# FitHub: A Gym Companion Application

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## Introduction

FitHub is designed to make fitness more accessible, intelligent, and enjoyable. Developed using React Native for the front end and Django with Python for the back end, and powered by a PostgreSQL database, this application addresses key challenges faced by fitness enthusiasts:

- Exercise Discovery: Users can find workouts—more than 1200—with available equipment, filter over muscle groups, set favorites, and get written and visualized instructions, ensuring effective training.
- Smart Nutrition Planning: By evaluating metrics such as height, weight, age, and fitness goals, the app generates customized meal plans that align with individual health objectives.
- Posture Detection: Using real-time pose estimation, the app evaluates user form during exercises like squats and lunges. The application provides corrective feedback to help users improve their posture, avoid injury, and get better results.

At its core, the Gym Companion Application acts as a virtual fitness coach, guiding users through every aspect of their fitness journey—offering the right workouts, tailored nutrition, and real-time form correction, all from the convenience of their smartphone.

## Academic Question

The academic question with my Gym Application is as:

How can the integration of AI-driven pose estimation, a structured exercise library, and personalized nutrition planning in a mobile fitness application enhance the overall user fitness experience?

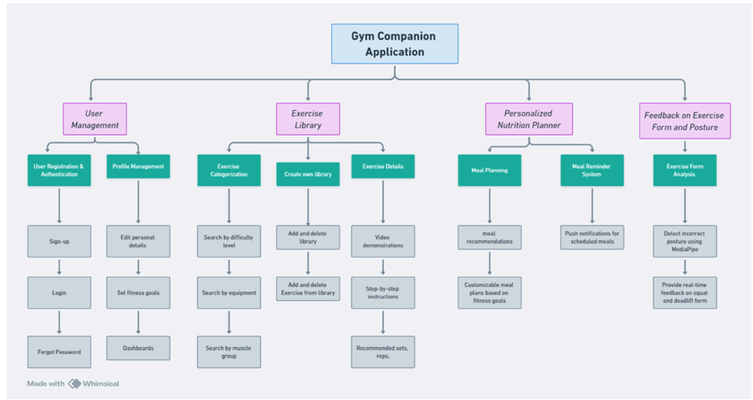
## Literature Review

| Feature | MyFitnessPal | Fit ON | Strong Workout Tracker | Fitness Companion Application |
|---|---|---|---|---|
| **Real-time Pose Estimation** | Not Available | Not Available | Not Available | Tracks exercises like squats and deadlifts using PoseNet. |
| **Personalized Nutrition Plans** | Basic calorie tracking | Not Available | Not Available | Fully customized meal plans based on height, weight, and fitness goals. |
| **Exercise Library** | Limited workout guidance | Guided programs by trainers | Minimal | Extensive library is categorized by difficulty, equipment, and machines. |
| **Progress Tracking** | Calorie-focused | Basic workout tracking | Tracks weightlifting progress | Tracks muscles worked and overall fitness progress. |
| **Beginner and Pro Modes** | Not Available | General guidance | Not Available | Tailored workout modes for beginners and pros. |
| **Exercise Suggestions** | Not Available | Not Available | Not Available | Recommend exercises based on user goals and preferences. |
| **Exercise Timer** | Not Available | Not Available | Basic stopwatch | Includes customizable interval times for exercises |

## Aims & Objectives

1. Integrate real-time pose detection with front/back camera toggle.
2. Calculate joint angles (hip, knee, ankle) to assess form.
3. Display live form correction messages on-screen.
4. Detect pose transitions to count reps accurately.
5. Create a categorized exercise library (by body part, equipment).
6. Implement keyword search and filter options for exercises.
7. Support pagination and error handling in exercise fetching.
8. Enable navigation to detailed exercise descriptions.
9. Design a meal plan interface categorized by time of day.
10. Fetch and show calorie/nutrition data per meal item.
11. Calculate total daily intake vs. user calorie goals.
12. Allow meal editing, saving, and consumption tracking.
13. Add gamified elements like streaks and rep achievements.
14. Display weekly/monthly progress via charts.
15. Track historical performance for consistency.

