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"Web Based System for Gym Workout Calories Burnt Prediction"

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A PROJECT SUBMITTED TO

INTERNATIONAL COLLEGE OF BUSINESS AND TECHNOLOGY (ICBT)

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

Bachelor of Science (Hons)

BSC (Hons) Software Engineering

Declaration

Statement of originality of submitted work.

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Here by confirm that the work presented here in this report, and in all other associated material, is my own work, and I agree to assessment for plagiarism.

Signature – Sajith

Date – 20/10/2023

Acknowledgement

I'm grateful to Mr. Shamirad, the lecturer, for his aid in completing this work effectively. For this task, I was able to perform extensive research and learn a great deal about fresh knowledge and modern technologies. In addition, I want to thank my parents and friends for always being there for me and motivating me to succeed.

Abstract

The purpose of a web-based calorie prediction system that uses cardio or exercise equipment is to give users an estimate of how many calories they will burn during a workout. This method generally takes into account the user's age, weight, gender, and activity length and intensity to determine how many calories are burned. People nowadays have incredibly hectic schedules as a result of changes in their lifestyles and job responsibilities. Obesity develops in those who do not pay attention to their eating habits. Obesity is becoming a serious issue in today's globe. By developing a web-based system for a gym, people would be able to see how many calories they had burned once the activity was completed. The primary goal of the proposed study is to investigate several methods that employ machine learning to calculate the number of calories burned during activity. In this paper, we create a machine-learning system that can estimate how many calories are burned during exercise. Many people in modern society are interested in what other people do, how they eat, and how many calories they burn when exercising. To overcome this problem, we can use machine learning techniques such as any acceptable regression.

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Chapter 1-Introduction

Weight loss, gain, or maintenance are all strongly tied to daily energy consumption. If a person wishes to lose weight, he or she must create a calorie deficit (burn more energy than they consume). People must, however, be aware of how many calories they consume each day. Most people believe that calories are the most useful unit for diet and weight loss. The calorie is variously described as a unit of energy or heat. Calories are the amount of energy required to raise one gramme (g) of water by one degree Celsius. Such statistics may be used by a few power-releasing systems outside of the living organism.

The amount of energy required by the human body to function is measured in calories. Understanding how many calories you burn each day is essential for anyone who wants to achieve and stay active, lose or gain weight. A person who wishes to lose weight can adjust their diet or exercise routine if they are aware of the factors that influence calorie burning. The number of calories burned every day is affected by a variety of factors. Some of the variables that impact daily calorie burn cannot be changed, but others can. Among these reasons is the fact that as people age, they consume less calories per day. Men consume more energy than women.

Consistent exercise level: Body composition: People who have more muscle than fat in their body burn more calories. Body mass index: Larger people burn more calories than smaller people, especially during rest. The phrase Thermogenesis refers to the energy that our bodies require to digest food. The web-based calorie prediction system provides users with a quick and easy way to track their physical activity levels, aiding them in meeting their fitness goals and maintaining a healthy lifestyle. In this article, we will look at the primary characteristics and benefits of this technology, as well as its shortcomings and potential future advances.

1. 1 Problem Statement

The primary goals of a problem statement are to comprehend the issue and develop system software to address the recognized root cause. As this gym grows in membership and success, it is concerned that there is no automatic way to assess calories burned. The usage of technology to track and monitor fitness goals is increasing, which has led to the problem identification of web-based calorie prediction systems employing cardio or workout machines. Many people utilize exercise machines such as treadmills, ellipticals, or stationary bikes to achieve their fitness goals, and they usually rely on web-based programmes to measure their progress.

The major goals of problem analysis are to understand the issue and to evolve its system software to address the revealed underlying cause. As this gym grows in membership and success, it is concerned that there is no automatic mechanism to compute calories burned.

- Because most individuals are extremely busy after working out, users will need to spend extra time manually calculating the calories burned.
- People are less conscious of their calorie consumption after exercise.
- They are unable to track and monitor calorie-related data.

- It is common for people to forget to do the things they wish to do. For example, a user may forget to check the quantity of calories expended after an exercise.

Problems could arise in the future:

- **Accuracy**: One potential difficulty with calorie estimation software is accuracy. These strategies usually rely on self-reported data, which may be inaccurate. Users may underestimate or overestimate their level of activity, resulting in inaccurate calorie estimations.
- **Data integrity**: Another potential concern is data quality. The accuracy of the calorie projections is affected by the quality of the data used to construct them. If the tool is based on outdated or insufficient nutritional data
- **User Participation:** Even if the technology is accurate, it might be challenging to keep users engaged. Users may lose interest in tracking their eating and exercise habits over time, resulting in inaccurate or missing data.
- **Inadequate customization:** Finally, a web-based calorie prediction tool's lack of adaptability may be a drawback. When it comes to keeping track of their food and exercise, different users may have different demands and goals.

1.2 Literature review

1. In recent years, there has been an increase in the market availability of health-related applications. These programmes provide a wide range of features and are intended to meet a variety of health and wellness requirements. They are becoming increasingly popular and useful not only to individuals but also to society as a whole.According to a survey, a sizable majority of the population, particularly 65.5% of those polled, use health applications on a daily basis. This statistic demonstrates the rising reliance on technology for health management and monitoring. Furthermore, 44.4% of respondents stated that they normally use these apps for a short period of time, namely one to ten minutes every day. One of the most common use for these health-related apps is to track and regulate eating habits. Users can enter data about the foods they eat, which allows the app to generate and analyse nutritional data. This function is beneficial for people who are concerned about their nutrition and wish to live a balanced and healthy lifestyle. It allows users to track macronutrients, measure calories, and obtain insights into their dietary choices. (Krebs & Duncan, 2019)

2. Some people who get services from particular organisations are sceptical that employing mobile applications will offer them with major benefits. Their scepticism stems from the assumption that in order to benefit from these apps, one must be comfortable and knowledgeable with mobile devices. This perceived demand for mobile device competency has, in turn, had a negative impact on the overall quality of their use of these applications. Despite this scepticism and potential uneasiness with mobile devices, there is a societal

trend in which an increasing number of individuals are incorporating health-related apps into their everyday routines. These applications have been shown to provide concrete advantages and have a favourable impact on the general well-being of those who use them. While there may be some initial doubts, the rapid popularity of health-related apps reveals that they do, in fact, offer significant benefits and have the potential to improve the lives of those who use them. (Kumar, 2021)

1.3 Objects of the Project

The proposed project's main purpose is to develop a web-based application that will improve the system's functioning by including a machine learning algorithm to anticipate the number of calories burned while accounting for different people's activities. To investigate and learn more about the existing system.

- To properly forecast calories burned based on the type of exercise. • This system will be useful in tracking a person's calories and creating a report.
- By specifying a post-workout time, this system will prompt users to keep track of their calorie consumption.
- By adhering to the system's demands, the application will become more user-friendly, dependable, time-efficient, and intelligent.

1.4 RESEARCH QUESTION

Model Accuracy and Improvement:

- How can the accuracy of calorie burn forecasts be increased, particularly for those with unusual traits or activities?
- Are there any machine learning algorithms or strategies that outperform others in properly estimating calorie burn?

Data Security and Privacy:

- Given the sensitivity of health-related information, what safeguards can be put in place to maintain the privacy and security of user data?
- How can you strike a compromise between gathering enough data to make accurate forecasts and protecting user privacy?

User Motivation and Engagement:

- What features or design elements can increase user interest and incentive to routinely utilise the calorie prediction system?
- Can gamification or social interaction components be used to motivate people to keep active and manage their calories?

User Variety and Inclusion:

- How can the system accommodate users with varying needs, such as those with varying exercise levels, food choices, or medical conditions?
- What steps can be taken to make the system inclusive and accessible to a diverse variety of users?

Real-time Feedback and Behaviour Change:

- Can real-time calorie burn feedback affect user behaviour and encourage better choices throughout the day?
- What tactics can be used to assist users in changing their behaviour in response to calorie burn data?

Through web-based calorie prediction system project, can use these research questions to drive inquiry and give valuable insights to the field of health and fitness technology.

1.5 RESEARCH OBJECIVES

1. **Improve Prediction Accuracy**

   Improve the accuracy of calorie burn forecasts through developing and refining machine learning algorithms, particularly for various user profiles and activities.

2. **Research Privacy Measures**

   Investigate and implement strong data privacy and security mechanisms to protect user data while retaining system functioning and utility.

3. **Enhance User Engagement**
   Identify design aspects and features that boost user engagement and motivation to use the calorie prediction system on a regular basis.

4. **Customize the User Experience**
   Implement algorithms and user interfaces that deliver a personalized experience by taking individual parameters like age, gender, and body composition into account.

5. **Integration and Data Sources**
   To improve the accuracy and ease of calorie burn tracking, investigate and integrate wearable fitness devices and new data sources.

6. **Behavioral Insights**
   To provide insights on how users might make healthier choices, analyses user behavior patterns and their impact on calorie balance.

Techniques Proposed:

- **Personalize recommendations:** To address the issue of generic guidance, the system can provide personalized recommendations based on the user's fitness level, weight, age, and other relevant factors. Furthermore, the system can take into account the user's fitness goals and provide personalized advise to help them achieve those goals.

- **Improve the user interface:** The user interface of the system can be improved to make it more approachable. The system can provide more user-friendly navigation and a straightforward user interface. The system can also provide the user with feedback on how they are progressing towards their fitness goals, such as tracking their weight loss or calorie expenditure over time.

- **Improve Accuracy:** The system's machine learning algorithms can be improved to solve the issue of inaccurate calorie prediction. Algorithms can be modified to become more accurate by developing new ones or modifying existing ones.

1.6 The Project's Scope

The end result will be an upgrade roadmap and a model that will raise estimates of calories burned for all consumers. And any gym could accuse this system of being used for client reasons. This system's primary users will be the system administrator and the users. The user has complete control over the quantity of calories expended based on the information they submit to the system. All users will be pleased with the end results, which may be saved and later produced as a report for their own use. Instead of a manual approach, our algorithm will boost user confidence and comfort by producing consistent results automatically.

Project Outcomes

• A user-friendly interface that is simple to use.

• The system is open to all users.

• Users should be able to register for the system.

• Users should be able to track their caloric consumption.

• The system should keep track of calories and generate a report.

• Alerts or reminders can be sent to users throughout the system.

1.7 Project's Limitations

To ensure that the system provides customers with accurate, practical, and secure forecasts, these constraints must be overcome by rigorous design, testing, and ongoing monitoring.

- **Accuracy**: The accuracy of the system is impacted by the quality of the data used to generate the forecasts. Variables such as exercise intensity, body weight, and metabolic rate can all affect the accuracy of the anticipated calorie burn.

- **User Error:** The accuracy of the system is also influenced by the data that users enter. Incorrect or partial data input can reduce the accuracy of the anticipated calorie burn.

- **Equipment limitations:** The system is dependent on the accuracy and availability of exercise equipment data, which may not be available for all types of exercise machines or may differ between machines.

- **Calorie Predictions Algorithm:** Because of differences in body composition, exercise preferences, and medical concerns, the algorithm's predictions may not apply to everyone.

- **User Adoption:** Adherence to the recommended training routines and system adoption are critical to the system's effectiveness. Elements such as the system's usability, the accuracy of the recommendations, and the rewards users experience from utilizing the system can all have an impact on user motivation and engagement.

- **Privacy and security:** The system may collect and store private user data, such as health and exercise preferences. It is critical to ensure that the system has adequate privacy and security safeguards in place to protect user data.

- **Technical Issues**: Technical issues like as server outages, software faults, and compatibility issues can have an influence on the system's usability and dependability.

1.8 SIGNIFICANT OF THE STUDY

The importance of your web-based calorie burn prediction system project resides in its potential to improve people's health and well-being while also improving the field of health and fitness technology. Here are a few essential elements underlining the importance of your research:

1. **Health Improvement:** By providing a tool to measure and manage calorie consumption and expenditure, your system can empower individuals to take charge of their health. This may lead to healthier lifestyle choices and, as a result, a lower risk of numerous health issues such as obesity, diabetes, and cardiovascular disease.
2. **Personalised Guidance:** By taking into account individual parameters such as age, gender, body composition, and amount of exercise, your system may provide personalised advise and recommendations. This personalisation has the potential to dramatically improve the effectiveness of health management techniques.

3. **Real-time calorie burn input can** operate as a behavioural incentive, pushing users to be more physically active and make better nutritional choices. This behavioural adjustment has the potential to have long-term positive consequences on the lives of users.

4. Insights from Data: Your project can create important data on user behaviour, calorie tracking patterns, and the influence of various activities on calorie balance. This data can be used by researchers and health professionals to obtain insights into population-level health patterns and improve public health efforts.

5. **Future Development**: As technology advances, your project can serve as a basis for future developments such as interfacing with wearable devices, introducing additional health metrics, and broadening the system's capabilities.

6. **Data Privacy and Security:** Addressing data privacy and security concerns is critical in the digital health era. While maintaining user confidence, your project can establish guidelines and best practises for handling sensitive health data.

In conclusion, web-based calorie burn prediction system has the potential to improve people's health, advance scientific research, and advance the field of health and fitness technology. It has the potential to enable users to make informed decisions about their health and fitness goals, while also creating a culture of well-being and prevention.

1.9 DESIGN OVERVIEW

A design review of my Gym workout web-based calorie burn prediction system project is required to guarantee you have a clear concept for how the system will be designed and function. The following are the main components and design considerations:

1. **UI (User Interface):**
- Create an easy-to-use interface that allows users to enter data, view calorie burn forecasts, and access pertinent information.
- Consider responsive design to guarantee that the system is usable on a variety of platforms (desktop, mobile, and tablet).

2. **Authentication and Authorization of Users:**
- To protect user data, implement a secure user authentication mechanism.
- To control access to specific features and data, define user roles and permissions.

3. **Collection and Input of Data:**
- Create forms or input fields where users can enter personal information such as age, gender, weight, height, degree of exercise, and dietary preferences.
- Validation should be used to ensure data accuracy and completeness.

4. **Integration of Machine Learning Models:**

- Create or include machine learning models capable of predicting calorie burn based on user input and other pertinent data.
- Train and upgrade these models on an ongoing basis to increase prediction accuracy.

5. **Data Storage and Administration:**
- Create a safe and scalable database to hold user profiles, input data, and historical tracking data.
- Implement data management solutions to efficiently handle data cleaning, storage, and retrieval.

6. **Testing and Quality Control:**
- To detect and address issues and assure system stability, conduct thorough testing, including unit testing, integration testing, and user testing.

7. **Performance and Scalability:**
- Create a scalable system architecture to support an increasing user population and ensure optimal performance, especially during high usage times.

8. **User Assistance and Help Centre:**
- To assist users with any queries or concerns they may experience, provide user support channels such as chat assistance or a knowledge base.

9. **Conformity and documentation:**
- Maintain detailed documentation for future reference and audits, and ensure that the system conforms with appropriate standards, such as health data privacy rules.

10. **Updating and Maintenance:**
- To keep the system relevant and secure, create a plan for continuing system maintenance, updates, and improvements.

1.10 WBS – Work Break Down Structure

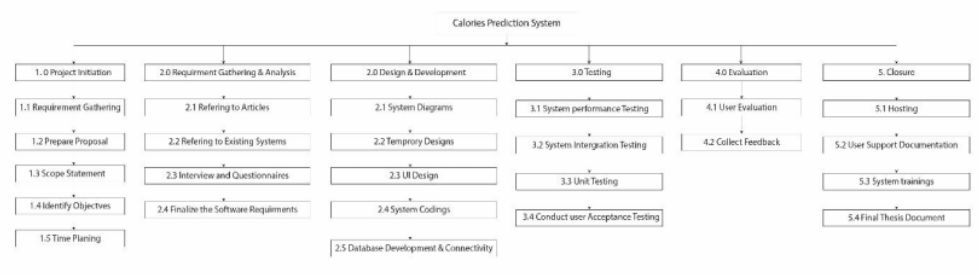


Figure 1: WBS

The primary work packages and tasks needed in constructing your web-based calorie burn prediction system are outlined in this Work Breakdown Structure (WBS). It encompasses the entire project, from early planning and requirement gathering to development, testing, data administration, user assistance, and maintenance. You can successfully plan, execute, and monitor progress throughout the project lifecycle by dividing the project down into manageable components.

