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AI-Based Personalized Fitness Trainer: AI Real-Time Pose Estimation and Form Correction Using Computer Vision

Suchetha N V[1], Skandan M J[2], Suchint M Shetty[3], Sagar D Patgar[4], and Nikhil M C[5]

[1]Associate Professor, Department of Computer Science & Engineering, Sri Dharmasthala Manjunatheshwara Institute of Technology, Ujire, Karnataka, India
[2, 3, 4, 5] BE Scholar, Department of Computer Science & Engineering, Sri Dharmasthala Manjunatheshwara Institute of Technology, Ujire, Karnataka, India

Correspondence should be addressed to Suchetha N V; itsmesuchethanv@gmail.com

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ABSTRACT- Over the past few years, workout tech was able to utilise smart software and camera tracking to enhance training alone. This paper presents a fitness assistant that is a browser-based implementation that works on AI, automatically counting the reps and identifying the incorrect postures in real-time using a standard web camera. It takes the place of special gear by using tools such as MediaPipe and TensorFlow to map significant body points when exercising. These systems accompany your limbs in examining the way in which joints bend and move as time goes on. When something is out of place, feedback appears immediately - assistance in correcting the technique in time. This correctly improves the accuracy of learning and reduces the risk of exercise injury. The device is paired with an interactive online training program to train, monitor progress or review previous outcomes - no wearable devices are required. It has passed tests with regards to its ability to detect correct form during the execution of such moves as squats, lunges, or push-ups and pose checks. The proposed option would be effective in terms of online fitness, monitoring progress in recovery, or upgrading gym equipment - it provides a low-cost solution to exercise progression smarter.

KEYWORDS- Posture Analysis, Real-Time Feedback, Repetition Counting, Exercise Monitoring, Workout Tracking, MediaPipe Pose, Real-Time Detection, Pose Estimation, Skeleton Tracking, Motion Analysis.

I. INTRODUCTION

Urban citizens are becoming increasingly exercising and health-conscious, thus individuals are using technology devices significantly more. Nowadays, these applications and devices can assist you in tracking your body progress. Traditional workout programs typically require you to enter things manually - or attach wearable devices such as bracelets. Such trackers provide estimated figures - believe pulse rates or calories burned - but to be honest, they are sometimes inaccurate. They are not able to even see the way to move when you are engaged in workouts and to determine whether your technique is correct or not. Harm is usually caused by bad exercise- habits - particularly when the novices are exercising individually. Nevertheless, intelligent cameras have made it possible to live monitor movement with ordinary videos with the help of machines. Such tools as OpenPose, MediaPipe, or PoseNet improved significantly in recent times - it identifies body joints clearly, even when you are moving rapidly. With these advancements, software no longer counts reps as it used to be many years back, but also measures your posture or movement level. The simplest webcam can record your pose, track the major action points on your body, and count the squats, push-ups, or lunges without any assistance. Other than comparing your position with an ideal illustration, it provides immediate suggestions through a pop-up message in case you do not follow the right direction. Simultaneously, the app indicates a personal summary consisting of numbers of exercises such as the number of moves completed, the duration of a session, or the correct form.

II. RELATED WORK

The suggested system will help to make the fitness tracking more precise, interactive, and affordable, particularly to home-based users and online trainers. It can also be a very efficient utility to physiotherapists, athletes, and people who appreciate fitness as it can be a cost-efficient method to track and optimise performance even without human intervention. This project will combine AI-enhanced pose recognition, real-time analytics, and web accessibility to reduce the gap between technology and fitness, which helps to perform safe, data-driven, and personalized workouts.

Chen, S., and Yang, R. R. [1], On-device Real-Time Smartphone-Based Automated Exercise Repetition Counting System. This paper introduces a simple, cell phone-based repetition counting system with the phone camera only. It uses MediaPipe to track the pose in real-time and Dynamic Time Warping (DTW) to recognize full repetitions of exercise. It has the ability to run without wearables and external sensors because the system has been improved to be battery efficient, provide real-time feedback, and run smoothly on the hardware-limited smartphones.

