FITNESS-RELATED COACHING AND DIET PLANNING USING IMAGE PROCESSING AND MACHINE LEARNING

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B.Sc. (Hons) Degree in Information Technology Specializing in Information Technology

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Project Proposal Report

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DECLARATION

I declare that this is my work. This proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or institute of higher learning. To the best of my knowledge and belief, it does not contain any previously published material written by another person except where the acknowledgment is made in the text.

Name	Student ID	Signature
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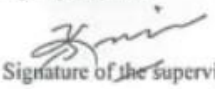
The above candidate is carrying out research for the undergraduate Dissertation under my supervision.



Signature of the supervisor:

29/02/2024

Date

(Koliya Pulasinghe)

ABSTRACT

This study addresses the need for personalized fitness solutions by developing a novel approach to creating workout plans based on body analysis using machine learning and algorithms. The research problem centers on the lack of customized workout routines in traditional fitness applications, which often overlook individual differences in body type and exercise preferences. The study proposes a system that collects data from users' body analysis results and integrates it with machine learning algorithms to generate personalized workout recommendations. Additionally, user feedback gathered during and after workouts is utilized to further refine the recommendations, ensuring a tailored approach to fitness. The basic design of the study involves gathering body analysis data, preprocessing datasets, implementing machine learning algorithms, and integrating user feedback mechanisms. The major findings of the study include the effectiveness of personalized workout plans in enhancing user engagement and satisfaction, as well as the positive impact of background music integration on the overall workout experience. In conclusion, the study highlights the importance of incorporating personalized elements into fitness applications to better meet the diverse needs and preferences of users, ultimately leading to improved adherence to fitness goals and overall wellbeing.

keywords: personalized workout plan, emoji response, background music, machine learning

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1.1 Background and Literature Survey

1.1.1 Background

The area of fitness technology has seen a significant transition in recent years, mostly due to the increasing focus on personalized approaches to health and well-being. Keeping it simple workouts seen in traditional programs are rapidly being replaced with personalized choices that address each person's goals, needs, and preferences. Modern technology developments, especially in the areas of wearables, machine learning, and real-time data processing, are primarily responsible for this transition. With the help of these advancements, users can now track their exercise activities with a level of accuracy, get personalized guidance, and modify their routines in real-time based on feedback. People may thus benefit from more efficient and interesting workout experiences, which enhances commitment and produces better results in terms of general health and fitness levels.

Research in customized fitness technology has been characterized by a strict approach meant to investigate various factors. The creation of mobile applications personalized to meet the needs of each unique workout planner is a popular field of study. These applications encourage greater commitment to workout routines by offering real-time feedback and incentive in addition to customizable workout timetables. In order to provide accurate activity tracking, researchers have also concentrated on incorporating wearable sensors into these systems. Exercise creation techniques that incorporate real-time user feedback are still lacking in research, despite major advances in customized fitness technologies. The previous study has mostly focused on producing personalized exercise recommendations based on basic user characteristics and preferences, ignoring dynamic input during training. This offers a chance to investigate the possible advantages of modifying workout routines in response to user experiences in real time, maybe combining techniques like using emojis to indicate mood. There are great opportunities for optimizing well-being and health outcomes through creative ways as the interaction between technology and customized exercise continues to develop.

It needs to have knowledge in a few important areas to create a mobile application for individualized fitness planning with Flutter, Python, Firebase, and TensorFlow Lite. Expertise in Flutter for cross-platform mobile development, Python programming for machine learning and backend activities, Firebase integration for user identification and data storage, and TensorFlow Lite for deploying machine learning models. Furthermore, developing a fitness app that is engaging, useful and increases user engagement and satisfaction in achieving health and wellness objectives requires an excellent understanding of real-time data processing methodologies and user experience design concepts.

Today's modern personalized fitness technology is defined by a wide range of tools and apps designed to improve user satisfaction and fitness results. There's a lot of space for innovation, especially when it comes to adaptive workout scheduling and real-time feedback. This research aims to expand limits of personalized fitness technology and provide innovative solutions to improve user engagement and satisfaction in the achievement of health and wellness objectives by expanding on and building upon earlier work in this field.

1.1.2 Literature Survey

Fitness technology is changing rapidly in the modern day due to developments in real-time data processing, machine learning, and personalized design. Personalized solutions are becoming more common. In this regard, the combination of cutting-edge features like music integration and emoji-based emotion communication with the machine learning algorithms for personalized exercise planning has a chance to entirely change the fitness experience. To offer insights into the creation of a complete fitness app that takes into consideration user preferences, requirements, and emotional states, this survey of literature focuses on relevant research papers and approaches that examine these factors.

1. Machine Learning for Personalized Workout Plans

Algorithms for machine learning have become extremely effective tools for generating meaningful insights from huge amounts of data analysis. This strategy is demonstrated by research by Sharma et al. (2020), in which complex machine learning models are trained on a variety of datasets including body composition measures, exercise preferences, and performance indicators [4]. Through the utilization of supervised learning and reinforcement learning methodologies, these models can produce customized workout plans that are based on the specific features and objectives of each user. For example, the algorithm may suggest strength training activities for those who want to gain muscle mass and prioritize fitness routines for people who want to lose weight. These personalized recommendations encourage long-term involvement and commitment in addition to improving the workout routine's performance.

2. Emoji-Based Emotional Communication

Promoting user engagement and satisfaction requires an understanding of and commitment to the emotional components of the exercise experience. Recent research emphasizes the importance of mood tracking with emojis in fitness apps, as demonstrated by Smith et al.'s (2019) work [5]. Users could express their emotional states during and after exercises through emoji-based feedback systems, which can provide important insights into their motivation, mood, as well as effort levels. By including such real-time emotional input, the app may dynamically modify the difficulty, duration, or choice of exercises to match the user's emotional demands, improving engagement and overall wellbeing.

3. Background Music to Improve Your Workout Experience

The impact of music on exercise performance and enjoyment has been thoroughly investigated in the domains of human kinetics and sports psychology. The effects of music speed, genre, and rhythm on exercise intensity, motivation, and perceived effort were thoroughly investigated by Johnson et al. (2018) [6]. Their results demonstrated the significant influence of music on influencing physiological and psychological reactions to exercise, with lively, energetic songs motivating higher levels of effort and enjoyment. Playlists specially designed for various types and levels of exercise may be obtained through

fitness applications. Playing a variety of music improves the whole experience of working out, whether it's energetic songs for physical activity or calming tunes for yoga sessions. Even while users might not be able to directly customize the music choices, having a wide range of selections ensures that people can choose music that fits their tastes and mood, inspiring them to stick with it and reach their fitness objectives.

