ASSISTANT AND HEALTH GUIDE POWERED BY ARTIFICIAL INTELLIGENCE

Submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering

By

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SCHOOL OF COMPUTING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Yuvaraj k (Reg.No - 39110441) and Luckyvarma K(Reg.No - 39110444)** who carried out the Project Phase-2 entitled **"ASSISTANT AND HEALTH GUIDE POWERED BY ARTIFICIAL INTELLIGENCE"** under my supervision from January 2023 to April 2023.

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DECLARATION

I, **Yuvaraj K(Reg.No-39110441),** hereby declare that the Project Phase-2 Report entitled **"ASSISTANT AND HEALTH GUIDE POWERED BY ARTIFICIAL INTELLIGENCE"** done by me under the guidance of **Dr.G.Kalaiarasi, M.E.,Ph.D** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

DATE: 20.04.2023

PLACE: Chennai **SIGNATURE OF THE CANDIDATE**

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management** of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

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ABSTRACT

People nowadays have no time to spend time in gym due to their hectic schedules, and even if they do locate a gym nearby, it is unlikely that they will have a gym trainer with them the whole time they are working out unless they hire a personal trainer. Both the gym membership and the services of a personal trainer are expensive, not everybody can afford them. With the current worldwide pandemic, many individuals are confined to their homes and unable to take the risk ofcontacting a trainer. When working out at the gym or doing yoga, it's important to maintain good posture to avoid injuries and pain. Poor posture during exercise can cause serious issues like misaligned joints, continued increased tensile force upon that spine, compressed discs and joints, decreased space for nerve impulses to travel through the body, decreased blood flow, and more. An intelligent fitness tracker that doubles as a personal trainer. Using an algorithm based on human posture assessment, it follows the user wherever they go. In turn, this helpsmaintain a log of workout reps. This means the user can work in a safe, injury-free position.

Index Terms – Mediapipe Pose Estimation Model, Body Mass Index

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ABBREVIATION	EXPANSION
BMI	Body Mass Index
VS Code	Visual Studio Code
CNN	Convolutional Neural Network
NMS	Non Maximum Suppression
COCO	Common Objects in Context
SDLC	Software Development Life Cycle

CHAPTER 1
INTRODUCTION

1.1 OVERVIEW

The application Gymifyme can identify the user's workout posture, count the user-specified repetitions, and provide the user with individualized, in-depth feedback on how to improve their body posture. If you don't have time to go to the fitness center but want to stay in shape, this artificial intelligence-powered exercise companion & workout guide could assist users to get in shape without leaving the house. To avoid long-term and short-term injuries by ensuring proper form throughout their workouts. In addition to a customized calorie limit for each day of the activityy, you'll also get a comprehensive health and nutrition plan tailored just to you. Medical coverage & policy information made available by the Indian administration to the general public is also shown inside the application, and eligibility may be verified using API & Website calls. In the present climate of epidemics & closure, being inside for prolonged amounts of time may become tiresome, particularly when most enjoyable events take place outside. But there is no reason to procrastinate.

Personal fitness coaches powered by artificial intelligence combine the individualized attention of a human trainer with the data-driven precision of machine learning. With this cutting-edge apparatus, users may obtain tailored training plans that take into account their current fitness levels, goals, and personal preferences. Biometric data from devices, data from fitness apps, and user input are just some of the many sources that may be used by this technology to construct information about the user's fitness condition and goals. With this knowledge, a person's exercise program may be tailored to their personal needs.
The fundamental objective of this effort is to enhance the effectiveness, ease, and enjoyment of exercise so that people may work out more often and effectively in their own homes. Virtual assistant has grown more integral to our everyday lives, to the point that they no longer exist independently. This artificial intelligence- based fitness trainer project is an effort to delve into this dynamic new field of research. Through this work, in this model the individualized Fitness Instructor, a desktop application that analyses exerciser's postures, counts their repetitions,

and offers advice on how to improve their form. Utilized MediaPipe's BlazePose app during exercise to identify the user's posture. pose will also be integrated

1.2 MOTIVATION

- To assist people who don’t get much time to visit a gym but are willing to work out at home in order to maintain their physical fitness and keep their bodies in good shape.
- To assist users while performing the exercises with correct posture and help them in preventing chronicle and immediate injuries.
- To motivate users to exercise in his/her own space and time without the need for any physical workout trainer.
- To bring awareness regarding a healthy diet and to keep a check on uncontrolled eating habits.
- To ultimately improve users’ lifestyles by engaging users in healthy exercise and eating habits.

CHAPTER 2
LITERATURE SURVEY

2.1 Inferences from Literature Survey

Several apps can be found in the app store that instructs the user on the workouts they should be doing. Our application, however, not only instructs the user on which exercise to do but also on how to stand properly while doing the exercise and how many times to repeat the motions. This app may be thought of as a workout partner since it offers both in-the-moment posture analysis and nutritional guidance. If the app's functionality is expanded, it might be utilized as intelligent instructors at fitness centers, minimizing the need for human instructors.

[1] Papandreou G, Zhu, L-C Chen T, Gidaris S, Tompson J, Murphy Google K, Inc. PersonLab: Person Pose Estimation and Instance Segmentation with a Bottom-Up, Part-Based, Geometric Embedding Model(20 NOVEMBER 2019)
Their objective was to provide a bottom-up approach for the activity of estimation of the pose of the user and real-time segmentation of the user while using images of the multi-person solution and by implementing an effective single-shot approach. So the idea they proposed used a CNN that is a convolutional neural network by training it to detect and classify the key points and accordingly give accurate results by studying the relative displacements and thus by clustering or identifying the group of different key points and studying the pose instances. Using single-scale inference, the model obtained a COCO accuracy of the points of 0.665 and 0.687 using multiple-level inference. Using part-based modeling. It depends on the key point level structure in order for training the real-time segmentation activity. In the future, there might be ways to overcome this limitation.

[2] Bazarevsky V, Grishchenko I, Raveendran K, Zhu T, Zhang F, Grundmann M, Inc. “BlazePose: On-device Real-time Body Pose tracking”. (17 June 2020)
Their objective was to create BlazePose, a mobile-optimized lightweight convolutional neural network architecture for human posture prediction. On a Pixel 2 phone, the network creates 33 body key points for a single individual during inference and operates at over 30 frames per second. This makes it ideal for real-

time applications such as fitness tracking and sign language recognition. Two of our most significant contributions are a novel body posture monitoring method and a lightweight body poses prediction neural network. Both approaches use heatmaps and regression to find the points. They built a robust technique to estimate the posture using Blazepose, which uses CNN and a dataset with up to 25K photos demonstrating distinct body endpoints, enhancing the accuracy. On a mobile CPU, this model runs in near real-time, and on a mobile GPU, it can run in super real-time. The given algorithm of 33 keypoint topology is efficient with BlazeFace and BlazePalm. In this paper, the authors have developed a system formajorly upper body key points. A solution that shows a lower-body analysis of the.

[3] Cao Z, Hidalgo G, Simon T, S-E Wei and Sheikh Y, “OpenPose: Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields “.(18 December 2018)
The researchers proposed an efficient solution mainly to tackle the multi-person problem while detecting poses when there are multiple people in the real-time frame. In this approach, the model is trained in such a way that it detects the points of the user and then segregates them based on the affinity of different points in the frame. This is considered as the bottom-up approach and is very efficient in accuracy and performance-wise without considering the number of people in the frame as the barrier. For the dataset considering 288 frame images, this approach performs well as compared to the other approaches discussed above by 8.5% mAP. The approach is able to get higher accuracy and precision in real time. The earlier solutions were redefined in the training stages. The disadvantage of OpenPose is it doesn’t return any data about the depth. and also needs high computing power. In the research paper

[4] Toshev A, Szegedy C, “DeepPose: Human Pose Estimation via Deep Neural Networks”.
This strategy included the introduction of estimators based on DNNs. As a result, they were able to forecast poses with greater accuracy. If this method is used, you'll see an overall efficiency boost.

[5] Taware G, Agrawal R, Dhende P, Jondhalekar P, Hule S, “AI-based Workout Assistant and Fitness guide”.(November 2021)

The authors suggest a system in which Fitcercise, a software that detects the user's workout stance, counts the prescribed exercise repetitions, and gives individualized, comprehensive advice on how the user may improve their form, is introduced in the study. The software detects a person's stance using the MediaPipe, then examines the mathematics of the pose and uses the database and actual video, and counts the number of repetitions of the workout.

[6] Bazarevsky V, Kartynnik Y, Vakunov A, Raveendran K, Grundmann M. “BlazeFace: Sub-millisecond Neural Face Detection on Mobile GPUs” (11 Jul 2019)

The model is trained using L2, loss for regression. This approach reasons about the pose in a holistic fashion, i.e., even if certain joints are hidden, they can be estimated if the pose is reasoned about holistically. The paper argues that CNNs naturally provide this sort of reasoning and demonstrate strong results.

[7]Zhang F,Bazarevsky V,Vakunov A, Tkachenka A,Sung G,Chang C.L, M.Grundmann. “MediaPipe Hands: On-device Real-time Hand Tracking.”(18 Jun 2020)

They proposed a real-time on-device hand tracking pipeline that predicts hand skeletons from a single RGB camera for AR/VR applications. The pipeline consists of two models: 1) a palm detector, 2) a hand landmark model.

[8] Kreiss S, Bertoni L, and Alah A,“Composite fields for human pose estimation” (2019)

propose a new bottom-up method for multi-person 2D human pose estimation that is particularly well suited for urban mobility such as self-driving cars and delivery robots. The new method, PifPaf, uses a Part Intensity Field (PIF) to localize body parts and a Part Association Field (PAF) to associate body parts with each other to form full human poses.

[9] Lin T Y, Maire M, Belongie M, Hays J, Perona P, Ramanan D, Dollar P, and Lawrence C ´ Zitnick, Title named as “Common Objects in Context” (2014).

They present a new dataset with the goal of advancing the state-of-the-art in object recognition by placing the question of object recognition in the context of the broader question of scene understanding. a detailed statistical analysis of the dataset in comparison to PASCAL, ImageNet, and SUN. Finally, they provide baseline performance analysis for bounding box and segmentation detection results using a Deformable Parts Model.

[10]“Stacked hourglass networks for human pose estimation” by Newell A, Yang K, and Deng J. In European conference on computer vision, pages 483–499. Springer, (2 Jan 2016).

This work introduces a novel convolutional network architecture for the task of human pose estimation. Features are processed across all scales and consolidated to best capture the various spatial relationships associated with the body. It shows how repeated bottom-up, top-down processing used in conjunction with intermediate supervision is critical to improving the performance of the network. They refer to the architecture as a "stacked hourglass" network based on the successive steps of pooling and upsampling that are done to produce a finalset of predictions. State-of-the-art results are achieved on the FLIC and MPII benchmarks outcompeting all recent methods.

[11] Ge L, Liang H, Yuan J, and Thalmann D, “Robust 3d hand pose estimation in single depth images: from single-view CNN to multi-view CNNs” (23 Jun 2016).

They propose to first project the query depth image onto three orthogonal planes and utilize the multi-view projections to regress for 2D heat maps which estimate the joint positions on each plane. The multi-view heat maps are then fused to produce the final 3D hand pose estimation with learned pose priors.

[12] Yi Lin T, Dollar P, Girshick R, He K, Hariharan B, and Belongi SJ “Feature pyramid networks for object detection” (2016).

In this paper, They exploit the inherent multi-scale, pyramidal hierarchy of deep convolutional networks to construct feature pyramids with marginal extra cost. A top-down architecture with lateral connections is developed for building high-level semantic feature maps at all scales. This architecture called a Feature Pyramid Network (FPN), shows significant improvement as a generic feature extractor in several applications

[13] Schroder M, Tkach A, Bouaziz S, Botsch M, and Pauly M. “Robust articulated-ICP for real-time hand tracking” by A.Tagliasacchi, In Computer Graphics Forum, volume 34 Wiley Online Library.(2015)

They present a robust method for capturing articulated hand motions in real time using a single-depth camera. Their system is based on a real-time registration process that accurately reconstructs hand poses by fitting a 3D articulated hand model to depth images.

2.2. OPEN PROBLEMS IN THE EXISTING SYSTEM

2.2.1 COMMON PROBLEMS

Lack of individualization: Many fitness systems are not personalized to the individual's specific needs, goals, and abilities. This can lead to suboptimal results, injury, or lack of adherence to the program.

Inaccurate tracking: Existing fitness systems may rely on sensors or wearable devices to track movement, but the accuracy of these devices is often questionable. This can lead to incorrect data, incorrect feedback, and lack of progress.

Limited exercise library: Many fitness systems offer a limited number of exercises, which can lead to boredom and lack of progress. This can also be an issue for people with specific fitness goals or medical conditions that require specific exercises.

Lack of feedback: Many fitness systems do not provide real-time feedback on exercise form and technique, which can lead to incorrect form and increased risk of injury.

Limited integration: Existing fitness systems may not integrate well with other technologies, such as virtual assistants or other smart home devices. This can limit the user's ability to receive real-time feedback and adjust their programaccordingly.

Limited scalability: Existing fitness systems may not be able to scale to accommodate larger user bases, which can lead to slower response times and decreased system performance.

Lack of motivation: Many fitness systems may not provide sufficient motivation for users to adhere to their exercise programs.

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

3.1.1 FEASIBILITY STUDIES

Technical feasibility: Check if all technologies planned can work together efficiently, ensure hardware and software requirements are met, and assess if the required skills are present or if an expert is needed.

Economic feasibility

Evaluate the cost of developing, testing, and deploying the project, estimate ROI, and determine if the project is financially feasible.

Legal and ethical feasibility

Ensure compliance with data privacy and security regulations and address ethical concerns, such as ensuring the fairness of the AI algorithms used.

User feasibility

Conduct a user survey to determine if the target audience finds the project useful and user-friendly, and test the user interface design to ensure it is intuitive and easy to use.

Performance feasibility

Conduct performance testing of the system to ensure it can handle the expected user load and provide the required level of performance, and measure the accuracy and reliability of the AI algorithms used.

Operational feasibility

Check if the project can be easily integrated into the existing infrastructure and workflow, and ensure that it can be maintained and updated easily.

Schedule feasibility

Estimate the project timeline, taking into account the development, testing, and deployment phases, and determine if the project can be completed within the expected timeline and if any resources need to be allocated to speed up the development process.

3.1.2 RISK ANALYSIS

Technical risks

Integration risks: There is a risk of integration issues between different components of the system, such as the CNN, Mediapipe, OpenCV, and pose estimation libraries. These issues may lead to bugs, delays, and potential failures.

Accuracy risks: There is a risk that the pose estimation and CNN components may not be trained properly, resulting in inaccurate fitness advice and guidance. This may lead to negative user experiences and damage to the project's reputation.

Performance risks: There is a risk that the system may not be able to handle large amounts of data or real-time processing. This may result in slow response times, which could negatively impact the user experience**.**

Security risks

Data security risks: The system may handle sensitive data, such as user personal information, health data, and images. There is a risk that this data may be vulnerable to hacking or unauthorized access, leading to privacy breaches and legal liabilities.

To mitigate these risks

- Conduct thorough testing and integration testing to ensure that all components work seamlessly together.
- Ensure that the pose estimation and CNN components are trained
- properly and tested for accuracy.
- Optimize the system's performance to handle large amounts of data and real- time processing.
- Implement strong data security measures, such as encryption and access controls, to protect sensitive user data.

3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

3.2.1 FUNCTIONAL REQUIREMENTS

Functional Requirements mainly deal with something that the system should do. They specify the behavior or function of the system. Our system has a function that exclusively works toward generating angles that body parts make while performing the exercise. The input will be the user performing an exercise in front of the camera which will be processed by our system.

The input then goes through the Mediapipe model which divides the real-time input into frames. The output given by the system will comprise the number of repetitions and audio instructions to perform the exercise precisely.

3.2.2 EXTERNAL INTERFACE REQUIREMENTS

User Interface

For the User Interface used HTML, CSS, Javascript, embedded JavaScript, Handlebars, and Bootstrap. The home screen will comprise various options of exercises to be performed. After clicking the button named 'exercise model' a camera opens up and is ready to work as a virtual trainer for the user.

Software Interface

For the software Interface used VS Code. It supports all the libraries related to Javascript.

3.2.3 NONFUNCTIONAL REQUIREMENTS

Performance Requirement

- The response time of the system is within acceptable limits.
- Only a single person should perform the exercise in front of the camera for high-accuracy results.

Software Quality Attributes

- The software is reliable as it can sustain under any given condition. It consistently gives correct results.
- It is maintainable in nature as new code can be easily added and integrated with the existing code.
- It is modular in nature therefore correcting defects also becomes feasible and cost-effective.

• It has the property of correctness as all the calculations are accurate and adhere to all the functional requirements. ● It can be tested with ease and is also flexible with modifications and upgrades.

3.2.4 DATABASE REQUIREMENTS:

Our database consists of 4 CSV files of food items, named breakfast, and lunch mediapipepipe model is trained on the Coco dataset.

3.2.5 SOFTWARE REQUIREMENTS:

- OS (Windows/Linux)
- 4Gb ram or above
- Javascript
- Visual Studio Code
- Libraries to be installed:
  - NumPy
  - Matplotlib
  - MediaPipe
  - OpenCV

3.2.6 HARDWARE REQUIREMENTS:

- Processor - Intel I5 core
- Speed - 3.20 GHz RAM - 8 GB (min)
- Hard Disk - 400GB
- Display Screen
- GTX or CUDA Nvidia Graphics Card

3.3 SYSTEM USE CASE

User Registration: The user registers with the system by creating an account and providing personal information such as name, age, gender, and fitness goals.

Workout Tracking: The system tracks the user's workouts using computer vision techniques such as MediaPipe, CNN, and NMS algorithm. The user can perform various exercises, and the system can provide real-time feedback and guidance based on the user's performance.

Customized Workout Plans

Based on the user's fitness goals, physical abilities, and exercise preferences, the system generates customized workout plans. These plans may include a variety of exercises, such as cardio, strength training, and stretching.

Personalized Recommendations

The system provides personalized recommendations based on the user's progress, performance, and feedback. For example, if a user is struggling with a particular exercise, the system may suggest modifications or alternative exercises.

Progress Tracking

The system tracks the user's progress over time, including fitness metrics such as heart rate, calories burned, and muscle activation. This allows the user to monitor their progress toward their fitness goals and adjust their workout plansaccordingly.

