**Project Aim, Objectives, Functional and Non-Functional Requirements**

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1. Project Aim

To design and implement a software solution focused on helping users achieve their fitness objectives. This involves developing a user-friendly platform for creating and customising workout routines, monitoring nutrition and workout progress, and offering health and fitness guidance. The main aim is to build an engaging and efficient fitness tool that encourages users to live healthier, more active lives.

1. Project Objectives

Please note all requirements will be marked by MoSCow Prioritization technique.

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| --- | --- | --- | --- |
| **ID** | **Objective** | **Description** | **Created** |
| O1 | Develop a Scalable and Secure Database Management System (DBMS) | Develop a scalable MySQL DBMS, including a central database for 2,000+ records and a local database for user data and watch data. Improve database performance and security and ensure GDPR compliance. | 09/10/2023 |
| O2 | Design a User-Centric Admin Management (AM) Website | Develop a responsive Admin Management website with secure sign-up/login, role-based access control, and the capability for Admins to edit the central database and push updates to the Alistana Fitness & Nutrition Tracker (AFNT) application. The website will prioritize a user-friendly design, encrypted communication, and security measures. | 09/10/2023 |
| O3 | Build the Alistana Fitness & Nutrition Tracker (AFNT) Application | Investigate the functional and non-functional requirements of a complete fitness website/application.  Develop the AFNT application with features for workout and nutrition tracking, body progress and measurement tracking. Connect to DBMS, AM website, and Arduino watch, and assess performance using user feedback. | 09/10/2023 |
| O4 | Design and develop an Arduino Watch | Create an Arduino watch to measure blood oxygen level and heart rate and investigate ways of connecting the Arduino watch to the AFNT and store it in a local database. | 16/10/2023 |
| O5 | Enhance Code Quality and Performance | Implement clean, maintainable code with 80% code coverage. Optimize application and website response times to under 2 and 3 seconds, respectively. | 25/10/2023 |

1. Functional Requirements

The functional requirements are divided into 4 categories: Database, Website, Application and Arduino Watch. These categories may be divided into further sub-categories to make them more readable, making it easier to track progress.

* 1. Database

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| --- | --- | --- | --- | --- |
| **ID** | **Summary** | **Priority** | **Status** | **Created** |
| **Central Database (CDB)** | | | | |
| FD1 | The central database should be stored in a MySQL Server. | M | Partially Complete | 25/10/2023 |
| FD2 | Should store preset meals, food items, exercises, and workouts with attributes such as meal\_id, food\_item\_id, exercise\_id, and workout\_id. | M | Requirements Complexity | 11/10/2023 |
| FD3 | Store user information in CDB with attributes such as user, email, password hash, type (User or Admin), gender, phone, address, and date created. | M | Requirements Complexity | 25/10/2023 |
| FD4 | Support queries to retrieve preset meals, food items, exercises, and workouts based on various filters such as meal type, food category, exercise category, and workout difficulty. | M | Requirements Complexity | 25/10/2023 |
| FD5 | Provide data synchronization capabilities to update the local database with the latest preset data by comparing the timestamps of the local and central databases. | M | Requirements Complexity | 25/10/2023 |
| **Local Database (LD)** | | | | |
| FD6 | The local database should be stored in the user drive using SQLite. | M | Requirements Complexity | 25/10/2023 |
| FD7 | Store both preset and custom (combined as one) in tables: meals, meal\_logs food\_items, food\_item\_logs. exercises, exercise\_logs workouts, workout\_logs, heart rate, blood oxygen level, and step count. | M | Requirements Complexity | 16/10/2023 |
| FD8 | Store user information in LD with attributes such as user, email, password hash, type (User or Admin), gender, phone, address, and date created. | M | Requirements Complexity | 16/10/2023 |
| FD9 | Support updates to custom meals, workouts, exercises, and health metrics by allowing users to add, modify, and delete records. | M | Requirements Complexity | 09/10/2023 |
| FD10 | Store health metrics from the Arduino watch including step count, heart rate and blood oxygen level. | M | Requirements Complexity | 17/10/2023 |
| FD11 | Store other metrics such as height (metres), weight (kg), BMI, skeletal muscle (kg), body fat (%) and water intake (ml), | M | Requirements Complexity | 26/10/2023 |