Innovation in customized fitness technology is encouraged by the combination of machine learning, emotional communication, and music integration. Through the integration of cutting-edge approaches and a collection of ideas from several study disciplines, developers may create a comprehensive fitness software that enhances not just exercise planning and performance but also promotes emotional well-being and engagement. As time goes on, more in-depth and user-focused fitness solutions that enable people to live longer, healthier lives should be available by means of ongoing research and development in these fields.

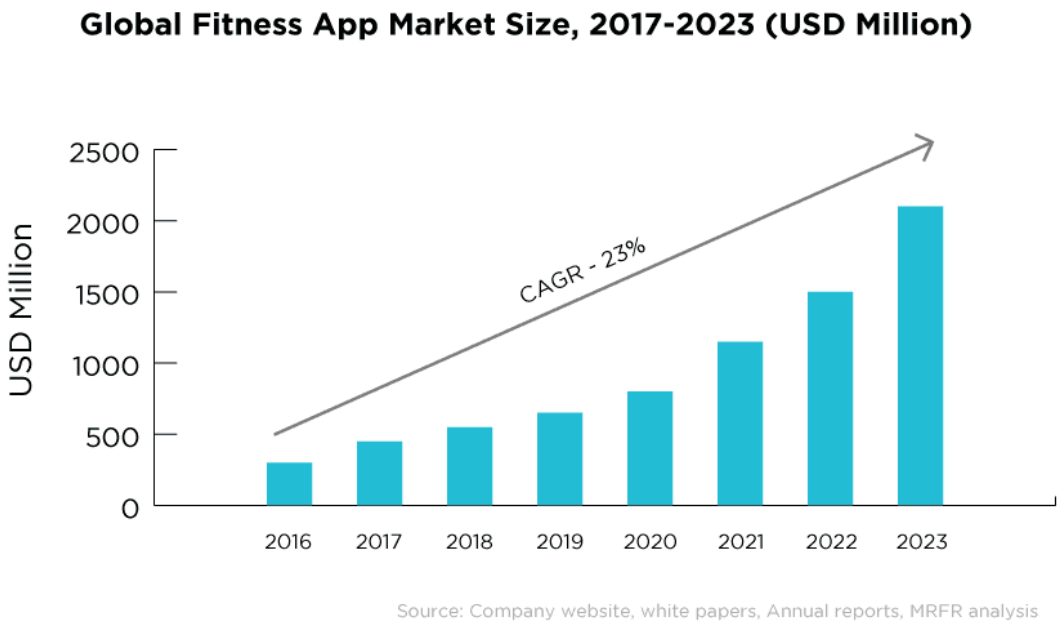

Figure 1.1: The Rise of Mobile Fitness Apps

As shown in Figure 1.1, mobile applications in the fitness industry are seen to be very beneficial and have lately become quite popular among people [7].

1.2 Research Gap

Many technologies have been created in the field of customized fitness technology to provide workout recommendations specific to each user. Previous research emphasizes the use of data processing methods and machine learning algorithms to provide customized training routines based on user attributes and real-time physiological data. Still, there is a lack of integration between dynamic workout advice adjustments during exercise sessions and thorough user feedback systems. Furthermore, even though wearable technology is frequently used to collect data, there is still space to use advanced data analytics to improve the efficacy and specificity of customized exercise suggestions.

However, As indicated in Table 1.1, there are three proposed systems available for personalized workout recommendation.

Research Gap	Ataman et al. (2023)	Koliya et al (2019)	(Manal Abdulaziz, 2021)	Proposed Solution
Real-time data from wearable devices or user inputs	✓	✓	✓	×
Body Analysis	×	×	×	✓
User Response Using Emojis for Satisfaction with Workouts	×	×	×	✓
Background Music Integration for Each Workout	×	×	×	✓
Mobile Application	✓	×	✓	✓

Table 1.1: Comparison between Existing Systems and Propped System

As detailed in the article "Personalized daily weekly workout arrangement application 'cardio fit'" by Ataman et al. (2023), presents a fitness application called "cardio fit" designed to provide personalized daily and weekly workout schedules [1]. The "cardio fit" personalized daily weekly workout schedule program helps users plan their workouts by helping them choose exercises that are appropriate for their fitness level and chosen equipment. Users are asked to enter their preferred equipment and workout goals when they first use the program. Then, if heart rate monitor data is available, the program uses it to identify suitable workouts and shows them on the home screen. By selecting certain exercises, users may go further into their options to workout and get more in-depth screens with more instructions. All things considered, the "cardio fit" app simplifies the process of creating customized workout schedules, increasing user interest and routine commitment.

The study "Image Processing and Machine Learning Based Nutrition and Fitness Journaling System" by Koliya et al. highlights the need of giving users personalized workout recommendations [2]. The study collects data from user profiles, such as gender, age, weight,

risk level, health issues, and preferred workout formats, to personalize workout schedules based on the specific characteristics and preferences of each participant. The research does not use body analysis to create workouts, in contrast to proposed solution. It does, however, provide an alternate technique that makes use of machine learning algorithms to improve customization and accuracy when developing customized workout schedules. Using machine learning algorithms and user data analysis, the system seeks to provide exercise routines that are customized to each user's unique requirements and objectives. The study, carried out at the Sri Lanka Institute of Information Technology by Koliya et al., emphasizes how crucial it is to use cutting-edge technology, such image processing and machine learning, to create creative solutions for managing diet and fitness. To meet the increasing need for personalized fitness solutions in the current digital era, this study employs an innovative approach that combines experience in health sciences and technology.

The research "Building a Personalized Fitness Recommendation Application based on Sequential Information" by Abdulaziz et al. provides a thorough framework for creating customized fitness technology [3]. To enable the real-time gathering of critical biometric data during exercise sessions, the study focuses on effortless integration of wearable technologies, such as smartwatches, into the fitness application. The capability of the research to collect a variety of biometric parameters, such as heart rate, speed, altitude (depending on the user's location), and other relevant data, is one of its primary features. The application uses sequential processing techniques to continually monitor these parameters in real-time to assess the user's physiological status and fitness goals. This enables the system to provide training plans that are suitable and customized to the person's requirements and level of performance. The research makes advantage of its real-time data processing capabilities to make sure that exercise recommendations stay responsive and sensitive to the user's changing requirements and performance levels throughout the user's fitness journey. Through individualized recommendations derived from current biometric data, the program seeks to improve users' efficacy and motivation in their fitness pursuits. The study, carried out by Abdulaziz et al. at emphasizes the significance of utilizing cutting-edge technologies and sequential processing algorithms to develop personalized fitness recommendation systems that are tailored to each user's unique requirements and preferences.