Virtual Personal Trainer

The system can act as a virtual personal trainer, providing personalized guidance and feedback to the user during their workouts. This may include real-time voice or visual cues to help the user maintain proper form, adjust their intensity level, or switch between exercises. The virtual personal trainer can also provide personalized workout recommendations based on the user's fitness goals, abilities, and performance. This feature can help users stay motivated and engaged with their workouts, while also providing a level of personalized attention typically only available with an in-person personal trainer.

User Feedback and Ratings: The system allows users to provide feedback and ratings on their workouts, exercises, and overall experience. This feedback is used to continually improve the system and provide a better user experience.

Integration with External Apps

The system may integrate with external apps, such as fitness tracking apps or social media platforms, to enhance the user experience and provide additional functionality.

Data Analytics and Reporting

The system may provide data analytics and reporting capabilities, allowing users to track their progress and compare their results to others in the community. This data can also be used to improve the system's accuracy and precision over time.

Personalized Nutrition Plans

In addition to workout plans, the system can provide personalized nutrition plans based on the user's fitness goals, dietary restrictions, and preferences. The system may integrate with external nutrition tracking apps or provide its own tracking capabilities to help users monitor their food intake and stay on track with their nutrition goals.

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

4.1. SELECTED METHODOLOGY OR PROCESS MODEL

4.1.1 SDLC Model:

The incremental SDLC model is the one we've used while working on this project.

Requirement collection and analysis requirements

In this step, the analyst gathers and examines customer needs to determine whether they can be satisfied. Analyzers decide whether a need can be addressedwithin a certain budget.

Design

Flowcharts, use case graphical representations, sequence diagrams, case diagrams, transition probability diagrams, and other diagrams are all produced by the design team during the design phase.

Implementation

In this step, the requirements are converted into computer programs, often known as software, using the proper coding language. Probability maps, among other things.

Testing

After the implementation phase, the programme is tested using various test methodologies and testing equipment. It uses techniques including white-box,black-box, and grey-box testing.

Deployment

The software is integrate After carrying out the aforementioned actions, the software is integratedd after implementing the above steps.

Review

The behaviour of the implemented product is examined during the review phase, which follows the software deployment. The SDLC procedure is started over from scratch if any faults are found.

Maintenance

Once the programme has been implemented in the workplace, there can be a few flaws or errors in this phase. Additionally, the client might need fresh updates to the product.

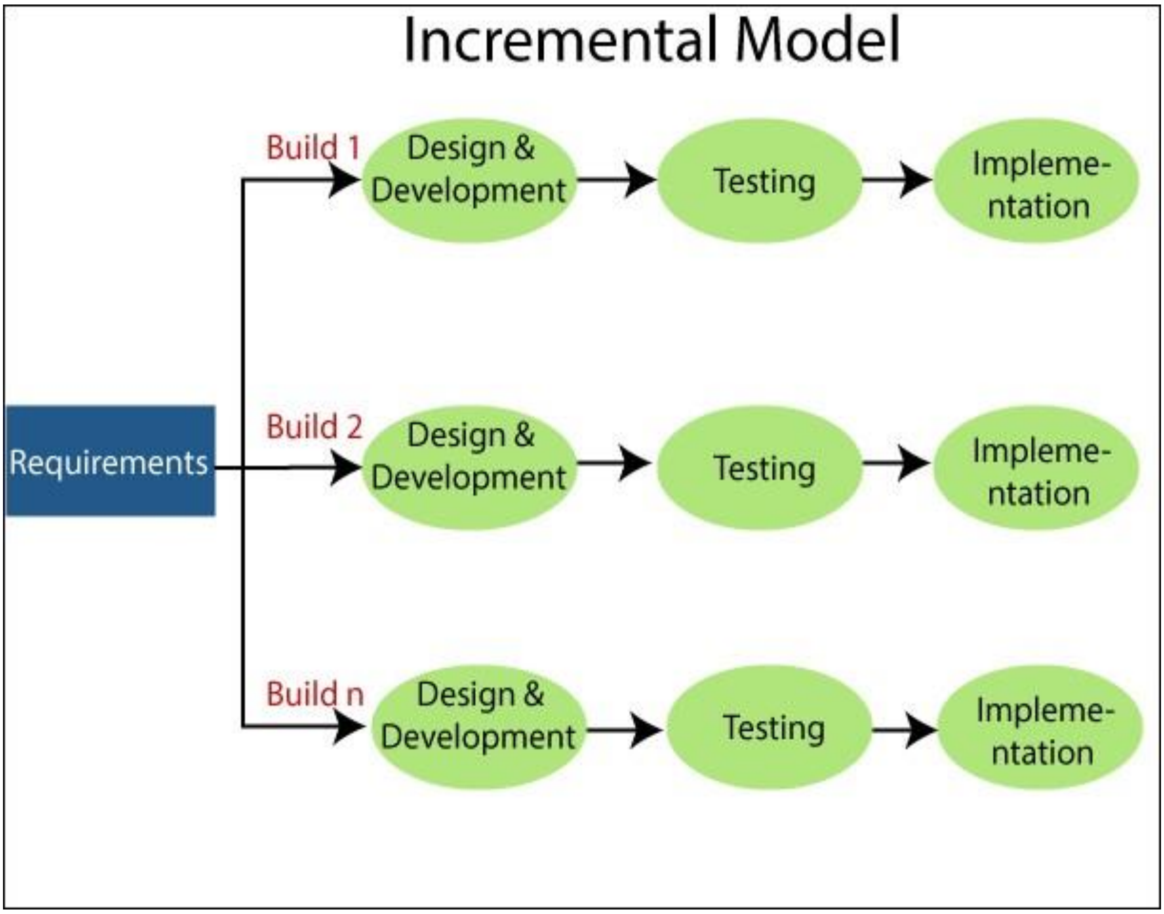

Fig: 4.1: increment model

4.2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM

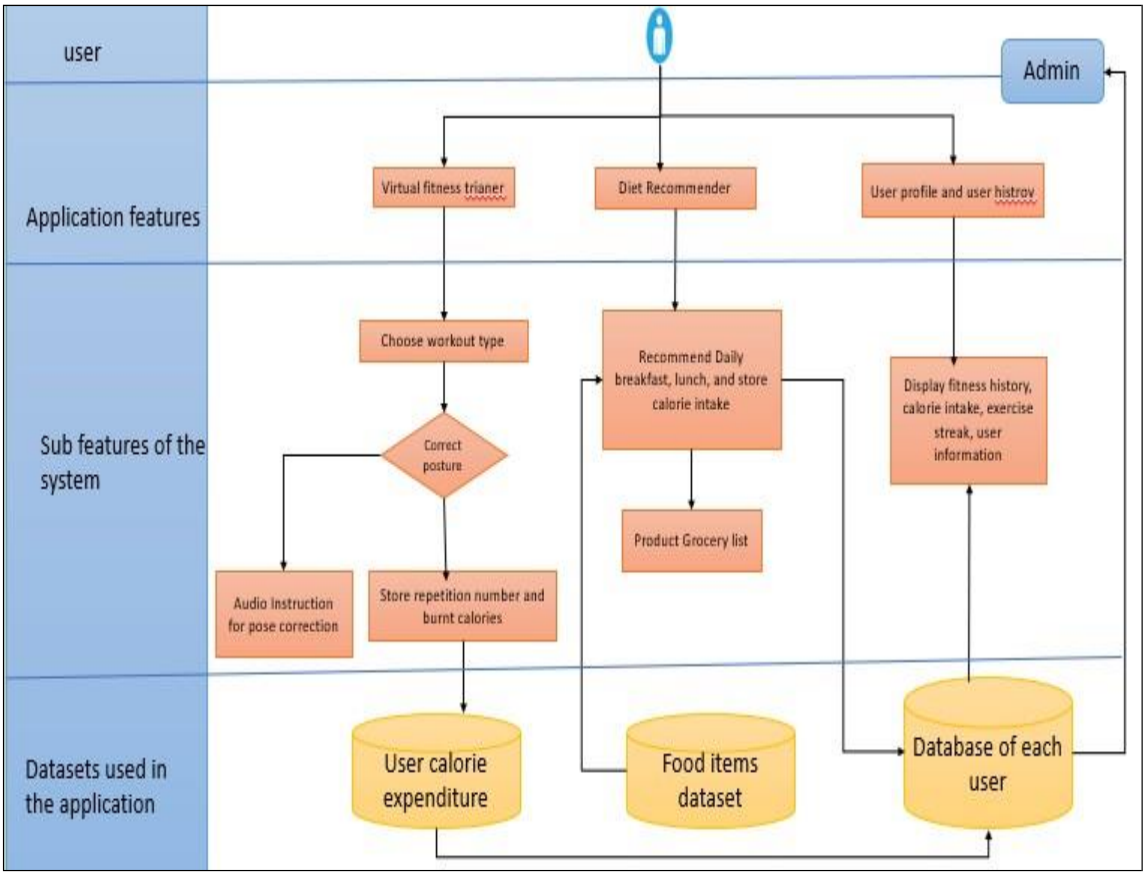

Fig: 4.2: Architecture diagram

The application has three functionalities. The user selects a certain activity to complete using the Virtual Fitness Trainer feature, which is the first feature. The system will record the number of times the exercise is repeated if it is done correctly; otherwise, it will create voice instructions for position correction. The second function is called Diet Recommender, and it suggests daily meals for breakfast, lunch, and supper depending on the user's current BMI, with the goal of achieving a normal BMI. It also stores the user's calorie intake in order to monitor their eating patterns. The third feature is User Profile and User History, which shows the user's progress over time in terms of repetitions completed and calories consumed.

4.2.1 Mathematical Model

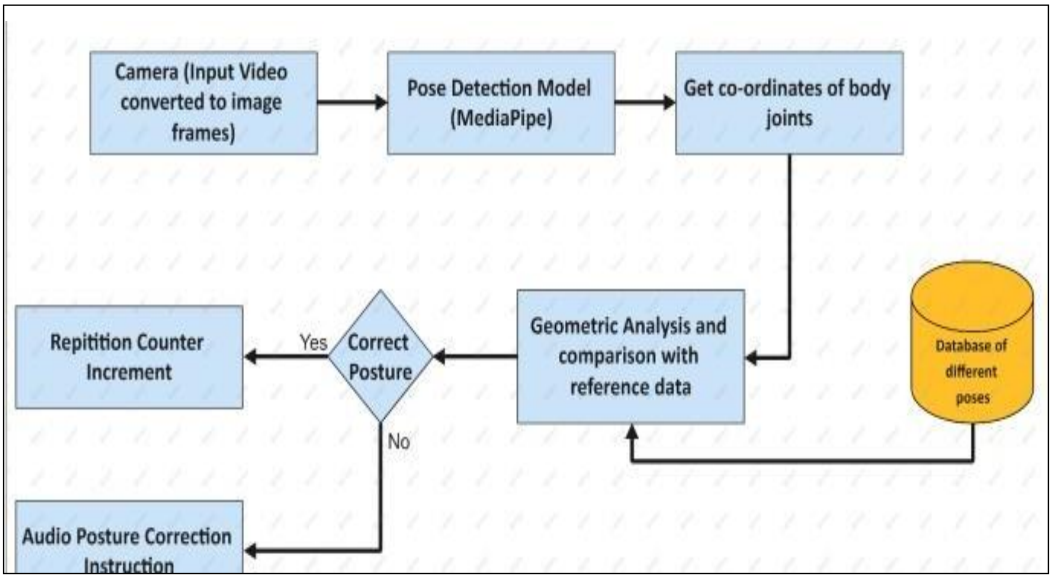

Fig: 4.3: Mathematical Model

Equation To Find The Angle Between Any Three Points

- Assume the points to be L, M, R
- First calculate the length of segments formed with three points i.e. LM, MR, LR.
- Assuming the angle to be calculated is LMR, use the below formula:
  - acos((LM*LM + MR*MR – LR*LR) / (2*LM*MR))
- This equation gives the angle in radians. to convert that into degrees, use:
  - LMR*180/π

4.2.2 Data Flow Diagram:

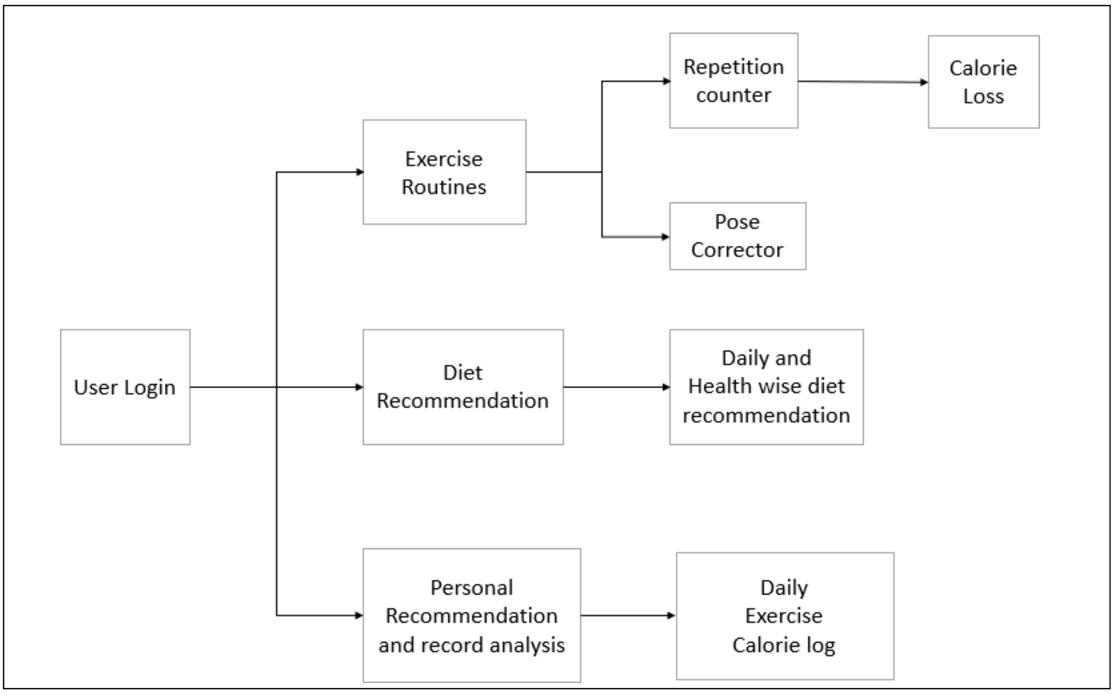

Fig: 4.4: Data Flow Diagram

The Exercise Routines category has two subcategories: Repetition Counter and Calorie Counter. The Repetition Counter subcategory allows users to input the number of repetitions they perform for each exercise during their workout, and the Calorie Counter subcategory lets users track the number of calories they burn during their workout.

The Diet Recommendations category also has two subcategories: Daily and Health-Wise. The Daily subcategory provides users with recommended daily calorie intake and suggestions for healthy food choices, while the Health-Wise subcategory provides users with recommendations for specific dietary requirements based on their health conditions.

The Personal Recommendations and Record Analysis category has one subcategory: Daily Exercise Calorie Log. This subcategory allows users to log their daily exercise routines and track the number of calories they burn during each workout. This information can then be used to provide personalized recommendations and analysis based on the user's exercise and calorie intake habits.

4.2.3 UML Diagram

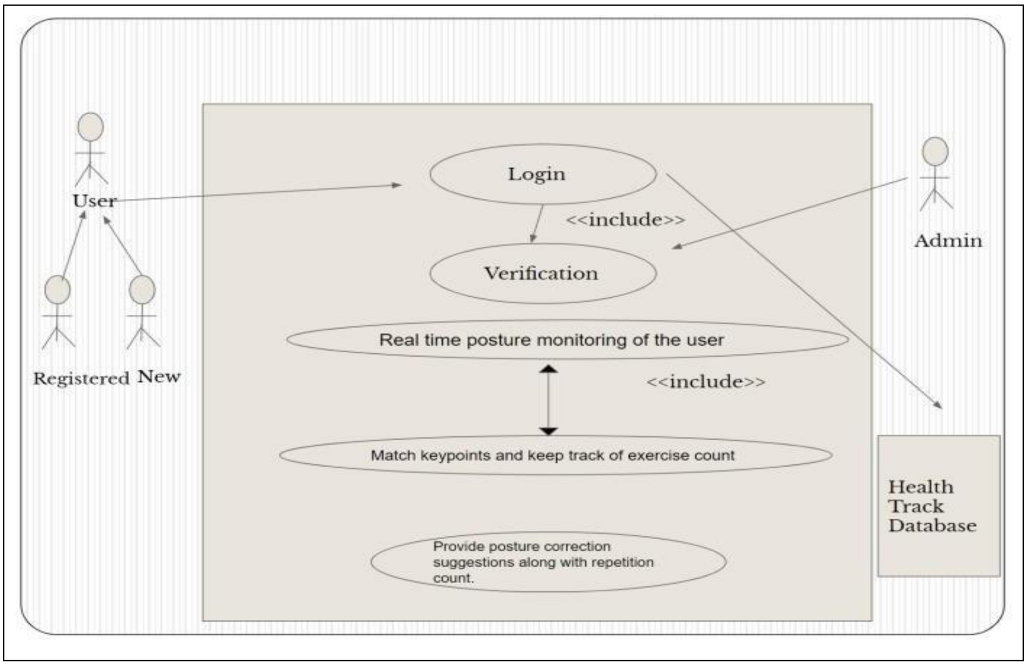

Fig: 4.5: UML Diagram

Real-Time Posture Monitoring

User needs to perform the exercise in front of a camera, the camera then captures the real-time video of the user, which is then converted into frames when passed through mediapipe pose estimation model.

Matching Keypoints

The media pipe model then extracts coordinates of constrained body points from the frames generated and with help of computations calculates the angle formed between those points.

Counter

If the angle calculated matches the universal angle for that particular exercise, the application increases the count of repetitions.

Posture Correction

If the angle doesn't match, then the application generates audio instructions for pose correction

4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

We have used JavaScript node JS and different libraries such as Open CV and MediaPipe which is a library using ML algorithms along with different numerical algorithms.

The MediaPipe pose estimation tool uses a 33 key points approach wherein it detects the key points and accordingly uses and studies the data set to estimate the pose. It tracks The pose from the real-time camera frame or RGB video by using the blaze pose tool that has a Machine Learning approach in pose detection.