Chapter2- Literature Review

The goal of performing a thorough literature review for the "Web-Based Calorie Burn Prediction System" in the context of gym activities is multifaceted. For starters, it provides a solid platform for making informed decisions during the system's design and development phases. We obtain significant insights into the cutting-edge approaches, algorithms, and technologies used in the field of calorie burn prediction and fitness tracking by investigating existing studies. Furthermore, the evaluation of the literature allows us to comprehend the scientific ideas and discoveries that underpin calorie estimation during physical activities. This is very important for maintaining the correctness and dependability of our system. We may improve on earlier studies and research by combining the most recent breakthroughs and tested approaches into our system's algorithms. In addition, the review assists us in identifying industry best practices and benchmarks established by existing web-based fitness products. Analyzing successful systems and their user-centric characteristics allows us to improve the usability of our own system. As a result, our application closely matches the expectations and preferences of our target users.

Dependent and Independent Variables

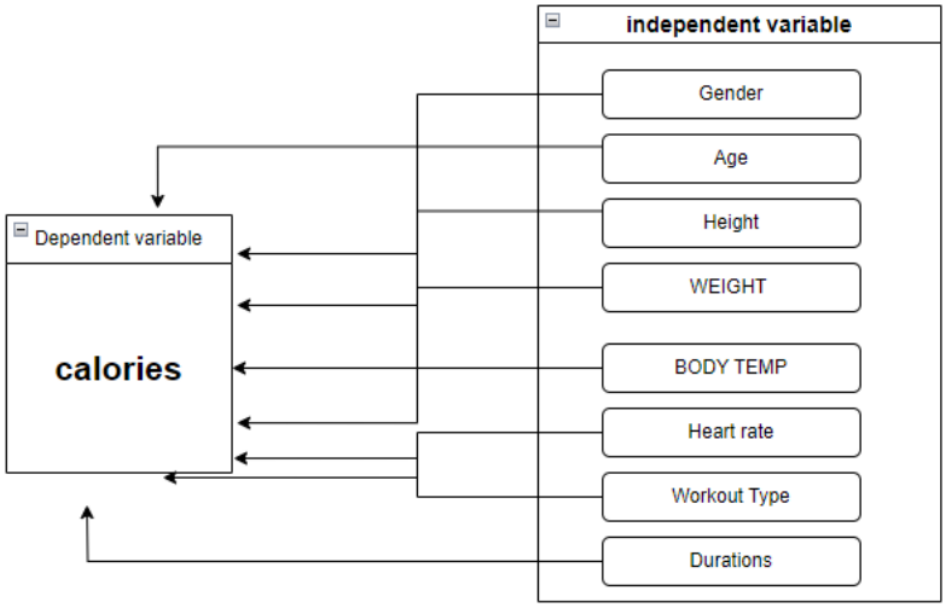


Figure 2: Conceptual Framework

The conceptual framework of the project is intended to define the links and interactions between the dependent variable, "calories," and the independent variables, which include "gender," "height," "weight," "duration," "workout type," and "heart rate." The conceptual framework in this context outlines how these independent factors influence or correlate with the dependent variable. For-

example, it will investigate how gender, height, and weight influence the quantity of calories burnt during a workout. It will also take into account the importance of parameters such as exercise duration, workout style, and heart rate on calorie expenditure. The goal is to create a clear understanding of how these variables interrelate and affect the accuracy of calorie burn prediction in the "Web-Based Calorie Burn Prediction System." By establishing these relationships, the project can develop more accurate and personalized algorithms for calorie estimation based on user-specific inputs.

2.1 DEPENDANT VARIABLE

A. In the year 2020, a group of Sona College of Technology students embarked on a ground-breaking project aiming at revolutionizing the way we track and manage daily calorie consumption. Several main aims drove this endeavor, which tried to solve the issues of monitoring nutrition and health in the setting of Indian cuisine. The fundamental goal of this endeavor was to create a unique algorithmic system that could not only gather but also reliably recognize photographs of meals. Furthermore, the students wanted to deliver precise nutritional data suited exclusively to Indian cuisines, recognizing the culinary landscape's distinctive richness and complexity. Furthermore, the system was created to categories these dishes based on the user's health needs, allowing users to make informed nutritional choices that fit with their particular well-being goals. The initiative relied on a comprehensive dataset that included information on calorie intake, food consumption habits, heart rate readings, and diabetes-related data to achieve these lofty goals. This plethora of information was critical in developing a comprehensive picture of an individual's health and nutritional habits. The technology enabled users to acquire insights into their food habits and their impact on overall health by integrating such data. Furthermore, the system went beyond simple data collection and processing. It actively helped users manage their calorie consumption by recommending ways to burn calories through physical activity or advising changes to their regular routines. This comprehensive approach to health and wellbeing transformed the system from a passive tracker to a proactive tool for promoting healthier lifestyles. The system's technical architecture was made up of two core elements. The first module used convolutional neural networks (CNNs), a form of artificial intelligence model, to classify and identify dishes from photographs. This method enabled the seamless recognition of a wide range of Indian meals, independent of their complexity or regional variances. The second module involved the creation of an Android application that functioned as the system's user interface. Individuals might use this app to effortlessly record photographs of their meals, receive instant nutritional information, track their calorie intake, and access personalized suggestions for maintaining a healthy diet and lifestyle. (Sathiya, et al., 2020)

B. Calorie Mama is a calorie-tracking programme that helps people manage their food choices and keep track of their calorie consumption. This software falls under the category of nutrition and calorie tracking apps, which are becoming increasingly popular among individuals attempting to live a healthy lifestyle. Calorie Mama's capacity to keep track of the items you consume and provide accurate nutritional information is one of its primary benefits. This covers not just the calorie count but also other important nutritional information such as protein, carbs, fats, vitamins, and minerals. This information can be quite useful for people who are conscious of what they consume and wish to make informed dietary decisions. Calorie Mama's use of image classification technologies to categorise food goods is a distinguishing feature. Simply take a photo of your meal, and the app will analyse it to provide nutritional information. This is especially handy when working with complex dishes or items that may not be easily found in a pre-existing database.Another noteworthy feature of Calorie Mama is its adaptability in terms of meal types. The software can suit your choices, whether you follow an international diet or enjoy Indian cuisine. It provides a variety of food options, making it appropriate for a diversified user base with varying dietary patterns.Azumi. Calorie Mama offers premium membership options for folks with specific weight loss goals. Premium customers have access to meal plans that are tailored to their specific goals, whether they want to gain, lose, or maintain weight. Individuals attempting to attain their fitness objectives may find these personalised strategies to be a beneficial resource.Keep in mind that, while Calorie Mama provides useful nutritional information and meal plans, it does not provide personalised health advice based on an individual's specific health situation. If users have special health issues or dietary limitations, they should get tailored dietary counsel from a healthcare practitioner. (Azumio, 2017)

C. The Fat Secret application, a nutrition and diet tracking tool, is headquartered in Australia. Users must submit a photo of their food as well as a tag with their name in order to use this programme properly. After receiving this information, the programme displays the calorie content of the food item. Users can connect with peers on the platform and share their dietary intake. One of the most important aspects of this programme is the availability of food regimens meant to aid individuals in their weight loss quest. However, access to these diet regimens is not completely free; users must pay a charge for a premium membership to gain access to this option. Furthermore, the programme has a barcode scanner for packaged foods, which can detect these items and provide nutritional information. It should be noted that the barcode scanning capability does not work for packaged goods from India. Premium membership is also required for direct conversation with a dietitian via this service. The programme also supports users by providing information about the quantity of calories they have consumed, allowing them to keep watchful of their daily intake. While the programme is well regarded for its primary goal, it is largely meant to meet the needs of foreigners. As a result, it may lack adequate dietary recommendations or full nutritional information for all

types of Indian cuisine. It's worth noting that the program's database of foods and nutritional content does not rely on complex classification methods like deep learning. Instead, the program's architects adopted different approaches for classification and information provision. This factor may have an impact on the program's accuracy and completeness when it comes to specific types of foods, particularly ones that are not commonly consumed by its target user group. (Fatsecret, 2018)

2.2 INDEPENDENT VARIABLE

1. In a 2013 study, Kooiman et al. sought to assess the precision of a specific web-based system developed to predict calorie expenditure during treadmill-based exercises. The major goal of this system was to provide users with information about how many calories they were burning while working out on a treadmill. The study's main finding was that the web-based method regularly overstated the number of calories burned during exercise by about 13.5%. In other words, when people used this approach to track their calorie expenditure, it frequently suggested that they had expended more calories than they had. The disparity between the system's calorie projections and the actual calorie burn witnessed in research participants cast doubt on the system's accuracy and efficiency. It was stated that the system might not be a viable tool for people looking for exact information regarding their calorie expenditure during treadmill activities. To explain this inaccuracy, the researchers suggested a theory. They proposed that including additional personalised and individualized data, such as heart rate information, might potentially improve the accuracy of the system's algorithm. Heart rate is an important indicator of an individual's effort and intensity during exercise, and it can provide more customized insights into calorie burn than generic estimations (Kooiman, et al., 2013)

2. In the year 2020, researchers began a project to quantify the calories burned during running activities. They used a single threshold technique accelerometer sensor, a cutting-edge technological equipment designed for precisely monitoring movement and activity levels, to accomplish this. The integration of this accelerometer sensor with a user-friendly mobile application distinguished this study. This programme was cleverly developed to harness the power of a common gadget that many people carry with them on a daily basis: the smartphone. This smartphone app was designed to act as a robust data-gathering tool for the study. The software capitalized on the shift in people's behavior when it comes to health and activity monitoring by leveraging the widespread adoption of mobile telephones with intuitive touchscreen displays. With their plethora of programmes and features, these devices have become a vital part of our daily lives, impacting how we track and engage in physical activity. The app's basic functionality was focused on monitoring and documenting physical activity. It accomplished this by meticulously tracking the number of steps taken and, more importantly, the calories burned during running sessions. The Android operating system's interoperability with the accelerometer sensor enabled this extensive data collecting. Android phones were outfitted with this advanced sensor technology, allowing them to calculate various physical activities precisely and consistently while running the Android operating system. Essentially, this study effort blended technology and human behavior. It used the capability of a touchscreen interface on a mobile smartphone and the precision of an accelerometer sensor to present users with significant data into their running habits. The resulting Android app acted as a useful and accessible tool for anyone wishing to track and improve their fitness levels by calculating the calories expended and steps completed during their runs. (Jefiza, 2020)

3. In 2022, a group of Amal Jyothi College of Engineering students began work on a project to develop a system capable of forecasting the number of calories an individual will burn during various forms of exercise. This project was motivated by a desire to investigate the capabilities of two different predictive machine learning algorithms as well as obtain insights into the calorie-burning tendencies of various exercisers. The study began with the collection of a large dataset, which contained information from over 15,000 exercise sessions. There was one major variable of interest in this dataset, which was the number of calories burned, as well as seven other descriptors or features that offered context and information about each exercise session. Details such as the type of exercise, duration, intensity, age of the exerciser, and other relevant parameters could be included in these descriptors. The students used a systematic technique to make the prediction system accurate and trustworthy. First, they used a piece of the dataset for training. This entailed teaching the machine learning algorithms the patterns and correlations between the descriptors and the calories burned using previous data. The ultimate goal was for the algorithms to be able to anticipate calorie burn based on the characteristics provided.----After completing the training phase, the students put the two predictive machine learning systems to the test. They used these algorithms to forecast calorie burn for a different set of workout sessions that the models had never seen before. They were able to examine the algorithms' prediction accuracy and reliability in real-world settings as a result of this. The students calculated the average absolute error to assess the performance of various algorithms. Across the test dataset, this error metric assessed the degree of the differences between projected and actual calorie burn values. A predictive model with a lower average absolute error was more accurate. Finally, after extensive testing and review, the students chose the machine learning model that predicted calorie burn with the highest accuracy. This model would serve as the cornerstone for their forecasting method for calorie burn. (Vinoy & Joseph, 2022)

2.3 MODERATING VARIABLE

The individual's fitness level or experience could be a moderating variable in the context of the "Web-Based Calorie Burn Prediction System" project. The link between the independent factors (gender, height, weight, duration, workout style, and heart rate) and the dependent variable (calories burned during a workout) is moderated by this variable. Each of these independent variables can effect the quantity of calories burned differently depending on your fitness level or expertise. A very fit person, for example, may burn calories differently during an exercise than someone who is less fit.

2.4 UNDERLYING THEORY

The fundamental idea behind the "Web-Based Calorie Burn Prediction System" project is based on research from a variety of domains, including exercise physiology, nutrition science, and data analysis. It is founded on the basic principles that control calorie burn during physical activities, which are regulated by characteristics like as gender, body composition, exercise intensity, and duration.A survey of important papers and research in these domains provides the project with a solid theoretical foundation. It covers a variety of issues, including calorie expenditure computation, the effect of different workout kinds on calorie burn, and the necessity of user-specific data in accurate projections. The review synthesises current knowledge and insights, allowing the project to incorporate the most recent scientific findings and best practises into the system's development.

2.5 GAPS IN LITERATURE REVIEW

The literature analysis for the "Web-Based Calorie Burn Prediction System" project has shown some critical topics that need to be investigated further. One important gap in the existing research is the scarcity of studies addressing the integration of real-time heart rate data into calorie burn calculations. While heart rate is an important predictor of exercise intensity, it is currently underrepresented in calorie calculation models.Another significant gap is the user-centric component of fitness programmes. There has been little investigation into how user choices and feedback affect the accuracy and usefulness of calorie prediction algorithms. Understanding the impact of user engagement, user interface design, and social interaction elements on system success is an important yet understudied topic. Furthermore, the literature review emphasises the need for more research into the various types of workouts and their individual impacts on calorie expenditure. The majority of available research focuses on a few frequent activities, leaving knowledge gaps about the calorie burn dynamics of less prevalent exercises.These gaps highlight the significance of the "Web-Based Calorie Burn Prediction System" project, which aims to address these gaps in the literature by developing a system that integrates real-time heart rate data, emphasises user-centric design, and incorporates a wide range of workout types for more accurate and personalised calorie burn predictions.

2.6 HYPOTHESIS DEVELOPMENT

The web-based calorie prediction tool should provide an accurate prediction of the number of calories burned during exercise sessions when compared to the actual calories burned as determined by indirect calorimetry.

To evaluate this notion, research might be conducted with participants who use the online calculator to forecast their calorie burn during training sessions. Following that, participants could go through indirect calorimetry to see how many calories they had burned during the training session. It is possible to compare the actual calorie burns determined by indirect calorimetry to the anticipated calorie burn utilizing the web-based application.

Is it possible for this method to estimate the number of calories burned?

This study's major purpose is to assess machine learning methods for measuring calories burned during exercise. The data set includes a dependent variable (calories) as well as various independent factors (weight, height, duration, type of exercise, age, body temperature, and heart rate), all of which are significantly related. This means that the system can forecast the number of calories burned based on the data presented by directing the appropriate machine-generation algorithms.

Based on the Independent Variables, Form a Hypothesis

Table 1 shows the hypothesis.

H1 - The greater the height, the less calories expended. H0 - The lower the height, the more calories expended.
Weight H1 - The more you weigh, the less calories you burn. Weight H0 - The less weight you have, the more calories you burn.
H1 Duration - The more calories burned, the longer the duration. H0 - The shorter the period, the lower the number of calories expended.
Type H1 Exercise - The more intensive the workout, the more calories expended. Type H0 Exercise - The less calories burnt by mild activity, the better.
H1 - the higher the heart rate. More calories are consumed. H0 Heart Rate - The slower your heart rate, the less calories you burn. .
Body Temperature H1 - The higher your body temperature, the more calories you burn. H0 Body Temperature - The lower your body temperature, the less calories you burn.
H1 - As you become older, you burn less calories. Age H0 - The younger you are, the more calories you burn.

If you observe a lack or negative correlation between the two sets of data, the final output result will be unaffected, rendering the prediction erroneous or wrong.

Chapter3-Methodologies for Software Development

3.1THEORITICAL FRAMEWORK

The major purpose of the strategy is to provide a novel and remarkable outcome that advances our field of research. When creating new software, research and data analysis must come first, followed by a number of other phases before the design can be turned into a working piece of software. There are some popular models that are offered by numerous. I chose one of these prototypes to design our system and decided to use the Agile Methodology to implement it.

Agile Technology: The logic behind using this methodology is that it will present people with a system to make judgements on, and then necessary changes to the system will be made while getting user feedback. Agile software development is precise, needs less resources, and promotes teamwork and cross-training. Functionality may be quickly built and shown.

