**Fitnessstan**

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**Final Approval**

This is to certify that we have read the report submitted by ***Zain Ul Abideen (35515)*, *Obaid Ullah (35739), Huzaifa Khan (35726)*** for the partial fulfillment of the requirements for the degree of the Bachelors of Science in Computer Science (BSSE). It is our judgment that this report is of sufficient standard to warrant its acceptance by Riphah International University, Islamabad for the degree of Bachelors of Science in Computer Science (BsCs).

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**Declaration**

We hereby declare that this document “**Fitnessstan**” neither as a whole nor as a part has been copied out from any source. It is further declared that we have done this project with the accompanied report entirely on the basis of our personal efforts, under the proficient guidance of our teachers, especially our supervisor **Muhammad Islam Abbasi**. If any part of the system is proved to be copied out from any source or found to be reproduction of any project from anywhere else, we shall stand by the consequences.

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**Dedication**

This work is devoted to Almighty Allah, the Most Merciful and the Most Beneficent, who granted us the knowledge, perseverance, and strength to complete this work. We also wish to extend our deepest gratitude to our parents for their unyielding love, support, and prayers along the journey. We finally dedicate this to our supervisor, “Muhammad Islam Abbasi”, with whose valuable guidance, mentorship, and encouragement we are able to make this project into reality.

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**Abstract**

In today's fast-paced world, people work tirelessly with dedication but often neglect their health and fitness, leading to a steady rise in the number of unhealthy individuals. Addressing this concern, we aim to develop a comprehensive platform, available as both a website and a mobile application, to help users manage their daily exercise and food intake effectively.

Existing apps and websites in Pakistan often fall short in providing personalized food recommendations tailored to users’ needs. While some platforms suggest exercise routines, they rarely focus on balanced nutrition or calorie management, which are essential for maintaining overall health. Moreover, these platforms lack customization based on user preferences, leaving a gap in truly effective fitness solutions.

Our solution, Fitnessstan, bridges this gap by offering personalized food and exercise recommendations. Using Flutter technology, we developed a user-friendly app that integrates an AI model to suggest appropriate calorie intake and workouts based on individual requirements. For users preferring web access, we also created a responsive website using React.js.

Fitnessstan is designed to empower users with tailored guidance, promoting healthier lifestyles through a combination of technology, innovation, and convenience. With this platform, we strive to make fitness accessible and achievable for everyone.

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**Chapter 1:**

**Introduction**

**Chapter 1: Introduction**

**Fitnessstan** is a web-based and app-based platform designed to provide a holistic solution for fitness enthusiasts, including individuals with diabetes. In today’s world, achieving a healthy lifestyle can be challenging, especially for beginners who lack personal guidance on balancing exercise and nutrition. Neglecting either aspect often leads to unsatisfactory progress or health risks. Existing platforms fail to offer comprehensive and personalized solutions, particularly for users with specific health needs.

Fitnessstan addresses these challenges by integrating artificial intelligence to deliver customized workout and dietary plans tailored to each user’s unique health metrics, goals, and preferences. The platform specifically supports diabetic patients by incorporating features that help manage their condition through personalized exercise and nutrition guidance. This seamless integration of fitness and health ensures safe and effective progress for all users.

With features like progress tracking and adaptive recommendations, Fitnessstan ensures long-term results and user satisfaction. Whether its weight loss, muscle gain, or managing conditions like diabetes, Fitnessstan empowers individuals to take control of their health journey while promoting a culture of sustainable fitness and well-being.

* 1. **Goals and Objectives**
     1. **Goals**

1. The platform in which Provide a personalized and user-friendly fitness platform for enthusiasts.
2. To facilitate users achieve and maintain their fitness goals through AI-powered workout and dietary recommendations.
   * 1. **Objectives**
3. To offer fitness workout plans as per users' fitness levels, preferences, and health metrics.
4. To provide dietary recommendations personalized to the specific needs of diabetic patients and general users, respectively.
5. To enable users to track progress and result analysis in measurable improvements over time.
   1. **Scope of the Project**

The scopes of the **“Fitnessstan”** are as following

1. Our website will be developed on java stack development and our app will be developed on Flutter.
2. We will develop a website and app that will provide platform for diabetic patient and for those people who loss, gain and maintain their weight.
3. User will upload their information without any hesitation because we are securing his information.
4. User will get personalized diet plan on the basis of his information.
5. Problem will be solved with Machine learning techniques.

The platform would also be accessible, interactive and user-friendly, and simplified for Users.

