

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

R24-122

Project Proposal Report

Herath H.M.R.B - IT21002106

BSc (Hons) in Information Technology Specializing in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

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## DECLARATION

We declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The supervisor/s should certify the proposal report with the following declaration. The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor:

Date: 28.02.2024

(Prof. Koliya Pulasingh)

 28/02/2024

## **ABSTRACT**

Common problem of incorrect exercise form and movements in fitness training, which is a significant issue worsened by modern lifestyles where health and wellness are often sacrificed for daily obligations. This issue reduces the effectiveness of the workout and increases the risk of injury, thus inhibiting the achievement of fitness objectives and overall well-being. In return, an advanced real-time feedback system is suggested that uses cutting-edge technologies such as computer vision and machine learning. Utilizing these cutting-edge technologies, the system is designed to closely monitor, track, and analyze exercise movements in real-time, giving users real-time feedback for form correction and performance enhancement. By following a systematic requirement gathering process and completing feasibility assessments that cover technical, economic, and operational aspects, the main aim is to design a user-centered solution that gives higher education and security levels while at the same time promoting holistic health and well-being. Emphasizing user experience and utilizing modern technologies such as OpenCV, MediaPipe, Python, and Flutter provide flexibility and effectiveness during the development process, closing the gap between conventional fitness training approaches and modern individual requirements in the dynamic world of today.

Keywords: Real-time feedback system, Incorrect exercise form, Computer vision, MediaPipe, OpenCV, Machine learning

# Table of Contents

DECLARATION.....	i
ABSTRACT.....	ii
LIST OF FIGURES.....	iv
LIST OF ABBREVIATIONS.....	v
1. INTRODUCTION.....	1
1.1 Background & Literature Survey .....	1
1.1.1 Background .....	1
1.1.2 Literature Survey.....	2
1.2 Research Gap .....	5
1.3 Research Problem .....	7
2. OBJECTIVES .....	8
2.1 Main Objectives .....	8
2.2 Specific objectives .....	8
3. METHODOLOGY .....	9
3.1 System Architecture .....	10
3.1.1 OVERALL SYSTEM DIAGRAM .....	11
3.1.2 Software Solution.....	12
3.2 Technologies.....	13
4. PROJECT REQUIREMENTS.....	14
4.1 Functional Requirements .....	14
4.2 Non-Functional Requirements .....	15
4.3 System requirements .....	15
4.4 User Requirements .....	16
4.5 Personnel Requirements .....	16
4.6 Use Cases .....	17
4.7 High Fidelity Diagram .....	18
4.8 DESCRIPTION OF PERSONAL AND FACILITIES.....	18
5. GANTT CHART .....	19
5.1 Work Breakdown Structure (WBS) .....	19
6. BUDGET AND BUDGET JUSTIFICATION.....	20
7. COMMERCIALIZATION.....	21
References.....	22

APPENDICES .....	23
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## LIST OF FIGURES

Figure 1- Displays the rise in searches for the term 'Home Workout' in the United States [7] .....	2
Figure 2 -National Estimate of increase of Injuries At-Home Exercise [8] .....	3
Figure 3- Exercise Movement Tracking with Real-Time Feedback System Architecture .....	10
Figure 4 - OVERALL SYSTEM DIAGRAM.....	11
Figure 5- Displays the six fundamental stages of agile methodology [15] .....	12
Figure 6- Use Case Diagram of Real time Exercise movements Tracking component. ....	17
Figure 7- High Fidelity Diagram of Real time Exercise movements Tracking Process. ....	18
Figure 8 - GANTT CHART .....	19
Figure 9- Work Breakdown Chart of Real time Exercise movements Tracking component. ....	19

## LIST OF TABLES

Table 1 - Comparison analysis of previous studies.....	6
Table 2 - Expenses for the proposed system .....	20

## LIST OF ABBREVIATIONS

Abbreviation	Description
NCD	Non-communicable diseases
AI	Artificial intelligence
GRNN	General Regression Neural Networks
NN	Neural network
ML	Machine learning
MEMS	Micro-Electro-Mechanical Systems

# **1. INTRODUCTION**

## **1.1 Background & Literature Survey**

### **1.1.1 Background**

A regular exercise activity provides a lot of benefits that are being healthy. Individuals of any age, gender, and physical condition gain from the incorporation of regular exercise activity into their life. One of the first benefits of exercise is weight management. Exercise activity helps in burning calories and this prevents obesity or helps in maintaining weight. The more intensive the exercise, the more calories are burned, and it can be applied in many ways to control weight [1].

Engaging in consistent exercise is an effective way to avoid various diseases and health issues. It plays a vital part in avoiding major health problems like stroke, metabolic syndrome, hypertension, and type 2 diabetes. Exercise is crucial for mental health and can act as an effective treatment for conditions such as anxiety and depression. Basically, incorporating physical activity into your everyday life does not only improve your physical fitness, but also improves the quality of your life in several ways including your physical and mental health. It is a total health care system that benefits people of various ages, skills, and experiences, irrespective of their heritage [2].

To achieve the maximum benefits from your workouts while minimizing the risk of injury, understanding your fitness goals, and developing a personalized plan aimed at their realization is paramount. Although any physical activity is good, making your exercise routine productive is of utmost importance. Overtraining is a typical error, which is caused by the general “all or nothing” mentality that is seriously rooted in our modern society. Overdoing the workout that has not been well prepared results in the possibility of injuries and training of desired activities. Improper form is another danger in workouts, be it running, weightlifting, etc. Correct form is important for both getting the outcome you desire and for minimizing risk of injury. In addition, rest and recovery being ignored is also a common mistake. Sufficient rest is critical to long-term efficiency, particularly after intense exercises. The more vigorous the exercise, the more necessary is the requirement of proper rest to render the body to recover and adjust. The only way to avoid these frequent errors is to ensure proper planning, form, and recovery, which will make your workout both productive and safe in terms of achieving your fitness goals [3].

Personalized fitness and health mobile applications are a comprehensive approach to health and wellness, targeting the unique needs and goals of users and promoting physical and mental well-being. With customized exercise plans, these apps help in weight control, disease prevention, and general quality of life. But the users must emphasize accurate planning, form, and recovery to maintain productivity and safety while reaching their fitness [4]

In conclusion, to address these challenges, the research is driven by integration of personalized fitness and health mobile applications supported with cutting-edge technologies that provide a comprehensive solution to improve physical and mental well-being. This app uses computer vision and machine learning algorithms to give real time feedback on movements during exercises so that users can maintain their proper form and avoid injuries. Besides immediate feedback, the



application offers visual support including video clips or avatars performing the correct exercise procedure. Visual cues assist users to comprehend and execute the correct form more efficiently, thereby improving their workout experience. And shows essential details like repetition counts, exercise duration, and other related metrics in real-time. Through giving users' actual data about their performance. This is achieved through concentration on proper planning, form, and rest, which allows individuals to derive maximum advantages from regular exercise, thereby ensuring effectiveness and safety in achievement of their fitness objectives.