Machine learning: Machine learning algorithms may be trained on massive datasets of activity and calorie data to develop exact calorie prediction models. These algorithms can then be integrated into the web-based service to provide consumers with customized calorie burn projections based on their workout data. It is vital to note that the function as well as the data that can be analyzed currently influence the choice of a machine learning algorithm. Furthermore, feature extraction, hyperparameter tuning, and the amount and quality of training data all influence how well machine learning models perform. As a result, while designing a machine learning-based calorie decision-making model for exercise by heart or machine systems, these characteristics must be carefully considered.

Regression analysis: Based on exercise-related factors such as duration, intensity, and heart rate, statistical models can be developed to forecast calorie burn. These models can be used in the web-based solution to provide customers with precise calorie forecasts. Eventually, a precise and trustworthy web-based calorie prediction tool for cardiac or machine exercise can be constructed by combining these methodologies.

3.2 POPULATION

Adults are the primary target population for the Web-Based Calorie Burn Prediction System. The normal age range for this audience is 18 and over. The system is intended to meet the unique demands and interests of adult users who are concerned with fitness, physical activity, and calorie expenditure.

Key Aspects of the Target Audience (Adults):

- Age Group: Adults aged 18 and above who want to live a healthy lifestyle and track their physical activities.
- Individuals who participate in various forms of physical activity, such as running, cycling, swimming, and other fitness activities, are referred to as fitness enthusiasts.
- Health-Conscious Users: Individuals who are aware of their calorie intake and are curious about how their physical activities contribute to their overall health and fitness goals.
- Individuals Seeking Motivation: Those seeking a tool to assist them in setting and achieving fitness goals by tracking their calorie burn progress.

- Adults who are comfortable using web-based tools and technology for fitness tracking and monitoring are considered tech-savvy users.
- Users who like connecting with friends and sharing their fitness successes on social media sites are considered socially active.

3.3RESEARCH APPROACH

Chapter 4 – Background of the Study

4.1 Why Is It?

Kilocalories, or kcal for short, are another term for the unit of energy found in food. The body need food for survival, although the amount varies during the day for a variety of reasons. Calorie counting is a self-reporting method that estimates how many calories we consume each day. Setting a general daily calorie target (or maximum) and attempting to remain within it during the day are common components.

4.2 What Is the Importance of It?

Calorie counting is practiced for a variety of reasons. For those who are more interested in numbers, thinking about food in terms of calories is simple. Keeping track of calories appeals to people who want to know every detail about their food as well as those who are precise. Many people believe that calorie counting is more precise and provides them more control over their eating habits, lifestyle, and physical appearance. In some exceptional cases, medical advice recommends calorie tracking (typically in conjunction with nutritional monitoring).

4.3 All User Requirements List

- All regular users and administrators must log in.
- Calculate the number of calories burned.
- A calorie counter on the dashboard
- Setting reminders to remind everyone to keep track of their calorie intake.

4.4 EXPLANATION OF THE CURRENT SYSTEM

There are systems that can estimate how many calories a person has burned by using a calorie counting web application. Many consumers believe the user interface to be unappealing and uninteresting. The algorithm just takes into account a few variables, and I believe the calories may differ from person to person. The current system is the first edition of the "Web-Based Calorie Burn Prediction System," and it incorporates important features such as user authentication, a registration process, a well-designed user interface (UI), and functional calorie burn forecasts. The following are the essential components and functionalities:

1. **Registration and Login of Users:**

- The system allows new users to create an account by entering basic information such as their email address, username, and password.

- Registered users can safely check in with their credentials to have access to personalized features and data.

2. **UI (User Interface):**

- The system has a visually beautiful and user-friendly user interface that improves the user experience.
- Users may simply navigate the application, choose options, and enter data with minimal effort.

3. **Calorie Burn Estimation:**

- The system's main feature is its ability to anticipate calorie burn depending on user input.
- Users can choose specific physical activities, determine their length and intensity, and get precise calorie burn projections.

4. **Functional Forecasts:**

- The system generates calorie burn estimations based on proven algorithms or data sources, ensuring reasonable accuracy.
- Users can make informed decisions regarding their workout routines and calorie intake by relying on the system's forecasts.

Current System's Strengths:

- User-Friendly UI: A well-designed user interface improves the user experience by making it simple for users to navigate and interact with the programme.
- Functional forecasts: The system's calorie burn forecasts are functional and accurate, giving customers important insights into their exercise routines.
- User Authentication: The processes of user registration and login contribute to security and personalisation.

4.5 DREW BACKS OF THE CURRENT SYSTEM

A web-based calorie prediction tool for exercise or machine exercise may have a number of disadvantages, including:

- **Inaccuracy:** Because the prediction is based on statistical models and does not account for various additional factors such as heredity, health status, and environmental variables, the accuracy of the calorie prediction may be called into question.

- **Poor personalization**: Because it only considers height, weight, and exercise type, the calorie prediction tool may not be sufficiently customised to deliver correct calorie forecasts for everyone. Individual differences in metabolism, exercise level, and other health factors may be overlooked by the tool.

- **Limited exercise options**: Because the web-based programme may only provide a limited number of workouts, it may be unable to provide precise calorie estimations for varied exercises.

- **Lack of professional guidance**: The web-based calorie prediction tool may not provide users with professional advice on physical activity regimens, food programmes, or other health-related issues, which may limit its effectiveness in improving overall health and wellness.

4.6 EXPLANATION OF THE PROPOSED SYSTEM

By addressing its limitations and bringing various new features and enhancements, the proposed system attempts to build on the present system's foundation, which includes user authentication, a user-friendly UI, and functional calorie burn projections. The following is an outline of the proposed system's primary components and functionalities:

1. **Better User Profiles:**Users can establish and manage detailed profiles that include personal information such as age, weight, height, heart details, gender, and exercise goals. This data will be used to precisely personalise calorie burn estimations.

2. **Progressive Algorithms and Data Sources:**

- For increased accuracy, the system will use modern calorie burn calculating algorithms and trusted data sources.
- Based on the most recent research and methodology, users should expect more precise calorie burn estimations.

3. **Integration with Wearable Devices:**The proposed system may integrate with popular fitness trackers and wearable gadgets, allowing users to seamlessly sync their activity data.

4. **Nutrition Monitoring (Optional):**Users may be able to measure their daily dietary consumption, providing a more comprehensive approach to health and fitness management.

5. **Personalized Suggestions:** The system can deliver personalised recommendations for physical activity and food choices based on user profiles, historical data, and fitness goals.

Chapter 5 –Feasibility Study and Requirements Gathering

5.1 Feasibility Studies

The information and data obtained during the feasibility research can be used methodically throughout the design and implementation of systems, but first a logical approach must be adopted because it requires systematic procedures.

To establish the risk assessment, both the helpful and harmful factors are thoroughly studied. However, the target users are taken into account in addition to the market analysis. Before beginning the design process, the project's capacity for long-term growth is assessed. The outcome or conclusion is unambiguous and supports the viability of the notion.

5.1.2 COST FEASIBILITY

The money invested on developing a system will be repaid once it is deployed. Increasing output can lead to increased revenue. However, there are risks because the wrong investments were made utilizing the wrong information system. The project may not be useful in the end. Cost analysis will assist minimize business overhead because it examines various investment possibilities on a regular basis.

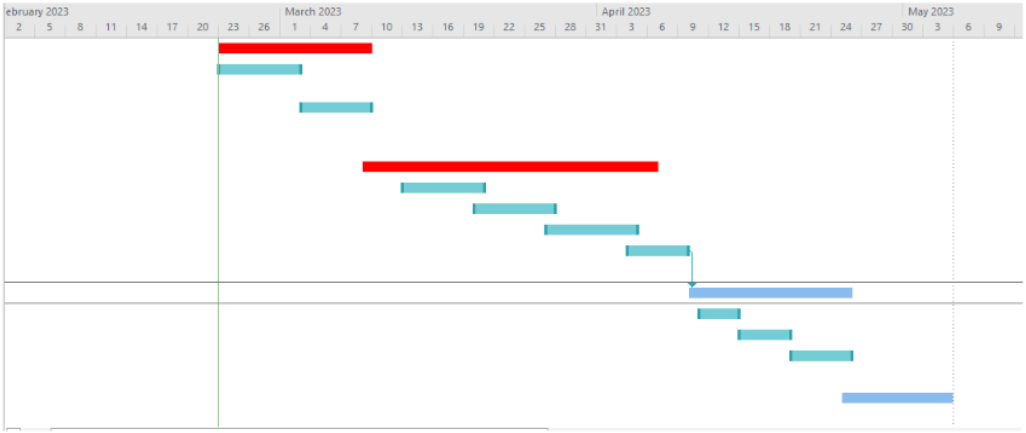
Project Details	**Price**
Proposal Concepts	Rs. 20,000
License for both hardware and software	Rs. 100,000
Monitoring and developing	Rs. 50,000
Organizing Hosting	Rs. 30,000
Maintaining of the System	Rs. 35,000
System Promotion	Rs. 30,000
Total	**Rs. 265000**

5.1.3 Feasibility of Time Management

In this context, we frequently assess time constraints to determine how long it will take to create the programmes we generate and whether they can be completed in a certain amount of time. The computer programme should have responded appropriately at that moment. If the project is not completed and used as soon as feasible, it will fail. We'll need around a month and a half to finish the system.

Task Mode	Task Name	Duration
	Plan And Research	11 days
	Planing about project	6 days
	Rearch about project	5 days
	Devoloping	21 days
	UI desining	6 days
	data set training	6 days
	server side works	7 days
	bug fixing	5 days
	Testing	12 days
	UI testing	4 days
	black box testing	4 days
	bug testing	4 days
	Implemention project	9 days

Time plan



Time plan Gantt chart

My project, Web Based System for Gym Workout Calories Burnt Prediction, should be finished in one and half month. All project tasks, including planning, development, testing, and deployment are included in the schedule. To ensure that each assignment is finished on time and within budget, the project team will collaborate to complete each task. To make sure the project continues on schedule, we will frequently check progress against the timeline and make adjustments as needed.

I have allotted 11 days for this step-in order to make sure the project is well planned and thoroughly studied. I will gather requirements, explore pertinent technologies and tools, establish project goals, and create a thorough project plan within this period. Also, I will identify any potential risks or difficulties that might occur throughout the project and create backup strategies to deal with them. This phase's objective is to provide a strong foundation for the project and make sure it is ready to succeed. The project's development phase will last around 21 days. I'll concentrate on a variety of activities during this phase, including creating the user interface, gathering and getting ready the data needed for model training, putting the machine learning methods into practice, and optimizing the model for performance. As part of my thorough examination, I'll make sure the system is accurate and efficient. I will work with team members to keep the project on track and to make sure that all development tasks are finished by the due date throughout the development phase.

The project's testing and implementation phase, which will last about 21 days, is called Web Based System for Gym Workout Calories Burnt Prediction; The system will be thoroughly tested throughout

this phase to make sure it functions as planned and adheres to all project requirements. This will entail running a variety of tests, including acceptance, integration, and unit tests. To ensure that the final product is of the highest caliber, any faults or problems that are found during testing will be immediately corrected. I will proceed to the implementation stage after the testing phase is finished, at which point I will deploy the system to production and make it accessible to end users. Additionally, I'll offer users the support and training they need to make the most of the system. In order to guarantee that the project is delivered on time and that all criteria are met, I will work collaboratively with team members and stakeholders throughout the testing and implementation process.

5.1.4 SCOPE FEASIBILITY

The operational feasibility of a system evaluates its ability to address problems, investigate opportunities indicated during scope definition, and meet needs established during the system's development stage. We're adding new features to the web-based system we're building, providing us access to many new capabilities the gym requires, such as the capacity to predict calories burned, track calories, and send reminders to check calories. To remedy the current deficiencies, all new features are being implemented

5.1.5 Technical Feasibility

Technically, it is conceivable to build a web-based calorie prediction system that incorporates cardio or workout equipment. To measure and track exercise data such as heart rate, speed, incline, and resistance, the necessary technology is freely accessible and may be integrated into existing workout equipment.This review focuses on the technological resources made available by this system. It enables This Company to assess the competency of technological resources as well as the technical staff's concepts' ability to become operational structures. Here are the main considerations:

1. **Stack of Technology:**
- Evaluation: The suggested technological stack must be technically possible to implement, including frontend and backend technologies, databases, and any third-party connectors.
- Consider whether the chosen technologies are scalable and maintainable in relation to the project's requirements.

2. **Development Knowledge:**
- Evaluating whether the project team holds the technical competence required to properly implement the planned system and features.
- Consider training or hiring team members with the required expertise to fill any skill gaps.

3. **Maintenance and Support:**
- Consider the system's ability to be maintained and supported beyond its first deployment.
- Consider: Plan for ongoing maintenance, upgrades, and user assistance to keep the system effective and secure.

4. **Budget and Resources:**
    - Evaluation: Determine the budget and resources required for technological development and continuous operations.
    - Take into account: Make sure the project is appropriately funded and has access to the necessary technical resources.

5.2 Requirements Gathering

5.2.1 SELECTING THE SUITABLE FACT GATHERING TECHNIQUE

To avoid surprises for stakeholders (such as software engineers, managers, clients, and so on), it is critical that everyone involved in the project understands their common goals. If the outcome has any unexpected plot twists, it will be bad news for such sellers. To appropriately collect information from the customer, evaluate what can and cannot be finished, and design methods after considering the client's perspective and checking the final papers with them, we must establish ways. All of these factors may lead to a thorough and accurate description of our clients' requirements, which would surely contribute to the construction of a final product that meets their expectations.

5.2.2Technique for Gathering Requirements – Questionnaire

I choose to collect information through surveys since it has various benefits. Surveys enable us to obtain data from a huge number of individuals fast, making them a more accessible tool. Participants can easily offer their responses and comments to the questions posed. Furthermore, surveys save time because they eliminate the need for one-on-one interviews, making it a more efficient procedure.it is critical to carefully construct the questionnaire to ensure that it matches with the system's objectives. I've developed a series of questions that I believe will be really useful in getting replies from the vast survey audience. These questions are strategically intended to elicit the information required to effectively accomplish the project's aims.some example Questionnaire in blow:

- Name
- Age
- Gender
- Do you estimate the number of calories burned during your cardio workouts?
- What type of cardio workout do you typically engage in?
- What motivates you to engage in cardio workouts?

5.2.3 REQUIREMENTS DETERMINATION

5.2.3.1 CORE REQUIREMENTS:

The core requirements are the main features and capabilities required for the effective creation and operation of the "Web-Based Calorie Burn Prediction System." These requirements are crucial to attaining the core aims of the project

- **.User authentication:** In order to utilise the calorie estimation tool, registered users must first create a profile on the system and obtain user authentication.
- **Calorie Prediction Algorithm:** The system must have a calorie prediction algorithm that calculates the number of calories burned based on the user's workout data (duration, volume, and heart rate).

- **Customised Recommendations (Reminder)**: Based on the user's goals and workout data, the system should give personalised recommendations for them, such as instructing them to stick to a specific training routine or lower their calorie consumption.

- **Data Visualisation** (Generate Report): The system should provide easy and interactive data visualisations to help users understand their daily physical activity and calorie burn over time

5.2.3.2 SECONDARY REQUIREMENTS:

Secondary needs are additions and enhancements that can improve the user experience and add value to the system but are not fundamental to its primary functionality. Based on available resources and user feedback, these requirements might be prioritized.

- **Accuracy**: The system should provide precise calorie calculations with a minimal margin of error based on the user's exercise data.

- **Reliability**: In order to provide users with continuous access, the system should be dependable, with little downtime and maintenance requirements.

- **Security**: To protect user data, the system must have effective security features such as user authentication and personal data encryption.

- **Usability:** Users should be able to use the system effortlessly, with clear instructions and user-friendly interfaces.
- **Scalability:** As the user base grows, the system should be scalable enough to serve a large number of users and a growing volume of data.

- **Performance**: Even during peak times, the system should respond rapidly and load pages quickly.

5.2.4 RESOURCE IDENTIFICATION

5.2.4.1 Hardware Requirements

- Core i3 Processor 2.80Ghz
- 4GB RAM (Memory)
- 40GB HDD Storage
- Intel or Any Graphics Memory
- A Mouse and a Keyboard
- Network Connection (LAN/WLAN)
- A Monitor

5.2.4.2 Software Requirements

- Google Collab
- VS Code
- PhpAdmin
- PyCharm
- Draw oi

5.2 THE SOFTWARE PROCESS MODEL

Agile Model for the "Web-Based Calorie Burn Prediction System" Project

The Agile paradigm is preferred for the "Web-Based Calorie Burn Prediction System" because it provides a flexible and user-centric approach to software development. Given the dynamic nature of fitness and customer preferences, Agile enables us to collect and incorporate user feedback on a constant basis, adapt to changing requirements, and deliver incremental improvements. This keeps the system sensitive to user needs, resulting in a more effective and gratifying user experience. The project's goal of establishing a web-based system that grows in response to user expectations and changing fitness trends combines nicely with Agile's emphasis on collaboration and iterative development. Here's an explanation of how the Agile methodology can be used in this project:

1.Iterative and incremental growth:

- Agile development takes place in small, incremental increments. This means that features and enhancements will be developed and delivered in small, manageable iterations for this project.