Comparison shows that personalized workout recommendations are prioritized by both Ataman et al. and Koliya et al.'s method, depending on user input data. The approach of Ataman et al. mainly depends on users' choices for equipment and workout objectives, which are then enhanced by modification based on heart rate monitor data. By collecting a wider range of user profile data, such as personal information and health-related characteristics, Koliya et al.'s method allows for more thorough personalization. By integrating real-time data from wearable devices during exercise, Abdulaziz et al.'s technique, on the other hand, stands out for collecting important physical markers like heart rate and altitude. However, Abdulaziz et al. do not specifically use data from body analysis or have real-time feedback systems, in contrast to Ataman et al. and Koliya et al. On the other hand, by incorporating body analysis data into workout planning and allowing customers to leave feedback using emojis both during and after workouts, the suggested approach increases user satisfaction and engagement. The suggested solution also incorporates background music for every workout, which improves user experience by improving motivation and inspiration.

1.3 Research Problem

The biggest challenge to maintaining ideal levels of fitness and health is the complexity of modern lifestyles. It might be difficult to find the desire and resources to prioritize exercise when people are handling a lot of responsibilities and time limitations. Even though there are lots of applications and resources available, and the fitness industry has experienced exponential development in recent years, many individuals still find it difficult to get advice that is specific to their needs and circumstances.

A major problem that today's fitness lovers are dealing with is the absence of personalized guidance and assistance provided by traditional fitness applications. These applications frequently offer general exercise routines that don't take into consideration the variations in each user's body type, level of fitness, and health objectives. Users may become disconnected and give up on their fitness pursuit because of feeling overloaded by incompatible recommendations or upset by their lack of success.

Furthermore, the problem is made worse by the fact that current fitness applications lack real-time feedback features. In the absence of prompt instruction on exercise technique, intensity, and dietary decisions, users run the danger of injuring themselves during workouts or accidentally developing bad habits. In addition to undermining the success of their fitness endeavors, this lack of individualized assistance puts their long-term health and wellbeing at risk.

To overcome these challenges, creative solutions that make use of modern technology to provide personalized guidance and support are much needed. Fitness applications can assess user data in real-time and provide personalized recommendations and useful information that are in line with user goals by utilizing image processing and machine learning algorithms. Throughout a user's fitness journey, these intelligent solutions may provide continuous support and inspiration by dynamically adapting to their changing demands.

Including functions like personalized workout schedules, real-time feedback on workout form, and dietary advice can also help users make wise choices and see outcomes that last. These next-generation fitness solutions have the power to completely change how people think about health and wellbeing because they integrate the latest advances in technology with scientifically proven methods of exercise and nutrition.

In conclusion, by creating an innovative approach that puts an emphasis on personalized instruction and assistance, the research seeks to overcome the fundamental shortcomings associated with traditional fitness applications. The suggested solution aims to give customers the tools they need to take charge of their fitness journey, overcome challenges, and more successfully reach their health and wellness objectives by utilizing cutting-edge technology and approaches.

2. OBJECTIVES

2.1 Main Objectives

The main objective of this project is to create personalized fitness software that uses body analysis data and machine learning algorithms to create customized workout routines. With the aim of increasing user engagement and satisfaction in reaching their health and wellness objectives, this application will have features that allow users to enjoy background music while working out and offer real-time feedback via emojis. Creating a smart mobile application that can personalize workout plans based on body analysis, integrating machine learning algorithms to optimize workout recommendations, incorporating an emoji-based user interface for real-time feedback, implementing background music features over the period of this year.

2.2 Specific Objectives

The specific objectives of the proposed solution are as follows:

1. Data Gathering for Workout Plan Generation

The objective involves gathering the necessary information needed to create customized workout plans. The focus is on getting the body analysis findings, which include things like body type and provide the foundation for personalizing workout plans to meet the requirements and preferences of each person.

2. Dataset Preprocessing for Machine Learning Model

This objective involves getting the dataset ready for the model's training. To guarantee that the input data is of the highest quality and appropriate for efficient model training, dataset preparation tasks include cleaning the data, handling missing values, and modifying features.

3. Algorithm Implementation for Personalized Workout Recommendations

The development and use of algorithms to generate personalized workout recommendations is the main goal of this project. The system, which is based on supervised learning techniques, personalizes workout schedules to each user's particular needs and preferences by taking into consideration a variety of criteria, including body type, exercise preferences, and fitness objectives. The algorithm also includes a background music option that corresponds with various training methods, which improves customers' motivation and overall workout experience and allows users to express satisfaction and feedback through emoji responses.