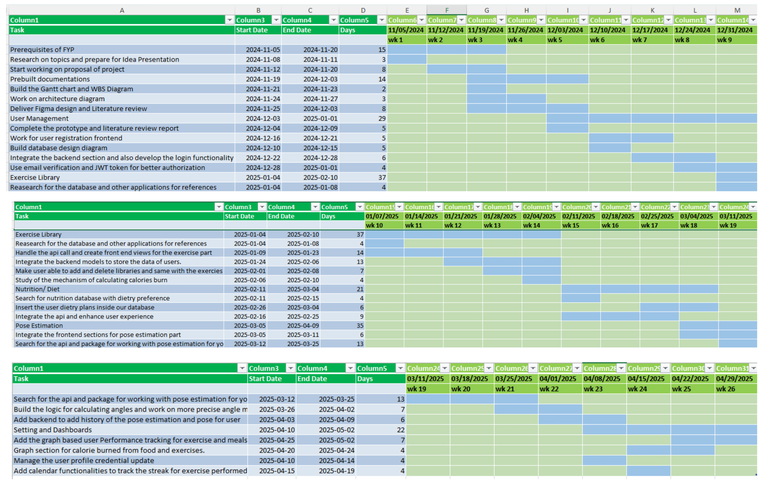
## Functional Decomposition Diagram




## Findings

The Gym Companion Application provides a smart and personalized solution for users seeking structured fitness support. It helps users discover suitable workouts based on difficulty, equipment, and goals while generating tailored nutrition plans from individual metrics like weight, height, and age. The real-time posture detection feature improves workout safety by guiding users to correct their form, especially during exercises like squats and deadlifts. The inclusion of beginner and pro modes ensures accessibility for all fitness levels. This shows that combining mobile technology with AI can currently enhance both the effectiveness and safety of individual workout routines.

## Gantt Chart



| Column1 | Column3 | Column4 | Column5 | Column6 | Column7 | Column8 | Column9 | Column10 | Column11 | Column12 | Column13 | Column14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Task | Start Date | End Date | Days | 11/05/2024 | 11/12/2024 | 11/19/2024 | 11/26/2024 | 12/03/2024 | 12/10/2024 | 12/17/2024 | 12/24/2024 | 12/31/2024 |
| | | | | wk 1 | wk 2 | wk 3 | wk 4 | wk 5 | wk 6 | wk 7 | wk 8 | wk 9 |
| Prerequisites of FYP | 2024-11-05 | 2024-11-20 | 15 | | | | | | | | | |
| Research on topics and prepare for Idea Presentation | 2024-11-08 | 2024-11-11 | 3 | | | | | | | | | |
| Start working on proposal of project | 2024-11-12 | 2024-11-20 | 8 | | | | | | | | | |
| Prebuilt documentations | 2024-11-19 | 2024-12-03 | 14 | | | | | | | | | |
| Build the Gantt chart and WBS Diagram | 2024-11-21 | 2024-11-23 | 2 | | | | | | | | | |
| Work on architecture diagram | 2024-11-24 | 2024-11-27 | 3 | | | | | | | | | |
| Deliver Figma design and Literature review | 2024-11-25 | 2024-12-03 | 8 | | | | | | | | | |
| User Management | 2024-12-03 | 2025-01-01 | 29 | | | | | | | | | |
| Complete the prototype and literature review report | 2024-12-04 | 2024-12-09 | 5 | | | | | | | | | |
| Work for user registration frontend | 2024-12-16 | 2024-12-21 | 5 | | | | | | | | | |
| Build database design diagram | 2024-12-10 | 2024-12-15 | 5 | | | | | | | | | |
| Integrate the backend section and also develop the login functionality | 2024-12-22 | 2024-12-28 | 6 | | | | | | | | | |
| Use email verification and JWT token for better authorization | 2024-12-28 | 2025-01-01 | 4 | | | | | | | | | |
| Exercise Library | 2025-01-04 | 2025-02-10 | 37 | | | | | | | | | |
| Reasearch for the database and other applications for references | 2025-01-04 | 2025-01-08 | 4 | | | | | | | | | |

