: none"> Discussed the initial draft on class diagrams and other object oriented design elements. Based on these the UI tasks were split equally among the members.
30th Jan	10:00-13:30	3 hrs 30 mins	<ul style="list-style-type: none"> Initial design document draft was completed. Discussed over what improvements and additions were to be made to the initial draft. UI tasks completed were evaluated and a unified UI interface was decided.
31st Jan	21:00-02:00	5 hrs	<ul style="list-style-type: none"> The team completed the intermediate draft of the project document and assigned sections to different members for cross-review and proofreading. The group went over each member's contribution to the document till now and it was made sure everyone made equal contributions.
2nd Feb	21:00-23:30	2 hrs 30 mins	<ul style="list-style-type: none"> The team completed the intermediate draft of the project document and assigned.

			<ul style="list-style-type: none">sections to different members for cross-review and proofreading.Final updates to be made on the document were decided and members were assigned work.Final Draft was completed
6th Feb	20:00-23:30	3 hrs 30 mins	<ul style="list-style-type: none">The document was submitted