* 1. Website

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| FW1 | The website shall link to the AM website for user login and registration. | S | Requirements Complexity | 09/10/2023 |
| FW2 | The website shall allow users to be able to create accounts with unique usernames and passwords. | S | Requirements Complexity | 09/10/2023 |
| FW3 | The website shall allow users to log in securely with their credentials. | S | Requirements Complexity | 09/10/2023 |
| FW4 | The website shall allow users to enter their email and phone details for security and verification reasons. | S | Requirements Complexity | 17/10/2023 |
| FW5 | The website shall allow users to be able to enter their dob during registration to receive age-related workout and meal suggestions. | S | Requirements Complexity | 17/10/2023 |
| FW6 | The website shall allow admins to modify the server database of Users (i.e., Profile picture, name, age, gender, dob, email, password, phone, address, and postcode. | C | Requirements Complexity | 09/10/2023 |
| FW7 | The website shall allow admins to edit their profiles with personal information (profile picture, name, age, gender, dob, email, password, phone, address, and postcode). | C | Requirements Complexity | 09/10/2023 |
| FW8 | The website shall allow users to edit their profiles with personal information (i.e., Profile picture, name, age, gender, dob, email, password, phone, address, and postcode). | C | Requirements Complexity | 09/10/2023 |
| FW9 | The website shall allow users to provide feedback and suggestions to improve the service. | C | Requirements Complexity | 10/10/2023 |