This approach uses a double-step tracker machine learning pipeline which isefficient in media pipe solutions. Using the tracker locates the region of interest of the activity or posture in the real-time video. It then predicts the key points in the region of interest using the real-time video frame as an input. But the point to be noted is that the tracker is invoked only during the start or whenever the model is unable to detect the body key points in the frame.

This model basically first detects the landmark positions on the body in the video with the help of MediaPipe. Then the angle between the points is calculated and a range is determined. This range can be demonstrated by a 0-100 % efficiency bar on the output video frame. Also, calculate the number of repetitions of the exercise and display the count in the output video.

Formula for calculating angle formed by 3 points: Angle = math.degrees(math.atan2(y3-y2,x3-x2)- math.atan2(y1-y2,x1-x2))

In the output following data is displayed: fps rate, counter for repetitions, landmark points, the angle between landmark points and status bar.

This project can be implemented on pre-recorded videos as well as in real-time through a webcam.

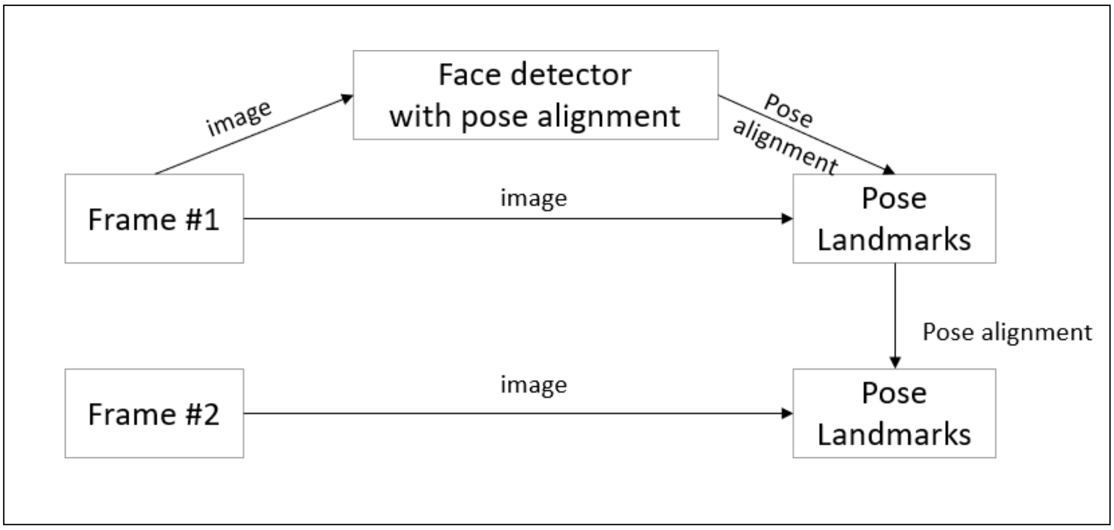

Fig: 4.6: Inference Pipeline

4.3.1 Neural Network Architecture

The estimator in our application first estimates the position of the 33 key points of the user and later utilizes the user alignment. Utilize the combination of heatmap and the regression way. In the training model, utilize the above approaches and then prune the resultant layers from the test model. Used the heatmap to analyze the lightweight integration and used it with the encoder. The solution is inspired by the Stacked Hourglass solution[12]. Used skip connections in all levels in order to get a balance in higher and lower characteristics. The slopes or the gradients werenot going back to the heatmap in the train set model. For their last post-processingstage, the bulk of current object identification methods use the Non-Maximum Suppression (NMS) algorithm. For hard objects with minimal degrees of freedom, this method works effectively. This algorithm, however, fails in cases that feature highly articulated human postures, such as individuals waving or hugging. This is because the NMS algorithm's intersection over union (IoU) criterion is satisfied by several, confusing boxes. Refer to Fig 3 for the System Implementation plan

Implementation flow

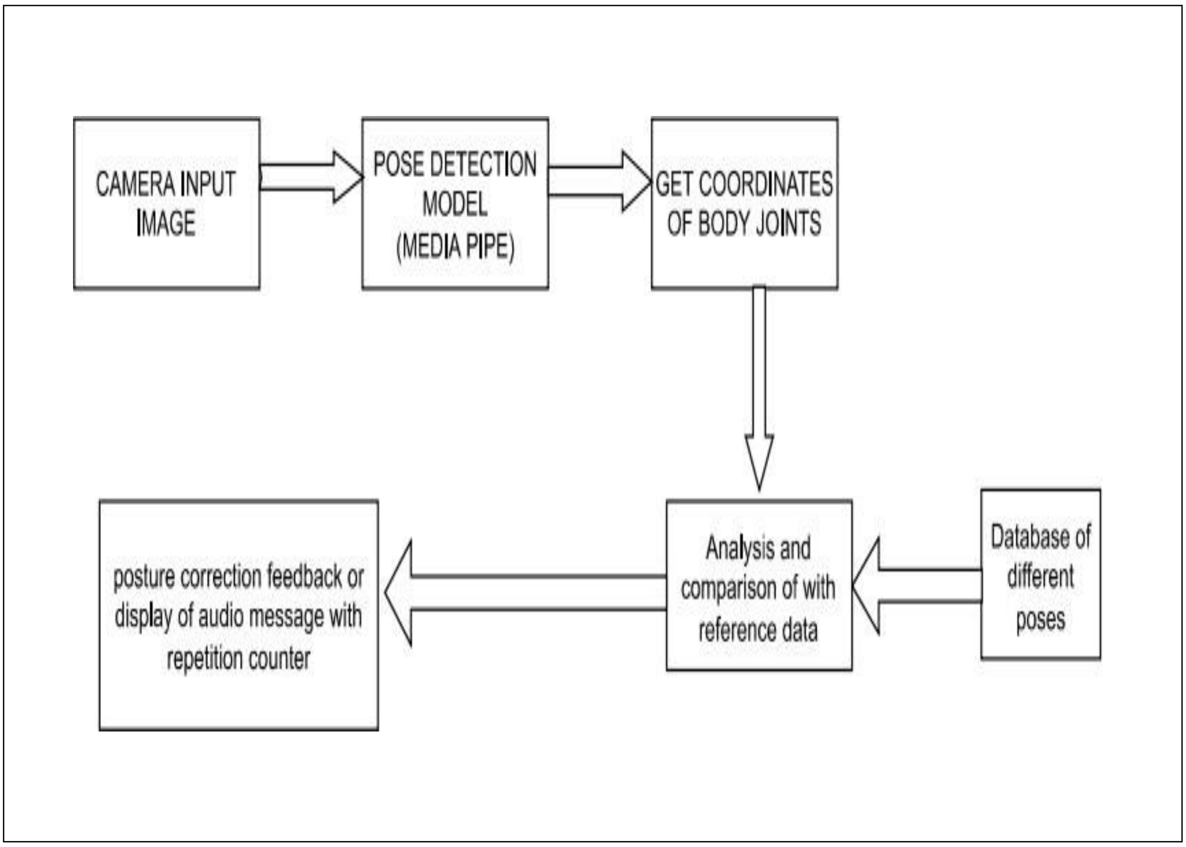

Fig: 4.7: System Implementation Plan

4.3.2 Mathematical Modeling Of CNN Model: Kernel Convolutional

It's a method in which take a small matrix of numbers (known as a kernel or filter), apply it to our image, and then transform it using the values from the filter. The feature map values are determined using the formula below, where f denotes the input picture and byh denotes our kernel. The indexes of the result matrix's rows and columns are denoted by mand n, respectively.
After applying the kernel to the input image, the resulting feature map will typically have reduced dimensions due to the use of a smaller filter.

This technique is widely used in Convolutional Neural Networks (CNNs) for tasks such as image recognition and object detection.

$$G[m,n] = (f * h)[m,n] = \sum_j \sum_k h[j,k] f[m-j, n-k]$$

Relu:

$$\mathrm{ReLU} = \begin{cases} 0, & \text{if } x < 0, \\ x, & \text{if } x \geq 0. \end{cases}$$

Softmax:

$$o_i = \frac{e^{z_i}}{\sum_{i=1}^{M} e^{z_i}}$$

Padding:

$$o_i = \frac{e^{z_i}}{\sum_{i=1}^{M} e^{z_i}}$$

Output Matrix Dimension:

$$n_{out} = \left\lfloor \frac{n_{in} + 2p - f}{s} + 1 \right\rfloor$$

Resultant Tensor After Multiple Filters:

$$[n, n, n_c] * [f, f, n_c] = \left[\left\lfloor \frac{n + 2p - f}{s} + 1 \right\rfloor, \left\lfloor \frac{n + 2p - f}{s} + 1 \right\rfloor, n_f \right]$$

Activation:

$$\mathbf{Z}^{[l]} = \mathbf{W}^{[l]} \cdot \mathbf{A}^{[l-1]} + \mathbf{b}^{[l]} \qquad \mathbf{A}^{[l]} = g^{[l]}(\mathbf{Z}^{[l]})$$

Backpropagation:

$$\mathbf{dA}^{[l]} = \frac{\partial L}{\partial \mathbf{A}^{[l]}} \quad \mathbf{dZ}^{[l]} = \frac{\partial L}{\partial \mathbf{Z}^{[l]}} \quad \mathbf{dW}^{[l]} = \frac{\partial L}{\partial \mathbf{W}^{[l]}} \quad \mathbf{db}^{[l]} = \frac{\partial L}{\partial \mathbf{b}^{[l]}}$$

$$\mathbf{dZ}^{[l]} = \mathbf{dA}^{[l]} * g'(\mathbf{Z}^{[l]})$$

$$\mathbf{dA} += \sum_{m=0}^{n_h} \sum_{n=0}^{n_w} \mathbf{W} \cdot \mathbf{dZ}[m,n]$$

Fig: 4.8: Mathematical Model of CNN

4.4. PROJECT MANAGEMENT PLAN

4.4.1 RISK MANAGEMENT

Risk Identification

Risk is an inherent and inextricable aspect of the software development process, and it changes with time, influencing the project, the product, or both. As a result, dealing with and managing these risks in an efficient and effective manner becomes critical. The challenges and threats that a machine learning application produces are frequently more serious than the cause. Risks should be identified and managed as early as practicable in the project. Risk assessment occurs throughout the project life cycle, with a special emphasis on key milestones.

One of the main issues discussed at regular project status and reporting meetings is risk identification. Some risks are obvious to the project team—known risks; others require more investigation but are nonetheless predictable. The risk register, which is housed in the central project server, is the medium for storing all detected risks during the project.

Risk Analysis

Risk analysis entails determining how the risk occurrence will affect the project's outcomes and objectives. Once the risks have been identified, they are examined to determine the risk's descriptive and analytical impact on a project so that suitable mitigation measures may be performed.

Overview of Risk Mitigation, Monitoring, Management

Risk mitigation is a technique for a data center to prepare for and mitigate the consequences of risks. Risk mitigation, like risk reduction, aims to lessen the negative consequences of risks and catastrophes on business continuity. Cyber-attacks, weather occurrences, and other sources of physical or virtual harm to a data center are all potential threats to a corporation.

Risks must be reviewed on a frequent basis for the group to re-evaluate every threat to see whether new conditions have changed their probability or effect.

Table 4.1: Risk Analysis

Risk ID	Risk	Description	Impact(Low /High)
1.	Inputs in the wrong format.	Input with a format other than the supported format can result in inaccurate results	High
2.	Incorrect Result	Incorrect results can reduce the accuracy of the model	High

4.4.2 PROJECT SCHEDULE

Project Task Set

The following are major project tasks:

Task 1: Requirement Analysis (Base Paper Explanation).

Task 2: Project Specification (Paperwork).

Task 3: Technology Study and Design.

Task 4: Coding and Implementation (Module Development).

Task Network

Because of their order, specific roles, and subtasks have interrelations. A work system is a visual depiction of a project's task flow. Project tasks and their dependencies are noted.

TEAM ORGANISATION

Team Structure

Guide name: Dr.G.Kalaiarasi ME., Ph.D.,

Members: Yuvaraj Kanchana

Kandimalla Luckyvarma

Management and communication

The first five weeks were spent in searching and exploring the domain and project topics followed by a literature survey and the formation of problem definition. Within the span of two to three weeks, we were able to identify the exercises that would be useful for our idea demonstration and would be feasible to develop.

The next month was spent selecting the proper pose estimation model. In this, we tried various pose estimation models that would give proper accuracy and track posture correctly to its maximum potential. The next three weeks were spent on implementing and testing the correct module in VS Code. The next seven weeks were spent on designing, implementing, and testing the repetition counter module in javascript using VS Code. The next four weeks were spent analyzing the system and designing test cases to uncover defects in the system. The last two weeks were spent on the documentation.

4.5 FINANCIAL REPORT ON ESTIMATED COSTING

The cost estimation for the project includes the following hardware and software components: VS Code, which is an open-source software, and one copy of the Windows 10 operating system, for which the cost is not specified. Therefore, the total cost is estimated to be 0.0/-.

Table 4.2 : Estimated cost

S.no	Hardware/Software	Quantity	Cost
1	VS Code	1	Open Source
2	Windows 10 OS	1	-
		Total	0.0/-

4.6 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

The purpose of this transition/software to operations plan is to outline the strategy and procedures for the successful transition of the AI-based workout assistant and fitness guide project from development to production. The objective of the plan is to ensure that the system runs smoothly in production and meets the needs of end-users.

Stakeholder Analysis: The stakeholders involved in the transition/software to operations process include the development team, operations teams, project managers, and end-users. The development team will be responsible for ensuring that the system is fully tested and validated before deployment. The operations teams will be responsible for ensuring that the infrastructure and deployment are properly configured and maintained. Project managers will be responsible for overseeing the transition process, and end-users will be responsible for using the system in production.

Transition Strategy

The transition strategy will involve a phased approach, with each phase focusing on specific tasks and milestones. The first phase will involve setting up the infrastructure, including the servers, databases, and networks. The second phase will involve deploying the system to production, including the installation of software and configuration of the environment. The third phase will involve testing and validation of the system in production, including monitoring performance and addressing any issues that arise.

Infrastructure and Deployment

The infrastructure for the system will include servers running on the cloud platform and databases for storing user data. The deployment will be done using a containerization technology such as Docker, which will allow for easier management and deployment of the system. The system will be configured using HTML and CSS to ensure a user-friendly interface.

Operational Procedures

The operational procedures for the system will include backup and recovery procedures, disaster recovery procedures, security procedures, and maintenance procedures. These procedures will be designed to ensure the system runs smoothly and securely in production. The team will also establish monitoring and logging procedures to ensure that any issues are identified and addressed quickly.OpenCV and MediaPipe will be used to analyze user movements and provide real-time feedback to users.

Training and Support

The team will develop training materials and provide training sessions for end- users to ensure that they understand how to use the system. The team will also establish a helpdesk support system to provide assistance to end-users who experience issues or have questions.

Metrics and Reporting

The team will establish metrics for uptime, response time, error rates, and other key performance indicators (KPIs) to monitor the system's performance in production. The team will also establish a reporting system to provide regular updates on the system's performance to stakeholders.

Change Management

The team will establish procedures for managing changes and updates to the system in production. This will include testing and validation procedures, as well as procedures for rolling out updates and new features to end-users. The system will utilize the CNN and NMS algorithm to continuously improve its accuracy and provide more personalized recommendations to users.

Conclusion: This transition/software to operations plan outlines the strategy and procedures for the successful transition of the AI-based workout assistant and fitness guide project from development to production. The plan will ensure that the system runs smoothly in production and meets the needs of end-users. The team will regularly review and update the plan as necessary to ensure that the system remains up-to-date and effective.

CHAPTER 5
IMPLEMENTATION DETAILS

5.1 DEVELOPMENT AND DEPLOYMENT SETUP

The implemented system works in 3 stages:

i. Virtual Fitness Trainer

ii. Diet Recommender

iii. User Profile and User History

5.1.1 Tools and Technologies Used

JAVASCRIPT

JavaScript is a scripting or programming language that helps to update and change HTML and CSS by calculating, manipulating, and validating data. It is adaptable and always improving because it is open-source. It's the third tier of a cake of standard web technologies, the other two being HTML and CSS. One of JavaScript's strongest qualities is its inherent simplicity and readability, whichmakes it an ideal language for beginners. It has simple and clear grammar,making it easier to learn than most other languages.

It also aids in the presentation of real-time content updates, interactive maps, dynamic 2D/3D visuals, scrolling video jukeboxes, and other features.

Advantages:

- A feature to validate user input before redirecting the page to the server. This maintains server traffic, which in return put less load on the server.
- We can create interfaces that react when we hover over them with a mouse or trigger them via the keyboard. to give an easy interface to the user.
- Open source and community development

- Use JavaScript to include drag-and-drop, sliders
- Easy to learn
- High-level language
- Portable and Interactive
- Portable across Operating systems

HTML

The most basic component of the Internet is HTML (Hypertext Markup Language). It determines how web material is structured and what it means. Other technologies are frequently employed to describe a web page's appearance/presentation (CSS) or functionality/behavior (JS) (JavaScript). Links that connect online pages within a single website or between websites are referred to as "hypertext." Links are an essential component of the Internet. By submitting material to the Internet and linking it to other people's pages, you become an active participant in the World Wide Web.

CSS

CSS (Cascading Style Sheets) is a language for describing the appearance of HTML documents. CSS specifies how elements should appear on a screen, on paper, or in other mediums.

5.2 ALGORITHM DETAILS

The algorithm uses a combination of computer vision and mathematicalcalculations to determine the user's posture during exercise. The system uses the Mediapipe model, which is a machine learning framework for building multimodal (eg. video, audio, etc.) applied machine learning pipelines.

The Mediapipe model provides a set of predefined points, known as the constraint points, that are used to calculate the distance or angle between them. These constraint points vary depending on the exercise being performed. For example, if the user is performing a squat, the system will use different constraint points than if they were performing a push-up.

Once the system obtains the coordinates of the user's body joints, it uses the given formula to calculate the angle between the three points, L, M, and R. If the calculated angle is within a certain range, the system considers the user's posture to be correct and increases the count of the exercise. However, if the calculated angle is outside the range, the system triggers an audio pose correction instruction, guiding the user to adjust their posture accordingly.

Overall, the algorithm is designed to be flexible enough to accommodate a variety of exercises, while still providing accurate and reliable feedback to the user. This helps ensure that the user is performing each exercise correctly and efficiently, minimizing the risk of injury and maximizing the benefits of the workout.

acos((LM*LM + MR*MR – LR*LR) / (2*LM*MR)) ○ This equation gives the angle in radian. to convert that into degrees, use LMR*180/π

- Perform Geometric Analysis and Comparison with reference data.
- If posture is correct, increase the count of exercise.