### 1.1.2 Literature Survey

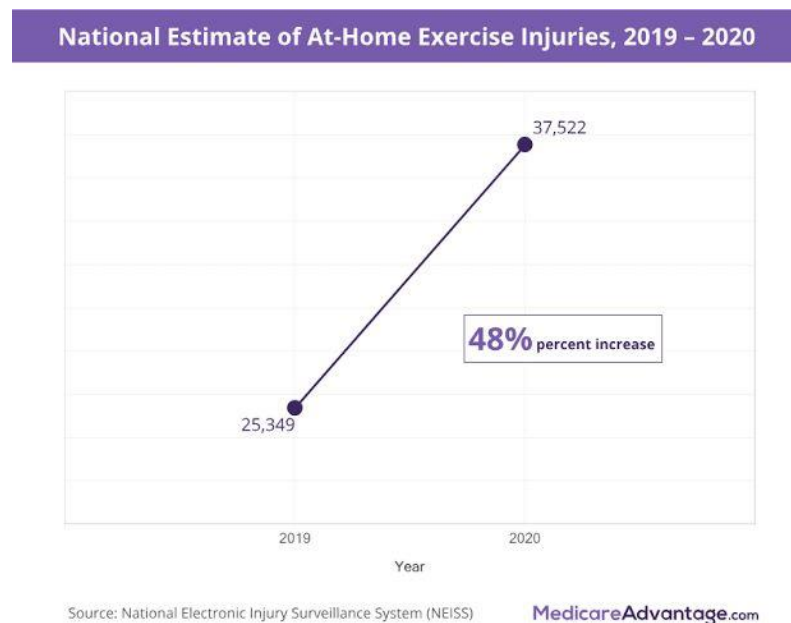
According to statistics, the prevalence of non-communicable diseases (NCDs) is on the rise, and cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes are the main diseases that still inflict a significant harm on the human health in the global context [5]. Nevertheless, even with this alarmingly growing tendency, contemporary people are finding it harder to take care of their health and as well as work out within the hustle and bustle of modern days. Exercise and good habits are a real struggle for most people. Consequently, the lack of exercise activity increases the prevalence of NCDs and thus, the rate of NCD deaths grows at an alarming rate.

In the face of the difficulties of life in the modern world and rising understanding of the need for physical activity, many people have accepted the concept of home exercise program as a convenient solution to their fitness aspirations. Exercising at home in the comfort of your house eliminates the need to commute to the gym and adhere to specific class times, thus enabling busy individuals to incorporate regular exercise into their daily lives. In addition, working out at home provides a level of comfort and privacy that cannot be found in public fitness locations, where individuals may feel vulnerable. As well as home workout has increased because of the Covid 19 pandemic situation [6].



Figure 1- Displays the rise in searches for the term 'Home Workout' in the United States [7]

Although home exercise allows for convenience, a major problem happens for many people who do not have the guidance or right knowledge of exercise techniques. People who do not have an opportunity to use a coach or instructor may have a problem with executing exercises properly that then leads to a risk of injury. Lack of individualized teaching and feedback reduces the chances of wrong poses or excessive effort that can cause strains, sprains, or injuries. Furthermore, the availability of numerous workout materials online may leave a person with plenty of exercise alternatives, but it can also be challenging for one who does not have the necessary knowledge to choose a safe and effective routine. Therefore, those attempting home workouts face many risks without realization. The absence of proper guidance and knowledge during home workouts has led to a notable increase in exercise-related injuries [6].



*Figure 2 -National Estimate of increase of Injuries At-Home Exercise [8]*

Gym facilities are often financially out of reach for most people due to high membership fees and additional costs for personal training sessions. Emphasizes the way these financial constraints reduce people's capacity to focus on their health and fitness objectives.

This is where a customized fitness app becomes necessary. With its personalized exercise plans, real-time feedback, and coaching resources, this type of app allows users to perform home workouts and gym workout effectively and safely. Individuals can minimize the risks of inappropriate exercise techniques and optimize the results of their exercise activities with personalized guidance and support.

Several efforts have been made to address the limitations of traditional fitness applications through the integration of machine learning and computer vision technologies [9]. These methods seek to provide personalized nutrition and exercise recommendations tailored work out plans to help the users in their fitness journeys. The main area of the research is the application of computer vision and machine learning algorithms to provide real-time feedback for correction of workout poses. The objective of this study is to monitor exercise movements during workouts and provide real time feedback to users, allowing exercise pose adjustments for better efficiency and reduced risk of injuries.

An overview of the literature that already exists shows that there is a rising interest in making use of technology to improve exercise performance. Previous research has investigated different methods such as sensor-based systems, wearable devices, and smartphone applications, exhibiting distinct advantages and drawbacks [10]. Although such innovations have proved to be beneficial in monitoring exercise metrics, most of them lack real-time feedback of exercise form that is critical to ensure optimum performance and prevention of injury.

For the research objectives to be achieved, competence in video processing, computer vision, and machine learning is crucial. It is worth noting that the knowledge in technologies like OpenCV, MediaPipe, and Python is required for the creation of powerful algorithms for real-time motion detection and analysis [11]. In addition, working with healthcare professionals, dieticians, and fitness instructors is essential to bringing domain expertise into the development of customized exercise recommendations.

The potential of computer vision methods in the accurate real-time tracking of human motions is tremendous. The algorithms through the video streams analysis can identify key landmarks and reading body poses for precise tracking of exercise movements. Machine learning algorithms are used for the analysis of the exercise movements and giving personalized feedback for the pose correction is one of their most important tasks. Such algorithms can be trained on larger data sets of exercise demonstrations to detect common mistakes and provide real-time corrective actions.

The combination of video processing and real-time feedback has the huge potential to revolutionize personalized fitness and exercise, whether it takes place at home or in the gym. The combination provides a special chance for skill acquisition making the workout environment and preferences of the people different. The technology captures the exercise movements in real-time and then analyzes them, providing the users with instant feedback, hence, leading them towards the proper form, or efficient workout techniques without any consideration of their location or setting. Live guidance like this can dramatically improve the performance of exercises, decrease injury risks, and improve overall fitness outcomes for both home and gym exercisers.

Through overcoming the drawbacks of the traditional models and utilizing modern technologies, researchers will design personalized, efficient, and user-friendly solutions with respect to exercise regimes that will help the individuals achieve their fitness goals.