**Chapter 2:**

**Literature Review**

**Chapter 2: Literature Review**

* 1. **Introduction**

**Fitnessstan** is a web-based and app-based platform designed to provide a holistic solution for fitness enthusiasts, including individuals with diabetes. In today’s world, achieving a healthy lifestyle can be challenging, especially for beginners who lack personal guidance on balancing exercise and nutrition. Neglecting either aspect often leads to unsatisfactory progress or health risks. Existing platforms fail to offer comprehensive and personalized solutions, particularly for users with specific health needs.

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* 1. **Background and Problem Elaboration**

While the industry of fitness is rapidly expanding, on many platforms users, especially first-time users, end up stuck in their goals due to the fact that most do not properly guide one both through exercise and nutrition. Most of them only give workout plans without connecting the critical role of nutrition for achieving fitness goals. This leads to less useful results, bad recovery, and potential health risks.

Also, many of these applications do not support different types of constraints, such as diabetes, and provide no full, personalized recommendations. There is also disconnection between guidance provided on exercise and nutrition, making the whole experience disjointed and giving the user no tools needed to be successful in the long term.

Fitnessstan offers a remedy to that problem by introducing AI-based online services combining customized workout routines, suggested diets, and monitoring to create one all-inclusive solution where every user will have the right resources for a holistic fitness journey.

* 1. **Detailed Literature Review**
     + - 1. **Definition**

Fitness refers to a state of health and well-being that allows an individual to perform daily tasks with energy and minimal fatigue. It has physical, mental, and emotional factors to it and, thus, outlines the importance of good regular exercise and lifestyle habits.

A diet, on the other hand, is a short-term measure that incorporates certain food-related restrictions designed to fit the requirements for achieving objectives like weight loss or improvement in the state of being healthy. Many diets are temporary and specific to the client's need.

On the other hand, a nutrition plan is generally a long-term approach or an eating regimen designed to maintain the body's necessary macronutrient and micronutrient inputs by proper consumption to achieve certain health and fitness goals.

* + - * 1. **Related Research Work 1**
        2. **Related Research Work 2**
  1. **Literature Review Summary Table**

**Table 2.1:** Summary of Research Paper

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Document** | **Domain** | **Algorithm** |
| 1 | AI Fitness Trainer Applications | Fitness Tracking and Personalization | BlazePose for pose detection, CNN for image analysis, RNN for sequence data |
| 2 | Virtual Fitness Trainer Using AI | Virtual Coaching and Training | MediaPipe for motion tracking, Recurrent Neural Networks (RNN) |
| 3 | Personalized Nutrition and Fitness Platforms | Diet and Exercise Personalization | Machine Learning for meal planning, Decision Trees for analysis |
| 4 | AI-Based Quantification of Fitness Activities | Real-Time Exercise and Health Monitoring | BlazePose for pose estimation, Random Forest for movement tracking |
| 5 | Fitness Trainer Application Using Artificial Intelligence | Fitness and Health Solutions for Diabetics | Linear Regression for calorie estimation, SVM for dietary recommendations |
| 6 | Virtual Personal Trainer Platforms | Personalized Fitness Guidance | BlazePose for motion capture, Decision Trees for user customi AI Fitness Trainer Applications zation |
| 7 | AI-Based Workout Recognition Systems | Real-Time Motion and Workout Recognition | CNN for video analysis, Naive Bayes for feedback analysis |
| 8 | AI Fitness Systems for Progressive Workouts | Progress Tracking and Exercise Recommendations | K-Nearest Neighbors (KNN), Deep Neural Networks (DNN) |
| 9 | Virtual Fitness Trainer Platforms for Cardio | Specific Activity Recognition | MediaPipe for activity tracking, SVM for cardio analysis |
| 10 | Advanced AI Fitness Platforms | Integrated Fitness and Nutrition | Random Forest for data analysis, Linear Regression for diet optimization |

* 1. **Problem Statement**

The fitness industry faces significant challenges, particularly for beginners who are dedicated to workouts but lack awareness of the critical role nutrition plays in achieving their goals. This neglect of proper diet not only slows their progress but also poses health risks, including poor recovery, nutritional deficiencies, and the exacerbation of conditions like obesity and diabetes. Additionally, many individuals struggle with tailored strategies to effectively lose weight, gain muscle, or maintain their current fitness levels. Without a holistic approach that integrates both exercise and personalized nutrition, these issues continue to undermine the overall success and well-being of fitness enthusiasts.

**Chapter 3:**

**Requirements and Design**

**Chapter 3: Requirements and Design**

In this chapter, we have developed the functional requirements for our actors, i.e., **User** and **Admin**. These requirements are specifically designed for the Fitnessstan platform.

**Fitnessstan** is both a web-based and app-based platform that offers personalized fitness solutions by integrating AI-powered workout and dietary recommendations. The platform is user-friendly, easy to navigate, and provides an efficient way for users to achieve their fitness goals and for admins to manage the platform's functionality seamlessly.