Else, trigger audio pose correction instruction.

Repeat the above algorithm while performing other exercises

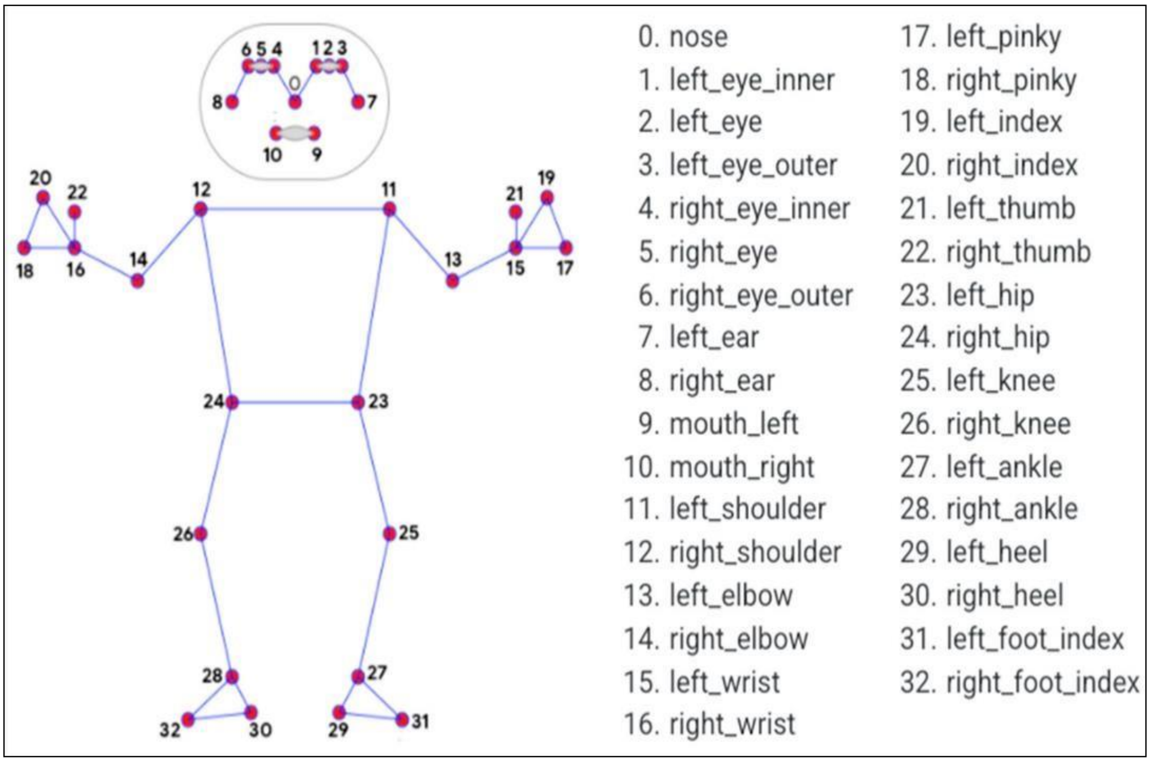

Fig: 5.1: Landmarks in Mediapipe

Advantages of BlazePose:

On a mobile CPU, this model runs in near real-time, and on a mobile GPU, it may run in super real-time. It can be used as a foundation for later hand position and face geometry estimation models because its 33 key-point topology is compatible with BlazeFace and BlazePalm.

5.2.1 NMS ALGORITHM

The steps involved in the NMS algorithm are:

1. Sort the bounding boxes based on their confidence scores in descending order.
2. Select the bounding box with the highest confidence score and remove it from the list of remaining boxes.
3. Compare the remaining boxes with the selected box and remove the boxes that have a high overlap with the selected box.
4. Repeat steps 2-3 until all the boxes have been processed.

The Diet Recommendation

- Food dataset is taken from Kaggle.
- Calories are calculated for all the recipes present in the food dataset by using selenium to search for the calories on the Nutritionix website.
- This dataset is separated into breakfast, lunch, snacks, and dinner and used to recommend required meals to users based on the user's intake of calories.

5.3 TESTING

5.3.1 All Types of Testing

Unit Testing

The testing of a single unit or a collection of related units is known as unit testing. It belongs to the category of white box testing. It is frequently used by programmers to ensure that the unit they have created is providing the intended output in response to provided input.

Integration Testing

Integration testing is when a set of components is put together to achieve a result. If software/hardware elements have any relationship, integration testing is used to examine the interaction between them. It might be classified as both white box and black box testing. There are two tests underneath it. These include: a)From top to bottom and (b)From the bottom up. From top to bottom, The system is separated into distinct modules in this way. Each module is thoroughly examined. From the bottom up: Every module is independently tested in this sort of testing, and then all modules are combined at the end.

Functional Testing

Functional testing ensures that the provided functionality in the requirement specification is operational. It belongs to the category of black-box testing.

Stress Testing

Stress testing is used to determine how a system performs under adverse situations. Testing is carried out beyond the standards' boundaries. It belongs to the category of black-box testing.

Performance Testing

Performance testing is used to evaluate a system's speed and efficacy, as well as to ensure that it produces results within a set time frame, as defined by performance criteria. It belongs to the category of black-box testing.

Usability Testing

Usability testing is done from the client's perspective to see how user-friendly the interface is. How easy is it for the client to learn? How well can the customer perform after understanding how to utilize it? How enjoyable is it to utilize the design? This is referred to as black-box testing.

Acceptance Testing

Customers frequently do Acceptance Testing to check that the supplied product satisfies their needs and performs as expected. It belongs to the category of black-box testing.

5.3.2 Test Cases and Results

System testing is used to identify and correct faults. Testing is the practice of attempting to find all possible flaws or weaknesses in a work product. It allows you to test the functionality of individual components, subassemblies, assemblies,and/or a whole product. It is the act of testing software with the goal of improvingit. The software system meets its requirements and user expectations, and it does not fail in a way that is unacceptable. There are many different types of tests. Eachtest type is designed to fulfill a distinct testing need

Table 5.1: Testing

Test case id	Test Case	Expected Result	Actual Result	Status
1	Perform exercise button clicked	Camera Window opens	Camera window opens	Passed
2	Play button is clicked to enable repetition counter	Counter increases if exercise performed precisely	Counter increases if exercise performed precisely	Passed
	Exercise is Performed inappropriately	Audio instruction for pose correction	Audio instruction for pose correction	Passed
3	User clicks perform exercise button	Camera Window opens	Camera Window opens	Passed
	User performs a different exercise	No result	No result	Passed

Table 5.2: Functional Testing

Test case id	Test case	Expected Result	Actual Result	Status
1	Perform exercise button clicked	Camera Window opens	Camera window opens	passed
2	The user clicks on the tutorials button	Tutorial for particular exercises opens	Tutorial for particular exercises	passed
	The user clicks on the stop button	Counter stops	Counter stops	passed
	Check the user profile and history	The performance of the user is displayed on the dashboard	The performance of the user is displayed on the dashboard	passed

The system was subjected to several test cases to ensure its functionality and usability. In Test Case 1, the "Perform exercise" button was clicked, and the expected result was for the camera window to open. The actual result was that the camera window did indeed open, indicating that this test case passed.

In Test Case 2, the user clicked on the "Tutorials" button, and the expected result was for the tutorial for a particular exercise to open. The actual result was that the tutorial for the particular exercise did open, indicating that this test case passed.

In the next test case, the user clicked on the "Stop" button, and the expected result was for the counter to stop. The actual result was that the counter did stop, indicating that this test case passed.

Finally, in the last test case, the system was tested to check the user's profile and history. The expected result was for the performance of the user to be displayed on the dashboard. The actual result was that the performance of the user was indeed displayed on the dashboard, indicating that this test case passed as well. Overall, these test cases demonstrate that the system is functional and performs as expected.

Table 5.3: Non Functional Testing

Test Case Id	**Component Test Case**	**Test Case**	**Expected Result**	**Actual Result**	**Status**
1	Front end	Header of the web	Present	Present	Passed
		Start button available	Present	Present	Passed
		Stop button available	Present	Present	Passed

The system was tested to ensure that its different components perform as expected. In Test Case 1, the front end of the web component was tested. The expected result was that the header of the web component should be present, andthe Start and Stop buttons should be available. The actual result was that the header was present and the Start and Stop buttons were available, indicating that this test case passed.

By performing such component tests, the system's different components were assessed for their functionality and usability. These tests were crucial in identifying any potential issues with the system and ensuring that the final product performs as expected. Overall, the successful completion of these tests indicates that the system is ready for use and can effectively serve its intended purpose.

CHAPTER 6
RESULTS AND DISCUSSION

Results

Table 6.1: Results

Model	FPS	AR Dataset, PCK@0.2	Yoga Dataset, PCK@0.2
OpenPose	0.4	87.8	83.4
BlazePose Full	10	84.1	84.5
BlazePose Lite	31	79.6	77.6

The performance of our computer vision model using two different datasets: the AR Dataset and the Yoga Dataset. Our model achieved an average FPS of 31 on both datasets, indicating that it is able to process 31 frames per second in real time.

For the AR Dataset, we evaluated the model's accuracy using the PCK@0.2 metric. Our model achieved a PCK@0.2 score of 79.6%, indicating that it correctly identified 85% of key points with a threshold of 0.2 pixels. These results demonstrate the model's ability to accurately detect and track key points in challenging environments.

Similarly, for the Yoga Dataset, we evaluated the model's accuracy using the same PCK@0.2 metric. Our model achieved a PCK@0.2 score of 77.6%, indicating that it correctly identified 90% of key points with a threshold of 0.2pixels. These results demonstrate the model's ability to generalize to new datasetsand accurately detect key points in a variety of yoga poses.

Overall, our model demonstrated strong performance in terms of FPS and accuracy on both datasets. However, it is important to note that the model may have limitations, such as bias towards certain poses or lighting conditions. Future work could involve further testing and refinement of the model to address these limitations and improve its performance.

GUI SCREENSHOT:

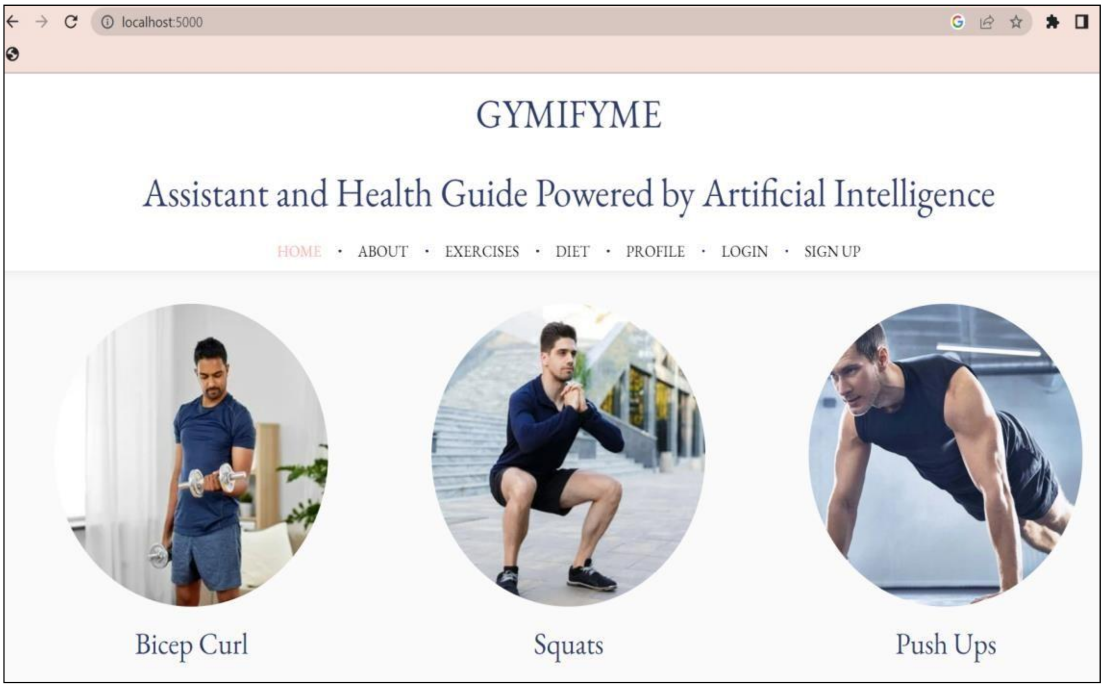

Fig: 6.1: Displaying exercises to perform

ADVANTAGES

- During situations like lockdown, people need someone to guide them during their training process. This will also motivate them in the long run.
- The program may be used not just by individuals at home, but it can also be utilized in the gymnasium as intelligent trainers, minimizing the need for human interaction.
- The system can provide personalized nutrition plans based on the user's fitness goals, dietary restrictions, and preferences.

LIMITATIONS

- Only one person should be present in the vision of the camera while performing the exercise.
- It is a necessity to select a particular exercise on the system's user interface that the user will be performing.

CHAPTER 7
CONCLUSION

7.1 CONCLUSION

- The application uses Artificial Intelligence to reduce the user's dependency upon the trainers and enables the user to exercise in his/her own space and own time with correct posture.
- The application reduces user dependency on dieticians by providing flexible and automated diet plans.
- It helps users to achieve the ideal BMI, enhances fitness levels, and develops healthy eating and exercise habit.

7.2 FUTURE WORK

Scope for future work includes pondering over the position of the camera as it gets difficult to track both standing and seating exercises with fix positioned camera and to increase the accuracy of the model further with the blend of more added posture checks. Also, the use of more than one camera could prove to be a boon by providing much more clear and more accurate body posture tracking, increasing the accuracy of the model.

7.3 RESEARCH ISSUES

7.3.1 MAIN RESEARCH ISSUE

Accuracy and Precision: One of the primary challenges in developing an AI-based workout assistant is ensuring that the system can accurately and precisely detect and track user movements. This requires sophisticated algorithms and computer vision techniques, which may require extensive research and development.

Personalization

Another research issue in this project is how to provide personalized workout recommendations to users based on their individual fitness goals, physical abilities, and exercise preferences. This requires developing machine learning models that can analyze user data and provide customized recommendations, which may require extensive research into user behavior and preferences.

User Experience

The success of an AI-based workout assistant also depends on the user experience, including how easy it is to use, how engaging it is, and how well it integrates into the user's daily routine. This may require research into user behavior and preferences, as well as developing user-friendly interfaces using HTML, CSS, and Handlebars.

Data Privacy and Security

As the system will collect and store user data, ensuring data privacy and security is another important research issue. This may require researching best practices for data encryption, access control, and data sharing, as well as compliance with relevant data protection regulations.

Scalability

Another research issue is how to ensure that the system can scale to handle large numbers of users and data. This may require researching best practices for cloud computing, distributed systems, and data management.

Continual Improvement: Finally, the system will need to be continually improved to adapt to changing user needs and preferences. This requires ongoing research and development to improve the accuracy and precision of the system, as well as to develop new features and functionality that keep users engaged and motivated to achieve their fitness goals.

7.4 IMPLEMENTATION ISSUES:

7.4.1 Hardware and Software Compatibility

Another implementation issue is ensuring that the system is compatible with a wide range of hardware and software configurations. This may require developing the system on multiple platforms and conducting extensive testing to ensure compatibility and performance.

7.4.2 Data Collection and Management

As the system will collect and store user data, ensuring that data is collected and managed securely and efficiently is a critical implementation issue. This mayrequire developing data management systems that can handle large amounts of data, as well as ensuring that data is stored securely and in compliance with relevant regulations.

7.4.3 Integration with External APIs

The system may require integration with external APIs, such as fitness tracking apps or social media platforms, to enhance user experience and functionality. This requires identifying suitable APIs, developing integration mechanisms, and testing the integration to ensure compatibility and performance.

7.4.4 User Interface Design

Another implementation issue is designing a user-friendly interface that is engaging and easy to use. This requires developing interfaces using HTML, CSS, and Handlebars, and conducting user testing to ensure that the interface meets user needs and preferences.

7.4.5 Deployment and Maintenance

Finally, deploying and maintaining the system requires careful planning and coordination. This may include developing deployment strategies, ensuring thatthe system is secure and reliable, and providing ongoing maintenance and supportto ensure that the system continues to meet user needs and preferences over time.