## 1.2 Research Gap

In the realm of fitness and exercise technology, progress has been made to improve user experience, exercise efficiency, and reduce the risk of injury. Notwithstanding the above developments, there are many research gaps in the current exercise system. The proposal exercise system will integrate video processing to identify incorrect movements, offer real-time feedback, use avatar-guided exercise instructions, employ General Regression Neural Networks (GRNN) technology, and create a dedicated mobile application for improved user experience and personalized exercise solutions to fill existing research gaps.

Matthias\_Kranz et al. [12] focused on the implementation and evaluation expert system of “Gym Skill”, a smartphone system utilizing built-in sensors to log data, recognize activities, and provide automated, personalized feedback to users, aiming to replicate the expertise of a human coach and motivate regular exercise. The Proposed System reveals a few research gaps compared to the main ideas in this research. First, whilst the proposal system insists on the use of video processing to identify incorrect exercise movements, the expert system centers on sensor-based data logging and activity recognition with minimum attention paid to video processing. Secondly, even though both the proposed System and expert system are aimed at achieving real-time feedback to users during workouts, the ways of its accomplishment are different. The proposed System suggests real time feedback integration in a mobile app, whereas prior research emphasizes automated expert assessment through sensor data logging. This highlights a difference in the way that real-time feedback is delivered in the two systems. The Proposed System also introduces the concept of guiding users through an avatar of a fitness trainer and displaying exercise-related data, such as the number of reps, which are not explicitly addressed in this research. Lastly, while both systems involve the development of a mobile application to support exercise monitoring and feedback, the specific features and functionalities of these applications differ.

Alireza Farrokhi et al. [13] focuses on IoT-driven smart fitness solutions but does not address the identification of incorrect movements using video processing. The study focuses on the implementation of IoT technology which includes fitness trackers and applications but does not delve into the details of movement analysis and feedback processes. Besides, the research examines how AI algorithms could enhance training but does not include the real-time feedback system as suggested in the proposed system. Hence, the proposed system is a more focused solution for the challenge of identifying incorrect movements during workouts. It enables users to gain information on how to proper exercise form and technique that increases the efficiency of their workouts by utilizing the advanced video processing technologies and real-time feedback mechanisms. Research recognizes the importance of interaction in smart fitness but does not include elements such as coaching users through a fitness trainer avatar or showing exercise-related data, which are key aspects of the proposed system. The study does not delve into specific

technologies such as GRNN for exercise monitoring. Both the proposed system and Research incorporate mobile applications as integral components of their frameworks for smart fitness solutions. Finally, both the proposed system and research utilize mobile applications.

Shilong Sun et al. [14] focuses on acquiring and analyzing motion data utilizing MEMS technology integrated into dumbbells. Nevertheless, it does not have the capacity to detect incorrect movements via video analysis. The proposed system uses video processing techniques to assess users' motions in real-time, enabling it to recognize and correct improper exercises. Research focuses on collecting and segmenting motion data but does not have a system for giving users immediate feedback throughout their exercises. On the other hand, the proposed approach includes real-time feedback systems that promptly notify users of any incorrect workout form. Furthermore, the proposed system surpasses this research by integrating sophisticated characteristics into its intelligent mobile motion application. Research recognizes the creation of an application but does not provide information on how users learn to do exercises correctly or how exercise data, including repetition counts, is shown. Research employs neural network (NN) methods for motion analysis, whereas the proposed system uses Generalized Regression Neural Network (GRNN) technology, which can provide certain advantages in terms of performance and computational efficiency.

The following table 1 shows how the above information can be organized into a table.

*Table 1 - Comparison analysis of previous studies*

Application reference	Matthias Kranz et al. [12] Research	Alireza Farrokhi et al. [13] Research	Shilong Sun et al. [14] Research	Proposed System
Identify incorrect movements using video processing	✗	✗	✗	✓
Real-time Feedback	✓	✗	✗	✓
Guide to the avatar of a fitness trainer and Display exercise-related data	✗	✗	✗	✓
Technology using GRNN	✗	✗	✗	✓
Mobile Application	✓	✓	✓	✓

### **1.3 Research Problem**

People have to manage their own health and wellness in the fast-paced lifestyles of today. With busy schedules and time limitations, finding enough time and attention for health-related activities such as exercises and self-care becomes a challenge. The bearing of work, family duties, and other obligations tends to outshine the need for a good lifestyle, making many people forget their physical health.

At joining, the research problem encompasses a multiple-aspect analysis of issues related to the correction of exercise form and movements within fitness training workouts. Incorrect exercise poses are one of the paramount issues that not only decrease the benefit of a particular workout but also create a high level of risk for physical injuries for any person undertaking physical activity. Exacerbated with online coaching, instructors have significant obstacles in properly assessing and correcting users' forms and poses, especially when using recorded exercise videos for evaluation.

In addition, the availability and cost of knowledgeable personal trainers have been highlighted as essential aspects, because a lot of people cannot find the required advice and assistance while aiming to make their fitness goals. When it comes to technology-driven solutions for fitness, standard apps frequently fail to meet expectations because of their general character. These applications lack individualized coaching techniques that are adapted to the specific requirements and preferences of everyone.

The lack of real-time feedback systems within these applications is a particularly significant problem. This lack of input inhibits the capacity of users to make educated decisions regarding exercise approaches, which has the potential to impede development and compromise overall health results.

Each of these challenges together emphasizes the need for creative solutions that solve what is missing in the traditional solutions and that makes fitness training experience beneficial to individuals. Therefore, the research question covers the thorough analysis on how advanced technologies such as computer vision and machine learning can be used to provide real time feedback for correcting exercise poses, which can term to better effectiveness, safety, and availability of fitness training programs.

The project seeks to establish a basis for developing personalized user-centric solutions that promote knowledge of lifestyle choices contributing to overall health and fitness thorough examination of these difficulties.

## **2. OBJECTIVES**

### **2.1 Main Objectives**

Develop a sophisticated system capable of continuously monitoring and analyzing exercise movements in real-time during workout sessions. This system will leverage cutting-edge computer vision algorithms and machine learning methodologies to deliver real-time feedback, thereby refining exercise poses and enhancing overall performance. By seamlessly integrating these advanced technologies, the goal is to create a comprehensive solution that enhances exercise execution, refines form, and fosters a safer and more efficient workout environment for users.

### **2.2 Specific objectives**

- Data Collection and Preprocessing

Generate the data for a complete dataset by capturing workout demonstrations by qualified instructors, with the emphasis on proper exercise techniques. Then, preprocess the collected dataset by removing noise and irrelevant information, and normalizing it to reduce the variation across workouts.