We created system use cases against each functional requirement and designed use case diagrams and fully dressed use cases for our actors, i.e., **User** and **Admin**.

1. **Requirements**
   1. **User/Customer Functionalities:**

**Table 3.1: User Functional Requirement**

|  |  |
| --- | --- |
| **S.no** | **Functionality Description** |
| 1 | The user must be able to sign up. |
| 2 | The user must be able to login to their account. |
| 3 | The user must be able to recover and forget their password |
| 4 | Input personal information, like DOB, weight, height, gender, religion, sleep-hour, occupation and exercise level, to compute BMI. |
| 5 | Diet recommendations that are specifically tailored to the needs of diabetics. |
| 6 | Monitoring of progress - calories burned, workouts performed, and nutritional intake. |
| 7 | User will be read the article about features and supplements. |
| 8 | User shall be able to give feedback about our recommendation. |
| 9 | Weekly updates and alerts on progress and fitness plan. |

* 1. **Admin Functionalities:**

**Table 3.2: User Functional Requirement**

|  |  |
| --- | --- |
| **ID** | **Functionality Description** |
| 1 | Admin must be able to login to the system |
| 2 | Administrators will be able to add users. |
| 3 | Admin must be able to delete the users. |
| 4 | Admin must be able to Manages user by adding, updating, or deleting accounts. |
| 5 | Admin must be reviewed the feedback given by user. |
| 6 | Monitor the platform’s overall performance and usage statistics. |
| 7 | Provide data security and impose privacy policies. |
| 8 | Manage system configurations and updates and Database management. |
| 9 | Resolve technical issues and provide platform support. |

1. **Non-Functional Requirements**
2. **Performance:** The application should respond to the user's inputs within 1 second to provide a smooth experience.
3. **Scalability:** The system must be able to support concurrent use by different users without considerable performance degradation.
4. **Security:** All user data, personal and health-related, should be encrypted for confidentiality and integrity.
5. **Usability:** The interface must be intuitive and accessible to users with different technical
6. **Reliability:** The platform should maintain at least 99% uptime to ensure that the application is always available.
7. **Compatibility:** The application should seamlessly run on both Android and iOS devices and be accessible through web browsers
8. **Hardware and Software Requirements**
   1. **Hardware Requirement**
9. **Server:**  
   A dedicated server or cloud hosting service to host the website and app, ensuring efficient handling of user requests, AI processing, and data storage.
10. **Storage:**  
    Adequate storage capacity to store user profiles, workout and dietary data, progress reports, and AI-generated recommendations.
11. **Processing Power:**  
    Sufficient processing power to manage concurrent user requests, perform AI computations for personalized fitness plans, and handle real-time data tracking and updates.
    1. **Software Requirement**
12. **Operating System:**

The server should run a compatible operating system such as Linux, windows server or macOS server.

1. **Flutter:**

It is used for cross-platform mobile application development, which allows smooth functionality on both Android and iOS devices.

1. **React.js:**

It is a JavaScript library used for creating responsive and dynamic web interfaces.

1. **Spring Boot and Java:**

These are used for back-end development to ensure scalable and robust server-side functionality.

1. **Python:**

It is used for AI/ML tasks such as generating personalized fitness and dietary recommendations.

1. **MongoDB:**

It is a NoSQL database for managing user data, activity logs, and app-related information.

1. **Bootstrap:**

Used for creating beautiful and responsive user interfaces.

1. **VS Code:**

Primary IDE for coding and debugging.

1. **Git:**

A version control system to collaborate on development and manage source code.

1. **Proposed Methodology**

Our solution focuses on providing personalized diet plans by leveraging advanced data clustering techniques and synthetic user data generation. To achieve this, we utilize unsupervised learning to cluster food items based on their nutritional values. This process categorizes foods into 14 distinct clusters, each representing specific nutritional characteristics, such as high protein and low fat, or high fiber and moderate carbohydrates. These clusters provide a structured representation of the nutritional profiles of various foods.

To align the dietary recommendations with individual needs, we create a synthetic dataset that simulates user information, including health metrics, dietary preferences, and fitness goals. This synthetic dataset enables the development and testing of personalized diet plans by mapping user requirements to the appropriate food clusters.

By combining nutritional clustering and synthetic user data, our approach ensures tailored, data-driven diet plans that cater to diverse dietary needs and health objectives, promoting sustainable and effective nutrition management.

1. **System Architecture**
2. **Use Cases**
3. **Fully-Dressed Use Cases**
4. **Methodology Diagram**
5. **Database Schema Diagram**