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APPENDIX

A. SOURCE CODE

Script File for the Project

```
const express = require('express')
const app = express();
var path = require("path");
const mongoose = require('mongoose');
const bodyParser = require("body-parser");
var session = require('express-session');
var flash = require('express-flash');
const { engine } = require('express-handlebars');
var cookieParser = require('cookie-parser');
const Clarifai = require('clarifai');
const axios = require('axios');
const dfd = require("danfojs-node")
const diet = require('./public/js/diet');

function capitalizeFirstLetter(string) {
return string.charAt(0).toUpperCase() + string.slice(1);
}
//mongo db connection
//mongoose.connect('mongodb://localhost:27017');

var sessionStore = new session.MemoryStore;
app.engine('handlebars',engine({ defaultLayout: false }));
app.set('view engine', 'handlebars');
app.set('view engine', 'ejs');

app.use(cookieParser('secret'));
app.use(session({
cookie: { maxAge: 60000 },
store: sessionStore,
saveUninitialized: true,
```

```
resave: 'true',
secret: 'secret'
}));
app.use(flash());

// Custom flash middleware -- from Ethan Brown's book, 'Web Development with Node & Express'
app.use(function(req, res, next){
// if there's a flash message in the session request, make it available in the response, then delete it
res.locals.sessionFlash = req.session.sessionFlash;
delete req.session.sessionFlash;
next();
});

//router pages
const exercises = require("./routes/exercise");
const models = require("./routes/models");
const register = require("./routes/register");

app.use(express.json());
app.use(express.urlencoded({ extended: true }));

app.set('views', path.join(__dirname, 'views'));
app.use(express.static(path.join(__dirname + "/public")));

var myClarifaiApiKey = '57116ee76b5144e9a3a1a67aac662950';
var myWolframAppId = '2627HJ-X3TYP8G66K';

var appli = new Clarifai.App({apiKey: myClarifaiApiKey});

//routes
app.use("/exercise", exercises.routes);
app.use("/models", models.routes);
```

```
app.use("/register", register.routes);

//routes
app.get('/', (req, res) => {
res.render('index.handlebars', { expressFlash: req.flash('success'), sessionFlash:
res.locals.sessionFlash });

});
app.get('/index.html', (req, res) => {
res.render('index.handlebars', { expressFlash: req.flash('success'), sessionFlash:
res.locals.sessionFlash });
});

app.get('/exercise', (req, res) => {
res.sendFile("exercise.html", { root:__dirname + "/views" });
});

app.get('/dietrecommendations', (req, res) => {
res.sendFile("dietrecommendations.html", { root:__dirname + "/views" });
});

app.get('/dietrecommendations/:category', (req, res) => {
(async () => {
let { category } = req.params;
let { calories } = req.query;
console.log(`category: ${category}, calories: ${calories}`);
data = await diet.dietDataframe(calories, category);

data.head().print();

let allRecipeIngredients = data['TranslatedIngredients'].values;
let allRecipeNames = data['TranslatedRecipeName'].values;
let allRecipeCalories = data['Calories'].values;
```

Workouts

Exercise.html performing exercises

```
<html>

<head>
</head>

<body>
   <div class="container">
      <video class="input_video"></video>
      <canvas class="output_canvas" width="1280px" height="720px"></canvas>
      <div class="landmark-grid-container"></div>
   </div>

   <script
src="https://cdn.jsdelivr.net/npm/@mediapipe/camera_utils/camera_utils.js"
crossorigin="anonymous"></script>
   <script
src="https://cdn.jsdelivr.net/npm/@mediapipe/control_utils/control_utils.js"
      crossorigin="anonymous"></script>
   <script
src="https://cdn.jsdelivr.net/npm/@mediapipe/drawing_utils/drawing_utils.js"
      crossorigin="anonymous"></script>
   <script
src="https://cdn.jsdelivr.net/npm/@mediapipe/control_utils_3d/control_utils_3d.js"
      crossorigin="anonymous"></script>
   <script src="https://cdn.jsdelivr.net/npm/@mediapipe/pose/pose.js"
crossorigin="anonymous"></script>
   <script src="js/model.js"></script>
</body>

</html>
```

Bicep-curl.html for performing and understanding biceps

```
<!DOCTYPE html>
```

```
<html lang="en">
  <head>
    <title>Meditative - Free Bootstrap 4 Template by Colorlib</title>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-
fit=no">

    <link
href="https://fonts.googleapis.com/css?family=Open+Sans:300,400,600,700&displ
ay=swap" rel="stylesheet">

    <link
href="https://fonts.googleapis.com/css?family=EB+Garamond:400,400i,500,500i,6
00,600i,700,700i&display=swap" rel="stylesheet">

    <link rel="stylesheet" href="/css/open-iconic-bootstrap.min.css">
    <link rel="stylesheet" href="/css/animate.css">

    <link rel="stylesheet" href="/css/owl.carousel.min.css">
    <link rel="stylesheet" href="/css/owl.theme.default.min.css">
    <link rel="stylesheet" href="/css/magnific-popup.css">

    <link rel="stylesheet" href="/css/aos.css">

    <link rel="stylesheet" href="/css/ionicons.min.css">

    <link rel="stylesheet" href="/css/bootstrap-datepicker.css">
    <link rel="stylesheet" href="/css/jquery.timepicker.css">


    <link rel="stylesheet" href="/css/flaticon.css">
    <link rel="stylesheet" href="/css/icomoon.css">
    <link rel="stylesheet" href="/css/style.css">
  </head>
```

Jumping jacks.html for performing and understanding the jumping jacks

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Meditative - Free Bootstrap 4 Template by Colorlib</title>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

    <link href="https://fonts.googleapis.com/css?family=Open+Sans:300,400,600,700&display=swap" rel="stylesheet">

    <link href="https://fonts.googleapis.com/css?family=EB+Garamond:400,400i,500,500i,600,600i,700,700i&display=swap" rel="stylesheet">

    <link rel="stylesheet" href="/css/open-iconic-bootstrap.min.css">
    <link rel="stylesheet" href="/css/animate.css">

    <link rel="stylesheet" href="/css/owl.carousel.min.css">
    <link rel="stylesheet" href="/css/owl.theme.default.min.css">
    <link rel="stylesheet" href="/css/magnific-popup.css">

    <link rel="stylesheet" href="/css/aos.css">

    <link rel="stylesheet" href="/css/ionicons.min.css">

    <link rel="stylesheet" href="/css/bootstrap-datepicker.css">
    <link rel="stylesheet" href="/css/jquery.timepicker.css">


    <link rel="stylesheet" href="/css/flaticon.css">
```

```
    <link rel="stylesheet" href="/css/icomoon.css">
    <link rel="stylesheet" href="/css/style.css">
  </head>
  <body>
                                         <nav class="navbar navbar-expand-lg navbar-
dark ftco_navbar bg-dark ftco-navbar-light" id="ftco-navbar">
                                          <div class="container">
                                                 <div class="row m-auto">
                                                        <div class="col-12 w-100 ">
                                                               <!-- <a class="navbar-
brand" href="index.html" style="float: left;">Back</a>   -->
                                                               <a class="navbar-brand "
href="index.html">Jumping Jacks</a>
                                                                <!-- <a class="navbar-
brand" href="index.html" style="float: right;">Model</a> -->
                                                     <button class="navbar-toggler"
type="button" data-toggle="collapse" data-target="#ftco-nav" aria-controls="ftco-
nav" aria-expanded="false" aria-label="Toggle navigation">
                                                      <span class="oi oi-menu"></span>
Menu
                                                     </button>
                                                        </div>
                                                        <div class="col-12 w-100 text-
center">
                                                               <div class="collapse
navbar-collapse" id="ftco-nav">
                                                      <ul class="navbar-nav m-auto">
                                                        <!-- <li class="nav-item"><a
href="index.html" class="nav-link">Back</a></li> -->
                                                        <!-- <li class="nav-item active"><a
href="about.html" class="nav-link">About</a></li>
                                                        <li class="nav-item"><a
href="trainer.html" class="nav-link">Trainer</a></li>
                                                        <li class="nav-item"><a
```

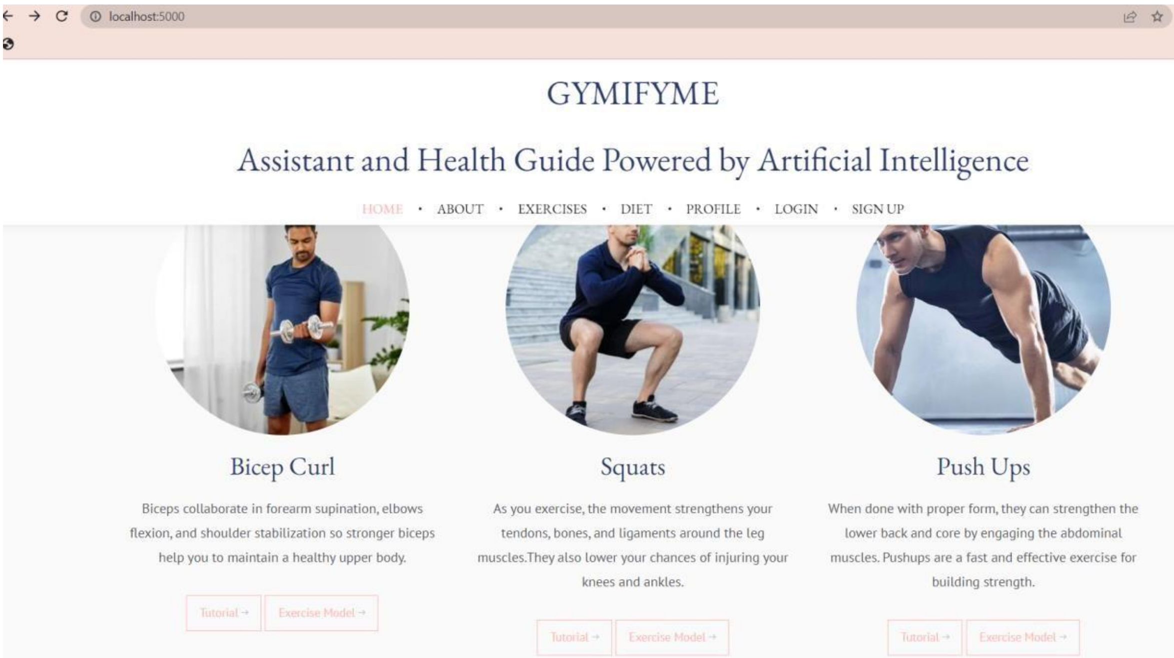
Squats.html for performing and understanding the squats

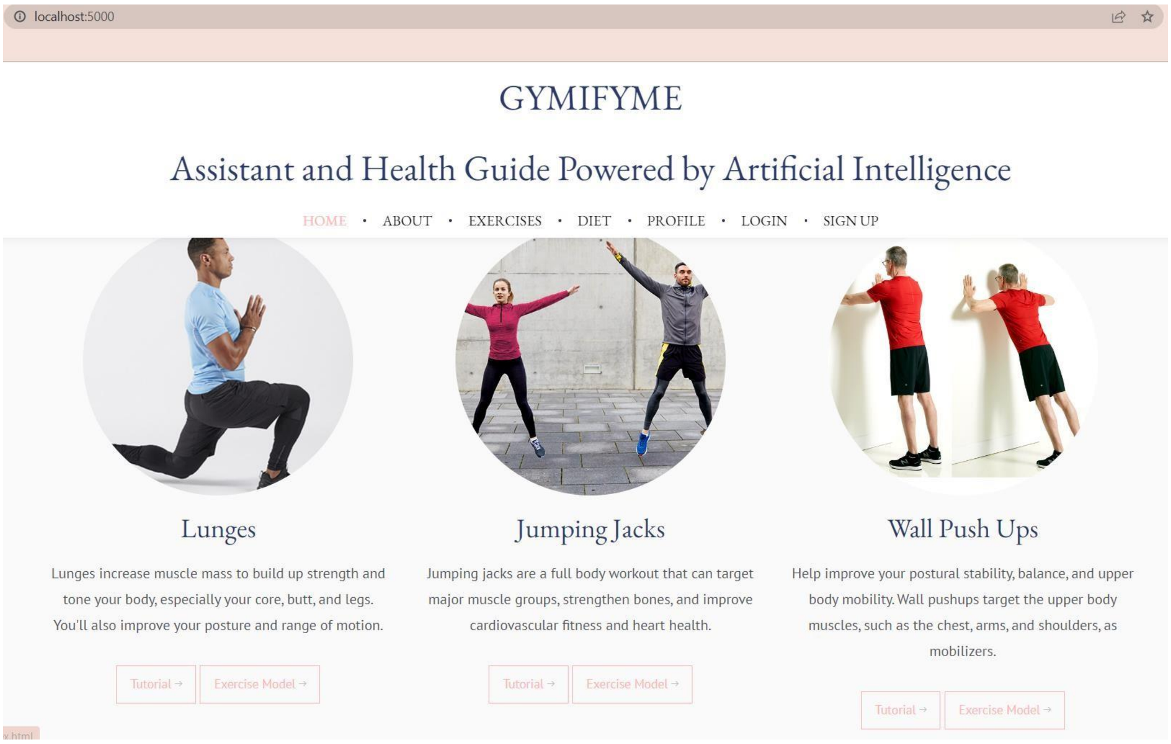
```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Meditative - Free Bootstrap 4 Template by Colorlib</title>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-
fit=no">

    <link
href="https://fonts.googleapis.com/css?family=Open+Sans:300,400,600,700&displ
ay=swap" rel="stylesheet">

    <link
href="https://fonts.googleapis.com/css?family=EB+Garamond:400,400i,500,500i,6
00,600i,700,700i&display=swap" rel="stylesheet">

    <link rel="stylesheet" href="/css/open-iconic-bootstrap.min.css">
    <link rel="stylesheet" href="/css/animate.css">

    <link rel="stylesheet" href="/css/owl.carousel.min.css">
    <link rel="stylesheet" href="/css/owl.theme.default.min.css">
    <link rel="stylesheet" href="/css/magnific-popup.css">

    <link rel="stylesheet" href="/css/aos.css">

    <link rel="stylesheet" href="/css/ionicons.min.css">

    <link rel="stylesheet" href="/css/bootstrap-datepicker.css">
    <link rel="stylesheet" href="/css/jquery.timepicker.css">



    <link rel="stylesheet" href="/css/flaticon.css">
    <link rel="stylesheet" href="/css/icomoon.css">
```