Riccio [2], Real-Time Fitness Exercise Classification and Counting based on Video Frames. In this paper, a deep learning based system that combines PoseNet, CNN and LSTM to classify exercises and count repetitions is proposed. The model is able to capture both spatial and time characteristics and attains accuracy of more than 99% and high performances in different lighting and camera conditions. It shows that it can be integrated into smart fitness.

In the same manner, Dsouza [3], Smart Gym Trainer System Utilizing Human Pose Estimation in Computer Vision. This paper proposes a fitness gym.

OpenPose-based trainer system with real time poses recognition and exercise tracker. It determines the joint angles and uses a rule-based method which counts repetitions and determines the accuracy of the form. The system offers live feedback to the users and works best in controlled settings where the background and lighting remain constant. It is a lightweight, threshold-based design with which it performs efficiently without having to use complex machine learning models.

Bharath Kumar and Julian [4], Artificial Intelligence-based Fitness Coach on Webcam-based Technology. The given paper presents an AI-based fitness coach that detects keypoints with MediaPipe BlazePose and classifies the posture and number of repetitions with an MLP. It is an online form essential in real time that records feedback on form, postural deviations, and presents corrective proposals on the screen. The system is operating in a browser format where computational efficiency, accuracy, and accessibility are ensured by just having a webcam.

Chariar et al. [5], Autoencoder-based AI Trainer Squat analysis and correction. The paper will introduce a squat analysis system based on AI with MediaPipe to estimate the pose, and autoencoder to identify abnormal postures. A Bi-GRU that has attention models the motion dynamics, which ultimately allows the system to distinguish between right and wrong squats and provide real-time corrective feedback. It provides customized recommendations, is highly accurate and generalizes effectively to other body types and style of exercise.

Kwon and Kim [6], Real-Time Workout Posture Correction with openCV and MediaPipe. In this paper, the designer introduces a real-time posture correction paradigm on MediaPipe Pose and OpenCV to follow key points and joint angles. It provides immediate form correction feedback which is angle-based, allowing it to be as accurate and easy as it can on a normal webcam.

Pawar et al. [7], AI FIT: AI-Based Virtual Gym based on Form Detection of exercises in real time. The present paper presents a virtual gym system called AI FIT, which uses MediaPipe and an LRCN to examine posture and movement to provide real-time feedback. It identifies different exercises, identifies deviations of the form, and provides immediate corrections without needing wearables, which increases its accessibility and the safety of workouts.

Shirsat et al. [8], AI-Based Fitness Trainer with Motion Correction and Real-Time Feedback. The presented paper introduces an AI fitness trainer that utilizes 3D pose estimation and a Graph Convolutional Network (GCN) to examine the joint motions. Dynamic Temporal Warping Loss are used to match posture sequences in accurate and real-time corrective feedback, which make the system very strong in identifying posture errors during motion cycles.

R. Dewang, Abid Ali, [9], Real-time Posture Correction System in sitting by Deep Learning Techniques. In this study, a wearable camera-based system is presented that exploits the computer vision to track sitting posture in real time and give instant feedback when it is identified as poor. The system will help users to improve their sitting position, by ensuring that they fix their back and neck issues by working longer hours because they will feel more comfortable and more productive at their workstations.

The Personalized Digital Fitness Coach- Leon Rothkrantz [10]. In this paper, the researcher discusses an expert system developed using CLIPS to provide personal fitness advice by encoding human expertise knowledge. It offers personalized fitness plans, physical training, and support of injuries, and has a smartphone prototype to be accessible on.

Kumar et al. [11], MediaPipe/OpenCV Human Posture Detection and Correction. This paper aims at creating a system to implement MediaPipe and OpenCV to monitor and rectify human posture in real-time. The first goal is to help people to exercise, including yoga, dumbbell lifting, push-ups, and squats, in proper form to avoid injuries and become more effective.

Sheng Jin, Lumin Xu [12], Whole-Body Human Pose Estimation in the Wild. In Computer Vision. Conventional human pose estimation algorithms tend to estimate body parts independently and thus resulting in discrepancies and more complexity. The authors provide a solution to this, COCO-WholeBody, an extension of the COCO dataset, which is annotated manually with 133 keypoints: 68 on the face, 42 on the hands and 23 on the body and feet. They suggest ZoomNet, a single-network model, to successfully use this dataset with the consideration of the hierarchical organization of the human body. To deal with the problem of the difference in scale of different body parts, ZoomNet resorts to use of zoom-in mechanism, which enables fine sizing of smaller parts of the body (hands and face) without losing the context of the entire body. Large-scale experiments show that ZoomNet, which is trained on the COCO-WholeBody, is better than the current methods in tasks related to whole-body pose estimation. Furthermore, the COCO-WholeBody dataset is useful as a pre-training dataset to perform other similar tasks like detecting facial landmarks and estimating hand keypoints.