2.Ongoing Feedback:

- Agile encourages stakeholders, especially users, to provide constant input. This is consistent with the project's goal of being user-centric. Surveys, interviews, and user testing can all be used to collect user feedback.

3.Adaptability and Flexibility:

- Agile is extremely adaptive to changing needs. As the project continues and user feedback is gathered, changes to the system's features and priorities can be made to better match user needs.

4.Adjustable Planning:

- Agile planning is adaptable, allowing for changes to the project plan as new insights emerge. This strategy is useful in a project where user requirements may change over time.

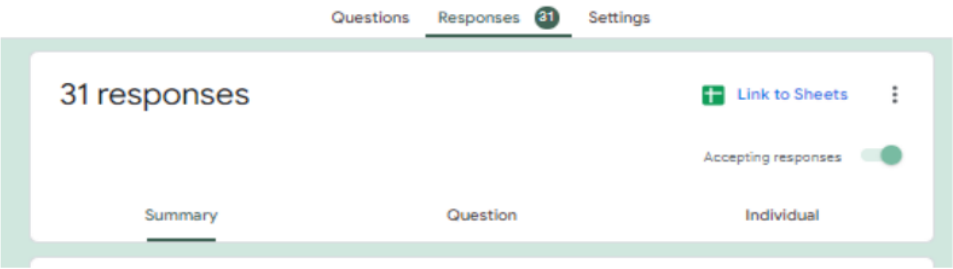
5.Design for the User:

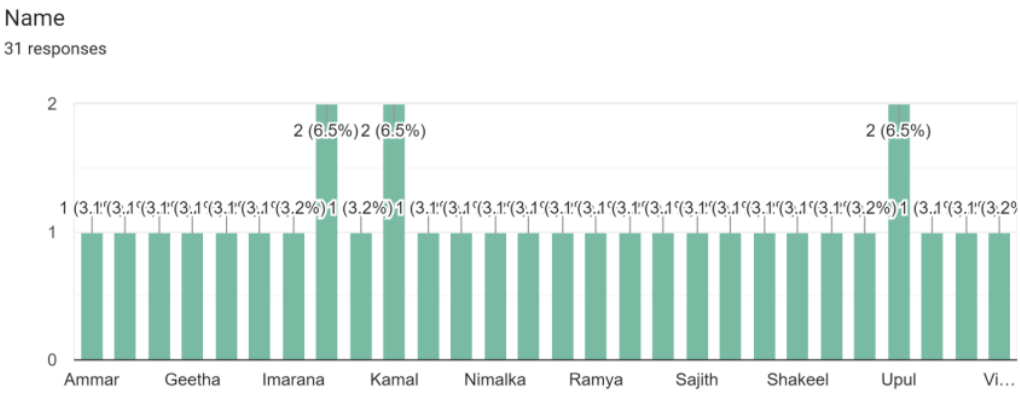
- Agile places a premium on user demands and happiness. It enables the rapid implementation of user-requested innovations and enhancements, resulting in a system that closely matches user expectations.

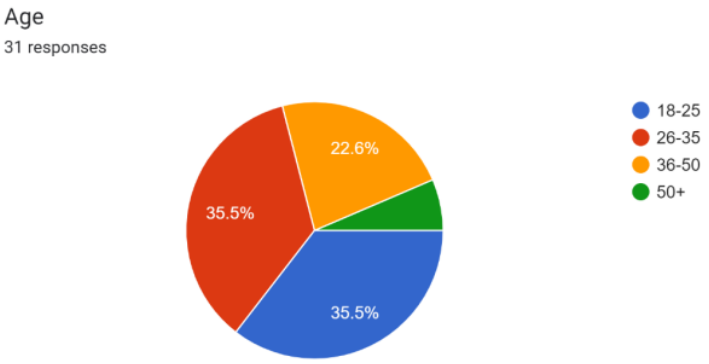
In summary, the Agile approach is well-suited to the project "Web-Based Calorie Burn Prediction System" since it provides a framework for iterative development, frequent user feedback, and the flexibility to adapt to changing needs and user preferences.

Questionnaire Requirement Analysis Based on Selected Technique

The outcomes of our information gathering meetings show that our plan is on the right track. The majority of people like our calorie burn prediction system. People in the study sample would be willing to switch to a new system if it had adequate functionality and guaranteed security.

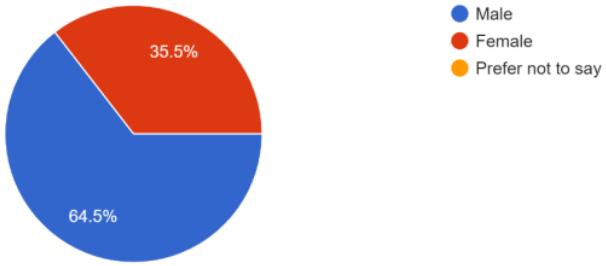






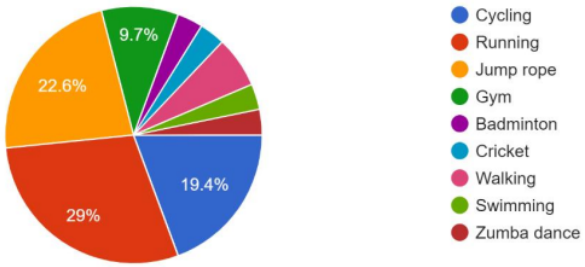
Gender

31 responses



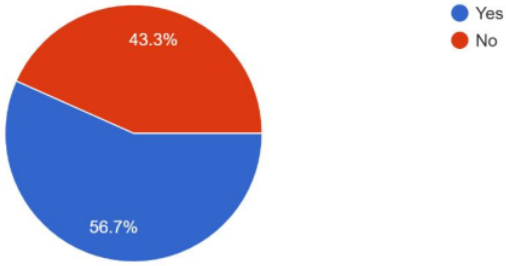
What type of cardio workout do you typically engage in?

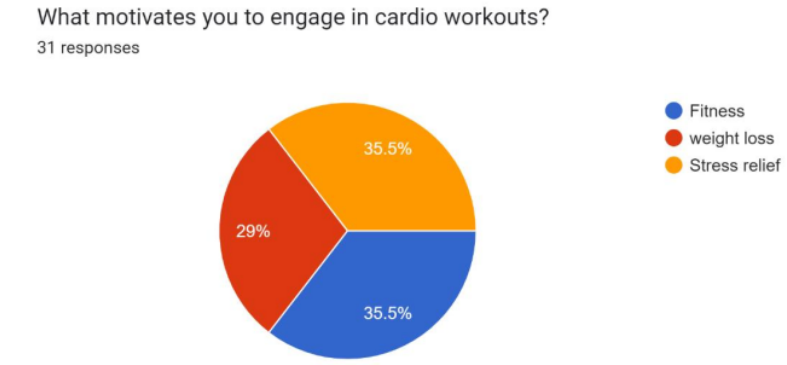
31 responses



Do you estimate the number of calories burned during your cardio workouts?

30 responses





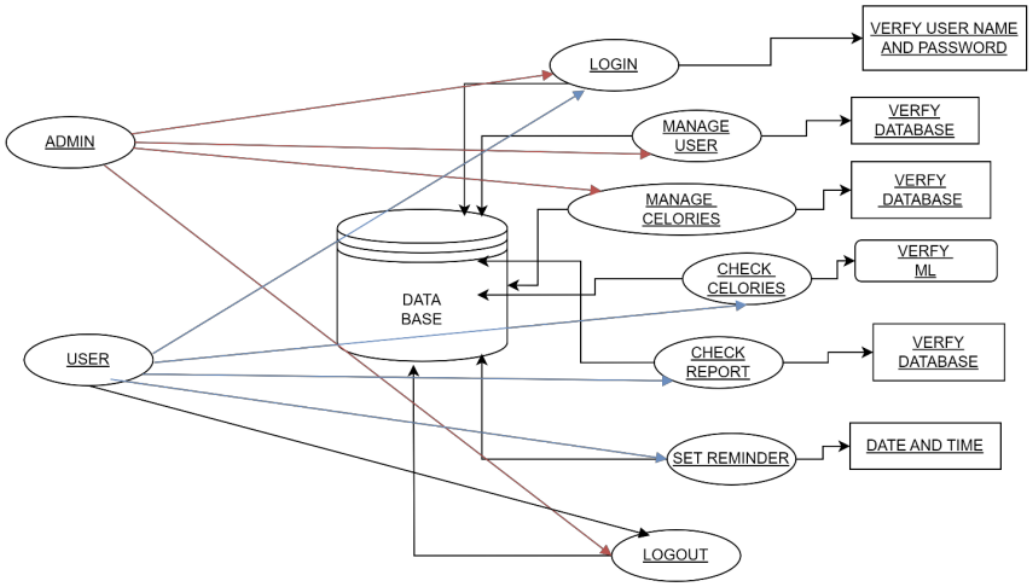
The graphs cited previously show that a large number of individuals favor the notion of creating a system that eliminates the need for computations to measure calories burnt. Many individuals are eager to use this technology once it is completed.

Chapter 7 – Design

Design is the initial stage in the application process. This can be described as a faultless, invention-free thinking experiment that provides a strategy for completing the tasks outlined in the required research stage.

1. System Design - Architecture

Use Cases Diagram



UML diagrams were similar to use-case diagrams. To evaluate the core needs for which they are engaged. This graphic depicts client communications in a class function that has a substantial impact on the client. These images, in particular, highlight how the system functions from the client's perspective.

Sequence Diagram

This is an example of a behavioural UML diagram. They are extremely important due to their obvious simplicity and importance in the design level paradigm for software product improvement. These depict the interactions and relationships between the framework's actors and classes.