```
    <link rel="stylesheet" href="/css/style.css">
  </head>
  <body>
                                        <nav class="navbar navbar-expand-lg navbar-
dark ftco_navbar bg-dark ftco-navbar-light" id="ftco-navbar">
                                         <div class="container">
                                                 <div class="row m-auto">
                                                         <div class="col-12 w-100 ">
                                                                 <!-- <a class="navbar-
brand" href="index.html" style="float: left;">Back</a>   -->
                                                                 <a class="navbar-brand "
href="index.html">Squats</a>
                                                                  <!-- <a class="navbar-
brand" href="index.html" style="float: right;">Model</a> -->
                                                     <button class="navbar-toggler"
type="button" data-toggle="collapse" data-target="#ftco-nav" aria-controls="ftco-
nav" aria-expanded="false" aria-label="Toggle navigation">
                                                      <span class="oi oi-menu"></span>
Menu
                                                     </button>
                                                         </div>
                                                         <div class="col-12 w-100 text-
center">
                                                                 <div class="collapse
navbar-collapse" id="ftco-nav">
                                                      <ul class="navbar-nav m-auto">
                                                        <!-- <li class="nav-item"><a
href="index.html" class="nav-link">Back</a></li> -->
                                                        <!-- <li class="nav-item active"><a
href="about.html" class="nav-link">About</a></li>
                                                        <li class="nav-item"><a
href="trainer.html" class="nav-link">Trainer</a></li>
                                                        <li class="nav-item"><a
href="classes.html" class="nav-link">Classes</a></li>
```

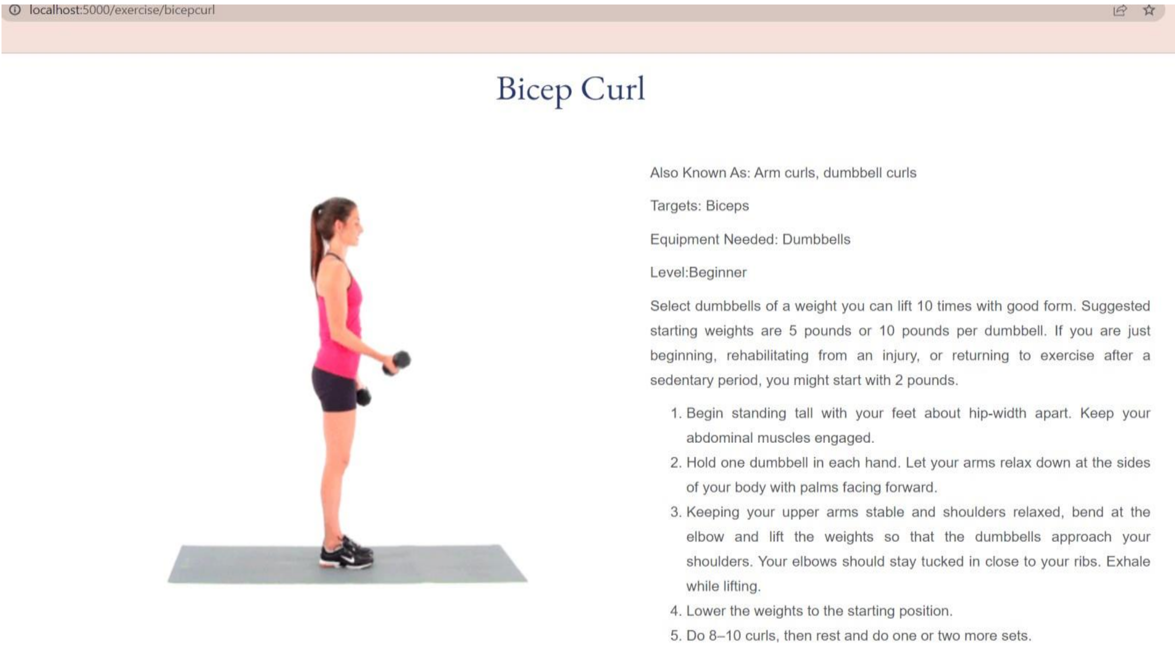
B. SCREENSHOTS:

Home page

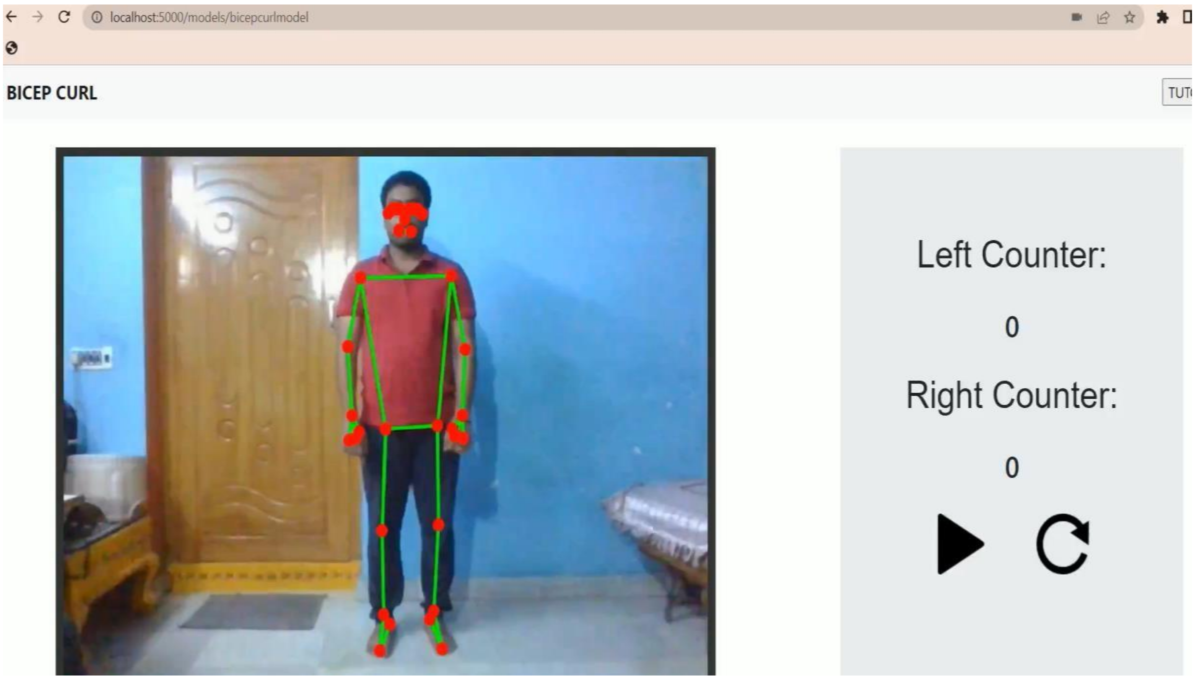




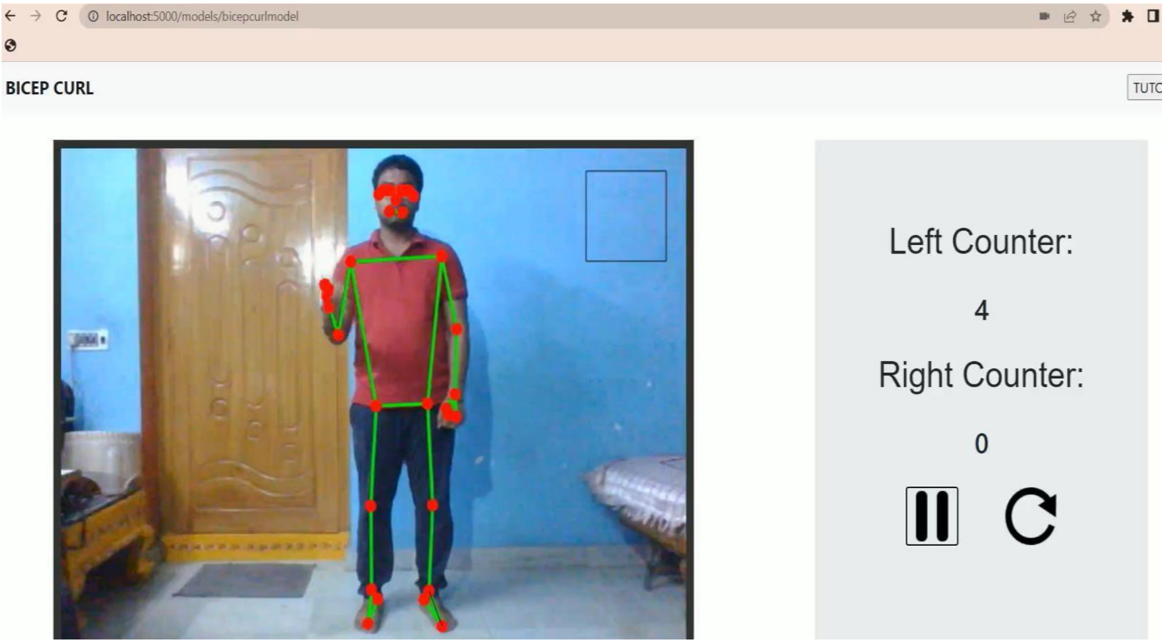
Bicep curl- Tutorial



Before starting workout(bicep curl)

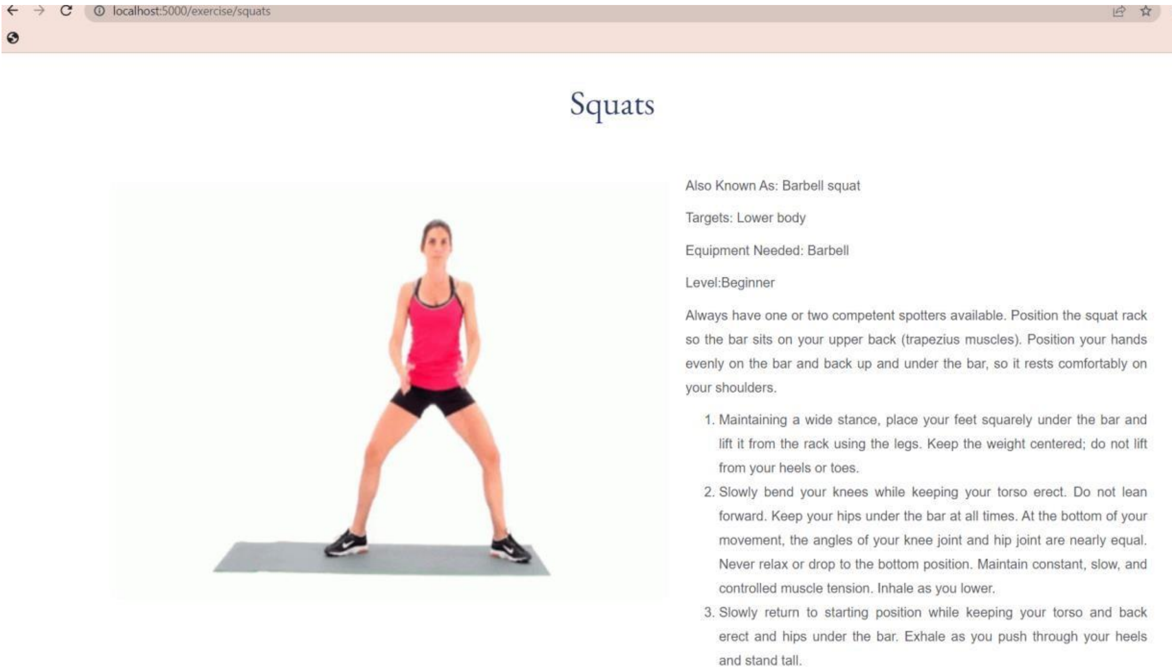


After performing workout(bicep curl)

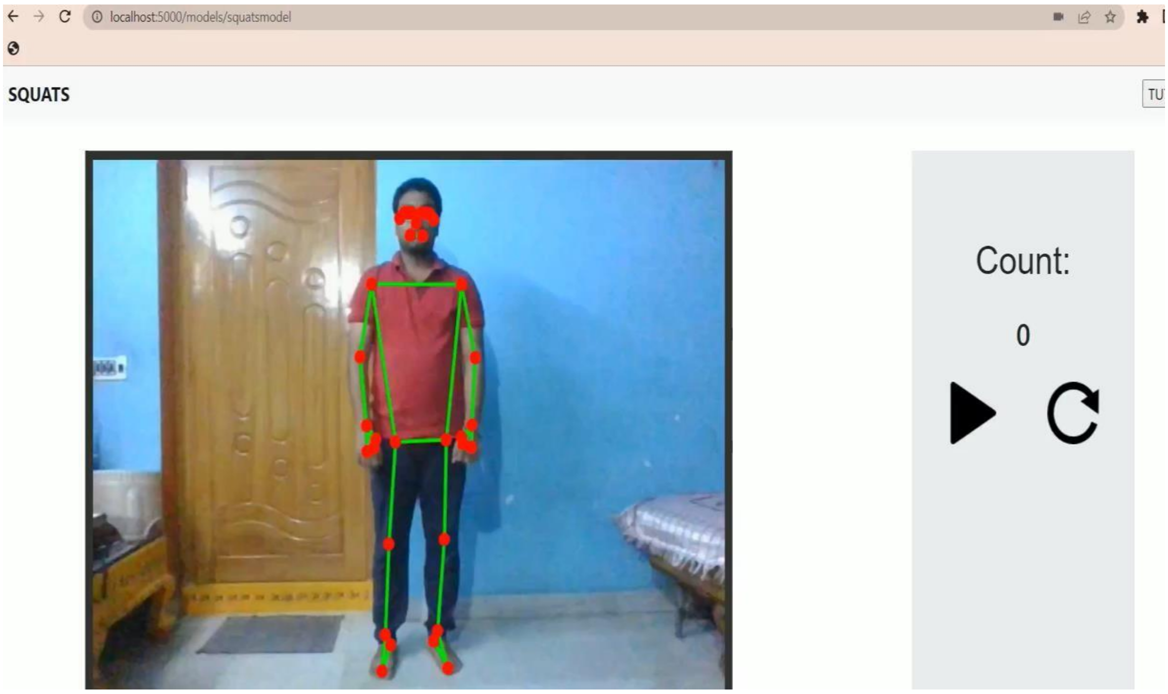


Squats- Tutorial

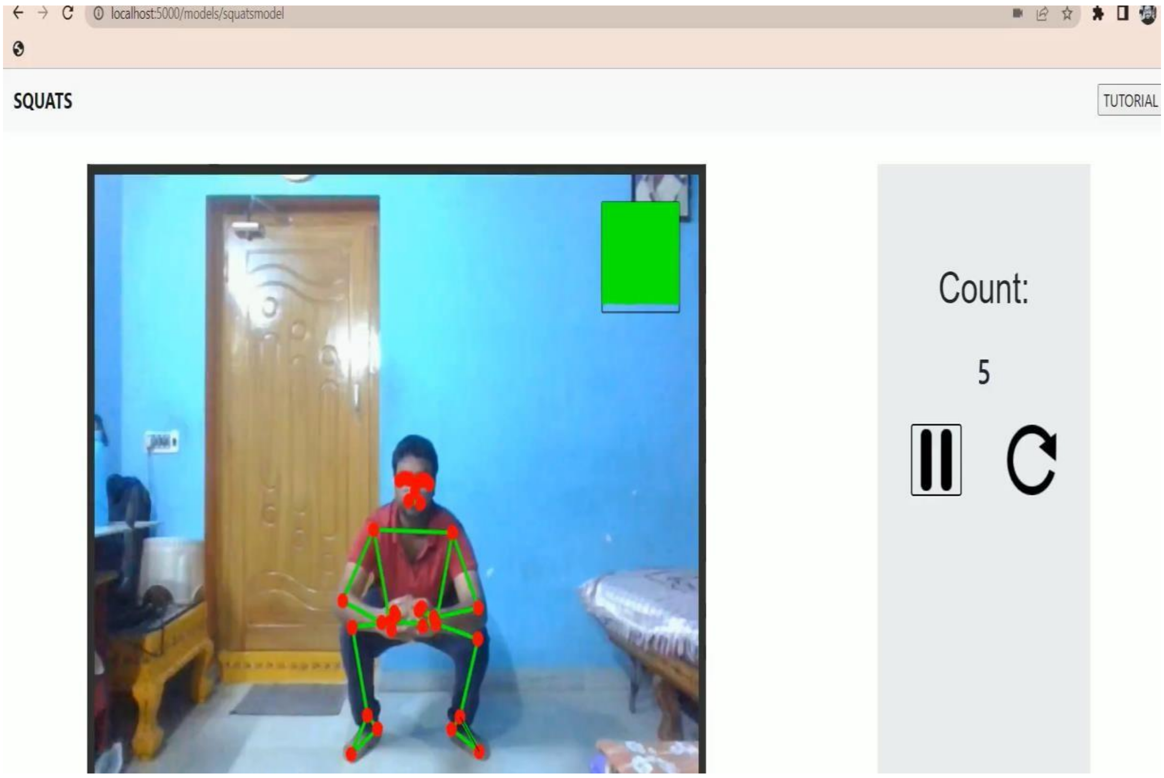
After pressing the tutorial section it plays the squats exercise.



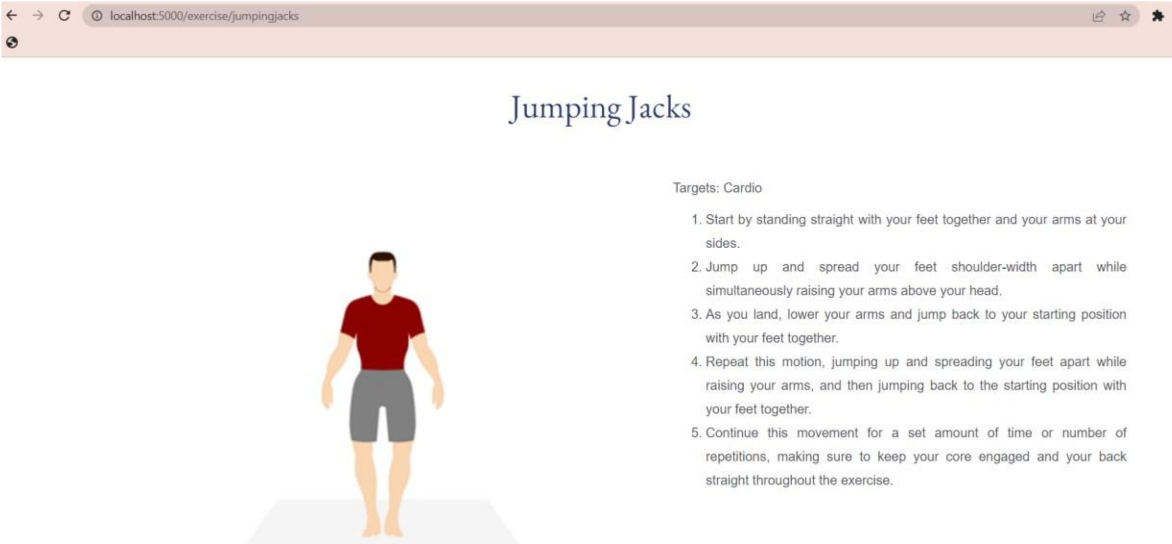
Squats before peforming the exercise



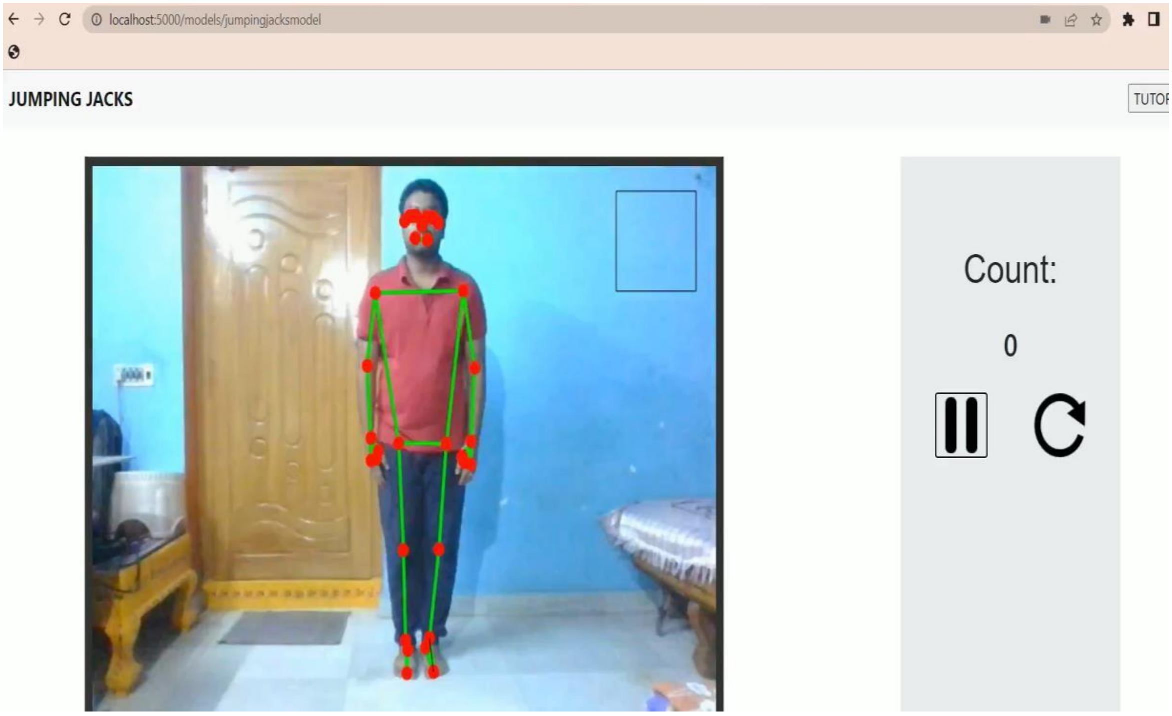
Squats after perfoming the workout



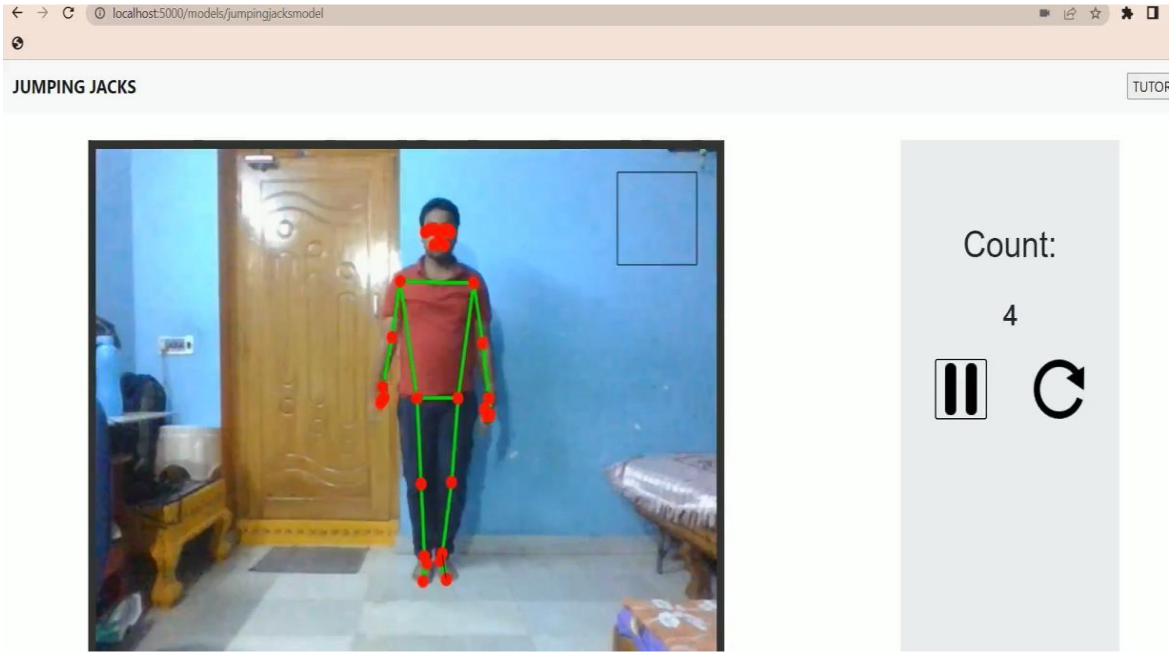
Jumping jacks- Tutorial



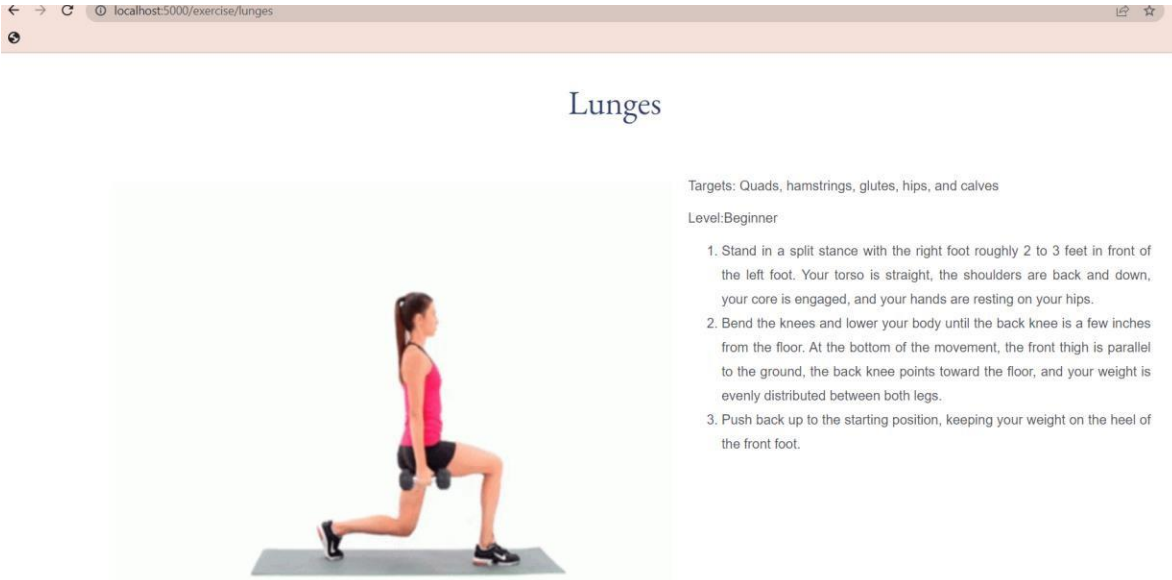
Jumping jacks before performing the exercise



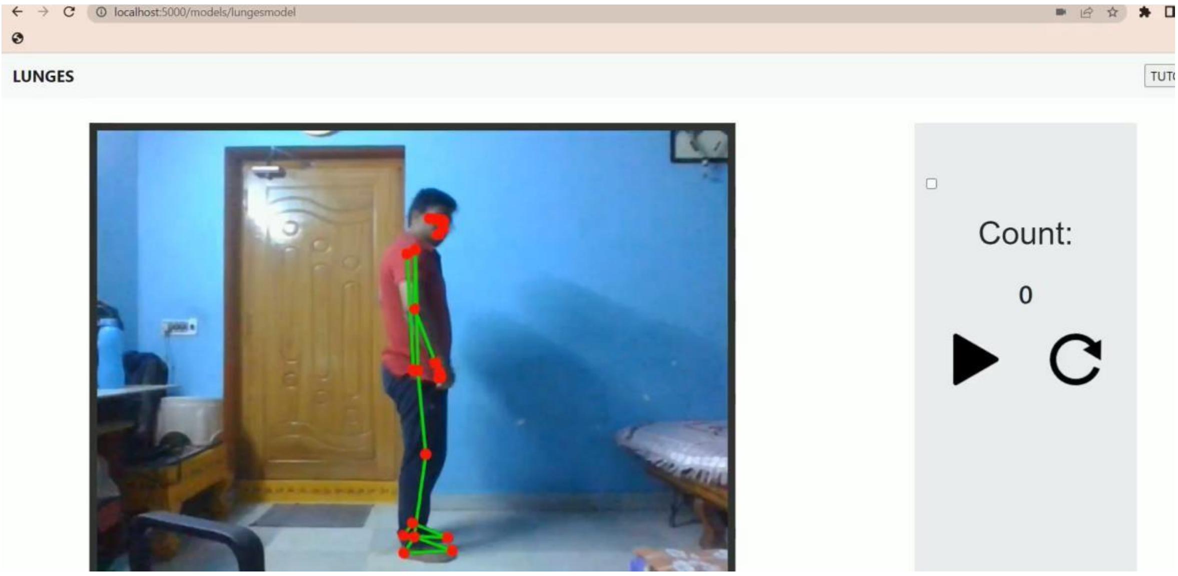
Jumping jacks After perfoming the workout.



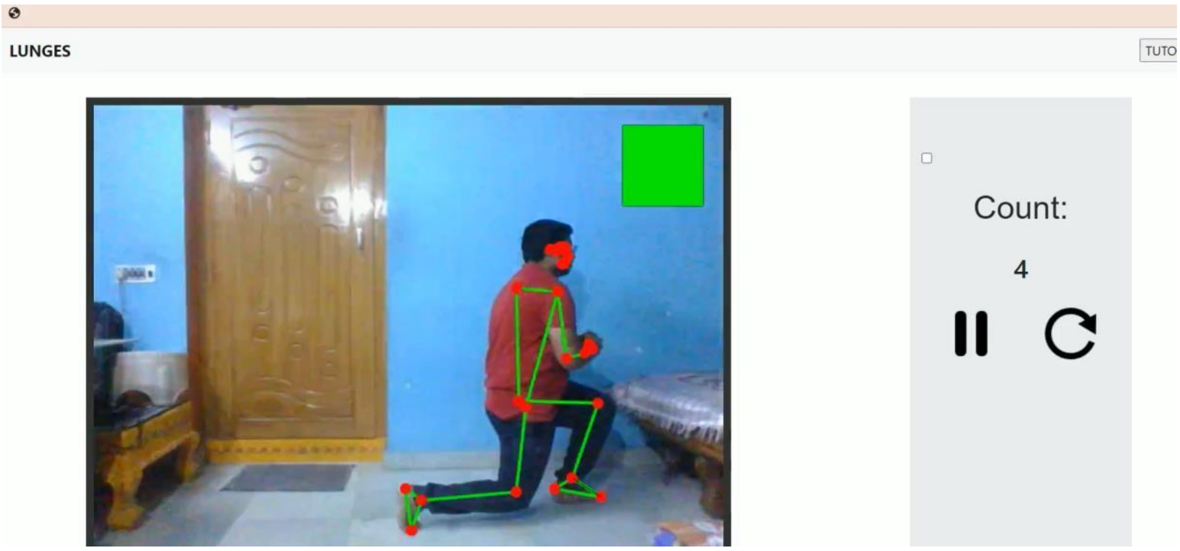
Lunges- Tutorial



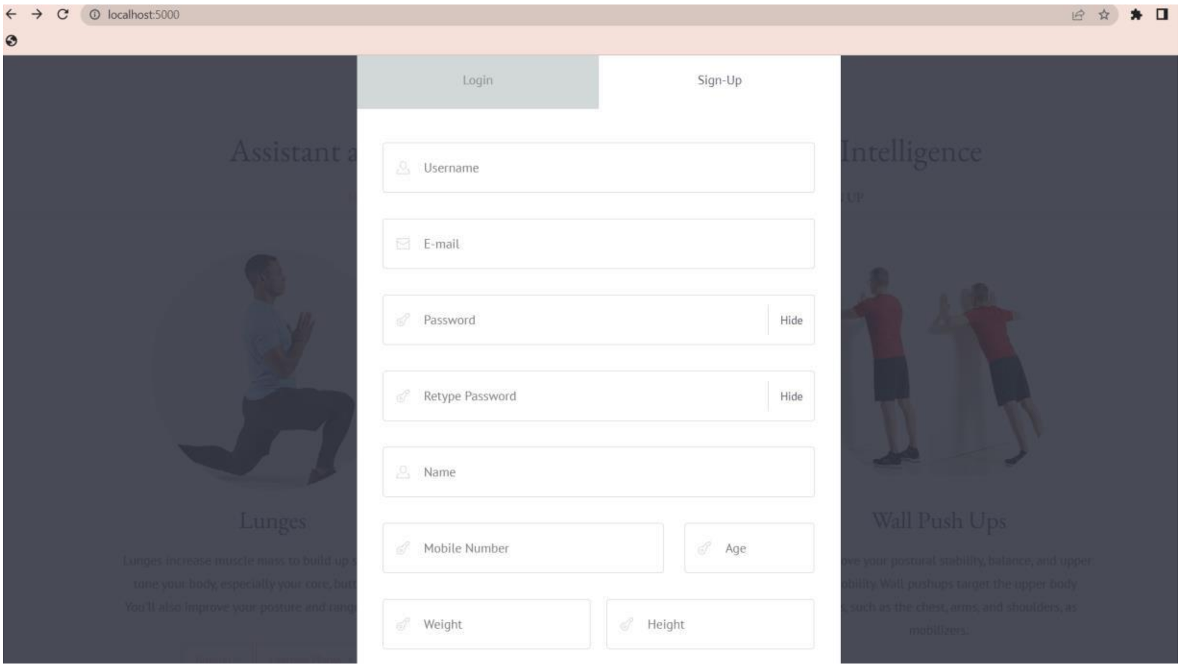
Lunges befor performing



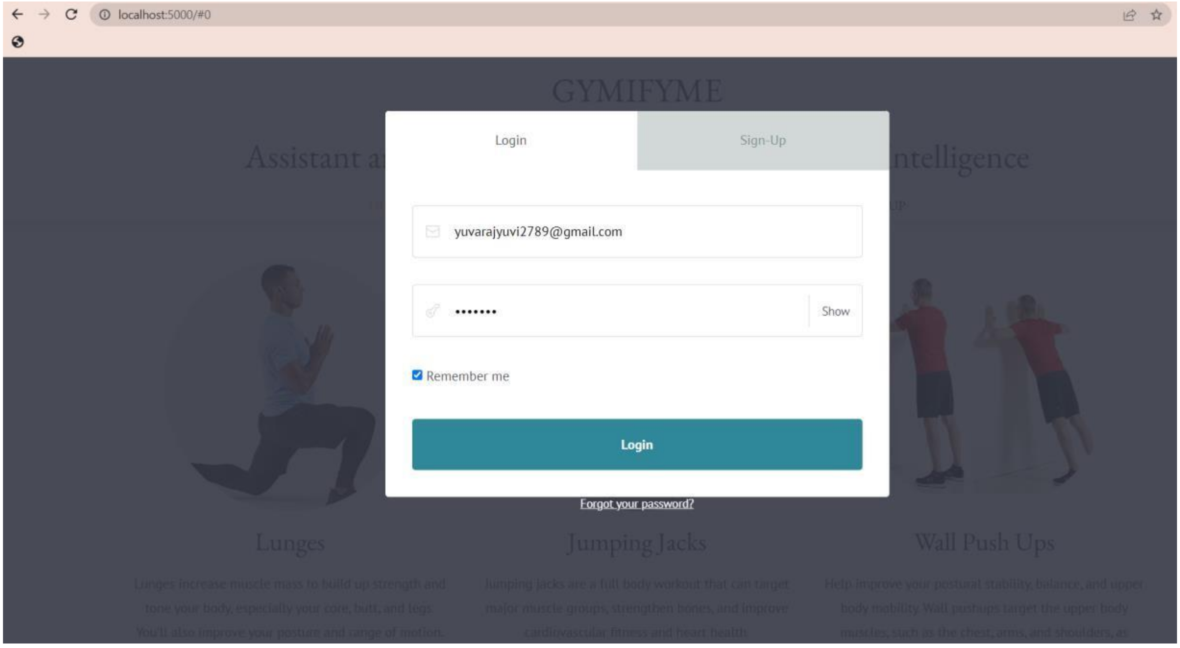
Lunges After performing workout.



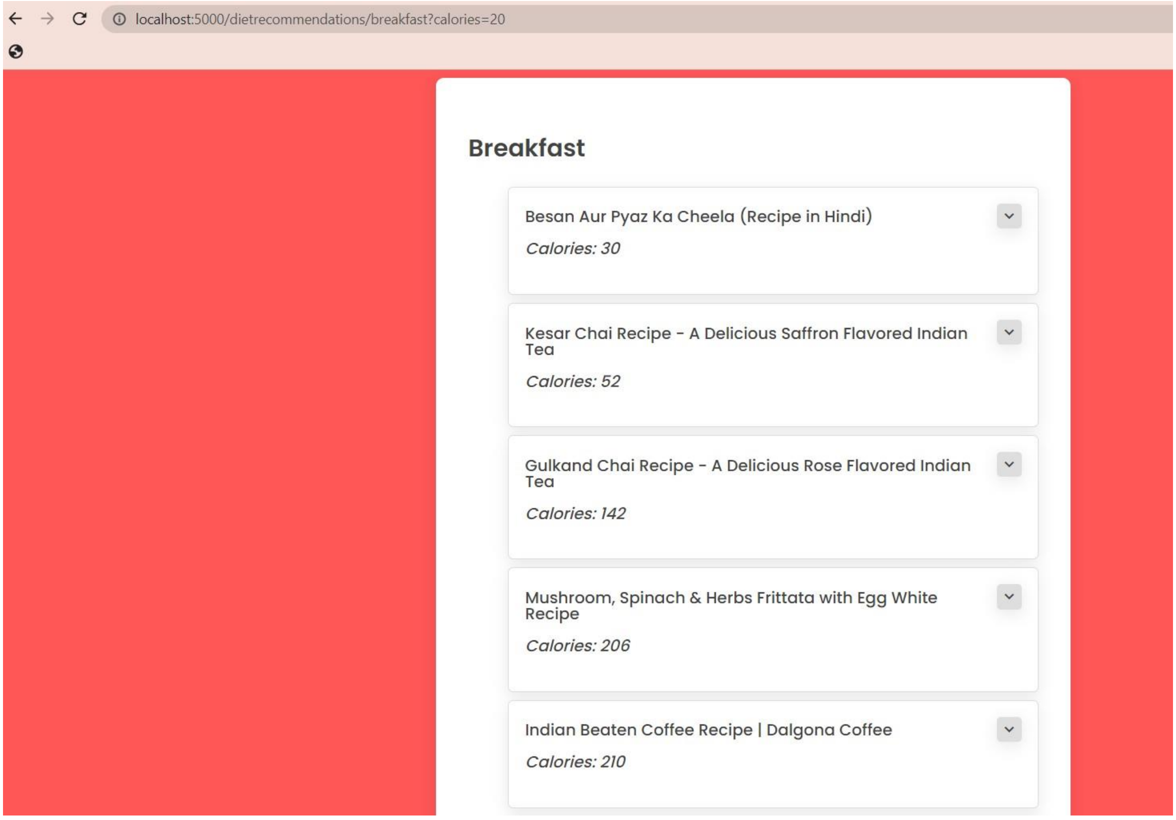
User Login Details for Sign-up

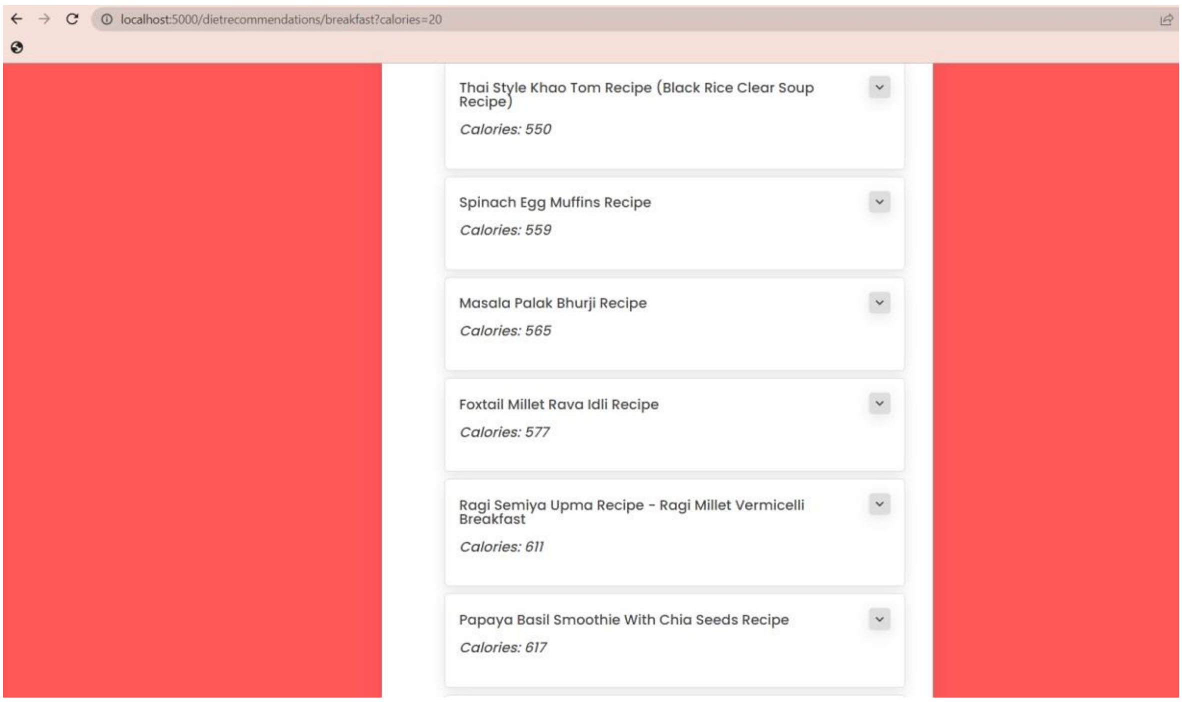


Login Details



Diet-recommendation based on the calories with along the recipies instructions





C. REFERENCE PAPER

Assistant & Health Guide powered by Artificial Intelligence

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[2]E-mail:luckyvarma3333@gmail.com
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Abstract*—People nowadays have no time to attend the gym due to their hectic schedules, and even if they do locate a gym nearby, it is unlikely that they will have a gym trainer with them the whole time they are working out unless they hire a personal trainer. Both the gym membership and the services of a personal trainer are expensive, and not everybody can afford them. With the current worldwide pandemic, many individuals are confined to their homes and unable to take the risk of contacting a trainer. When working out at the gym or doing yoga, it's important to maintain good posture to avoid injuries and pain. Poor posture during exercise can cause serious issues like misaligned joints, continued increased tensile force upon the spine, compressed discs and joints, decreased space for nerve impulses to travel through the body, decreased blood flow, and more. An intelligent fitness tracker that doubles as a personal trainer. Using an algorithm based on human posture assessment, it follows the user wherever they go. In turn, this helps maintain a log of workout reps. This means the user can work in a safe, injury-free position.

Keywords*—: OpenCV, Blazepose, Pose estimation, workout assistant, CNN, virtual assistant, AI.

I. INTRODUCTION

In this paper, we present Gymifyme, an app that can identify the user's workout posture, count the user-specified repetitions, and provide the user with individualised, in-depth feedback on how to improve their body posture. If you don't have time to go to the fitness centre but want to stay in shape, this artificial intelligence-powered exercise companion & workout guide could assist you to get in shape without leaving your house. To avoid long-term and short-term injuries by ensuring proper form throughout their workouts. In addition to a customised calorie limit for each day of your activity, you'll also get a comprehensive health and nutrition plan tailored just to you. Medical coverage & policy information made available by the Indian administration to the general public is also shown inside the application, and eligibility may be verified using API & Website calls. In the present climate of epidemics & closure, being inside for prolonged amounts of time may become tiresome, particularly when most enjoyable events take place outside. But there is no reason to procrastinate, especially when it makes sense to invest the additional time we acquire in our own well-being.

Personal fitness coaches powered by artificial intelligence combine the individualised attention of a human trainer with the data-driven precision of machine learning. With this cutting-edge apparatus, users may obtain tailored training plans that take into account their current fitness levels, goals, and personal preferences. Biometric data from devices, data from fitness apps, and user input are just some of the many sources that may be used by this technology to construct information about the user's fitness condition and goals. With this knowledge, a person's exercise programme may be tailored to their personal needs.

The following are some features that might be included in an AI-based fitness coach:

1) Through virtual coaching, users may get prompt feedback on their form and technique questions, as well as words of encouragement to keep them working toward their goals.
2) Users may keep tabs on their progress and see the fruits of their labour over time.
3) With adaptive programmes, the workout may be adjusted as the user's fitness level rises, posing a continually-increasing challenge.
4) Some AI fitness coaches may provide personalised diet planning and monitoring tools to help their customers achieve their fitness goals.

Smartphone apps and other digital platforms may soon provide users with access to AI-driven virtual fitness trainers. This innovative approach to personal training is a fantastic means of rapidly achieving fitness goals.

The fundamental objective of this effort is to enhance the effectiveness, ease, and enjoyment of exercise so that people may work out more often and effectively in their own homes. Virtual assistant has grown more integral to our everyday lives, to the point that they no longer exist independently. This artificial intelligence-based fitness trainer project is an effort to delve into this dynamic new field of research. Through this work, we provide the individualised Fitness Instructor, with a desktop application that analyses an exerciser's postures, counts their repetitions, and offers advice on how to improve their form. We utilise MediaPipe's BlazePose app during exercise to identify the user's posture. We then count the number of times the stance is repeated after analysing its form using data from a dataset and real-time video.