- Develop the algorithms to real-time Exercise Movement Tracking

Develop and implement a highly accurate real-time tracking system capable of capturing and analyzing exercise movements with minimal latency. Train machine learning algorithms on the preprocessed dataset to recognize correct and incorrect exercise movements in real-time.

- Optimized real-time Feedback Integration

Utilize the trained machine learning algorithms to identify wrong exercise movements or poses in real time. Implement advanced feedback technologies, including machine learning and computer vision algorithms, to provide users with immediate and precise corrections during their workouts.

- Enhanced User Experience

Create interfaces that are both intuitive and user friendly and also provide informative and actionable feedback to improve the training overall. Implement unique feedback mechanisms to address users' specific needs and preferences, hence maximizing user engagement and satisfaction.

### 3. METHODOLOGY

Research results on the creation of a real-time exercise movement tracking system that focuses on the performance of proper exercise workouts. Such a technology has been tailored for fitness training, enabling users to get immediate feedback and corrections using a smart phone application. Utilizes advanced computer vision techniques to enable real-time tracking of workout movements. The algorithms identify movements and analyze them compared to proper exercise techniques to ensure conformity with set standards in various exercise scenarios.

Begin by carefully capturing workouts demonstrated by qualified instructors, emphasizing correct movements that adhere to proper exercise guidelines. Utilizing the high-quality cameras that can capture training sessions, capturing delicate movements from different sides. Moreover, concentrate on the exercise that targets separate muscles and used various training equipment. This comprehensive data collection methodology ensures that the dataset is comprehensive as well as detailed. These recordings are used as the training set for our system.

Then data preprocessing stage, collected data is initially cleaned to remove noise or non-relevant data and make it quality for analysis. After this, normalization techniques are employed to maintain consistency across workouts and sessions. The exercise sessions are divided into smaller parts for a more detailed analysis, and each segment is labeled with metadata to ensure that they are clearly and systematically categorized. This stage of preprocessing makes it certain that the dataset is properly cleaned and organized, as well result it became uniform and suitable for further analysis. Successful training of machine learning algorithms depends much on the important process of data preparation because this essential step must be completed initially.

Train the machine learning algorithms on a preprocessed dataset to recognize incorrect exercise movements and poses in real-time. Through iterative processes, these algorithms learn to recognize patterns associated with correct and incorrect exercise techniques. To verify the trained algorithms, the real time testing has to be conducted during the user performing exercises. This method requires an ongoing tracking of the user's activities through the mobile app while the user is exercising. By interacting with the app, users give real time feedback on performance of the system thus making it effective and reliable for real-life exercise exercises.

If incorrect movements or poses are detected, the system provides users with immediate feedback through the mobile application. This allows the user to correct the mistakes right away. Additionally, the mobile application seamlessly integrates into user's workouts, providing real-time feedback and guidance. Such interaction will help users to get response in time and adjust the degree of difficulty whenever needed, throughout workout sessions.

In additionally, On the left side of the mobile application screen, exercise-related data are shown. This gives information about the repetitions performed for each exercise. As users are doing the exercises, they will observe the increase of the rep count in real-time, thereby giving them instant feedback on their progress. In addition, the app contains user avatar videos which show how the exercise should ideally be performed, helping users maintain good form and technique when they exercise.