3. METHODOLOGY

3.1 System Architecture

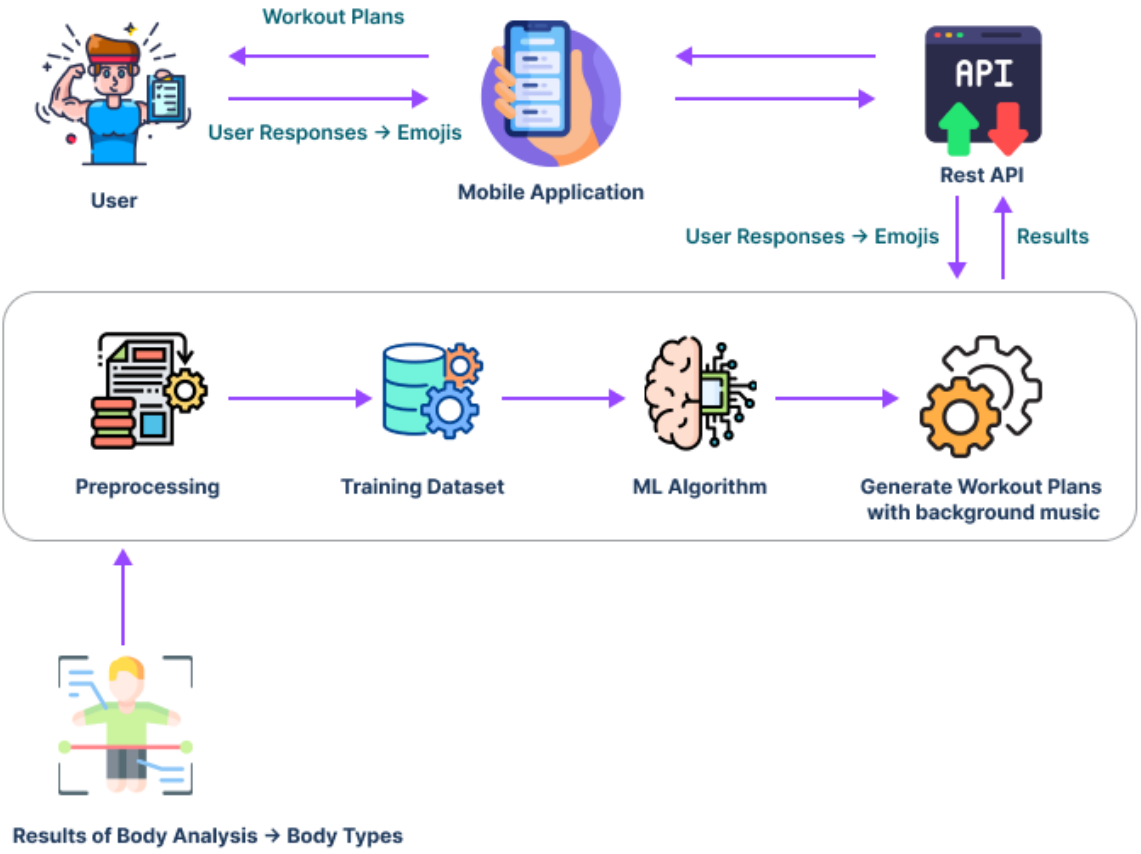

Figure 3.1: Generate Personalized Workout Plan System Architecture

Figure 3.1 shows the system diagram of generating personalized workout plans. At first, the system collects information from the findings of the body analysis, specifically identifying various body types. After that, this data goes through preprocessing, an important stage in which it is cleaned, standardized, and made ready for additional analysis. After preprocessing is finished, the data is used to build a training dataset, which is what the machine learning algorithm uses as input. During this stage, a decision tree algorithm that was chosen through supervised learning is used to provide personalized workouts. The generated workouts are then displayed to the user through an API. During workouts, users have the option to provide feedback through emojis, indicating their satisfaction or preferences regarding the exercises. These responses are stored in a database for future recommendations, enabling the system to adapt and improve over time based on user feedback. New workouts are generated on a weekly basis, prompting users to undergo a new body analysis to ensure the most accurate and personalized recommendations. For the generation of new workouts, the system considers both the new body analysis data and the user responses from previous workouts.

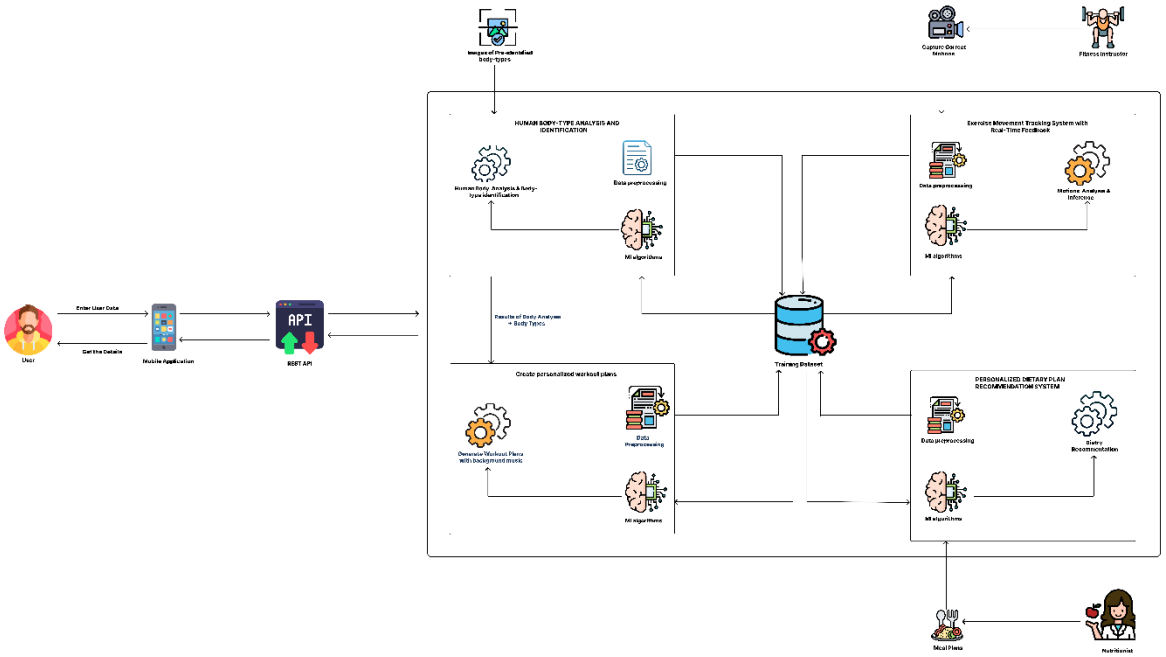

Figure 3.2: Overall System Diagram

Project Execution

To complete the project, a systematic and phased approach is used, including the following key steps:

1.Project Planning and Preparation

We will start by providing a thorough project plan that includes specific objectives, deadlines, and achievements. In order to ensure smooth collaboration, this step will entail forming the project team, defining roles and duties, and establishing communication channels.

2. Requirement Gathering

After that, in order to determine the needs and details for the customized fitness application, we will carry out in-depth investigation and evaluation. Understanding user requirements, industry developments, and technology aspects will be necessary to ensure compatibility with project objectives.

3.Design Phase

The design phase begins when requirements are gathered, during which we will develop the application's architecture and user interface. Wireframing, prototyping, and establishing the general style and feel of the application are all part of this process.

4. Development and Implementation

With the design in place, we will proceed to the development phase, where the application will be built according to the specifications outlined in the design phase. This will involve

coding, testing, and iteration to ensure the application meets quality standards and functional requirements.

5. Integration and Testing

Once the machine learning models are developed, they will be integrated into the application framework. Comprehensive testing will be conducted to ensure the functionality, reliability, and performance of the application across various scenarios and user interactions.