| Column1 | Column3 | Column4 | Column5 | Column15 | Column16 | Column17 | Column18 | Column19 | Column20 | Column21 | Column22 | Column23 | Column24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Task | Start Date | End Date | Days | 01/07/2025 | 01/14/2025 | 01/21/2025 | 01/28/2025 | 02/04/2025 | 02/11/2025 | 02/18/2025 | 02/25/2025 | 03/04/2025 | 03/11/2025 |
| | | | | wk 10 | wk 11 | wk 12 | wk 13 | wk 14 | wk 15 | wk 16 | wk 17 | wk 18 | wk 19 |
| Exercise Library | 2025-01-04 | 2025-02-10 | 37 | | | | | | | | | | |
| Reasearch for the database and other applications for references | 2025-01-04 | 2025-01-08 | 4 | | | | | | | | | | |
| Handle the api call and create front end views for the exercise part | 2025-01-09 | 2025-01-23 | 14 | | | | | | | | | | |
| Integrate the backend models to store the data of users. | 2025-01-24 | 2025-02-06 | 13 | | | | | | | | | | |
| Make user able to add and delete libraries and same with the exercies | 2025-02-01 | 2025-02-08 | 7 | | | | | | | | | | |
| Study of the mechanism of calculating calories burn | 2025-02-06 | 2025-02-10 | 4 | | | | | | | | | | |
| Nutrition/ Diet | 2025-02-11 | 2025-03-04 | 21 | | | | | | | | | | |
| Search for nutrition database with dietry preference | 2025-02-11 | 2025-02-15 | 4 | | | | | | | | | | |
| Insert the user dietry plans inside our database | 2025-02-26 | 2025-03-04 | 6 | | | | | | | | | | |
| Integrate the api and enhance user experience | 2025-02-16 | 2025-02-25 | 9 | | | | | | | | | | |
| Pose Estimation | 2025-03-05 | 2025-04-09 | 35 | | | | | | | | | | |
| Integrate the frontend sections for pose estimation part | 2025-03-05 | 2025-03-11 | 6 | | | | | | | | | | |
| Search for the api and package for working with pose estimation for yo | 2025-03-12 | 2025-03-25 | 13 | | | | | | | | | | |

| Column1 | Column3 | Column4 | Column5 | Column25 | Column26 | Column27 | Column28 | Column29 | Column30 | Column31 | Column32 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Task | Start Date | End Date | Days | 03/11/2025 | 03/18/2025 | 03/25/2025 | 04/01/2025 | 04/08/2025 | 04/15/2025 | 04/22/2025 | 04/29/2025 |
| | | | | wk 19 | wk 20 | wk 21 | wk 22 | wk 23 | wk 24 | wk 25 | wk 26 |
| Search for the api and package for working with pose estimation for yo | 2025-03-12 | 2025-03-25 | 13 | | | | | | | | |
| Build the logic for calculating angles and work on more precise angle m | 2025-03-26 | 2025-04-02 | 7 | | | | | | | | |
| Add backend to add history of the pose estimation and pose for user | 2025-04-03 | 2025-04-09 | 6 | | | | | | | | |
| Setting and Dashboards | 2025-04-10 | 2025-05-02 | 22 | | | | | | | | |
| Add the graph based user Performance tracking for exercise and meals | 2025-04-25 | 2025-05-02 | 7 | | | | | | | | |
| Graph section for calorie burned from food and exercises. | 2025-04-20 | 2025-04-24 | 4 | | | | | | | | |
| Manage the user profile credential update | 2025-04-10 | 2025-04-14 | 4 | | | | | | | | |
| Add calendar functionalities to track the streak for exercise performed | 2025-04-15 | 2025-04-19 | 4 | | | | | | | | |

## System Evaluation & Testing

The testing approach involves systematic functional testing across key modules of the fitness application, including authentication, workout logging, nutrition planning, pose estimation, and user profile management. Each test scenario is designed to validate expected behavior, handle edge cases, and ensure data integrity. Both valid and invalid user inputs are tested to assess system robustness. Real-time features like pose detection and feedback are evaluated for responsiveness and accuracy. Results are compared against expected outcomes to determine pass or fail status.

## Future Scopes

The Gym Companion Application come now with certain limitations whereas will continue to evolve with features that further personalize and enhance the fitness experience.

- It will include intelligent workout progression tracking based on user feedback and performance data.
- Integration with wearable devices will offer real-time health monitoring, such as heart rate and calorie tracking.
- The app will expand its pose detection to cover more exercises like push-ups, yoga, and lunges.
- Social features like community challenges and expert-guided programs will help boost involvement.
- People can view others streak and performances too which are made public