Pardeshi, H., Ghaiwat, A. et al. [13], "Fitness Freaks": A System to detect Definite Body posture by means of OpenPose Estimation. Singh, P.K., Wiederchon, S.T., Chhabra, J.K., Tanwar, S. (eds) Futuristic Trends in Networks and Computing Technologies. The Fitness Freaks system uses the OpenPose multi-person 2D pose estimation library which is based on OpenPose, a real-time and multi-person library to recognize and analyze human body postures. The system uses video input to detect the accuracy of postures of users in different physical actions by recording the prominent body parts. It is supposed to provide immediate suggestions during exercise - thus to maintain good positions, to count reps, but not to sustain injuries of improper positions. This concept was mentioned due to the fact that many individuals cannot find trainers or fitness facilities, especially at the time when such events as a global health crisis occur. Fitness Freaks aims to make the guidance in the field of fitness more convenient and less expensive by providing an automated option.

A. Nagarkoti. et al. [14], Realtime indoor workout analysis using machine learning and computer vision, this application can assist individuals to exercise correctly by tracking their gestures and providing them with real-time feedback in a gym or their living room. It employs computer vision to record the posture of the user during exercises and machine learning algorithms to estimate how the form is appropriate.

Comparison of the user movements with the predefined standards allows the system to identify the deviations and recommend some corrections to enhance the effectiveness of the exercises as well as minimize the integrity of the risk of injury.

A. Rohan, M. Rabah, et al. [15], "Human Pose Estimation Convolutional Neural network-based Real-Time Gait Analysis. It presents a real-time gait analysis system that uses pose estimation and deep learning. The system obtains the data of the skeleton through video sources, then analyzes significant features and uses a CNN to categorize gait patterns as normal or abnormal. The first aim is to offer a simple, noninvasive and automated gait assessment clinical tool that does not require special hardwares and manual sensations. Central elements: Pose Estimation: Pampering computer vision to obtain skeletal keypoints out of frames of a video. CNN-Based Classification: Analyses the extracted skeletal data to differentiate normal and abnormal gait patternsReal-Time Processing: The proposed methodology will analyze gait in real-time, which will allow providing instant feedback and may have clinical implications.

G. Samhitha, D. S. Rao, et al. [16], Vyayam: An AI-powered smart bicep workout tracker. It works out low-quality regular web cameras footage to identify seven key points on the body when lifting. It does not rely on guesswork but maps the movement based on posture detection technology. It obtains arm angles at any given moment using this data. Not only reps but also checks the quality of each movement are checked. It provides real time suggestions on your technique as you train. No additional equipment required - you, camera, and live instructions. The purpose of this approach is to provide people with an affordable and convenient option to conventional fitness tracking solutions, especially to those who train at home without the help of a personal trainer.

V. G. Biradar, C. M and B. JB [17], "AI Tool as a Fitness Trainer with Human Pose Estimation," This study uses the BlazePose, a model of pose estimation that was developed by Google in real-time to examine the exercise of the user using a regular web camera. It recognizes the essential body landmarks and compares the posture of the user during a workout. The AI trainer provides real-time feedback to correct the detected pose by comparing it with the correct forms to enhance the effectiveness of the exercise and decrease the risk of injury.

Pauzi, A.S.B. et al. [18], Movement Estimation with Mediapipe BlazePose. Published in 2021 in the journal of Advances in Visual Informatics, the paper Movement Estimation Using Mediapipe BlazePose is devoted to the work on the use of the MediaPipe BlazePose framework offered by Google to estimate human movement. The paper discusses the effectiveness of BlazePose to identify and track the important human body landmarks in real-time, which are essential in the fitness, rehabilitation, and human-computer interaction applications. The study examines the accuracy, speed, and strength of BlazePose in a wide range of conditions with the aim of assessing its ability to perform real-time movement estimation operations without the need of complex hardware.