6. Deployment and User Feedback:

Upon successful testing, the application will be deployed to a test environment, where users will have the opportunity to interact with it. Feedback will be collected and analyzed to identify areas for improvement and refinement.

7. Documentation and Training

Lastly, thorough documentation will be created to offer instructions on how to use, manage, and maintain the program. To acquaint stakeholders with the capabilities and operation of the application, training sessions may also be held.

Structured Tasks and Subtasks for Personalized Workout Plan Development

The project comprises a set of specific tasks and subtasks that have been carefully characterized to enable the creation of a personal fitness application.

The crucial phase of Task 1 is obtaining information from the Body Analysis Phase. Here, the focus is on collecting relevant body analysis findings, which in this case relate to body types. To do this, a comprehensive plan of techniques will be used to guarantee the accurate and efficient gathering of relevant information.

Task 2 will now focus on preprocessing a diverse dataset. This includes describing the preparation stages, such as analysis of features, data cleaning, and normalization. Preprocessing methods will then be put into practice to guarantee that the dataset is ready for the next step of training a machine learning model.

Task 3 focuses on implementing algorithms for personalized workout recommendations, emphasizing the use of supervised learning approaches. The decision tree algorithm will be used in this area to create the customized exercise suggestion system. The first stages will be studying and choosing suitable machine learning algorithms. Decision tree models will be prioritized because of their understanding and relevance for categorization tasks. The chosen algorithm will next be carefully tested and developed to make sure its performance satisfies specified testing measures. The algorithm's efficacy in offering customized exercise suggestions based on user body type is ensured by this systematic methodology.

Task 4 is dedicated to the incorporation of a customized exercise recommendation system. This means building the system architecture with the recommendation system integrated seamlessly. In order to ensure seamless functioning, APIs or interfaces will also be established to link with frontend and backend components.

The Implementation of Emoji Feedback Functionality is the main topic of Task 5. Here, emoji feedback input will be made easier with well-considered user interface features. In order to improve user satisfaction and engagement, backend infrastructure will be created concurrently to handle and evaluate emoji feedback data.

Lastly, Task 6 is all about developing an algorithm to choose background music. This involves looking into music selection algorithms that complement various workout approaches and styles. Later on, algorithms will be created to choose and play background music on their own, thereby improving the user experience even more.

Materials and Resources Required for Project Execution

To carry out the project, the following materials and resources will be required:

Firstly, a variety of tools will be required, such as laptops or PCs set apart for testing and development. Furthermore, mobile devices will be needed to enable comprehensive application testing on several platforms, including iOS and Android.

Tools and software for development are part of the equally important supportive computer infrastructure. Improved development workflows will require version control systems, project management platforms, and integrated development environments (IDEs). Moreover, reliable database management systems would be necessary for the deployment and administration of data, guaranteeing effective storage and accessibility of gathered data. The application's capabilities will be further enhanced by the creation and implementation of complex algorithms made possible using machine learning frameworks and libraries.

To create visually appealing user interface (UI) designs, wireframes, and prototypes, specialist tools will be used. In addition to guaranteeing a clear and visually appealing user experience, this will make it easier to communicate design concepts effectively throughout the development process. To further improve the application's general usability and attractiveness, graphic assets including icons, pictures, and visual components will be provided.

Apart from software and hardware resources, a number of additional requirements will be crucial to the project's success. It will be essential to have continuous internet connection in order to use online resources, collect data, and communicate with other team members. Essential project data will have dependable backups in the form of external storage devices, protecting it from any loss or corruption. Text editors, spreadsheets, and presentation software will all be used as documentation tools to thoroughly record project procedures and results. Last but not least, the use of collaboration tools will promote effective team coordination and communication, creating an efficient and productive work environment over the duration of the project.

4. PROJECT REQUIREMENTS

4.1 Functional Requirements

1. The system should facilitate the creation of personalized workout plans tailored to individual users' body analysis data.

2. Based on the body type, the system should suggest appropriate workouts, sets, repetitions, and intensity levels using machine learning algorithms.

3. The system should integrate a user feedback mechanism using emojis. Users should have the capability to express their feelings and satisfaction levels regarding their workout experiences through the selection of emojis.

4. The system should dynamically modify workout programs in response to user feedback and progress, ensuring ongoing improvement and personalization of the exercise schedule.

5. The system should create playlists that are supposed to improve the workout routine.

6. The system should send timely reminders and notifications to users to help them stay on track with their workout routines.

4.2 Non-functional Requirements

1. Compatibility – The system should be compatible with a wide range of mobile devices and operating systems, ensuring accessibility to a diverse user base. It should function seamlessly across various devices, including smartphones and tablets, running different operating systems such Android.

2. User-Friendly Interface – The system should feature a user-friendly interface that facilitates easy navigation and interaction. The interface should be simple and visually appealing, allowing users to navigate through different sections of the app effortlessly. To improve usability and reduce user misunderstandings, labels, buttons, and menus should be clear and simple. Additionally, the interface should adapt to different screen sizes and orientations to provide a consistent experience across devices.

3. Reliability – The system should be reliable, ensuring consistent and dependable performance under normal operating conditions. It should minimize the occurrence of system failures, crashes, or errors that could disrupt user experience.

4. Accuracy – The system should maintain high levels of accuracy in its functionalities and data processing. It should provide reliable and precise information, particularly in areas such as workout recommendations, data analysis, and feedback interpretation.

5. Performance – The system should demonstrate optimal performance, delivering fast response times and smooth interactions. It should be responsive to user inputs and commands, providing quick access to features and functionalities.

6. Availability – The system should be available and accessible to users whenever they need it. It should ensure uninterrupted service availability, with minimal downtime or maintenance periods.

4.3 System Requirements

The software resources required for ensuring the appropriate functionality of the proposed component are included in the system requirements. The following are the criteria for the software specifications:

1. Flutter – The main framework used to create the mobile application.

2. Python – Used for backend development activities such as API integration, algorithm implementation, and data preparation.

3. Firebase – Real-time database storage.

4. TensorFlow Lite – To implement machine learning models and provide customized exercise recommendations.

4.4 Personal Requirements

Using online resources such as Kaggle datasets and partnerships with in-person trainers or fitness experts, the customized fitness application may collect extensive data to produce a strong and customized dataset. This information will be used as the basis for the creation of machine learning algorithms that will provide customized workout schedules and suggestions, improving the application's overall efficacy and user experience.