### 3.1 System Architecture

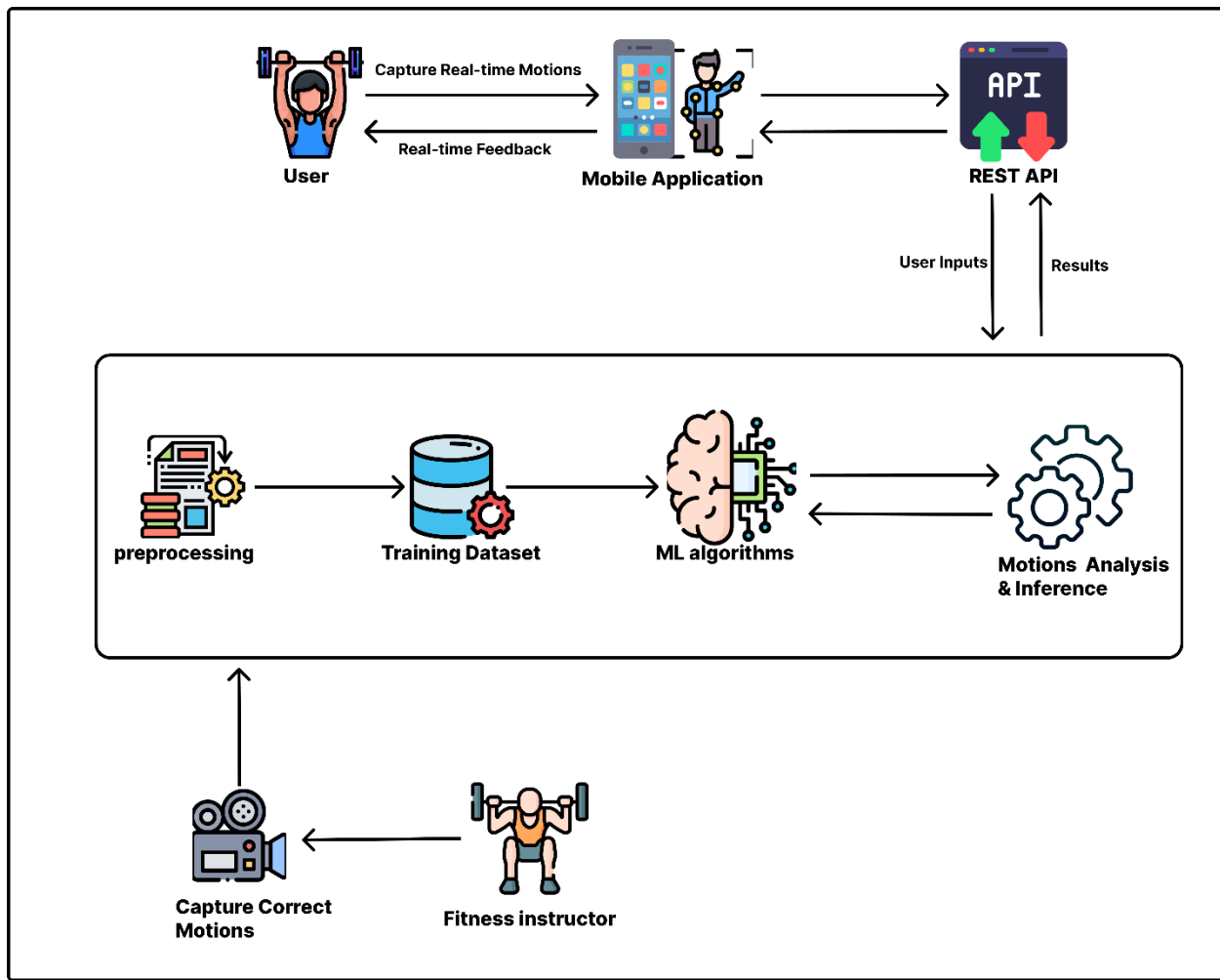


Figure 3- Exercise Movement Tracking with Real-Time Feedback System Architecture

### 3.1.1 OVERALL SYSTEM DIAGRAM

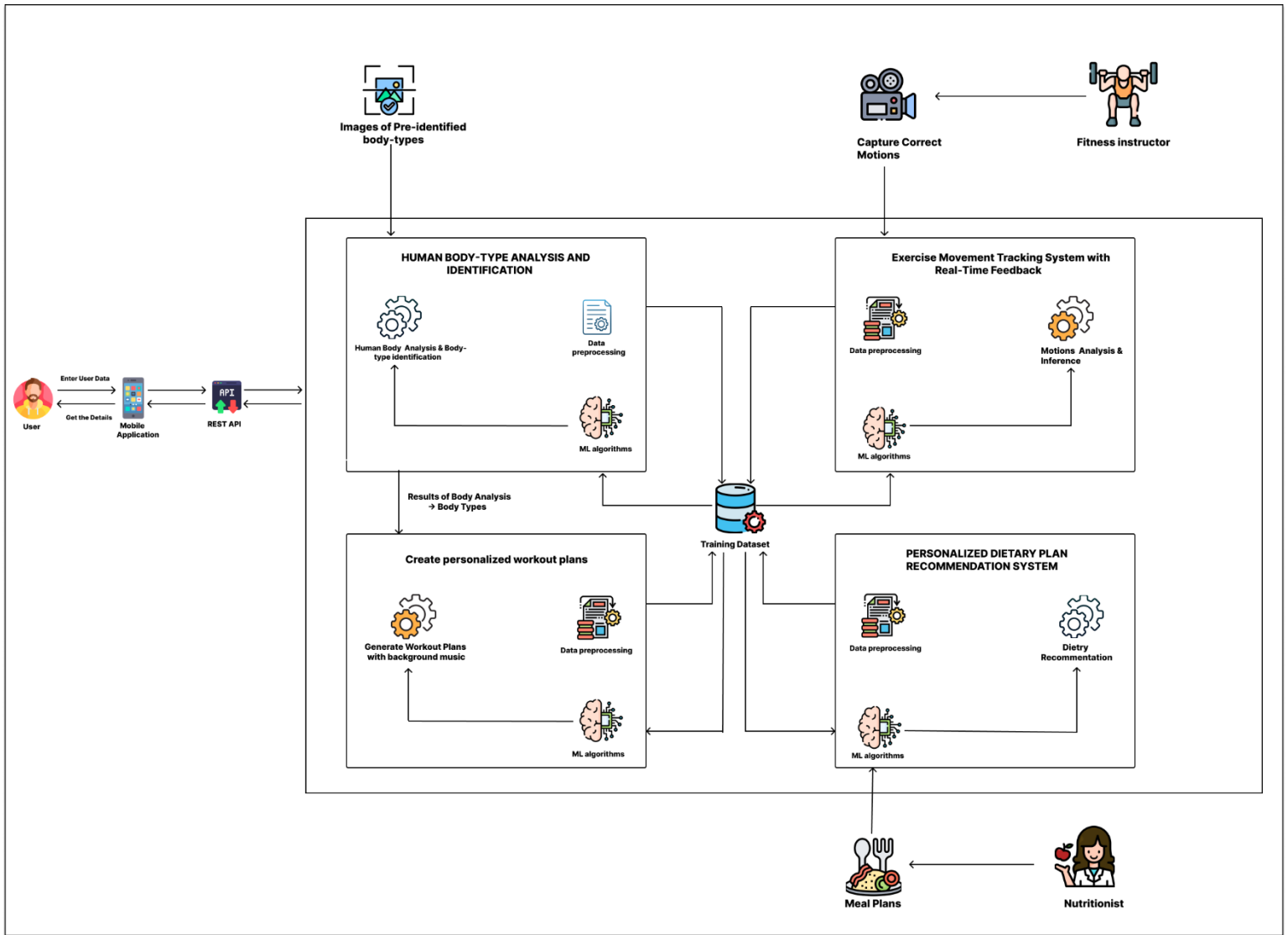
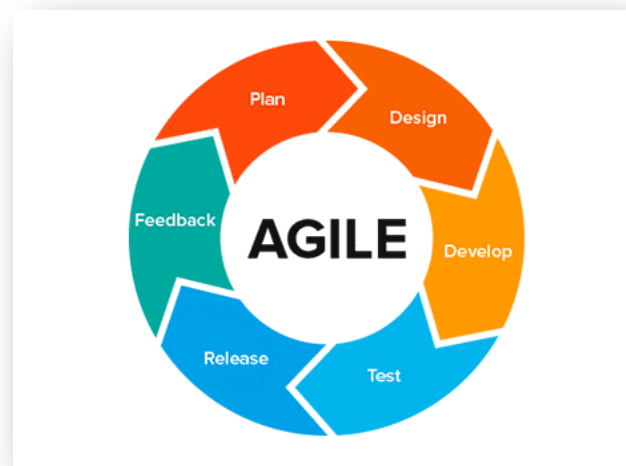


Figure 4 - OVERALL SYSTEM DIAGRAM

### 3.1.2 Software Solution

The Software Development Life Cycle (SDLC) is a systematic approach to software development that guarantees code accuracy and reliability. Under the usual technique, software developers cannot revisit previous phases when need change, therefore they must complete all processes in the right sequence. Yet, if the agile technique is used in the Software Development Life Cycle (SDLC), developers are not obligated to do so. Agility involves adjusting to changes. Scrum is the most effective agile framework compared to various other agile frameworks. Scrum is a lightweight agile project management system designed to address and resolve complex adaptive challenges [15].



*Figure 5- Displays the six fundamental stages of agile methodology [15]*

- Requirement gathering

Requirement Gathering and Analysis for the research is a careful process in which the needs and aims of the project are identified. In this phase, Mr. Chandana Thilakarathne, the experienced personal trainer at Zimantra Leisure Center in Battaramulla, is one of the key players. His skills and knowledge of fitness training dynamics offer useful input in identifying the needs of the proposed system. Interviewing and discussing with Mr. Thilakarathne, and other researchers and our seniors, defines the functional as well as non-functional requirements of the system. These requirements cover elements like real-time exercise's movement, tracking, feedback, user interface design, and mobile app integration. The compiled requirements are folded in thorough documentation that acts as an absolute reference along with the development process that helps to align with the stakeholder expectations and project objectives.