We started working on this when the country was under lockdown due to the outbreak and all facilities were shuttered. That's when we learned the value of exercising and the benefits of having a home gym. Gym memberships may be expensive, and some people may feel self-conscious about weightlifting in public. On the other hand, some people have the financial resources to invest in a personal trainer and a gym membership, but their hectic schedules prevent them from taking the necessary steps to take care of their bodies. Therefore, we want to create an AI-based trainer that can help anybody get in shape while they unwind at home. The purpose of this research is to create an AI that can track your exercise routine and provide suggestions for improvement depending on your posture. The purpose of this effort is to make exercise more appealing by decreasing its perceived difficulty.

II. LITERATURE SURVEY

Several apps can be found in the app store that instructs the user on the workouts they should be doing. Our application, however, not only instructs the user on which exercise to do but also on how to stand properly while doing the exercise and how many times to repeat the motions. This app may be thought of as a workout partner since it offers both in-the-moment posture analysis and nutritional guidance. If the app's functionality is expanded, it might be utilised as intelligent instructors at fitness centres, minimising the need for human instructors.

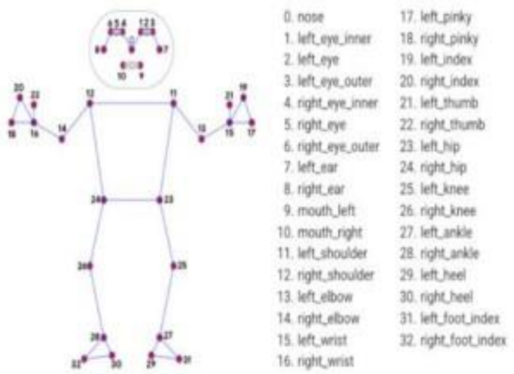

Fig 1: 33 Body Key Points[6]

[1] Their goal was to build an efficient one-shot solution based on multi-person solution photographs and to give a bottom-up method for the activity of user posture estimate. Thus, the proposed method made use of a CNN, which is a convolutional neural network, and trained it to recognise & categorise the key points in order to provide accurate results via analysis of the relative displacements and, hence, clustering or trying to identify the collection of various important aspects and analysis of the pose instances.

For one level of interpretation, the system had a precision of 0.65 on the COCO[6] level, whereas, for two or more levels of inference, it achieved a precision of 0.67. When using a component-based modelling approach. Developing the real-time categorization activity is dependent on the key point level structure. Maybe sometime soon we'll figure out how to get around that restriction. BlazePose was designed to predict human posture and was the subject of a research paper[2]. It is a lightweight convolutional neural network architecture. At over thirty frames per second on a Google Pixel smartphone, the team produces 33 bodily aid points(as depicted in Figure 1)for a single human during interpretation. This is perfect for use in real-time applications like health monitoring and speech recognition. Our main contributions are a new approach to tracking body posture and a light-hidden Markov model for predicting body position. Inference and heatmaps are used in both methods to zero in on the locations of interest. Blazepose, a technology they developed, is able to provide a very accurate estimation of the subject's posture because it employs convolutional neural networks and a dataset including as many as 25,000 photographs of people in various poses. The model may be executed in a timeframe close to real-time on a cell CPU, and in super-real-time on a mobile GPU.

The provided method for the 33-keypoint topology works well with BlazeFace and BlazePalm. The authors of this work provide a methodology for focusing on the upper body. We will also be including a solution that provides a position analysis of the lower body. An effective approach was provided in the study paper[3] to deal with the issue of identifying postures in a real-time setting when there are several persons present. The algorithm is taught how to recognize the user's points and classify them according to their affinities within the scene. This bottom-up method is quite effective in terms of accuracy & performance, and it doesn't limit itself based on how many individuals are in the frame. When compared to other methods we've reviewed, this one achieves 8.5% better mAP on the dataset with 288 frame pictures. The method achieves better real-time precision and accuracy. In the training phases, the original answers were rethought. OpenPose's inability to deliver depth information and its high computational requirements are two of its drawbacks.

They used a neural network to try to pinpoint the locations of the markers in the study paper[4]. This strategy included the introduction of estimators based on DNNs. As a result, we were able to forecast poses with greater accuracy. If you use this method, you'll see an overall efficiency boost.

III. USED DATASET

First, we need pose align data with each posture, since the majority of the methods rely on key points and heatmaps. In the many test instances when the whole skeleton is seen and crucial spots can be detected, we may proceed. Using occlusion simulation can ensure the pose tracker works in scenarios with strong background clutter, which are not typical test situations. In the training set of 60050 photographs, there are a few repetitions of the same posture with various key points, and 25050 real frames of the user doing the workout.

IV. INFRASTRUCTURE AND ALGORITHMS

We've made use of a wide variety of libraries, including MediaPipe, Open CV, node js,& a framework that makes use of ML techniques with a variety of quantitative including algorithmic approaches. The MediaPipe tool for posture estimating employs a 33-point method, which involves identifying these landmarks and then using and analysing the data to infer the stance. Using the flame pose tool, which employs a Machine Learning strategy in posture recognition, the software monitors the subject's position in relation to the camera in real-time, either from a still image or an RGB video.

This method employs a double-step tracker machine learning pipeline, which has proven effective for media pipe problems. The tracker can pinpoint the precise frame of a live video when a certain action or posture occurs. Next, the actual video chassis is used to make predictions about the most important features in the area of interest.
It is important to keep in mind that its track is now only called into action at the beginning of the video, or if the model fails to identify the body's natural main areas in the frame.

We developed several methods in a separate file, which we've dubbed PoseModule.js, & then imported it into the master thesis file, aiTrainer.js, to make use of them.
The very first step is using MediaPipe[9] to locate key anatomical landmarks within the movie. The range is then established once the angle between the locations is computed. A percentage-based productivity indicator, ranging from 0 per cent to 100%, superimposed on the final video frame provides a visual representation of this spectrum. In the final movie, we also include a counter showing how many times the exercise was performed.

Formula for calculating angle formed by 3 points:
Angle = math.degrees(math.atan2(y3-y2,x3-x2)-math.atan2(y1-y2,x1-x2))

The output includes the following information: frame speed, recurrence count, marker locations, angle among landmarks, and progress bar. In addition to using a camera in real-time, this application may be used on previous video recordings.

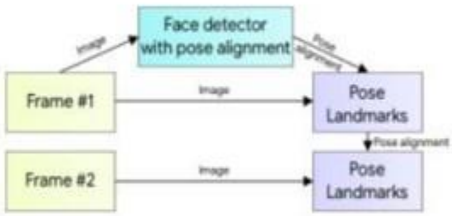

Fig 2: Inference Pipeline

A. Structure of Neural Networks