* 1. Application

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| **Workout Tracker** | | | | |
| FA1 | The application shall allow users to create their own workout plans. | M | Requirements Complexity | 09/10/2023 |
| FA2 | The application shall allow users to customize their own workout plans. | M | Requirements Complexity | 09/10/2023 |
| FA3 | The application shall allow users to choose pre-designed workout plans based on their goals. | M | Requirements Complexity | 09/10/2023 |
| FA4 | The application shall allow users to receive suggested workouts based on fitness goals. | S | Requirements Complexity | 09/10/2023 |
| FA5 | The application shall allow users to track their workouts by recording exercises, sets, reps, and weights (For custom exercises). | M | Requirements Complexity | 09/10/2023 |
| FA6 | The application shall allow users to rate their performance for each exercise (For both preset and custom). | M | Requirements Complexity | 09/10/2023 |
| FA7 | The application shall allow users to rate their performance for each workout (For both preset and custom). | M | Requirements Complexity | 09/10/2023 |
| FA8 | The application shall allow users to view their workout logs (For both preset and custom). | M | Requirements Complexity | 09/10/2023 |
| FA9 | The application shall allow users to view their exercise logs (For both preset and custom). | M | Requirements Complexity | 09/10/2023 |
| FA10 | The application shall allow users to display graphs of each exercise progress (i.e., Bench press max weight every month). | M | Requirements Complexity | 09/10/2023 |
| FA11 | The application shall allow users to display graphs of cardio-related exercises (i.e., Step/Distance for treadmill session) by manually inputting the information. | M | Requirements Complexity | 23/10/2023 |
| FA12 | The application shall allow users to display graphs of cardio-related exercises (i.e., Step/Distance for treadmill session) provided by the Arduino watch. | M | Requirements Complexity | 23/10/2023 |
| FA13 | The application shall produce charts for weight in kilogram (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA14 | The application shall allow users to set goals for workouts. | C | Requirements Complexity | 24/10/2023 |
| **Nutrition Tracker** | | | | |
| FA15 | The application shall allow users to select preset food items. | M | Requirements Complexity | 09/10/2023 |
| FA16 | The application shall allow users to select preset meals. | M | Requirements Complexity | 09/10/2023 |
| FA17 | The application shall allow users to create custom food items and define their nutritional contents (i.e., calories, protein, carbs, fats etc.) | M | Requirements Complexity | 09/10/2023 |
| FA18 | The application shall allow users to create custom meals and add food items (Both custom and preset) to the custom meal. | M | Requirements Complexity | 26/10/2023 |
| FA19 | The application shall allow users to modify custom food items. | M | Requirements Complexity | 09/10/2023 |
| FA20 | The application shall allow users to modify custom meals. | M | Requirements Complexity | 09/10/2023 |
| FA21 | The application shall allow users to input daily water intake in milliliters (Per day). | M | Requirements Complexity | 09/10/2023 |
| FA22 | The application shall allow users to generate a daily calorie intake graph based on a selected date range. | M | Requirements Complexity | 24/10/2023 |
| FA23 | The application shall allow users to generate a daily nutritional content intake (i.e., Carbs, fat, protein intake per day) graph based on a selected date range. | M | Requirements Complexity | 24/10/2023 |
| FA24 | The application shall allow users to generate a daily water intake graph based on a selected date range. | M | Requirements Complexity | 24/10/2023 |
| FA25 | The application shall allow users to set goals for nutritional intake. | C | Requirements Complexity | 25/10/2023 |
| FA26 | The application shall allow users to set goals for their water intake | C | Requirements Complexity | 25/10/2023 |
| **Body Measurements Tracker** | | | | |
| FA27 | The application shall allow users to input their daily weight in kilograms (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA28 | The application shall allow users to input their daily height in meters (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA29 | The application shall allow users to input Skeletal muscle data in kilograms (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA30 | The application shall allow users to input Body fat data in percentage (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA31 | The application shall use weight and height data and calculate user’s BMI (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA32 | The application shall produce charts for weight in kilogram (Per day). | M | Requirements Complexity | 26/10/2023 |
| FA33 | The application shall produce graphs for height change. | M | Requirements Complexity | 26/10/2023 |
| FA34 | The application shall produce charts for BMI change. | M | Requirements Complexity | 26/10/2023 |
| FA35 | The application shall allow users to set goals for step counts/distance covered per day. | M | Requirements Complexity | 26/10/2023 |
| FA36 | The application shall allow users to generate a heart rate graph provided by the Arduino watch. | M | Requirements Complexity | 26/10/2023 |
| FA37 | The application shall allow users to generate a blood oxygen chart provided by the Arduino watch. | M | Requirements Complexity | 26/10/2023 |
| **Gym Locator** | | | | |
| FA38 | The application shall allow users to get a list of the nearest gyms based on a mapping API. | S | Requirements Complexity | 24/10/2023 |
| **Health & Nutrition Advice** | | | | |
| FA39 | The application shall allow users to access health-related advice. | W | Requirements Complexity | 09/10/2023 |
| FA40 | The application shall allow users to access fitness-related advice (i.e., correct exercise forms etc.). | W | Requirements Complexity | 09/10/2023 |

* 1. Arduino Watch:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| FAW1 | The watch shall have an oximeter module attached to measure heart rate and blood oxygen levels in real-time. | M | TinyCircuits Website | 16/10/2023 |
| FAW2 | The watch shall have an accelerometer module attached to measure steps in real-time. | M | TinyCircuits Website | 16/10/2023 |
| FAW3 | The watch shall also use the accelerometer to count reps for the bench press in real-time. | M | TinyCircuits Website | 18/10/2023 |
| FAW4 | The watch shall have a microSD storage unit to store body measurements in real-time. | M | TinyCircuits Website | 18/10/2023 |
| FAW5 | The watch shall compile, and store measured data in a CSV file type. | M | TinyCircuits Website | 18/10/2023 |
| FAW6 | The watch shall use a Bluetooth (low energy) module to transfer data to the application. | M | TinyCircuits Website | 18/10/2023 |
| FAW7 | The watch shall also use a wired connection via a micro-USB port to transfer watch data to the application. | M | TinyCircuits Website | 18/10/2023 |
| FAW8 | The application shall process and store watch data in the local database. | M | Requirements Complexity | 18/10/2023 |

1. Non-Functional Requirements

The non-functional requirements are divided into 9 categories: Application, Performance, Efficiency & Sustainability, Data Storage Optimization, Privacy & Security, Reliability, Usability, Data Backup & Recovery, and Third-Party Service Integration. These categories may be divided into further sub-categories to make them more readable, making it easier to track progress.