- **Feasibility Study**

1. Technical Feasibility

- The research component is highly technically feasible, as it uses widely accessible technologies like OpenCV, MediaPipe, Python, Yolo, Flutter, Jupyter, and Firebase. These instruments offer strong templates for deploying computer vision and machine learning algorithms that are required for real-time tracking of movements during exercise. Furthermore, the skills of the research team and availability of required hardware and software resources also improve technical feasibility, thus, the proposed system will be developed and implemented successfully.

2. Economic Feasibility

- The economic viability of the research component is good since it has certain benefits, which are greater than the associated costs. It may be necessary to make upfront investments in personnel, technology, and infrastructure but the expected results, which are improved fitness outcomes and reduced injury risks, make these costs worthwhile. In addition, the financial implications of the research findings in terms of revenue generation or cost savings contribute to the economic feasibility of the project and make it an investment worth undertaking.

3. Operational Feasibility

- Operational feasibility assessments verify the feasibility and efficacy of applying the study findings in fitness facilities and mobile applications. Mr. Chandana Thilakarathne, a personal trainer at Zimantra Leisure Center, plays a key role in gathering requirements for research, ensuring that it is closely connected to the practical aspects of fitness training environments. The suggested solution is created to smoothly incorporate into current operations, guaranteeing little interruption and optimal usability for end-user.

### **3.2 Technologies**

Below are some of the technologies that can be considered for the development of the system,

- OpenCV
- MediaPipe
- Python
- Yolo
- Flutter
- Jupyter
- Firebase

## 4. PROJECT REQUIREMENTS

### 4.1 Functional Requirements

1. Real-Time Movement Tracking:
  - The system must accurately track exercise movements in real-time using computer vision techniques.
  - It should detect and recognize different types of exercises performed by the user.
2. Movement Analysis:
  - It should be able to analyze exercise movements and compare them to proper techniques to identify incorrect poses or movements.
3. Real-time Feedback:
  - The system must provide real-time feedback to users during their workout sessions, informing them of incorrect poses and suggesting corrections.
4. Algorithm Development and Integration:
  - Develop computer vision algorithms for exercise movement tracking.
  - Integrate machine learning models for predictive analysis of exercise movements.
5. Feedback Optimization:
  - Implement optimized feedback methods to accurately correct workout forms in real-time.
  - Continuously improve feedback algorithms based on user performance and feedback.
6. User Interface Design:
  - Create intuitive and user-friendly interfaces for seamless interaction.
  - Provide visual representations of exercise poses and feedback to aid users in understanding corrections.

## 4.2 Non-Functional Requirements

1. Performance:
  - The system must perform efficiently, with minimal latency in tracking and providing feedback during exercise sessions.
2. Accuracy:
  - It should have a high level of accuracy in detecting and analyzing exercise movements to provide reliable feedback.
3. Scalability:
  - The system should be scalable to accommodate many users and exercise scenarios.
4. Reliability:
  - The system should operate reliably without frequent downtime or errors, ensuring uninterrupted use during the exercise session.
5. Security:
  - User information must be maintained and secured in a safe manner, and suitable precautions must be taken to keep unauthorized access from occurring.

## 4.3 System requirements

1. Hardware Requirements:
  - High-resolution cameras capable of capturing detailed exercise movements.
  - Sufficient processing power to run computer vision algorithms in real-time.
  - Adequate memory and storage capacity to store exercise data and user profiles.
2. Software Requirements:
  - Programming Languages: Utilize Python for backend development and Flutter for mobile application development.
  - Libraries and Frameworks: MediaPipe for real-time pose estimation and movement tracking, TensorFlow for implementing machine learning models for movement analysis, YOLO (You Only Look Once) for real-time object detection in video streams.

3. User Interface Requirements:

- The user interface should be designed to be easy to understand, providing clear instructions and visual representations of exercise activities.
- It should be responsive and adaptable to different screen sizes and resolutions.

4. Performance Requirements:

- The system should be capable of processing and analyzing exercise movements with minimal latency, providing real-time feedback to users.

5. Compatibility Requirements:

- The system should be compatible with a different range of devices, including smartphones and tablets.
- It should support various mobile operating systems.

6. Security Requirements:

- The system must have strong security mechanisms that protect user data and provide secure authentication.
- It should encrypt sensitive information during transmission and storage, following industry best practices.

#### **4.4 User Requirements**

- Users should be able to capture real-time video footage of their exercise routines using their smartphone's camera within the application.
- Users require real-time feedback on their exercise movements to correct any mistakes and optimize their performance.
- The application should be compatible with various smartphone models and operating systems, ensuring accessibility for a wide range of users.

#### **4.5 Personnel Requirements**

Creating dataset and Collecting resource

- Mr. Chandana Thilakarathne - personal trainer at Zimantra Leisure Center in Battaramulla and National powerlifter
- Zimantra Leisure Center in Battaramulla