1. Login Sequence Diagram

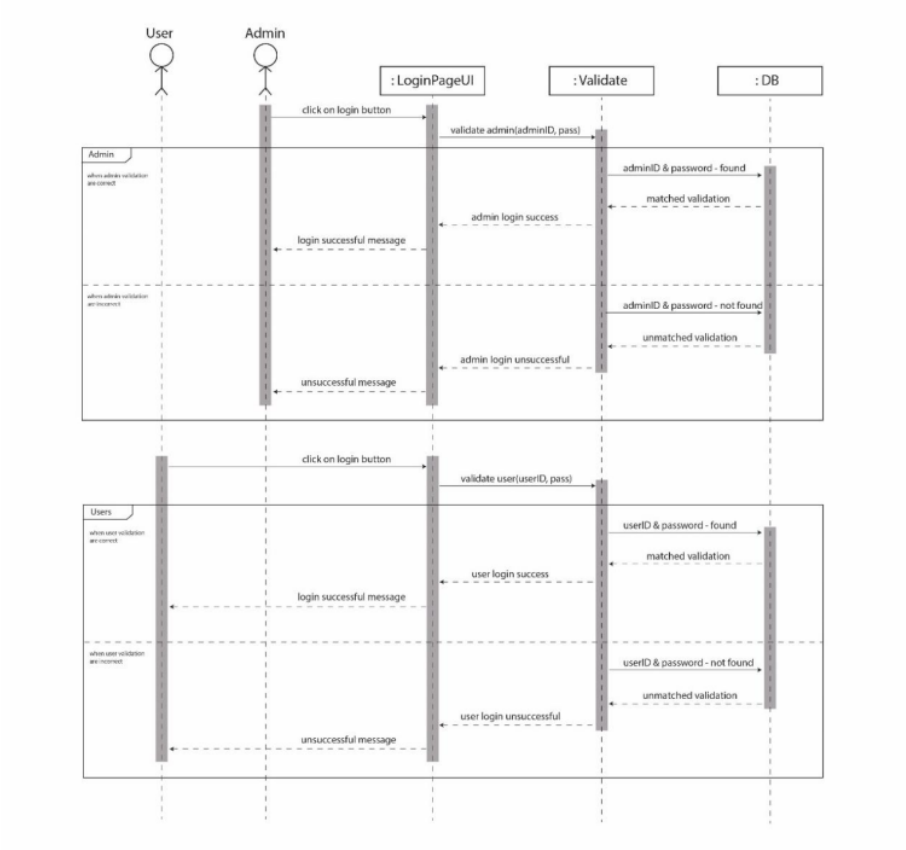


Figure 3: Login Sequence Diagram

2. User Registration Sequence Diagram

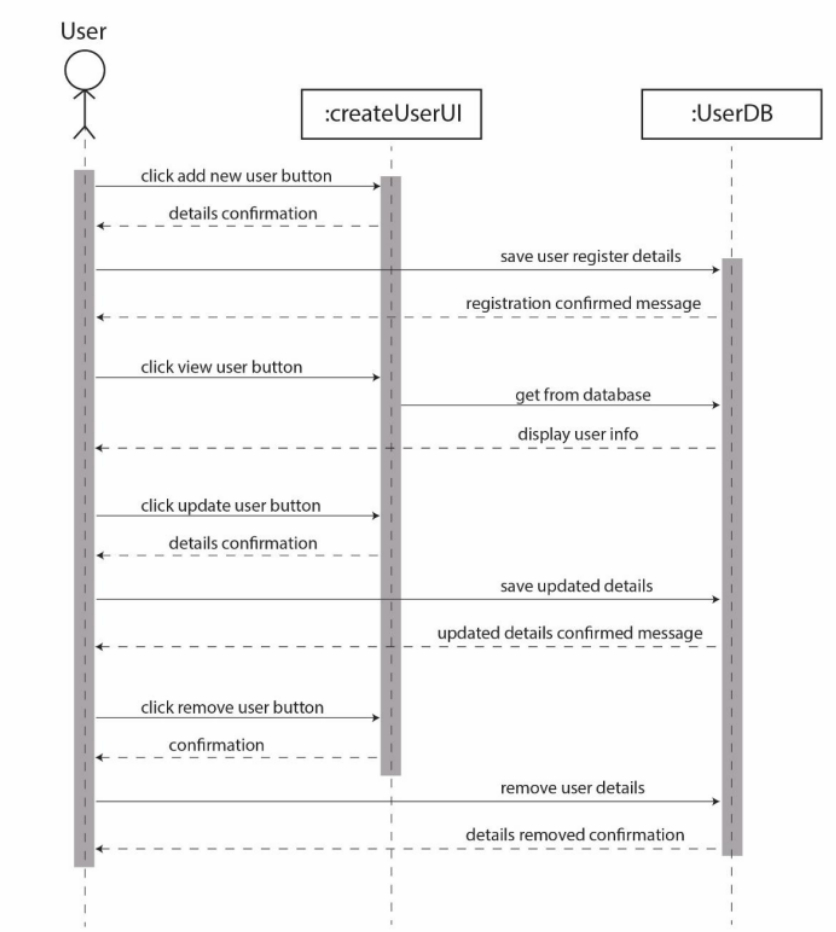


Figure 4: Registration Sequence Diagram

3. Calories Sequence Diagram

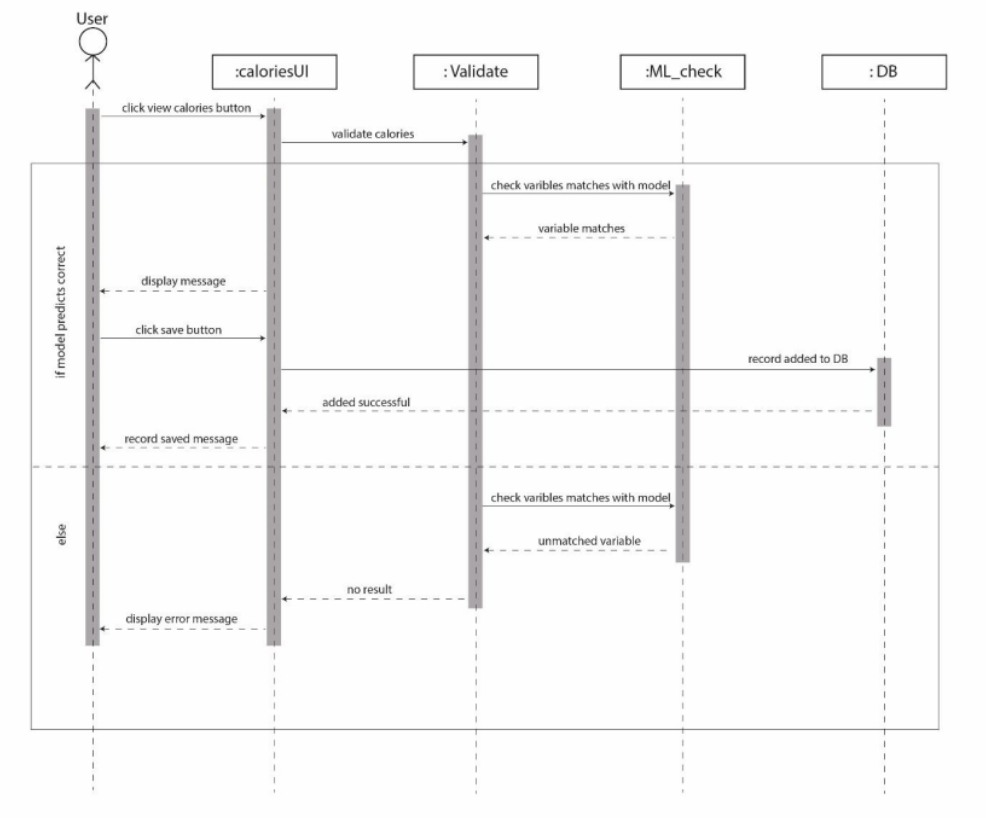


Figure 5: Calories Sequence Diagram

Class Diagram

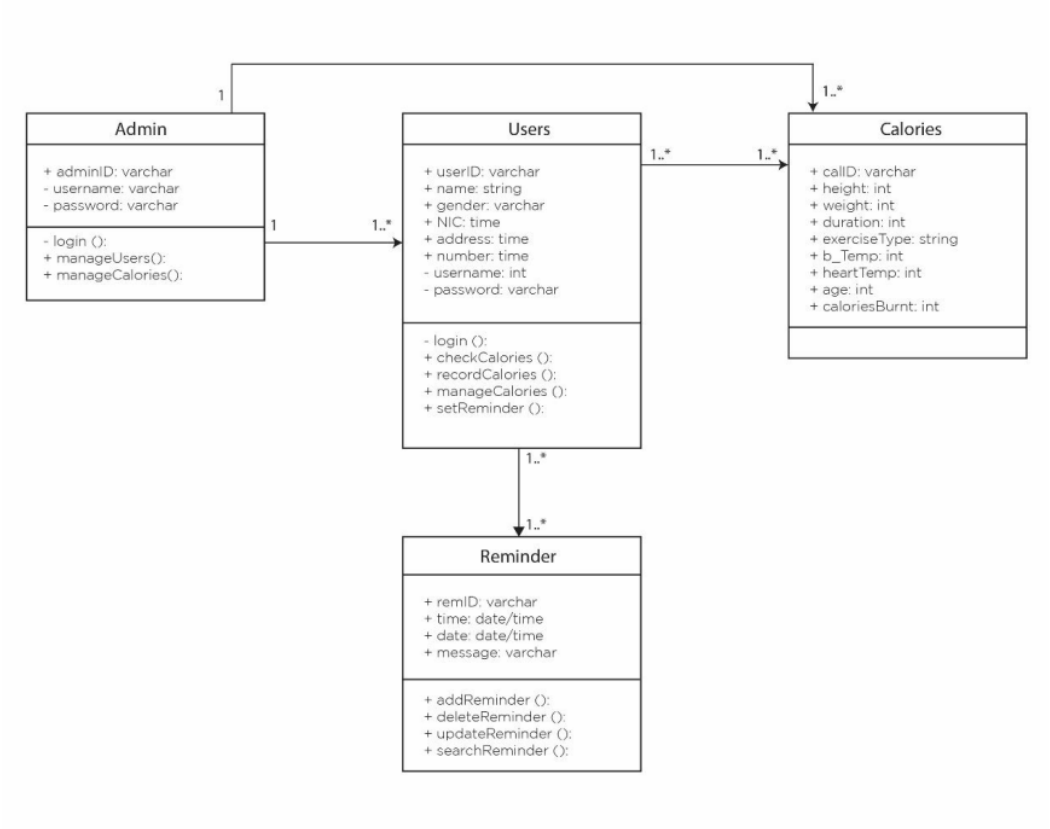


Figure 6: Class Diagram

Entity Relationship – ER Diagram

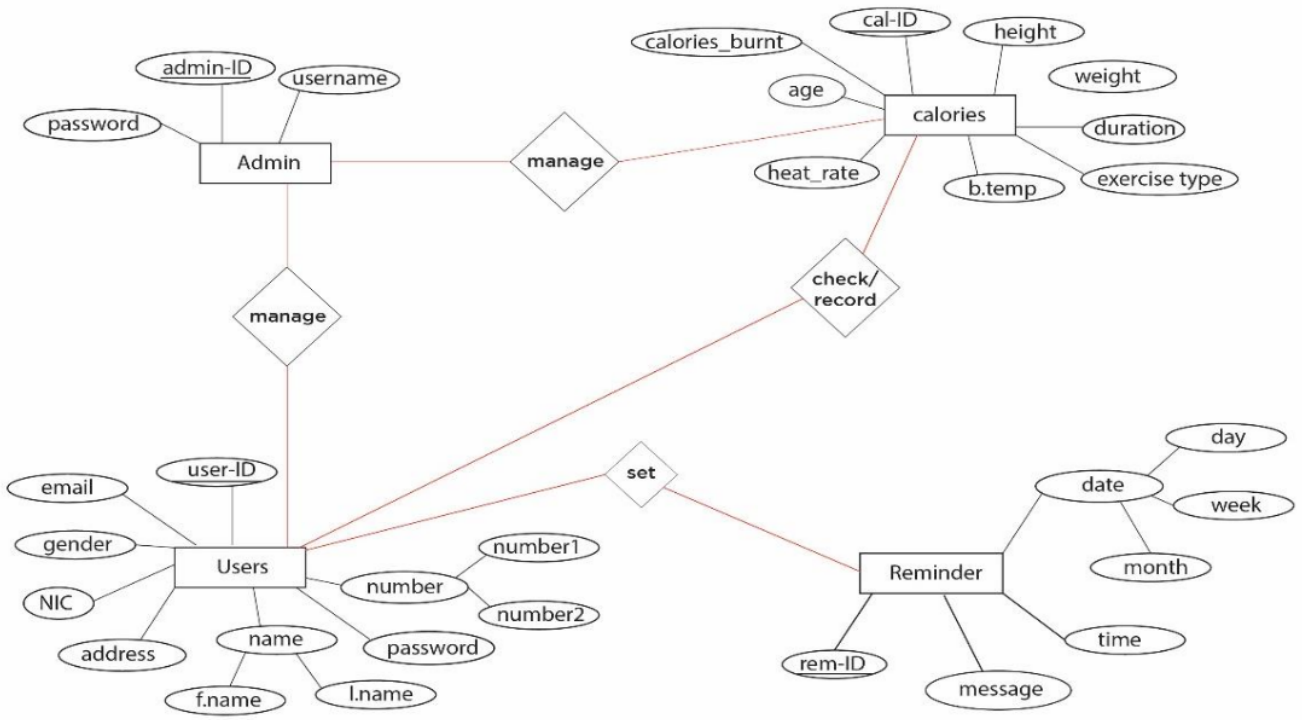


Figure 7: ER Diagram

Context Diagram

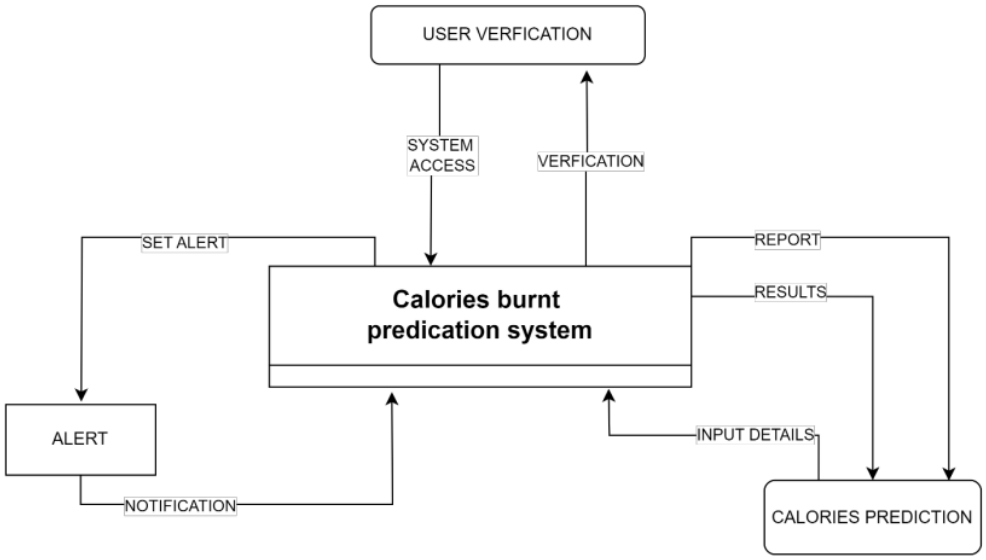


Figure 8: Context Diagram

Context Diagram – Graphical

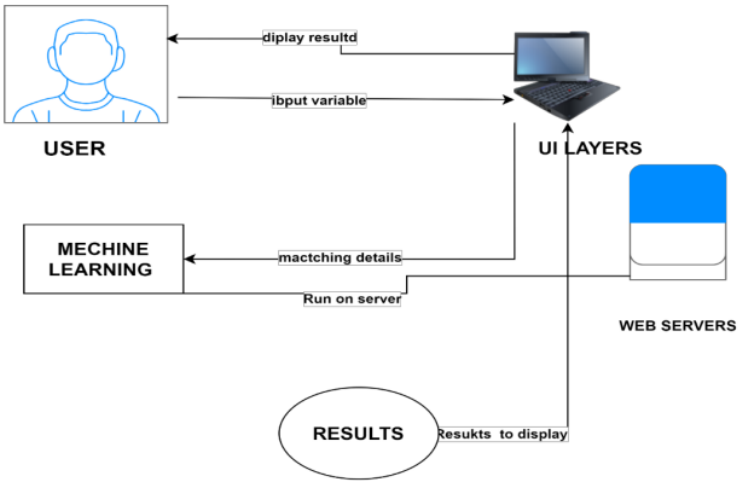


Figure 9: Graphical Context Diagram

2. Mockups / Wireframes UI

A wireframe is a website's conceptual design or rough draught. This will be excellent for presenting to clients or explaining as a visual aid. I created a prototype of these designs in Draw io, which I then changed based on the criteria discovered.