* 1. Application:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| **Workout Tracker** | | | | |
| NFA1 | Users can add an unlimited number of custom exercises | M | Requirements Complexity | 25/10/2023 |
| NFA2 | Users can add an unlimited number of custom workouts | M | Requirements Complexity | 25/10/2023 |
| NFA3 | Users cannot modify preset workouts and exercises. | M | Requirements Complexity | 25/10/2023 |
| NFA4 | Users can only select one workout per day. | M | Requirements Complexity | 25/10/2023 |
| NFA5 | Users can choose up to 20 exercises (incl. custom exercises) per workout. | M | Requirements Complexity | 25/10/2023 |
| NFA6 | Users cannot modify preset workouts and exercises. | M | Requirements Complexity | 25/10/2023 |
| NFA7 | The application shall display suggested workouts to the user based on user-provided data (Gender, age, weight, height, goals etc.) | M | Requirements Complexity | 25/10/2023 |
| **Nutrition Tracker** | | | | |
| NFA8 | Users can add an unlimited number of custom food items | M | Requirements Complexity | 25/10/2023 |
| NFA9 | Users can add an unlimited number of custom meals | M | Requirements Complexity | 25/10/2023 |
| NFA10 | Users cannot modify preset food items and meals. | M | Requirements Complexity | 25/10/2023 |
| NFA11 | Users can modify meal logs and food item serving size in that meal (Can be both custom or preset meal and food item.) | M | Requirements Complexity | 26/10/2023 |
| NFA12 | Users can only select up to 4 meals (Morning, Afternoon, Evening, and Dinner) per day. | M | Requirements Complexity | 25/10/2023 |
| NFA13 | Users can choose up to 8 food items (incl. custom food items) per meal. | M | Requirements Complexity | 25/10/2023 |
| NFA14 | Users cannot modify the nutrition content of preset meals and food items. | M | Requirements Complexity | 25/10/2023 |
| NFA15 | The application shall display suggested meals to the user based on user-provided data (Gender, age, weight, height, goals etc.) | M | Requirements Complexity | 25/10/2023 |

* 1. Performance:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFP1 | The AM website should load in under 2 seconds, ensuring optimal user experience | S | Requirements Complexity | 09/10/2023 |
| NFP2 | The AM website shall respond to user input within 200 milliseconds, providing a smooth and responsive interaction. | S | Requirements Complexity | 09/10/2023 |
| NFP3 | The application shall load within a 2-second time frame, ensuring users can access the features promptly. | S | Requirements Complexity | 09/10/2023 |
| NFP4 | The Arduino watch should display heart rate, blood oxygen level, steps count in real time on the watch display. | M | Requirements Complexity | 17/10/2023 |

* 1. Efficiency & Sustainability:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFES1 | The AM website should have a memory usage of no more than 500 MB and a CPU usage of no more than 10% under normal operating conditions. | C | Requirements Complexity | 09/10/2023 |
| NFES2 | The application should have a memory usage of no more than 200 MB and a CPU usage of no more than 5% under normal operating conditions. | C | Requirements Complexity | 25/10/2023 |
| NFES3 | The watch should collect and store data with a latency of no more than 100 milliseconds and a storage usage of no more than 50 MB. | C | Requirements Complexity | 24/10/2023 |
| NFES4 | The watch should transfer data to the application with a latency of no more than 200 milliseconds and a data transfer rate of at least 1 Mbps. | C | Requirements Complexity | 24/10/2023 |
| NFES5 | Ensure database consistency and integrity by implementing ACID (Atomicity, Consistency, Isolation, Durability) properties in database transactions. | C | Requirements Complexity | 25/10/2023 |