4.5 Use Case Diagram

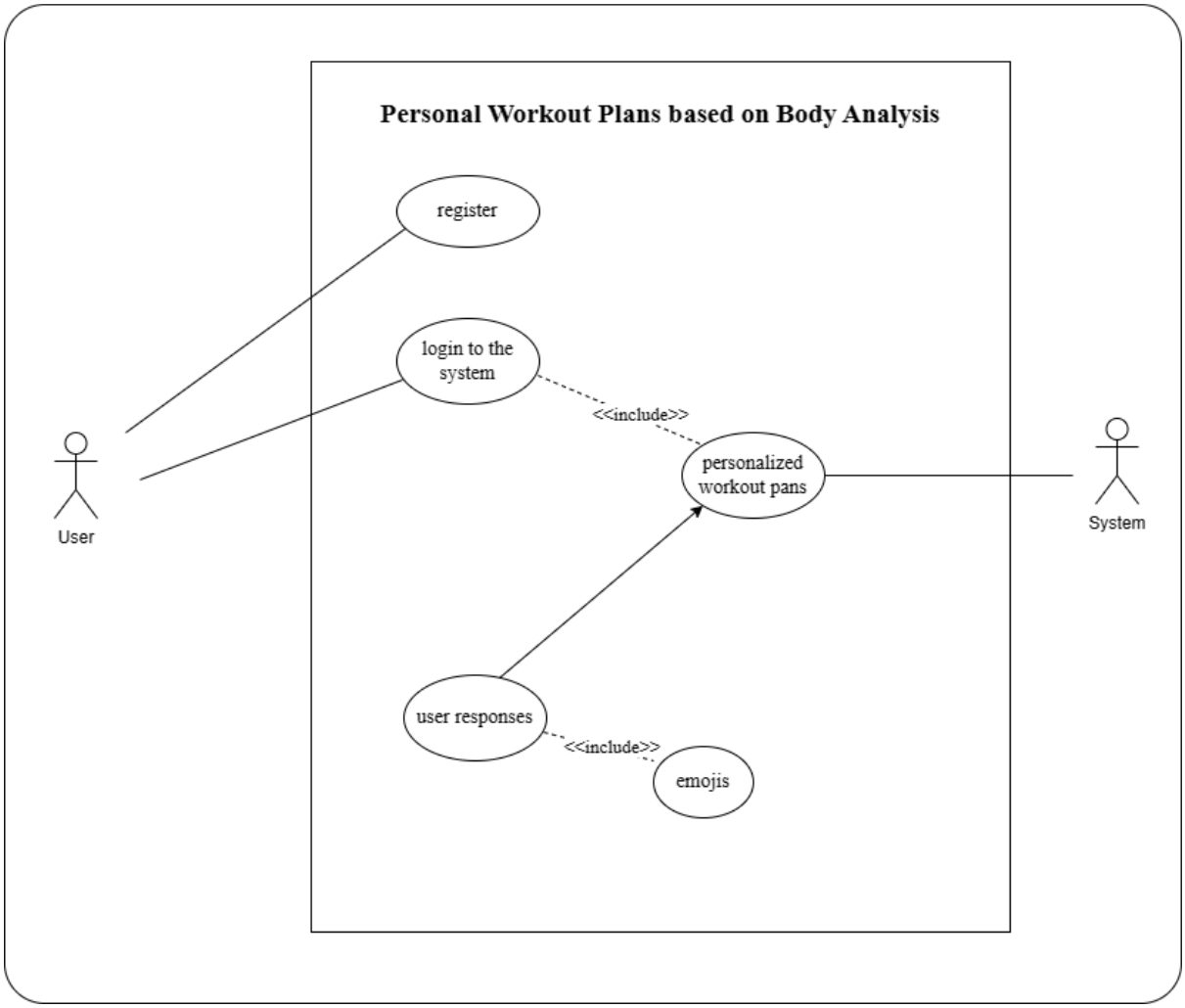

Figure 4.1: Use Case Diagram for Personalized Workout Plan

4.6 Test Cases

Test Case 1

Title: Data Gathering from Body Analysis

Description: Testing the process of retrieving data from the body analysis phase.

Precondition: Body analysis phase has been completed by another team member.

Assumption: The data retrieved accurately represents the results of the body analysis.

Test Steps:

1.Retrieve the body analysis data from the designated source.

2.Verify the integrity and completeness of the retrieved data.

3.Check for any inconsistencies or shortcomings in the data.

Expected Result: The retrieved data accurately represents the body analysis results, with no missing or incorrect information.

Test Case 2

Title: Preprocessing Diverse Dataset

Description: Testing the preprocessing steps applied to the diverse dataset.

Precondition: Diverse dataset including body analysis and exercise preferences is available.

Assumption: Preprocessing steps include data cleaning, normalization, and feature engineering.

Test Steps:

1. Apply data cleaning techniques to remove any inconsistencies or outliers in the dataset.
2. Normalize the data to ensure uniformity and consistency across different features.
3. Perform feature engineering to extract relevant information and enhance the predictive power of the dataset.

Expected Result: The dataset is clean, normalized, and feature-engineered, ready for machine learning model training.

Test Case 3

Title: Algorithm Implementation for Personalized Workout Recommendations

Description: Testing the implementation of the machine learning algorithm for generating personalized workout recommendations.

Precondition: Preprocessed dataset and user preferences are available.

Assumption: The algorithm employs decision tree algorithm under supervised learning.

Test Steps:

1. Input the preprocessed dataset and user preferences into the algorithm.
2. Generate personalized workout recommendations based on the input data.
3. Validate the accuracy and suitability of the generated workout plans.

Expected Result: The algorithm produces personalized workout recommendations that align with user-specific factors and fitness goals.

Test Case 4

Description: Testing the integration of the personalized workout recommendation system into the application framework.

Precondition: Personalized workout recommendations from the algorithm are available.

Assumption: The recommendation system seamlessly integrates with the application framework.

Test Steps:

1. Integrate the recommendation system into the application framework.
2. Verify that users can access and view personalized workout recommendations through the application interface.
3. Ensure smooth navigation and interaction with the recommendation system.

Expected Result: Users can easily access and view personalized workout recommendations through the application interface, with no disruptions or technical issues.

Test Case 5

Title: Emoji Feedback Functionality

Description: Testing the functionality of capturing user feedback through emojis during and after workouts.

Precondition: User feedback conveyed through emojis is available.

Assumption: The application accurately captures and stores user feedback for future analysis.