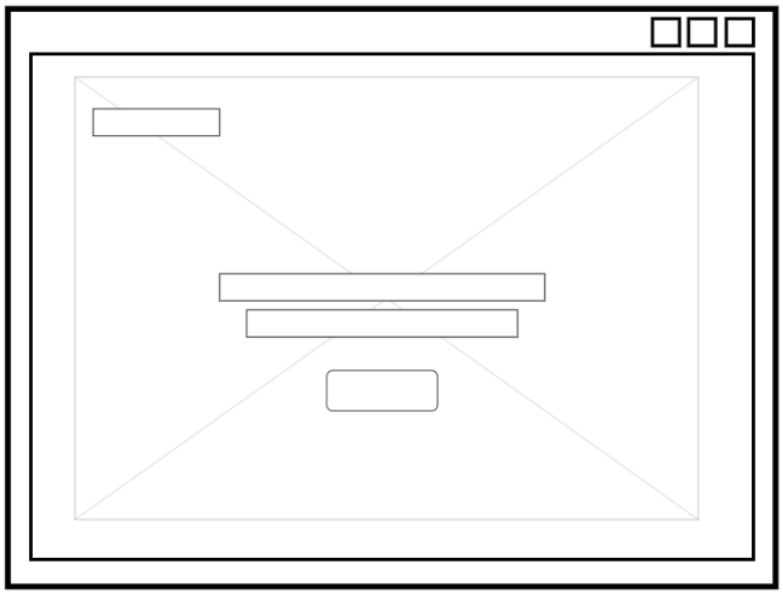


Figure 10: Home Wireframe

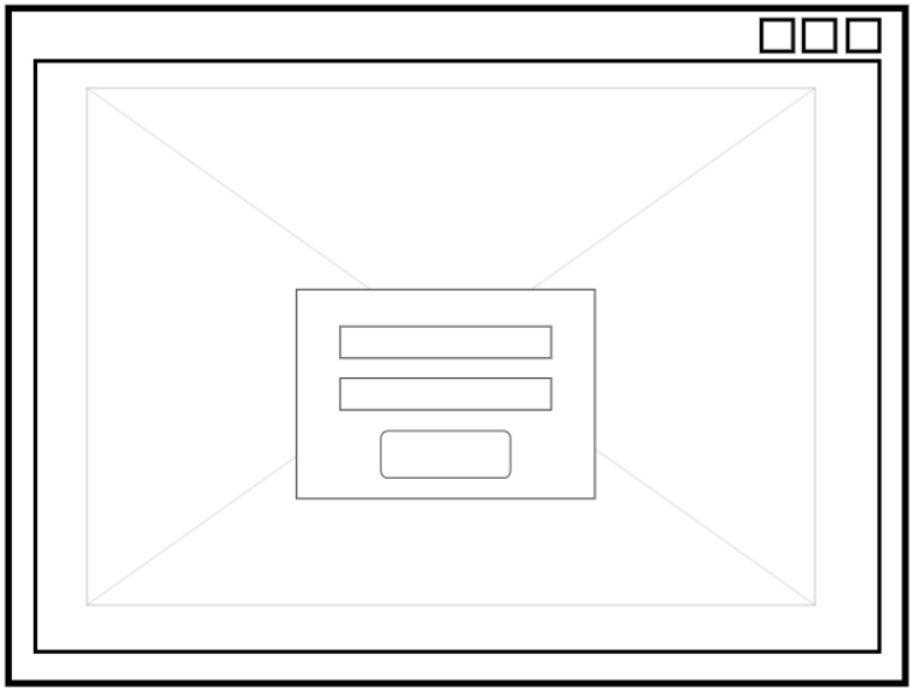


Figure 11: Login Wireframe

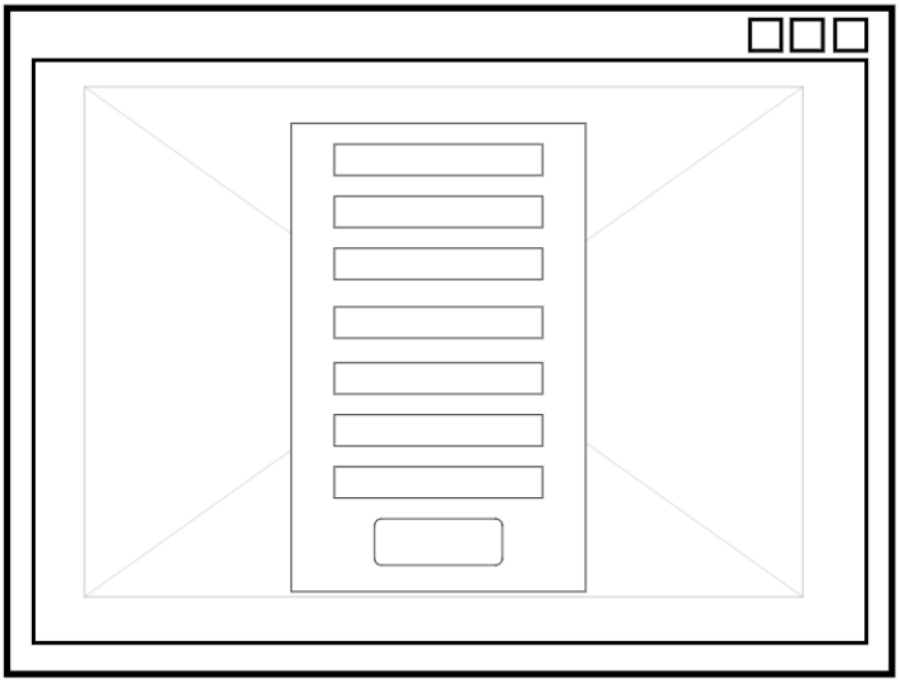


Figure 12: Registration Wireframe

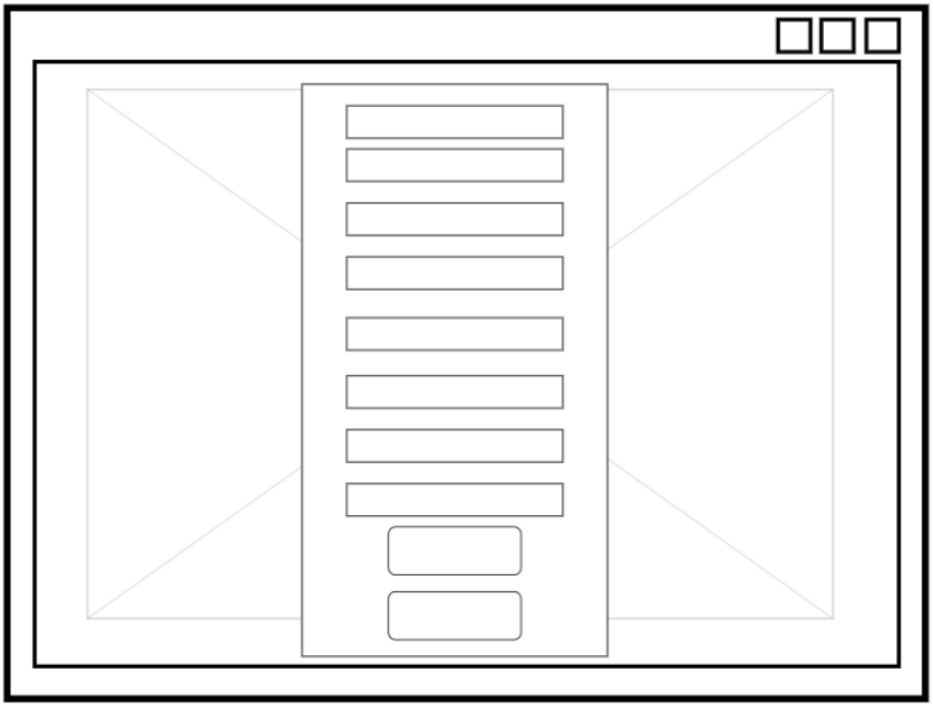


Figure 14: Prediction Wireframe

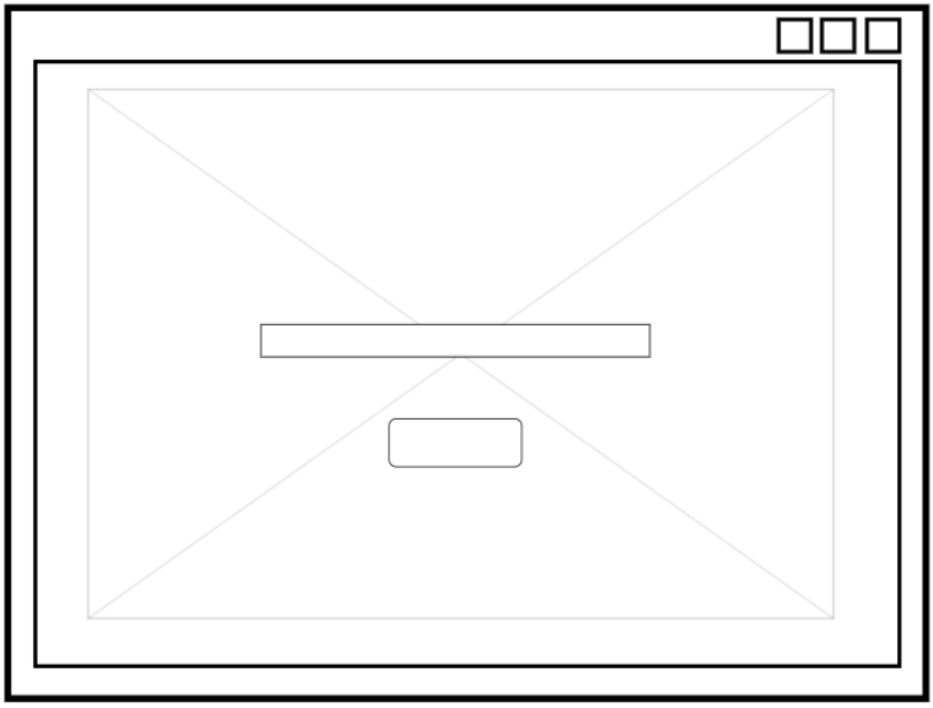


Figure 13: Result Wireframe

Chapter 8 – Implementation

Setting up a web-based calorie prediction tool for cardio or machine activities involves several steps.

- Initially a user-friendly interface for entering fitness data, such as time, intensity, and type of action, must be developed and tested for the system.
- A machine learning algorithm that predicts the number of calories burned depending on the user's input should also be included in the system. For optimal performance, a large amount of workout data and corresponding calorie burn data will be necessary.
- Lastly, the approach must be checked and validated to ensure accuracy in calculating calorie burn for diverse exercise kinds and individuals with varying physical features.

1. Database Development

To manage tables and data in MySQL, this software makes use of phpMyAdmin, a free and open-source database management tool. Databases. The argument is that phpMyAdmin can run on any operating system or server, and that its graphical user interface makes it much easier to use. This programme requires the installation of the Apache server, PHP, and MySQL. However, all of the previously stated utilities are included in XAMPP, a software package. As a result, XAMPP was utilised to build the database.

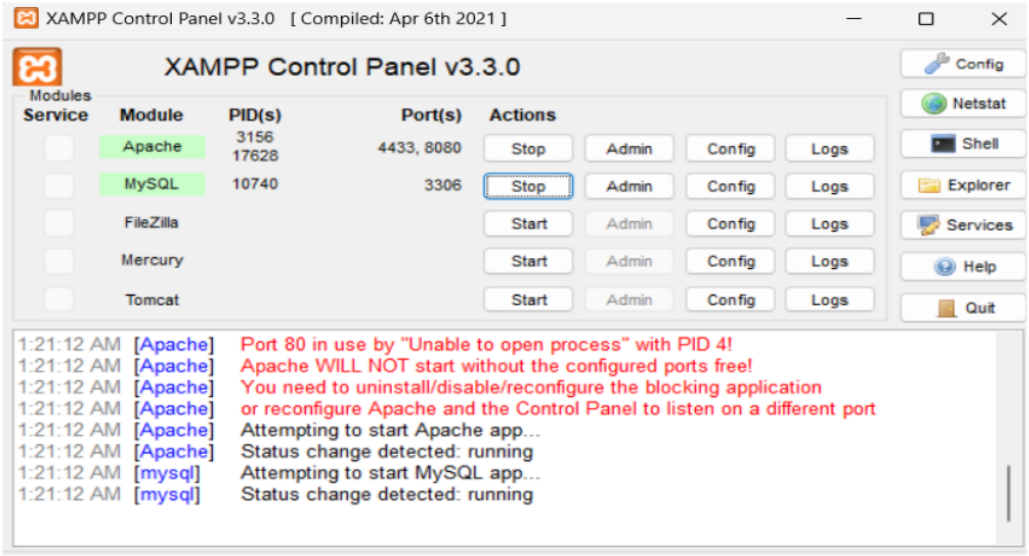


Figure 15: XAMPP Server

Coding for Database Connection

```
conn=mysql.connector.connect(host="localhost",user="root",password="",database="calories")
cursor=conn.cursor()
```

Figure 16: Database Connection Code

Registered Details

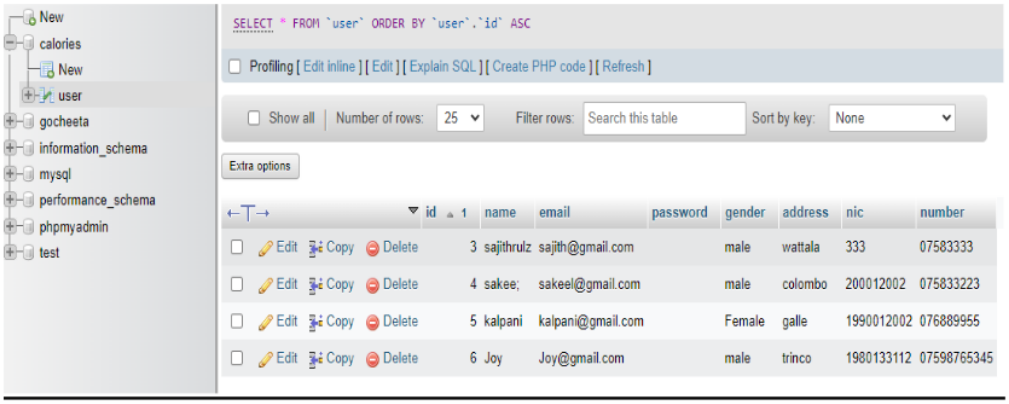


Figure 17: Registered Details

Database Table Details

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
☐	1	id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
☐	2	name	varchar(225)	utf8mb4_general_ci		No	None			Change Drop More
☐	3	email	varchar(225)	utf8mb4_general_ci		No	None			Change Drop More
☐	4	password	varchar(30)	utf8mb4_general_ci		No	None			Change Drop More
☐	5	gender	varchar(50)	utf8mb4_general_ci		No	None			Change Drop More
☐	6	address	varchar(225)	utf8mb4_general_ci		No	None			Change Drop More
☐	7	nic	varchar(50)	utf8mb4_general_ci		No	None			Change Drop More
☐	8	number	varchar(30)	utf8mb4_general_ci		No	None			Change Drop More

Figure 18: Database Table Details

1. System Implementation

Python and JavaScript were used for a well-organized and successful system implementation.

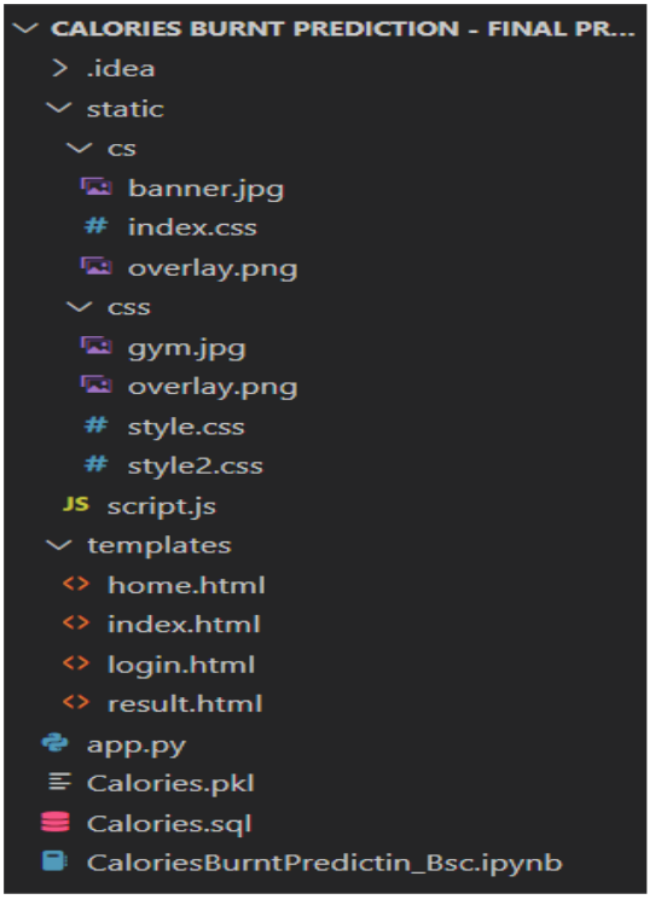


Figure 19: Implementation Folder

app.py > ...

```python
from flask import request, Flask, render_template, redirect, session
import mysql.connector
import os
import pandas as pd
import numpy as np
import pickle

app = Flask(__name__)
app.secret_key=os.urandom(24)

conn=mysql.connector.connect(host="localhost",user="root",password="",database="calories")
cursor=conn.cursor()

model1 = pickle.load(open('Calories.pkl', 'rb'))

def drop(test_df):
    test_df.drop([""],axis=1,inplace=True)
    return test_df

def handle_categorical(test_df):
  Gender_val= 'Gender' + '_' + test_df['Gender'][0]
  if Gender_val in test_df.columns:
    test_df[Gender_val] = 1

  Exercise_Type_val= 'Exercise_Type' + '_' + test_df['Exercise_Type'][0]
  if Exercise_Type_val in test_df.columns:
    test_df[Exercise_Type_val] = 1


  return test_df

@app.route('/')
def home():
    return render_template('home.html')
```

Figure 21: Implementation Code 1

app.py > ...

```python
@app.route('/login')
def login():
    return render_template('login.html')

@app.route('/index')
def index():
    if 'id' in session:
      return render_template('index.html')
    else:
      return redirect('/')

@app.route('/login_validation', methods=['POST'])
def login_validation():
    name=request.form.get('name')
    password=request.form.get('password')

    cursor.execute("""SELECT * FROM `user` WHERE `name` LIKE '{}' AND `password` LIKE '{}'"""
    .format(name,password))
    users=cursor.fetchall()

    if len(users)>0:
      session['id']=users[0][0]
      return redirect('/index')
    else:
      return render_template("login.html")

@app.route('/add_user', methods=['POST'])
def add_user():
    name=request.form.get('username')
    email=request.form.get('useremail')
    password=request.form.get('password')
    gender=request.form.get('gender')
    address=request.form.get('address')
    nic=request.form.get('nic')
    number=request.form.get('number')
```

Figure 20: Implementation Code 2

app.py

app.py > predict

```
72
73      cursor.execute("""INSERT INTO `user` (`id`,`name`,`email`,`password`,`gender`,`address`,`nic`,`number`) VALUES(NULL,'{}','{}','{}'
74      conn.commit()
75
76      cursor.execute("""SELECT * FROM `user` WHERE `name` LIKE '{}'""".format(name))
77      myuser=cursor.fetchall()
78      session['id']=myuser[0][0]
79      return redirect('/login')
80
81
82
83  @app.route('/predict',methods=['POST'])
84  def predict():
85      print('Applied Machine Learning Course')
86      features = request.form
87      print(features)
88      Gender = features['Gender']
89      Age = features['Age']
90      Height = features['Height']
91      Weight = features['Weight']
92      Duration = features['Duration']
93      Heart_Rate = features['Heart_Rate']
94      Body_Temp = features['Body_Temp']
95      Exercise_Type = features['Exercise_Type']
96
97
98      user_input = {'Gender':[Gender],'Age':[Age],'Height':[Height],'Weight':[Weight],'Duration':[Duration],'Heart_Rate':[Heart_Rate],
99      'Body_Temp':[Body_Temp],'Exercise_Type':[Exercise_Type]}
100     test_df = pd.DataFrame(user_input)
101
102     new_df = pd.DataFrame(np.zeros(shape=(1,4)).astype(int),columns=(['male','female','Cardio','Machine']))
103
104     test_df = pd.concat([test_df],axis=1)
105
106     test_df = handle_categorical(test_df)
107
108     print(test_df)
```

Figure 23: Implementation Code 3

app.py

app.py > predict

```
107
108     print(test_df)
109
110     prediction = model1.predict(test_df)
111
112     output = float(np.round(prediction[0], 2))
113
114     print(output)
115
116     return render_template('result.html', prediction_text='Your Calorie Burnt is {}'.format(output))
117
118
119 if __name__ == "__main__":
120     app.run(debug=True)
```

Figure 22: Implementation Code 4

2. UI Implementation

HTML, CSS, JS, and jQuery were used to construct the system user interface. The result of the implementation is shown in the screenshot below.

