

Adaptive Fitness Application

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Github Repo: <https://github.com/aksaes/adaptive-fitness-app/>

1. Alignment with Guardian Angel.

The Adaptive Fitness Guide Application contributes a new piece of advancement in fitness technology, merging user data with state-of-the art computational techniques to deliver tailored fitness experiences.

Integration and Role of Core Components in Personalized Fitness

The foundational elements of the application—Login, Account Creation, Personal Details, Workout Preferences, Profile Manager, and Neural Network for Calorie Prediction—play a crucial role in the app's adaptability. Each element contributes significantly to personalizing fitness plans based on user-specific data:

1. **Login and Account Creation:** Act as the gateway for users, providing secure and personalized access.
2. **Personal Details:** Users provide essential data such as age, weight, and height, which form the basis for custom fitness plans and goals.
3. **Workout Preferences:** This feature enables users to specify their preferred workout settings and objectives, enhancing the customization of their fitness experience.
4. **Profile Manager:** Allows ongoing user profile updates, ensuring that fitness recommendations remain aligned with changing user needs and goals.

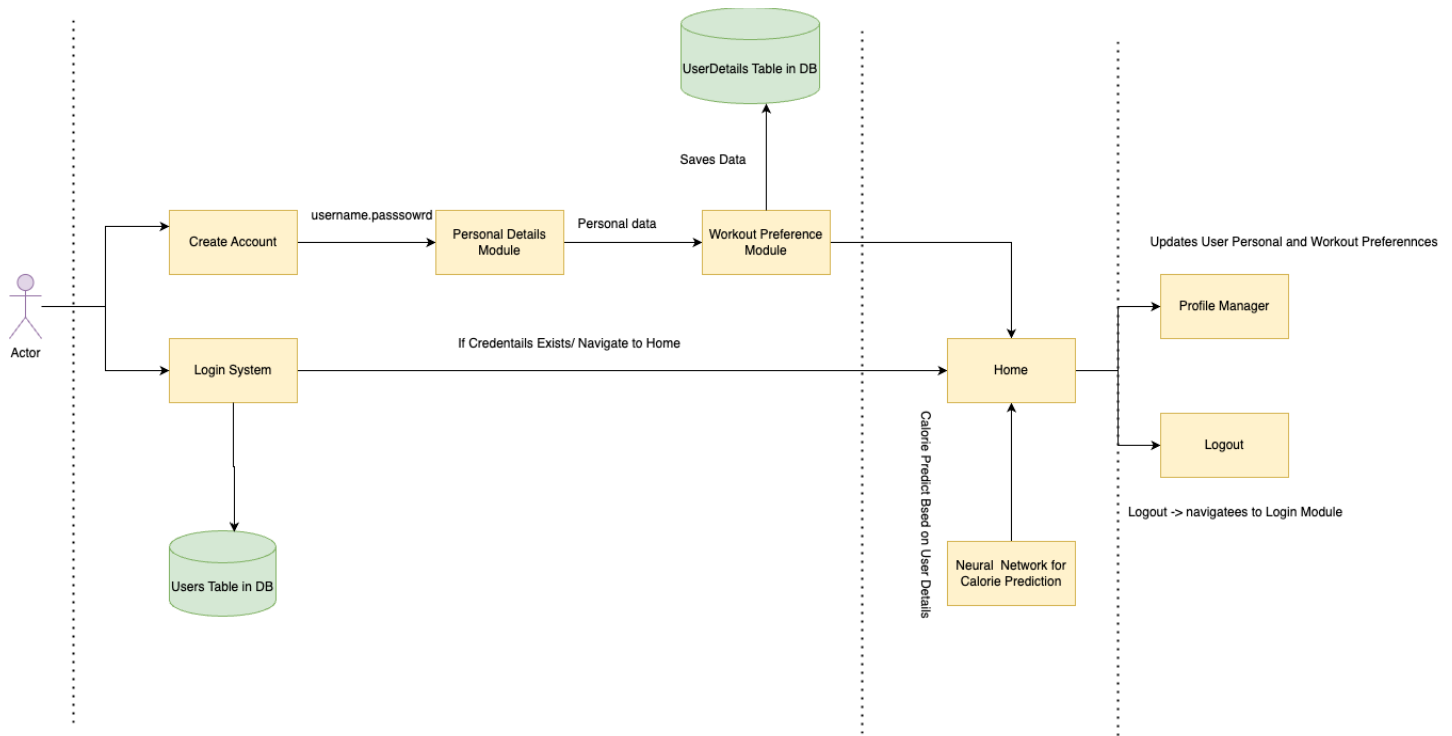
Significance of the Neural Network in Personalization

The application's cutting-edge Neural Network for Calorie Prediction is key to its personalized approach. It leverages user data to predict calorie expenditure accurately, integrating these findings into tailored fitness recommendations.