Test Steps:

1. Allow users to provide feedback through emojis during and after workouts.
2. Verify that the application captures and stores the user feedback accurately.
3. Analyze the stored feedback to ensure it reflects user feelings and satisfaction levels.

Expected Result: The application effectively captures and stores user feedback through emojis, providing valuable insights for future recommendation adjustments.

Test Case 6

Title: Background Music Selection Algorithm

Description: Testing the algorithm for selecting background music based on workout type.

Precondition: Workout type and user preferences for background music are available.

Assumption: The algorithm chooses appropriate music based on workout intensity and user preferences.

Test Steps:

1. Verify that the algorithm selects suitable background music for each workout session.
2. Assess the appropriateness of the chosen music based on the workout intensity.

Expected Result: The algorithm selects background music that enhances the workout experience, aligning with the workout intensity and user preferences.

4.7 Wireframes

High-Fidelity User Interface

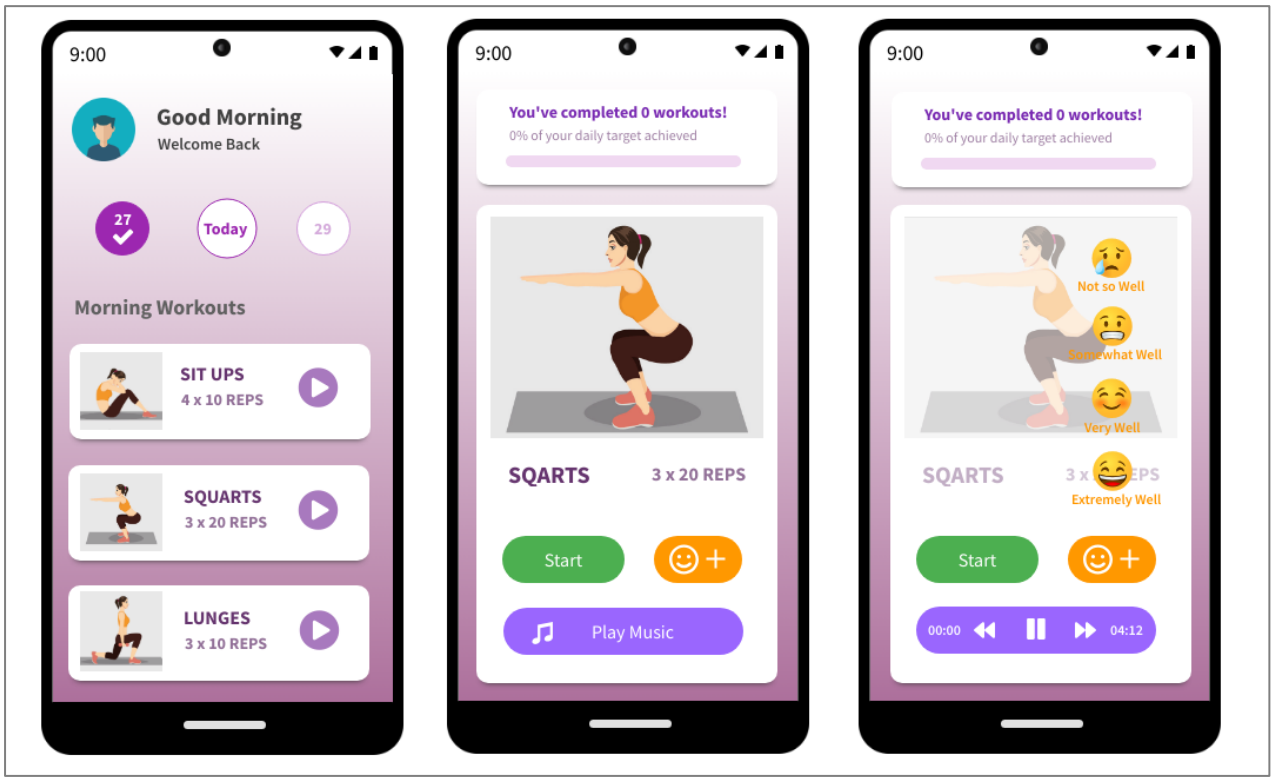

Figure 4.2: Wireframes of personalized workout plan

5. GANTT CHART

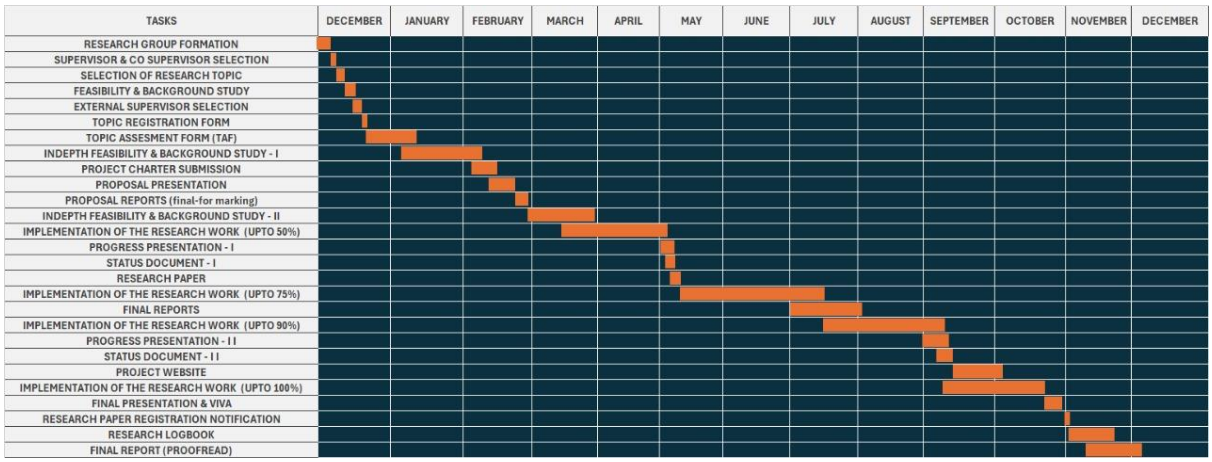

Figure 5.1: Gantt Chart

5.1 Work Breakdown Structure (WBS)

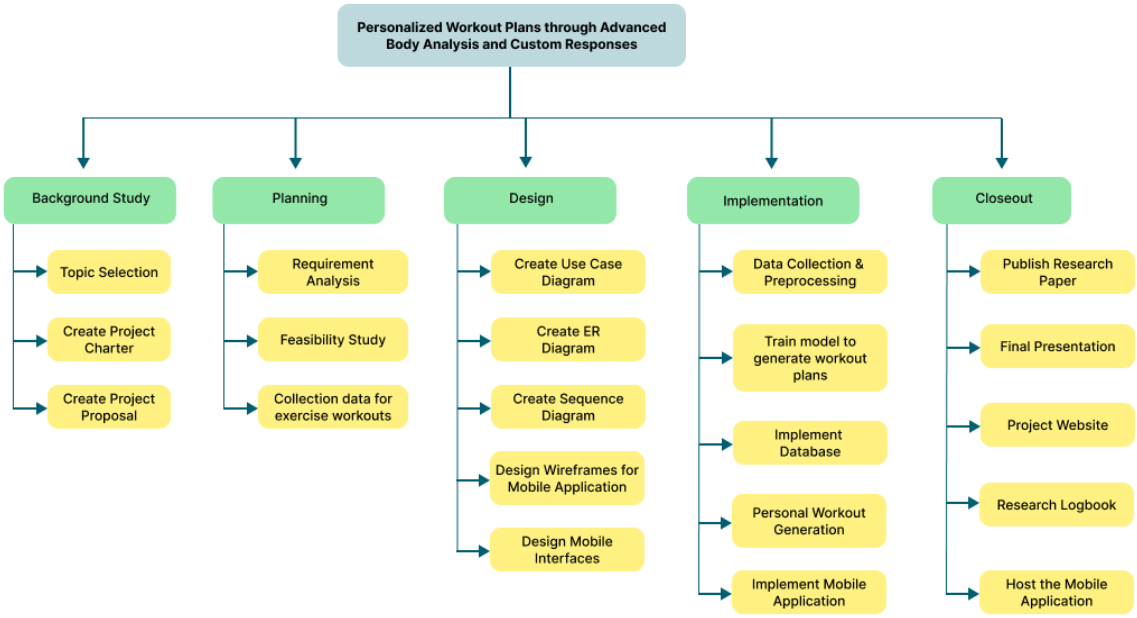

Figure 5.2: Work Breakdown Structure of Personalized Workout Plan

6. COMMERCIALIZATION

Marketplace

The purpose of the customized fitness application is to transform how customers feel about health and wellbeing by emphasizing education, accessibility, and user-friendliness. Through its release on the Google Play Store, the app expands its audience and gains more recognition by ensuring that people of all ages may easily utilize its features without age limitations. The application features a user-friendly interface that has been carefully designed to accommodate users with a range of technological skills. It's simple navigation and simple design components enable users to easily navigate through its functionality. Additionally, the app's instructional materials provide users with helpful information on fitness and nutrition concepts, covering everything from exercise methods to food recommendations. By providing these instructional resources, the app not only improves user retention as well as engagement but also gives users the information they need to make wise decisions on their journey toward fitness and health.