Home Page UI

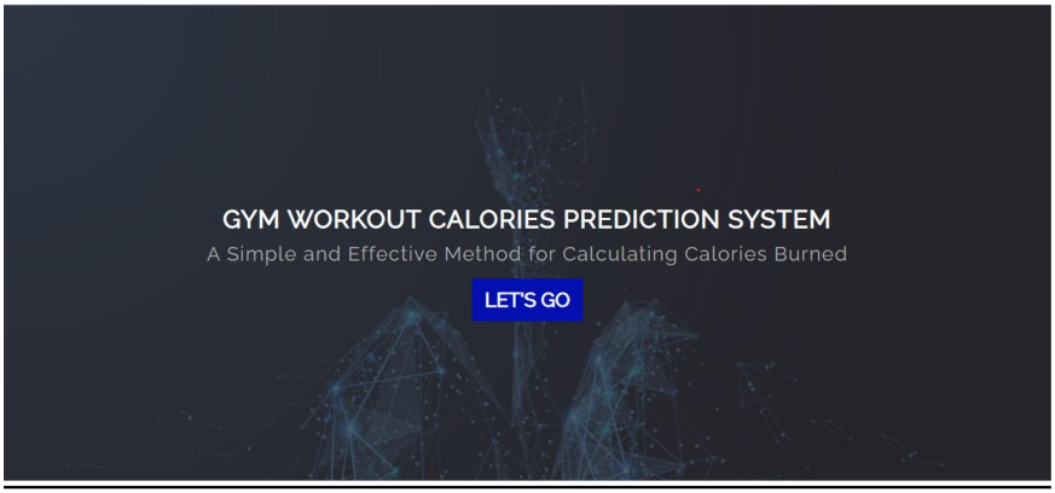


Figure 24: Home Page UI

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <meta name="viewreport" content="width=device-width, initial-scale=1.0">
    <title>
        Calories Burnt Prediction
    </title>
    <link rel="stylesheet" type="text/css" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css" />
    <link href="https://fonts.googleapis.com/css?family=Raleway&display=swap" rel="stylesheet" />
    <link rel="stylesheet" type="text/css" href="../static/cs/index.css" />
</head>
<body>
    <div class="container-fluid banner">
        <div class="row">
            <div class="col-md-12">
                <nav class="navbar navbar-md">
                    <div class="navbar-brand">WELCOME</div>
                    <ul class="nav">
                        <li class="nav-item">
                            <a class="nav-link" href="#"></a>
                        </li>
                        <li class="nav-item">
                            <a class="nav-link" href="#"></a>
                        </li>
                        <li class="nav-item">
                            <a class="nav-link" href="#"></a>
                        </li>
                        <li class="nav-item">
                            <a class="nav-link" href="#"></a>
                        </li>
                    </ul>
                </nav>
            </div>
            <div class="col-md-8 offset-md-2 info">
                <h1 class="text-center">CALORIES BURNT PREDICTION</h1>
                <p class="text-center">
                    A quick and efficient way to analyze your calories
                </p>
                <a href="{{ url_for('login') }}" class="btn btn-md text-center">GET STARTED</a>
```

Login / Registration Page UI

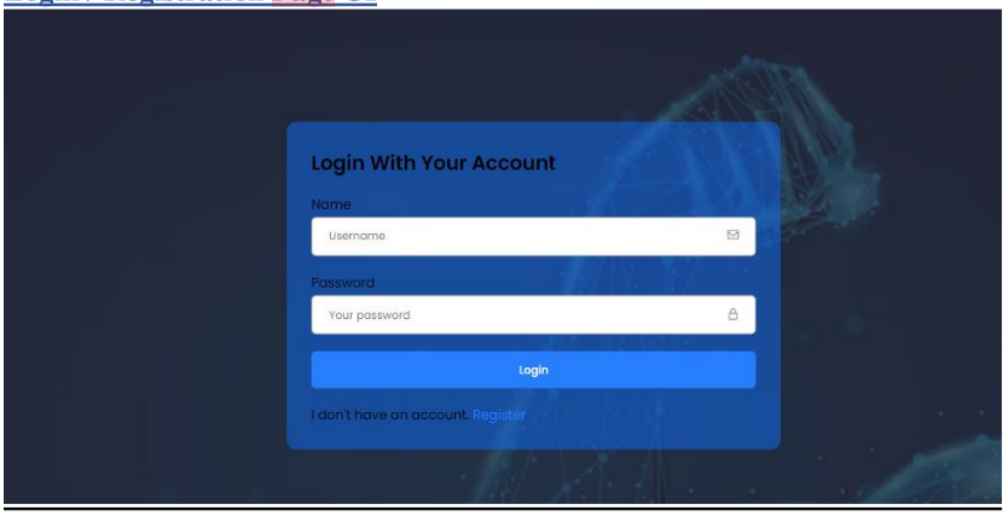
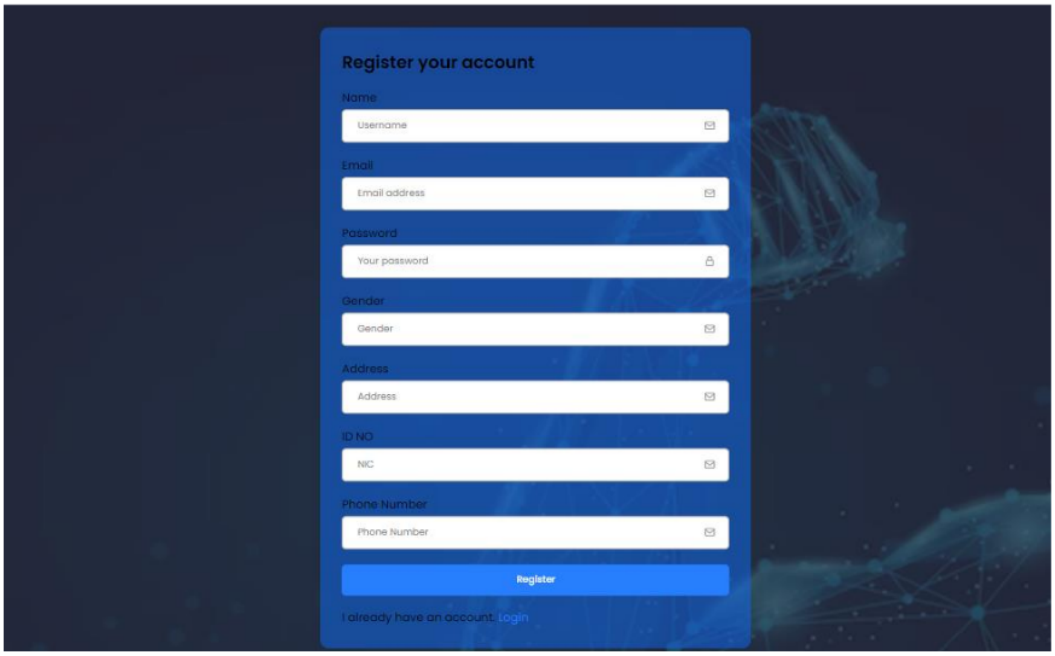


Figure 26: Login Page UI



```
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <link href='https://unpkg.com/boxicons@2.0.9/css/boxicons.min.css' rel='stylesheet'>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/style2.css') }}">
    <title>Responsive Login And Register Form</title>
</head>
<body>

    <div class="container">
        <form class="login active" action="login_validation" method="post">
            <h2 class="title">Login with your account</h2>
            <div class="form-group">
                <label for="name">Name</label>
                <div class="input-group">
                    <input type="text" id="name" placeholder="Username" name="name">
                    <i class='bx bx-envelope'></i>
                </div>
            </div>
            <div class="form-group">
                <label for="password">Password</label>
                <div class="input-group">
                    <input type="password" id="password" placeholder="Your password" name="password">
                    <i class='bx bx-lock-alt' ></i>
                </div>
            </div>
            <button type="submit" class="btn-submit">Login</button>
            <p>I don't have an account. <a href="#" onclick="switchForm('register', event)">Register</a></p>
        </form>

        <form class="register" action="/add_user" method="post">
            <h2 class="title">Register your account</h2>
            <div class="form-group">
                <label for="Name">Name</label>
                <div class="input-group">
                    <input type="text" id="username" placeholder="Username" name="username" required>
                    <i class='bx bx-envelope'></i>
                </div>
            </div>
            <div class="form-group">
```

Figure 28: Registration / Login UI Code

Prediction Page UI

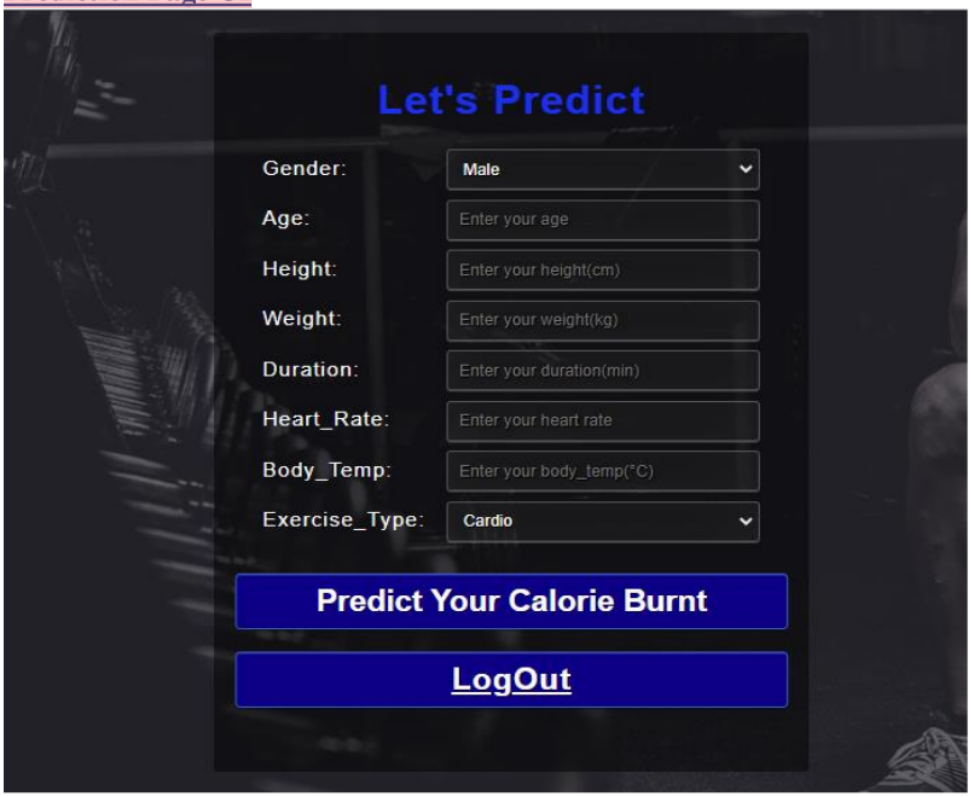


Figure 29: Prediction Page

```
<div class="login">
 <div class = 'content'>
   <div class = "heading">
     <h1>CALORIES PREDICTION</h1>
   </div>



   <form action="{{ url_for('predict') }}" method="post">
     <div class ='InsideContent'>

         <div class = 'block'>
           <label>Gender:</label>
              <select name="Gender" id="dropdownblock" style="width: 80px;">
              <option value="0">male</option>
              <option value="1">female</option>
           </select>
         </div>
         <div class = 'block'>
              <label>Age:</label>
              <input type="text" name="Age" placeholder="Enter your age" size="80" required="required" />
         </div>
         <div class = 'block'>
              <label>Height:</label>
              <input type="text" name="Height" placeholder="Enter your height(cm)" size="80" required="required" />
         </div>
         <div class = 'block'>
           <label>Weight:</label>
           <input type="text" name="Weight" placeholder="Enter your weight(kg)" size="80" required="required" />
         </div>
         <div class = 'block'>
           <label>Duration:</label>
           <input type="text" name="Duration" placeholder="Enter your duration(min)" size="80" required="required" />
         </div>
         <div class = 'block'>
           <label>Heart_Rate:</label>
           <input type="text" name="Heart_Rate" placeholder="Enter your heart rate" size="80" required="required" />
         </div>
```

Figure 30: Prediction Page UI Code

Result Page UI

Figure 31: Result Page UI

result.html

templates > result.html > html > body > div.prediction > h1

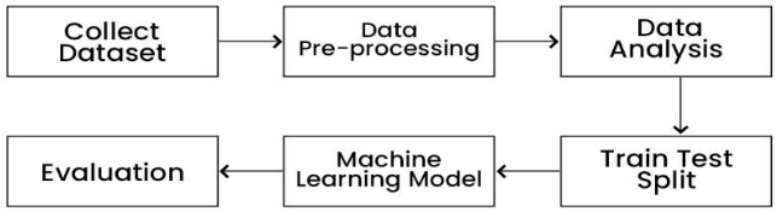
```
<!DOCTYPE html>
<html >
<head>
  <meta charset="UTF-8">
  <title>Calories Burnt Prediction</title>
  <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300' rel='stylesheet' type='text/css'>
<link rel="stylesheet" href="{{ url_for('static', filename='css/style1.css') }}">

</head>

<body>


    <div class = "prediction">
      <h1>{{ prediction_text }}</h1>
      <a href="{{ url_for('index') }}" class="btn btn-primary btn-small" id="btnp">Back</a>

</body>
</html>
```

4. Model Implementation

I used random forest regression algorithms on a specific set of data to anticipate the total amount of calories burned during an exercise session based on the person's gender, age, weight, height, duration, body temperature, heart rate, and type of activity. The Random Forest methodology is a hybrid strategy that can effectively address classification and regression issues by combining several decision trees with a bootstrap and aggregate, or bagging, approach. The main idea is to use many decision trees to determine the conclusion rather than relying on just one. Random Forest's learning frameworks are built on numerous decision trees. We generate trial data for each model by statistically selecting rows and attributes from the dataset.

Diagram of Workflow

As a result, this programme differs from others in that its major goal is to collect and analyse data in order to forecast the number of calories expended throughout individual people's exercises. When the model is complete, the user can interact with the built mobile application to determine the number of calories they burned based on the app's parameters.



Work Flow Diagram

Dataset Details

Table 1: Dataset Details

Features of Dataset	Functions of Dataset
Gender	Male or female
Age	Age must show in current year
Height	Height should be in cm
Weight	Weight of a user should in kg
Duration	Where the time should mention in Mins
Heart Rate	Average exercise heart rates (more than 75 pulses per minute)
Body Temperature	Over exercise, the human body temperatures rise above 37°C.
Exercise Type	What exercise is carried out?
Calories	Total amount of calories burned while workout

Dataset Analyzation and Correlation

```
calories.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4319 entries, 0 to 4318
Data columns (total 10 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   User_ID        4319 non-null   int64
 1   Gender         4319 non-null   int64
 2   Age            4319 non-null   int64
 3   Height         4319 non-null   int64
 4   Weight         4319 non-null   int64
 5   Duration       4319 non-null   int64
 6   Heart_Rate     4319 non-null   int64
 7   Body_Temp      4319 non-null   float64
 8   Exercise_Type  4319 non-null   int64
 9   Calories       4319 non-null   int64
dtypes: float64(1), int64(9)
memory usage: 337.5 KB
```

Figure 33: Dataset Analyzing

```
plt.figure(figsize=(10,10))
sns.heatmap(correlation, cbar=True, square=True, fmt='.1f', annot=True, annot_kws={'size':8}, cmap= 'Reds')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb6237eab10>
```

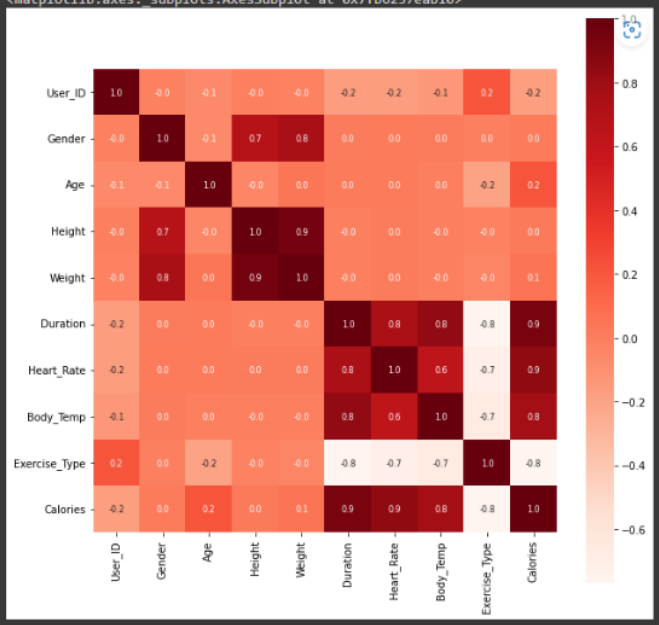


Figure 34: Correlation Heatmap

Dataset Training and Testing (Model)

```
#train and texting data
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_state=2)

print(X_train.shape, X_test.shape, Y_train.shape, Y_test.shape)

(3455, 8) (864, 8) (3455,) (864,)

#model training
model = RandomForestRegressor
#(n_estimators = 1000 , max_features = 3 , max_depth = 6)

model.fit(X_train, Y_train)

RandomForestRegressor(max_depth=6, max_features=3, n_estimators=1000)
```

Figure 35: Training the Dataset

```
#prediction on test data
test_data_prediction = model.predict(X_test)

print(test_data_prediction)