## 4.6 Use Cases

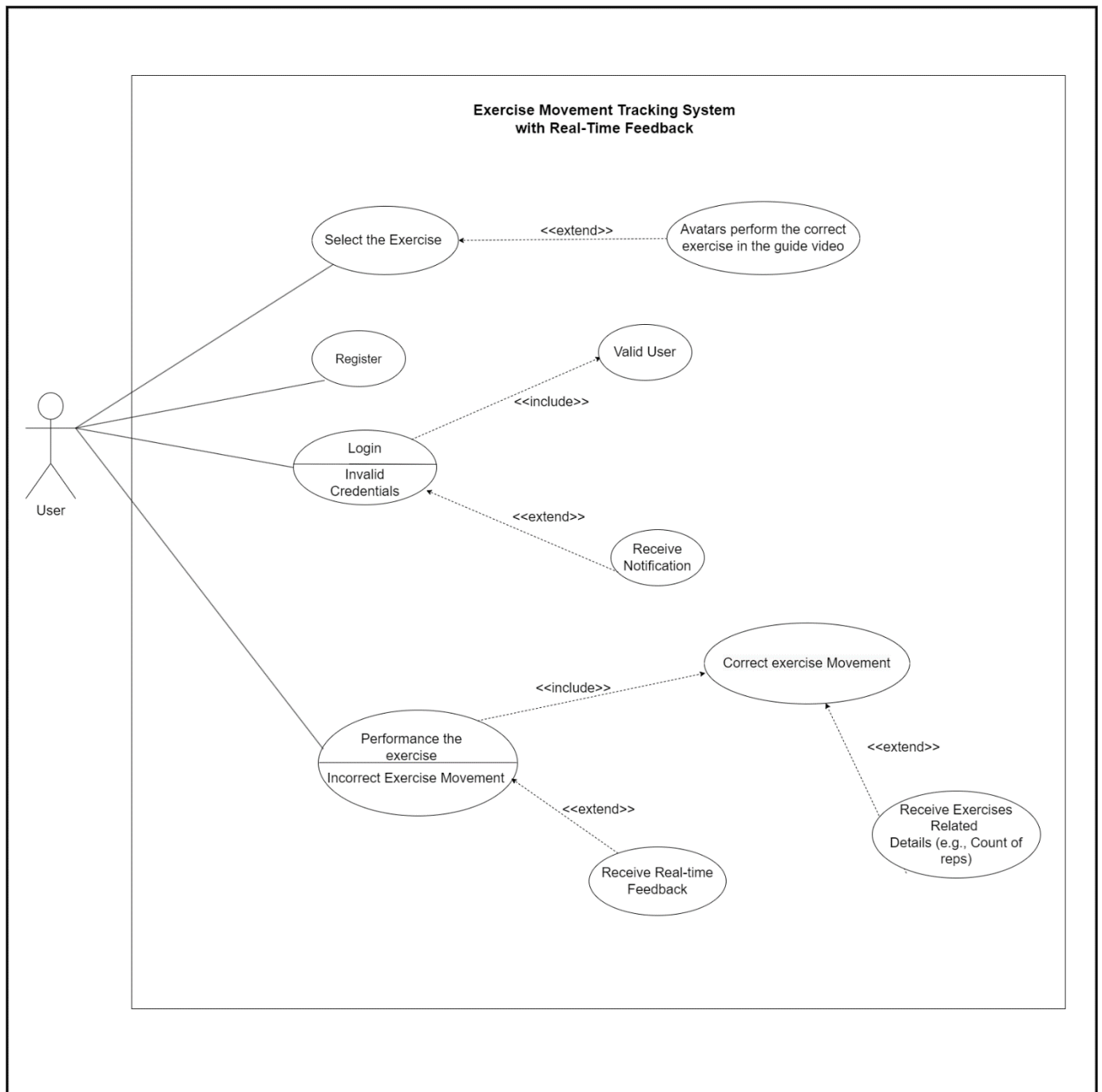
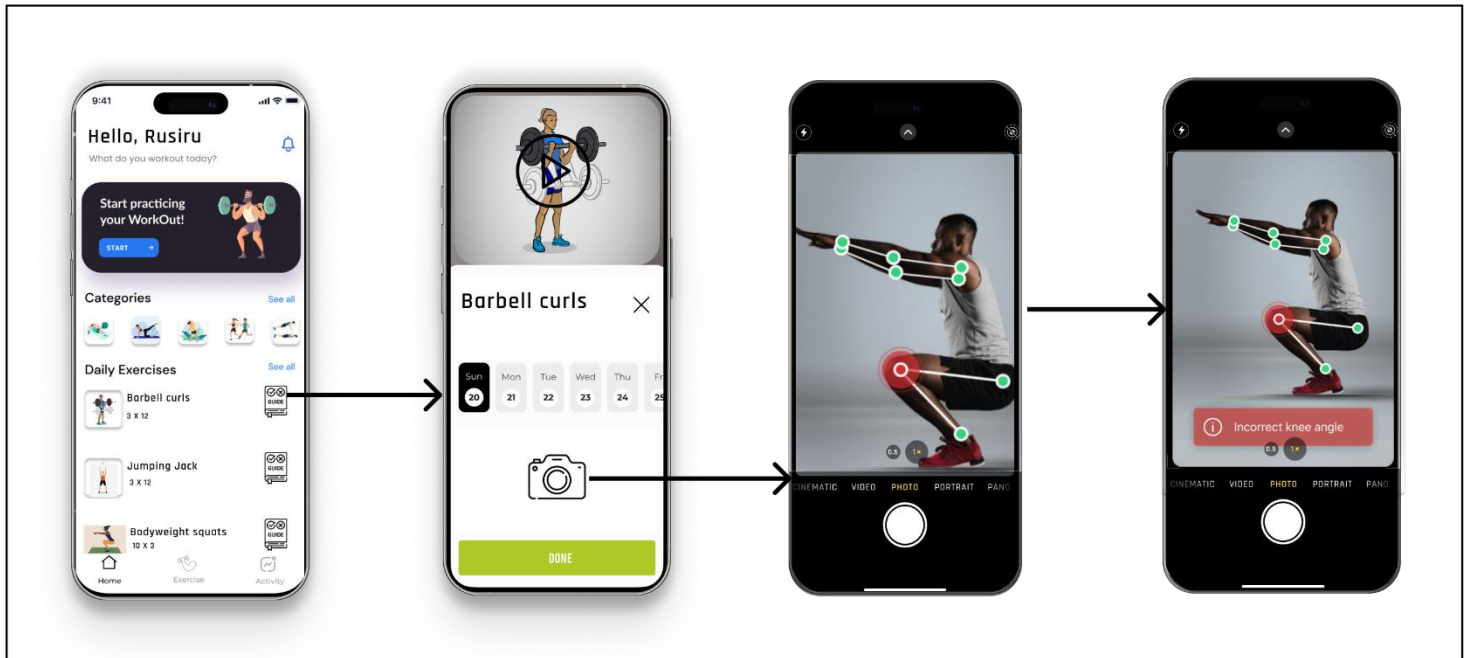


Figure 6- Use Case Diagram of Real time Exercise movements Tracking component.