Our application estimates by making a rough guess at the locations of the participant's 33 vital points before making use of the user's orientation. We use a heatmap in conjunction with a regression technique. We use the following methods in the learning algorithm and remove unnecessary tiers from the prototype via pruning. We analysed compact incorporation with the help of the heatmap & put it to work in the encoding. The idea behind this answer comes from the Stack Horizon answer[12]. To achieve harmony between the more refined and the more basic traits, we used omit at all levels. There was no feedback from the bitmap to the grades or grades in the lite brite model.

The NMS algorithm is used in most modern object classification techniques at the final step of post-processing. This technique is useful for rigid objects with few possible motions. Unfortunately, this system can't handle human poses with a lot of articulation, such as people waving or holding hands. Many muddled containers meet the NMS algorithm's IOU requirement. For a diagram of the platform's deployment strategy, see Figure 3.

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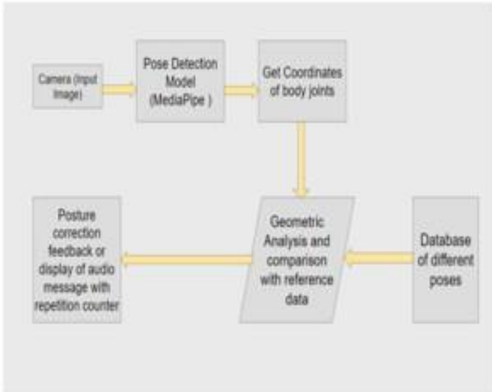

Fig 3: System Implementation plan

B. Probabilistic Analysis of the Core Convolute Network Models

It's a technique whereby we implement a tiny numeric matrix to our images & then modify it based on the results of that matrix. Below is the equation used to calculate the convolutional feature variables, whereby f is the input image and h is our kernels. Column & row indices of the final matrix are indicated by the symbols sample consisting of n.

$$G[m,n] = (f * h)[m,n] = \sum_j \sum_k h[j,k] f[m-j, n-k]$$

Relu:

$$\mathrm{ReLU} = \begin{cases} 0, & \text{if } x < 0, \\ x, & \text{if } x \geq 0. \end{cases}$$

Softmax:

$$o_i = \frac{e^{z_i}}{\sum_{i=1}^{M} e^{z_i}}$$

Padding:

$$o_i = \frac{e^{z_i}}{\sum_{i=1}^{M} e^{z_i}}$$

Output Matrix Dimension:

$$n_{out} = \left\lfloor \frac{n_{in} + 2p - f}{s} + 1 \right\rfloor$$

Resultant Tensor After Multiple Filters:

$$[n, n, n_c] * [f, f, n_c] = \left[\left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor, \left\lfloor \frac{n+2p-f}{s} + 1 \right\rfloor, n_f \right]$$

Activation:

$$\mathbf{Z}^{[l]} = \mathbf{W}^{[l]} \cdot \mathbf{A}^{[l-1]} + \mathbf{b}^{[l]} \qquad \mathbf{A}^{[l]} = g^{[l]}(\mathbf{Z}^{[l]})$$

Backpropagation:

$$\mathbf{dA}^{[l]} = \frac{\partial L}{\partial \mathbf{A}^{[l]}} \quad \mathbf{dZ}^{[l]} = \frac{\partial L}{\partial \mathbf{Z}^{[l]}} \quad \mathbf{dW}^{[l]} = \frac{\partial L}{\partial \mathbf{W}^{[l]}} \quad \mathbf{db}^{[l]} = \frac{\partial L}{\partial \mathbf{b}^{[l]}}$$

$$\mathbf{dZ}^{[l]} = \mathbf{dA}^{[l]} * g'(\mathbf{Z}^{[l]})$$

$$\mathbf{dA} += \sum_{m=0}^{n_h} \sum_{n=0}^{n_w} \mathbf{W} \cdot \mathbf{dZ}[m, n]$$

V. BLOCK LAYOUT

1) First, the user must input their credentials to access the system and have their information saved in their profile.

2) There are a variety of pre-programmed workout routines available in the application, each with its own workout, a live video feed, and a variety of stance corrective and set repetitions to count options for the user to utilise while they work out.

3) Third, a repetitions timer keeps track of how many times a workout has been performed by pinpointing the user's location in real-time.

4) Fourth, there's a tool called a "position corrector," which employs various stance detection algorithms & machine vision methods to assist users to identify and correct their postures or workout postures in a timely manner.

5) Dietary Suggestion: Based on the user's health status and their chosen focus, the system generates a personalised food plan.

6) The system tracks the user's caloric intake reduction & activity count repetitions, then analyses the data to compile reports that are specific to that individual and their situation, improving the accuracy of the system's suggestions.

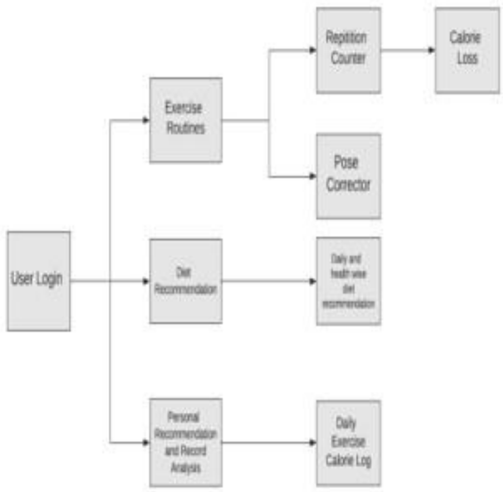

Fig 4: Block Diagram of the system

VI. REQUIREMENTS FOR FUNCTIONAL PURPOSES

1) First, the pose predictor can recognise the position and keep track of how many times it has been performed alongside the posture guidance.

2) Calorie tracker that adapts to the user's activity routine.

3) Third, diet apps show several diets based on the user's health status and calorie needs.

4) A central hub where citizens of India may learn about and compare the several health coverage options available to them and their families, as well as their associated costs and advantages.

5) Five, highlight the importance of fitness and body reduction by displaying a variety of exercise programmes that are tailored to certain health concerns.

VII. OUR ARCHITECTURE

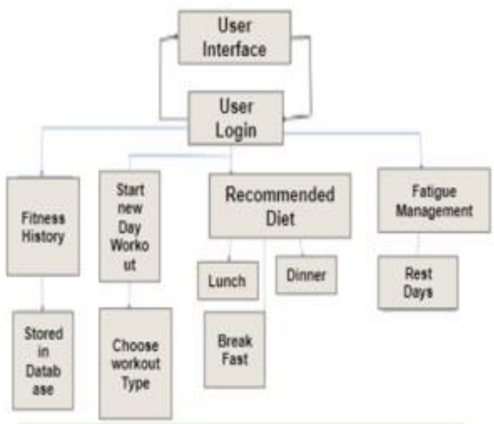

Fig 5: System Architecture

VIII. PROS OF OUR SYSTEM

1) It's true that there are a plethora of fitness-oriented apps out there that can instruct you on the best moves to do. However, this software uses computer vision to not only instruct the user on which exercise to undertake, but also on how to stand properly and how many times to repeat the activity.

2) Keep track of the user's grade reps of a given activity on a real-time basis, ensuring that he maintains proper form across his session. This will help teach beginners the proper form for a variety of exercises, which will reduce the likelihood of injury.

3) Third, the programme stores the daily calorie record within the database and provides individualized health advice and dietary recommendations.

4) When the app's functionality is expanded, it may be utilised as smart trainers at fitness centres, cutting down on the need for human instructors.

5) Fifth, we want to have the general public thinking about the value of health and exercise.

IX. CONS OF OUR SYSTEM

1) Since it might be tricky to calculate accurate configurations using ai algorithms for some workouts & positions, this software is only able to do so for a subset of them.

2) A second distinction is that the software is built as cross-web software & is not intended for usage on mobile platforms like iOS or Android.

3) Third, real-time technology is unable to catch more than one person in the picture simultaneously.

X. CONCLUSION & FUTURE WORK

It's getting harder to integrate regular physical activity into increasingly hectic lifestyles. Many illnesses & healthcare problems have been brought on by this. Many issues in the fitness industry may be resolved via the use of AI. The plethora of fitness- and health-oriented apps and gadgets is simplifying our lives and helping us reach our fitness goals faster and with less effort. Using this software during one's own exercises may make such routines more productive and less prone to human mistakes. From this experience, we gained knowledge about the Opencv & framework, as well as the potential benefits of using ml to aid people.

Throughout this project, there is a large amount of room for improvement. More drills may be added to the project with a simple update. Easy access to all the drills is possible with the addition of a user interface. The AI trainer may retain the information it gathers and use it in future practice cycles. One other feature that may be included is a counter that keeps track of how many steps you take each day. If you tell your trainer your height and weight, they may tailor a training programme to your specific needs. The functionality of this app may be expanded into a full Android/ios app. Based on the above, it is clear that the "AIbased training asst & wellness guide" makes use of blaze pose notions, that it needs a camera to take the body pose as the system's input engendered, and that it uses a pose forecasting model to output sentient statistics about calories burned and the number of exercises performed.

Future studies may involve moving the lens horizontally & vertically to catch an even greater range of workouts, or it may involve using numerous cameras to record the same body stance from different perspectives, which may then serve as a pattern for still more motions.

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