[ 78.14187934 122.83188993  86.96871939  45.84754523  60.06271604
 195.82416249  55.36636758  52.60080099  55.19852161  83.17996333
  57.28930936 128.51162905  59.10489894 107.62500638 127.18704208
  53.6081265  146.387294    80.18695136  56.51107082  60.9308577
  49.45948863  53.43134823 172.91086075  55.39873831  84.20492475
  83.69788062 108.48206334  57.68468066  57.28919694  52.00307473
  59.71330463  52.38176806 113.92423928  86.47118309  51.24345535
 183.6894865   58.15288152  88.50631472 158.50916564  42.32899336
  53.78802839  81.78702542  52.29194463  55.91885944  88.09005012
 143.69754584  82.15807771  52.79453755  49.33060688  91.64416394
  59.78068227  52.34825949  53.17792845  40.15971117  55.30974098
  43.72517778  56.71085374 175.38449174  55.71910577  53.16243262
 162.27486522 130.75287481 209.98812172  58.52458095  80.74974346
  80.76600288 164.15531358  87.04195243 130.62146286 134.39805418
  57.48734119  54.82931918  56.12583745  92.40089877 147.96120258
  76.91569528 147.83181407  82.63169499 178.27335926  79.43321985
  55.99744161  55.21319715  43.56272725 156.99175574  43.12924822
  58.80519254  81.12102975  58.76418561  59.16880264  57.17341825
  82.95642752  60.43638779  44.42898302  57.66514206  81.60959577
  87.77657342 101.15114125 171.25548893  44.88257558  46.5669739
  80.66993048 160.12689701  59.15097779  48.45295772 118.52765751
  98.09081817  52.54668747  81.3508569   78.31965652  88.008012
  49.84200669 124.19414837  56.07840774  49.71071056 140.73409893
  78.59903456 118.1244982   52.68537037 103.33776019 103.67463024
 109.58753917  82.42480206  52.51580854  60.92801197 190.05154869
  44.74829911  58.47761213 118.88932688  54.58318246  55.80565812
 122.12941046 106.46905812  59.87560596  57.96557123  48.97146593
 124.19439483  79.863067   132.08203473  58.78307896  52.52839405
 101.82629105  60.11337044  52.29870396  46.80543794 151.71620286
  53.9970211  222.72106895 118.41579377  43.50710985  39.73716806
  61.41641828 100.27202472 109.30921037  61.53022745  51.175909
  61.71295382  47.55884186  49.56711108 190.18699409  55.48879455
  83.03831663 183.9079196   57.26245954 215.54008336  81.4961162
  55.49248014 115.67488039 177.48080074  53.17297194  58.59505095
 160.33861428 168.77378022  52.32864186  56.8781684   56.82224684
 107.81970024  60.76004593  53.3566056   78.98546285  59.64829473
  61.07933525  49.60410549  85.37557403  60.58172515  54.10617071
 161.33630041  81.57146953  44.78224142  88.6801557  216.22423815
  50.55326813  80.62452787 164.75716258 185.2840347  164.91570606
 121.10377388  53.56670162  53.50042374 224.02827472 131.60237695
  81.61280598  47.26113883  59.20503879  57.59119428 100.05377984
 172.14226924  50.83614704  43.20751264  58.84399417  56.09556884
  87.13079616  46.2031291  189.45188912 113.49145779  50.87331921
 126.33317323  58.33393086 204.34190307 109.0669738   96.79833786
  47.22000295 197.81458567  59.82102004  52.3737983   78.42435046
  83.54590836  44.03407075 156.18093471  59.03425831  80.00288069
  53.23294918  98.44485941 177.99518026  83.14323557 120.0017096
```

Figure 36: Testing the Dataset

Chapter 9 – System Maintain

System maintenance is the final stage of the software development life cycle, which begins after the full system has been produced and deployed. Once a system is operational, it usually necessitates continuing assistance. In other words, the software runs for a long time after it is installed and requires frequent maintenance to ensure that the finished product continues to work at the greatest levels of functionality. Coding specialists provide programming support throughout the application development cycle, suggesting solutions in accordance with a company's goals, informing users of system flaws, and managing potential security threats. The maintenance phase is when the developers resolve any issues discovered to guarantee that the system continues to perform as planned or provides value in the long run.

1. Deployment and Release Schedule

After being planned, developed, implemented, and reviewed, the structure must be released and launched into the actual system. Customers and users of this web-based application would be able to use the system for its intended purpose as long as they had internet connectivity and devices that met the project's specifications (Google Chrome, Microsoft Edge). Once the system has been built, an administrator will be manually created and assigned to the right customer, who will then be able to use the programme for their company's activities.

2. System Supply and Assistance

According to the feasibility assessment, users may encounter a few difficulties while attempting to use or operate the system; as a result, training on the basic technical abilities required to use the device is critical. To streamline the process and provide effective maintenance assistance to the customer, it is generally desirable to share the workload of client requests and concerns on the development side.

3. Common Maintenance Problems

- Hardware maintenance entails ensuring that all hardware parts, including as servers, storage systems, and networking equipment, are in good working order. To remain in good working order, the hardware may need to be inspected and repaired on a regular basis.
- Software maintenance includes updating and patching the system's software components. Vulnerabilities are reduced by ensuring that the system is running the most recent security patches and software versions.
- Data maintenance comprises ensuring that the information in the system is correct and complete. Regular backups and recovery techniques should be in place to protect against data loss and damage.

- User administration includes controlling user access, permissions, and accounts. To identify and stop unwanted access to the system, user activity records should be frequently checked.

- Monitoring the system's performance parameters, such as speed of response, productivity, and resource use, is known as performance maintenance. To make sure the system is running at its best, performance should be periodically examined, and adjustments should be made as needed.

Conclusion - The overall health and functionality of the web-based calorie prediction tool for exercise by cardio or machine system are largely reliant on system maintenance. It ensures that the system runs as smoothly as possible, minimising downtime and minimising the risk of data loss, security breaches, and other issues that could degrade the overall user experience.

Chapter 10 – Critical Evaluations & Conclusion

1. Summary

The primary goal of this project is to look into machine learning techniques for calculating the number of calories burned during a workout. In this research, we first develop a machine learning system that can estimate how many calories will be expended during exercise. Many people nowadays are concerned about their workout routines, diets, and the quantity of calories they burn after working out. To stimulate user interaction with the system, we may employ ML methods such as the Linear and XGB regressors built into web apps. Given the aforementioned, this project report describes in detail how the system is produced, beginning with project organisation and progressing through requirements evaluation, system design, system installation, testing, and finally post-release support. There are also other significant chapters in the book that cover everything from background research to design sketches.

2. Evaluation

This built system initially satisfies the ideal end user's demand in line with the project goal of building a reliable, consumer-friendly, and cost-effective calories burnt forecast, as well as the other project goals that must be accomplished. Users can access the website using the supplied credentials and obtain results based on their inputs. Users will also be able to do previously limited procedures such as calorie counting and reminder creation. On the other hand, the platform's superuser (admin), who has full control once enrolled on the platform, may handle the programme successfully. This system is accessible to everyone with a web browser. It will be a platform that prioritises user involvement, efficiency, and durability.

3. Limitations

- This operating system is not suitable for every user.
- For the system to give accurate results, correct data entry is required.
- An active internet connection is required.
- Incorrect user input will cause the system to behave abnormally.
- The unpopular system for which it was designed.

4. Learnings

Working on this project provided me with a thorough understanding of the software development process. I was able to obtain a thorough understanding of how commercial projects are developed, from requirement gathering to the opportunity to design apps using cutting-edge technologies, procedures, and frameworks. I had a few ideas for how I would get about and finish this system before starting my project, but while I worked on it, a lot of internet sources and lessons helped me learn about many IT-related improvements in technology. More importantly, I grasped the logic of coding and became engrossed in learning a variety of computer languages.

5. Future Improvements

- A mobile application for Android
- Significantly expand the dataset to improve calorie detection accuracy.
- Enhance the user interface by including a calories graph that graphically depicts daily calorie changes.
- Take pictures of your meals and count the calories they contain.
- to improve the system by incorporating features for calculating additional parameters such as nutrition.
- reaching a weight-loss goal.
- Guidance on how to gain or lose weight based on calorie consumption.
- Send a reminder to the software.
- Data should be stored in databases.

6. Conclusion

The goal of this thesis is to provide consumers control over an intelligent, practical platform that allows them to accurately anticipate their calorie expenditure. To precisely compute the calories and include them in a webpage, we used a highly unique machine learning technique. Calorie restriction is becoming increasingly important in leading a healthy and active lifestyle. Trying to balance the diet and construct a healthy diet plan by maintaining track of the number of calories needed based on personal tastes can take a lot of time and effort.

A lot of intriguing, odd, and thrilling things happened while this was being developed as well. There was a better opportunity to improve the framework through effective demand gathering and project management. The ability to collaborate with other inventions and systems was critical. Because the present firm employed the same strategies, project management procedures were essential for developing professional experience. To summarise, this work has given me some fantastic skills that will come in helpful very soon.

Chapter-11 REFERENCE

APPENDIX A: REFERENCE

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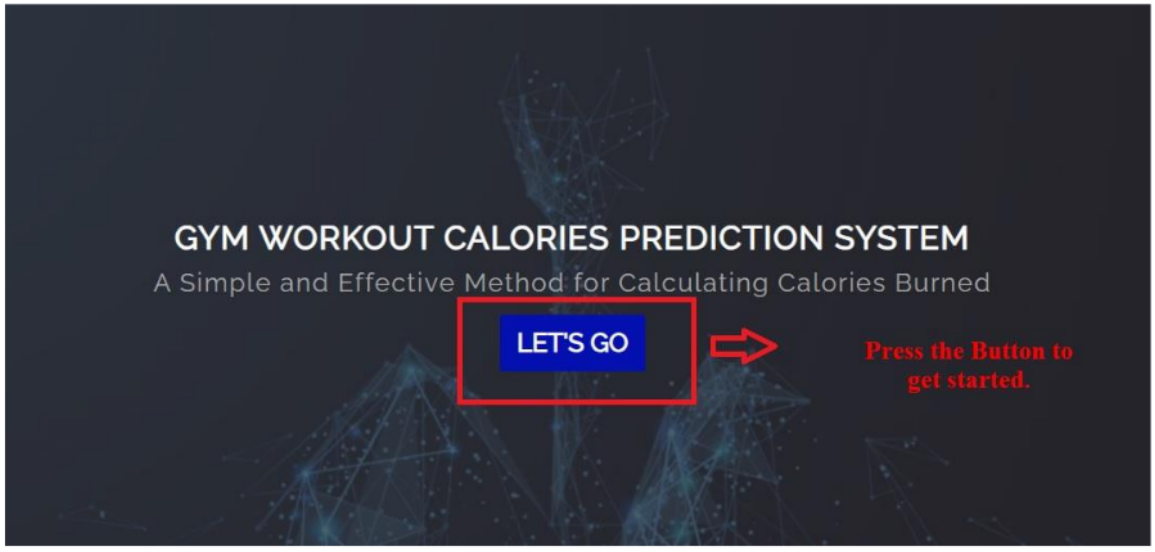
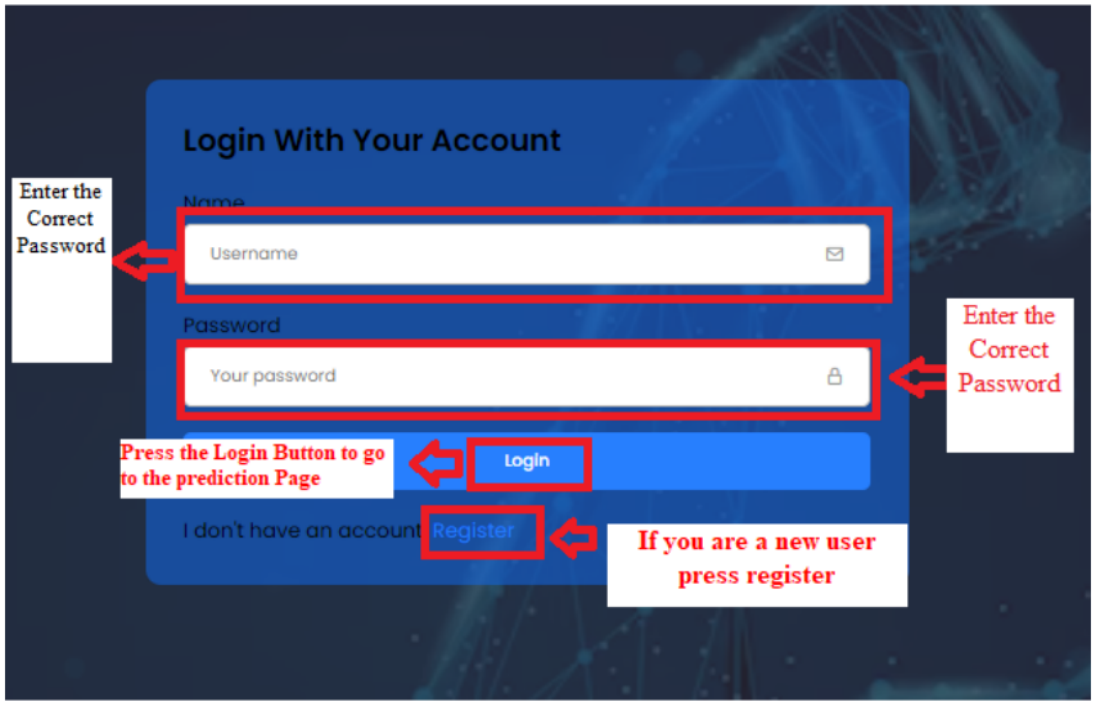
APPENDIX B: USER MANUAL






Register your account
Name
Username
Email
Email address
Password
Your password
Gender
Gender
Address
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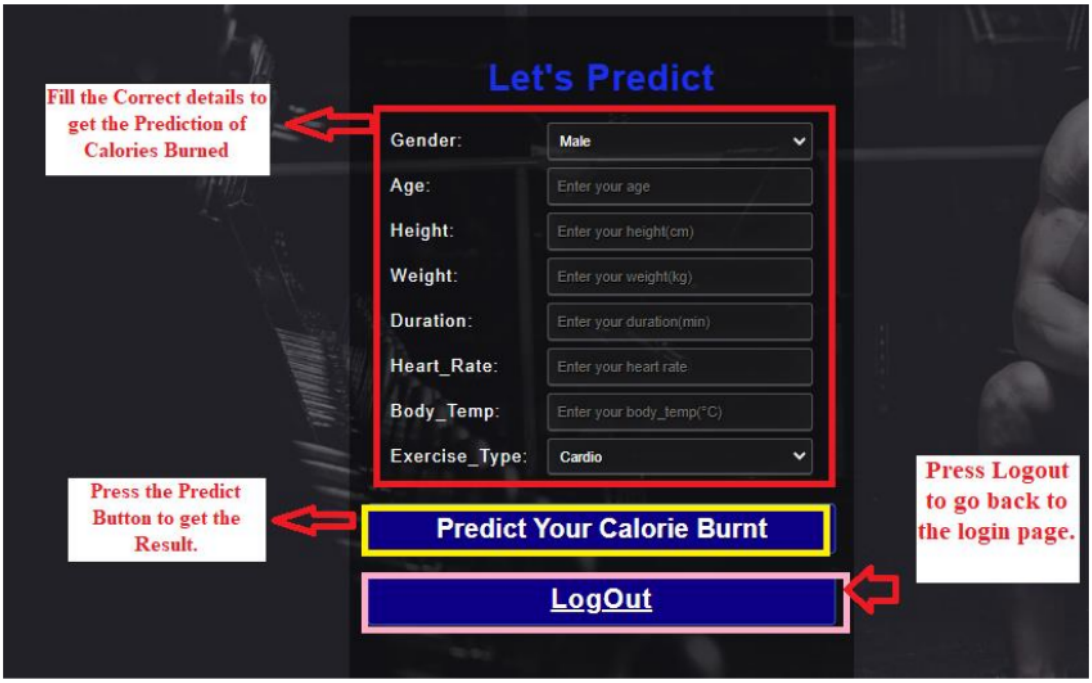
NIC
Phone Number
Phone number
Register
I already have an account Login
Enter the Correct Details to get Registered to the System
Press Register after Filling the Details to get your Account.
Press Login if you already have an account.


Let's Predict
Gender: Male
Age: Enter your age
Height: Enter your height(cm)
Weight: Enter your weight(kg)
Duration: Enter your duration(min)
Heart_Rate: Enter your heart rate
Body_Temp: Enter your body_temp(°C)
Exercise_Type: Cardio
Predict Your Calorie Burnt
LogOut
Fill the Correct details to get the Prediction of Calories Burned
Press the Predict Button to get the Result.
Press Logout to go back to the login page.


Your Calorie Burnt is 129.14
your predict result
Go Back
Press Back Button to go back to the Prediction Page

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