## 4.7 High Fidelity Diagram



*Figure 7- High Fidelity Diagram of Real time Exercise movements Tracking Process.*

## 4.8 DESCRIPTION OF PERSONAL AND FACILITIES

Facilitators:

- Prof. Koliya Pulasinghe - Sri Lanka Institute of Information Technology (SLIIT)
- Ms. Jenny Krishara - Sri Lanka Institute of Information Technology (SLIIT).
- Mr. Chandana Thilakarathne - Zimantra Leisure Center in Battaramulla

Facilities:

- Zimantra Leisure Center in Battaramulla

## 5. GANTT CHART

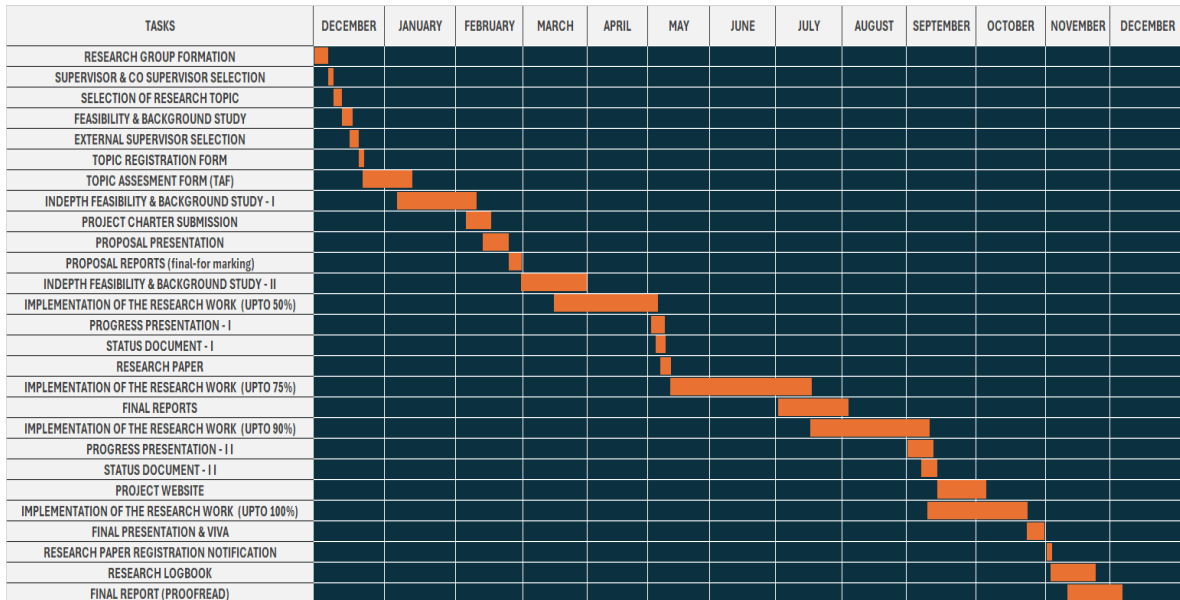


Figure 8 - GANTT CHART

### 5.1 Work Breakdown Structure (WBS)

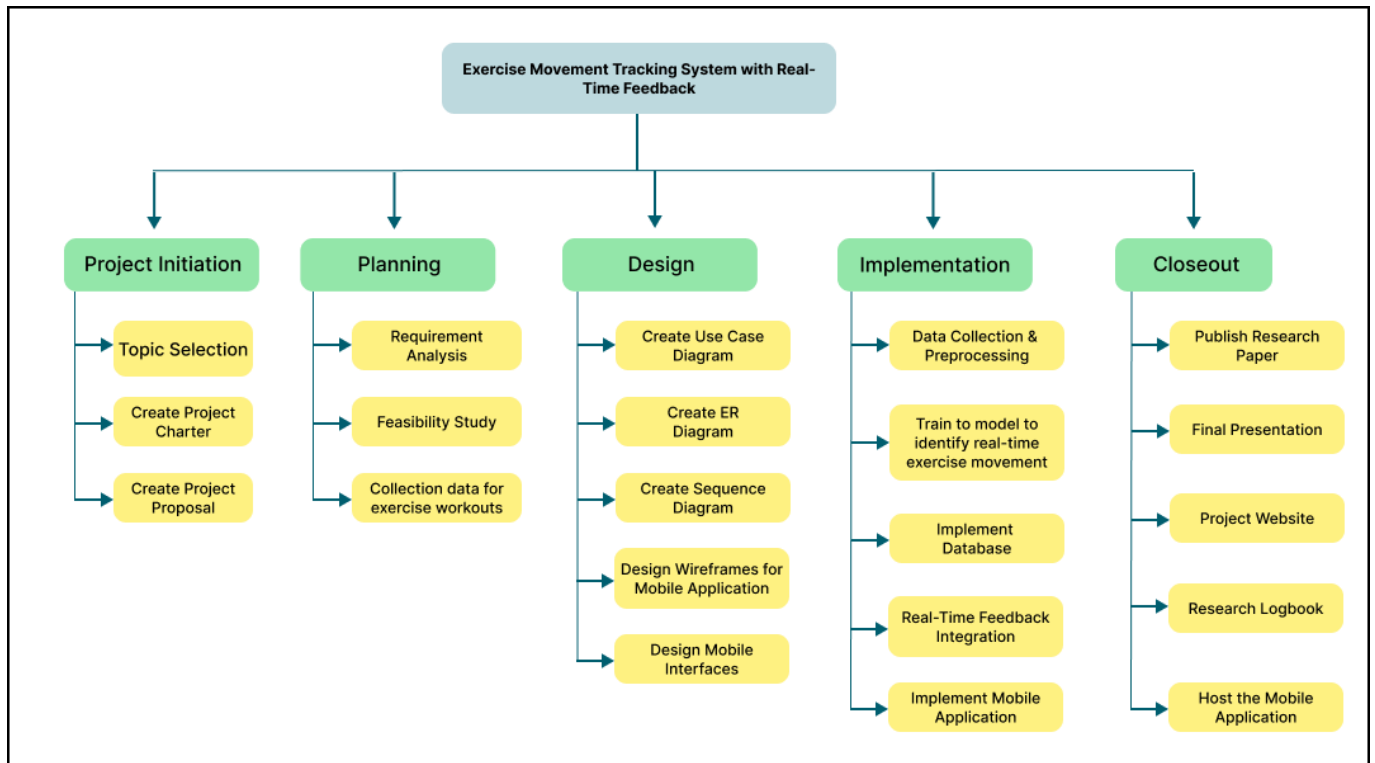


Figure 9- Work Breakdown Chart of Real time Exercise movements Tracking component.

## 6. BUDGET AND BUDGET JUSTIFICATION

Requirement	Cost (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 2 - Expenses for the proposed system*

## 7. COMMERCIALIZATION

### Marketplace And Target Audience

1. Target Audience
  - Fitness Enthusiasts
  - Health-conscious Individuals
  - Gym-goers
  - Personal Trainers
2. Marketplace
  - Make the app accessible to users of all ages without age limitations.
  - Easy to use for individuals without advanced technological knowledge.
  - Provide educational resources within the app to guide users on fitness and nutrition principles.

Offers two versions to accommodate the varied requirements of users:

1. Free Version
  - Identification of Body Types
  - Real-time Exercise Feedback
  - Dietary Recommendations
  - Personalized Workout Plans
2. Premium version
  - Advanced Body Analysis
  - Advanced Real-time Exercise Feedback
  - A wider variety of diet plans and workout options

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## APPENDICES

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