Target Audience

The application is targeted for a broad range of users, including:

- Fitness Enthusiasts
- Health-conscious Individuals
- Gym-goers
- Personal Trainers

Subscription Plans

There will be two subscription stages available for the application to generate earnings.

1. **Free Plan**: The application's fundamental features and functionality are accessible to users at no cost under the free plan.

2. **Premium Plan**: Compared to the free plan, the premium plan provides customers with more advanced features and a greater range of exercise possibilities.

7. BUDGET AND BUDGET JUSTIFICATION

Component	Price (Rs)
Travelling cost	20000
Developers' value of time	100,000
Database Price	7000
Play store publishing	9000
Marketing and Advertisements	14000
Total Value of the application	**150,000**

Table 7.1: Expenses for the proposed solution

Expenses for travel, the time and experience of the developers, database charges, Play Store publication fees, marketing, and advertising are all included in the expected budget for the designed fitness application.

1. Travelling Cost - This budget item addresses the cost of any required travel for conferences, project meetings, or other important events.

2. Developers' Value of Time - The value of the time developers spent planning, creating, testing, and perfecting the application is reflected in this budget line item.

3. Database Price - The cost of purchasing and maintaining a reliable database system to store user data effectively and safely is included in the database pricing.

4. Play Store Publishing - This budget allocation pays for the one-time registration fees and yearly developer account expenses related to launching the application on the Google Play Store.

5. Marketing and Advertisements - The program must be promoted, and users must be drawn in by spending money on marketing and advertising. This budget line item pays for influencer collaborations, digital marketing campaigns, social media ads, and other promotional efforts meant to boost the application's user base and exposure.

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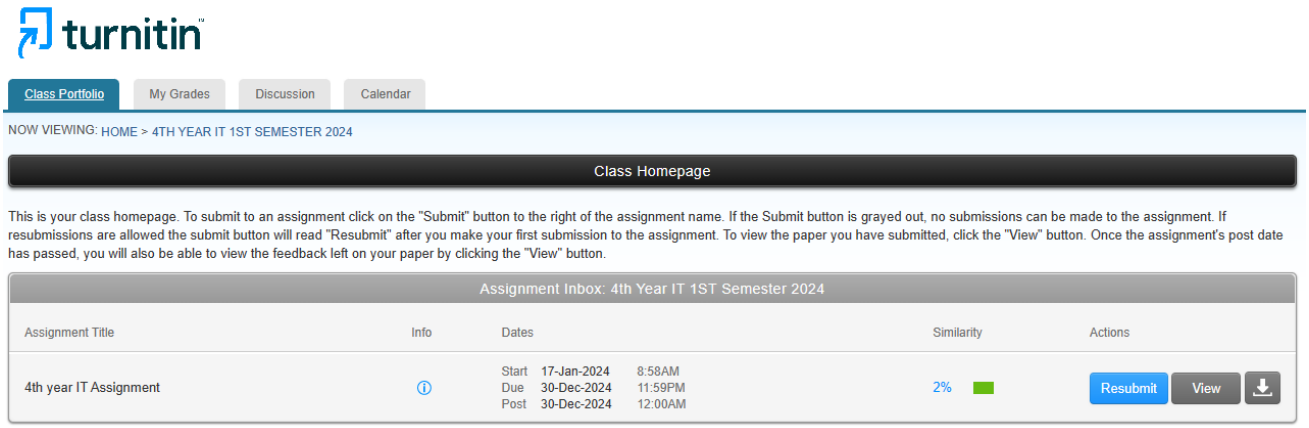
APPENDICES



Appendix A – Plagiarism Report