2. Technical Specifications:

Component Specifications:

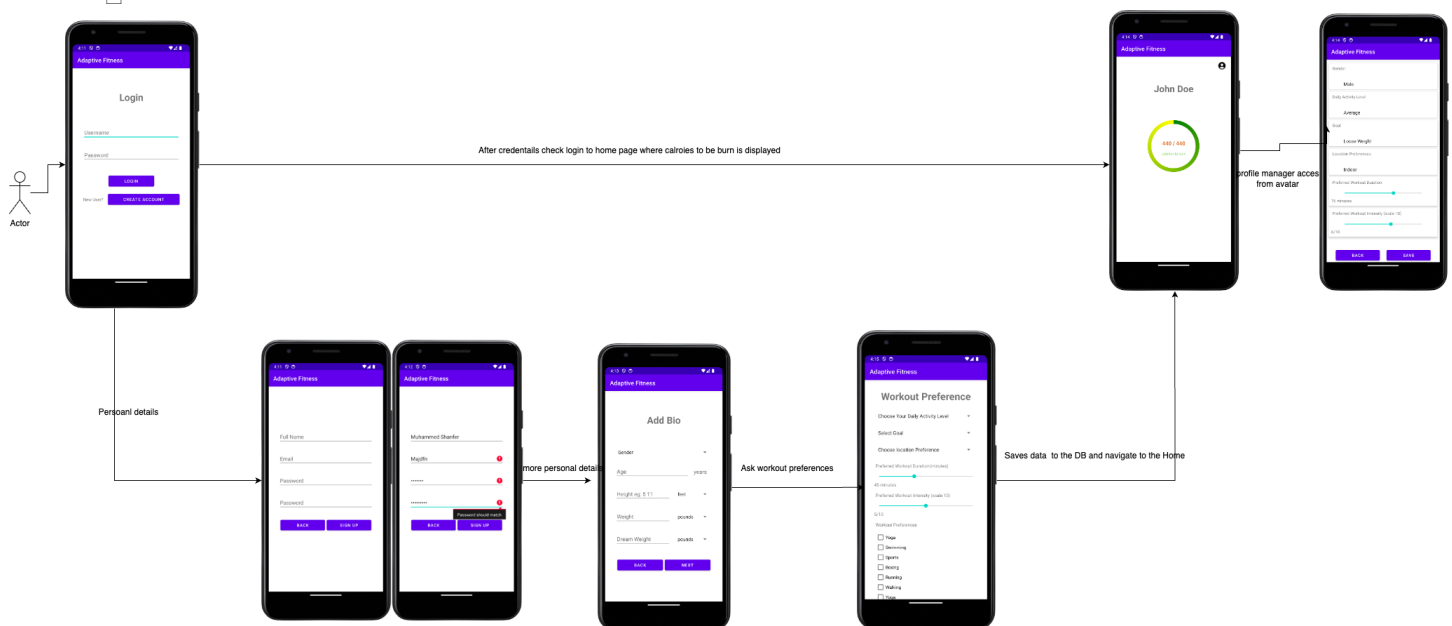
1. Login and Account Creation
 - ☐ Function: Securely manage user access and personal data.
 - ☐ Process: Utilizes standard authentication and data storage practices to ensure security and integrity.
2. Personal Details Input
 - ☐ Function: Collects essential user data including age, weight, height, and health parameters.
 - ☐ Process: Users input their data, which is then stored and used to personalize fitness recommendations.
3. Workout Preferences
 - ☐ Function: Allows users to specify their workout environment, equipment availability, and fitness goals.
 - ☐ Process: User selections are used to tailor workout suggestions, making them relevant and achievable.
4. Profile Manager
 - ☐ Function: Enables users to update their personal information and preferences.
 - ☐ Process: Modifications in user data dynamically adjust the fitness plans and recommendations.
5. Neural Network for Calorie Prediction
 - ☐ Function: Predicts calorie burn based on individual user data.
 - ☐ Process: Uses machine learning algorithms to analyze user data and provide accurate calorie expenditure predictions.



3. Design

Technology Stack: The application leverages a robust technology stack, including:

- ☐ **Android SDK:** For building a responsive and intuitive mobile application interface.
- ☐ **TensorFlow Lite:** Utilized in the Neural Network module for efficient and effective calorie burn predictions.
- ☐ **Java/Kotlin:** Primary programming languages for Android app development.
- ☐ **SQLite:** For local database management, storing user details and preferences.
- ☐ **Espresso:** For conducting comprehensive UI and integration tests.
- ☐ **Mockito:** Used in unit testing for mocking objects and ensuring the reliability of individual components.
- ☐



4. Testing Strategies Employed

- a. **Unit Testing:** To validate the functionality of individual components independently. I used Mockito for mocking dependencies and creating isolated test environments.
- b. **Neural Network Testing:** To evaluate the accuracy and efficiency of the neural network in predicting calorie burn. The Key metrics used are:
 - i. Root Mean Square Error (RMSE).
 - ii. Validation Tests: Conducted using Test split of the dataset.

User Interface and Integration Testing:

To verify the interaction between different components of the application. Tools Used are Espresso for Android UI Testing, ensuring that the components work seamlessly together, especially in user flow scenarios like moving from account creation to personal details entry.

5. Navigating Challenges:

The development of the Adaptive Fitness application posed a set of unique challenges. These ranged from technical hurdles in integrating a complex neural network for personalized fitness recommendations to ensuring stringent user data privacy.

1. Integrating the Neural network: I employed a modular approach, allowing isolated development and testing of the neural network. Also Utilized simulated data for initial testing to refine the algorithm before integrating real user data.
2. Ensuring User Data privacy: With the application handling sensitive information, ensuring data privacy and security was important. I implemented robust encryption methods for data storage and transmission. Conducted regular security audits to identify and rectify potential vulnerabilities.