* 1. Data Storage Optimization:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFDS1 | Implement efficient data storage techniques such as indexing, partitioning, and normalization to ensure that the average database query time is no more than 200 milliseconds for read queries and no more than 500 milliseconds for write queries. | S | Requirements Complexity | 09/10/2023 |

* 1. Privacy & Security:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFPS1 | The system shall implement features such as data minimization, purpose limitation, data portability, and the right to be forgotten, to comply with GDPR guidelines. | C | Requirements Complexity | 09/10/2023 |
| NFPS2 | The system shall implement role-based access control, secure authentication and authorization mechanisms, and regular security audits to ensure data privacy and security for user personal and health data. | W | Requirements Complexity | 09/10/2023 |
| NFPS3 | User data, both at rest and in transit, shall be encrypted using industry-standard encryption algorithms (e.g., AES-256) to ensure data is stored and transmitted safely. | C | Requirements Complexity | 24/10/2023 |
| NFPS4 | The Bluetooth or wired data transfer from the Arduino watch to the app shall use secure protocols (e.g., TLS/SSL) and industry-standard encryption algorithms (e.g., AES-256) to ensure the data is transferred securely and encrypted. | S | Requirements Complexity | 24/10/2023 |

* 1. Reliability:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFR1 | The AM website will have an uptime of at least 99.9% by implementing robust error handling and failover mechanisms. | S | Requirements Complexity | 10/10/2023 |
| NFR2 | The application shall implement robust error handling to ensure that any errors are gracefully handled, and logged for analysis and that the application recovers without crashing. | M | Requirements Complexity | 24/10/2023 |
| NFR3 | The database and server shall implement robust error handling to automatically recover from failures and backup mechanisms to ensure data is backed up at least once a day and can be restored within 24 hours in case of data loss. | M | Requirements Complexity | 09/10/2023 |
| NFR4 | The Arduino hardware shall be constructed with materials that meet industry standards for wearables. | C | Online | 16/10/2023 |
| NFR5 | The smartwatch shall have a power management system that optimizes battery usage to ensure at least 12 hours of continuous operation on a single charge under normal usage conditions. | C | Online | 16/10/2023 |

* 1. Usability:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFU1 | The AM website shall achieve WCAG 2.1 AA compliance, as verified by automated testing tools. | C | W3C Website | 09/10/2023 |
| NFU2 | The application shall have a user-friendly interface with a System Usability Scale (SUS) score of at least 70, indicating good usability. | C | Requirements Complexity | 24/10/2023 |
| NFU3 | The AM website UI shall have a navigation menu that is clearly visible and accessible from all pages, and a user flow that requires no more than three clicks to reach any page. | S | Requirements Complexity | 25/10/2023 |
| NFU4 | The website and application shall implement features such as screen reader compatibility, keyboard navigation, and text alternatives for non-text content to enhance accessibility for users with disabilities. | W | W3C Website | 25/10/2023 |
| NFU5 | The application shall synchronize health data from the smartwatch to the app by pressing a sync button, ensuring that the data is up-to-date and accurate. | M | Requirements Complexity | 16/10/2023 |
| NFU6 | The application shall display clear and informative error messages in case of data transfer issues from the watch and provide a troubleshooting guide in the help section of the app. | S | Requirements Complexity | 16/10/2023 |

* 1. Data Backup & Recovery:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFDBR1 | The system shall have an automated backup and recovery system that creates daily backups of the database and stores them in a secure location, with the ability to restore data within 24 hours in case of data loss. | M | Requirements Complexity | 09/10/2023 |
| NFDBR2 | The program's source code shall be backed up regularly to GitHub, with automated daily backups to OneDrive for additional redundancy. The backup system should support version control, allowing for the recovery of specific versions of the code if needed. | M | Requirements Complexity | 09/10/2023 |

* 1. Third-Party Service Integration:

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| **ID** | **Summary** | **Priority** | **Source** | **Created** |
| NFTPS1 | The system shall integrate with mapping APIs to provide location-based services such as gym locator. The integration should be seamless, with real-time data synchronization and minimal latency. | C | Requirements Complexity | 09/10/2023 |