Wang, Y., Li. M. et al. [19], Lite pose: efficient architecture design to estimate 2d human pose. At IEEE/CVF conference on computer vision and pattern recognition (pp. 13126-13136). LitePose is an efficient 2D pose estimator, which utilizes a single branch architecture to be deployed on edge devices. Fusion Deconv Head and Large Kernel Convolutions have been part of the design to enhance performance through low cost of computation.

Qiu C., and Zhang, Z. et al. [20], Deep learning to 3d human pose estimation and mesh recovery: A survey. Neurocomputing, 128049. This questionnaire is an overall overview of deep learning techniques in the domains of 3D human pose estimation and mesh recovery. It focuses on the most diverse methods, such as single-person and multi-person methods, and explains how they are used in such spheres as computer vision, autonomous driving, and robotics.

III. PROBLEM STATEMENT

Physical activity is needed to maintain good health and overall well-being. However, the effectiveness and safety of any physical activity program highly depend on the proper posture and the accurate repetitions. Traditional fitness centers have professional trainers who guide clients to ensure the exercises are done in the best technique. Nevertheless, at home exercises or online fitness, this kind of instruction is not available to the majority of people. This usually results in: Sitting in the wrong position, which with time, may cause injuries. Error in counting of repetition which causes too little or too much training.

The lack of instant communication, the weakening exercise motivation and effectiveness. As it currently stands, the majority of fitness applications and online workout programs: Show instructional videos without comments. Mandate physical activity (smartwatches, motion bands, etc.) by using wearables or sensors. Do not focus on your body shape and posture during exercises in reality. Some of these limitations render fitness tracking to be a hard, unreliable, or costly to many users. The greatest problem is to develop a system capable of delivering a real-time, accurate, and conveniently available information. Measure physical movements, which are not accompanied by accessories. Read the structure with the help of the anatomical markers and provide real time information about repetitions and posture correction. The proposed solution is a fitness assistant, which is an online application that can be used to solve this problem using computer vision and pose estimation algorithms. It can work only with the help of a simple webcam and a web browser, and no further equipment is needed. The system is constantly monitoring the posture of the user with mediapipe pose, calculates the angles of the joints, and uses logic rules to detect the wrong posture and the number of repetitions.

The Proposed System Objectives.

The Objectives of the proposed project are as follows: each of them will be designed to solve the existing challenges and the gaps of the existing digital payment system by integrating blockchain into the system:

- In order to apply real-time pose estimations.
- To come up with a smart rep counting system.
- In order to identify unsuitable posture or shape.
- In order to create a user friendly and responsive web application.

IV. METHODOLOGY

The approach used to create the AI-Based Personalized Fitness Trainer: Real-Time Pose Estimation and Form Correction Using Computer Vision, non-obtrusive, and available system of exercise monitoring. It consists of a number of stages:

A. Requirements Analysis and technology approval:

The main aim was to create a system that would be able to operate with any standard consumer equipment (laptops/smartphones) without special sensors.
Computer Vision: Google MediaPipe pose was referenced due to the fact that it has high fidelity landmark detection and cross-platform optimization. Backend Framework: Python Flask allows the structuring of flexibility of the handling of API calls and application to scientific computing (NumPy). Frontend: A web-based solution (HTML 5/JavaScript) was embraced to make it available to zero-installation.

B. Data Acquisition:

The system makes use of the device camera of the user in order to capture a live video feed. This method uses only 2D RGB data in contrast to the traditional depth-sensing system (e.g. Kinetic). Frame-to-frame processing of the video feed is done to provide the real-time performance.

C. Pose Determination and Characteristic Alert:

The MediaPipe Pose model identifies 33 3D skeletal landmarks in every video frame. The system derives important geometric quantities based on these land marks namely, the joint angles (e.g. knee angle in the squat and elbow angle in a pushup) and the limb vectors. These features are those that are the raw input of the exercise analysis algorithms.

D. Workout Rational and State Control:

A state machine has been custom-built to capture human movement. The system does not use basic thresholding, but it monitors the movement of the user in phases (e.g. eccentric, concentric, isometric). This is to avoid repetitions in which case a complete, valid movement cycle is taken into account.

E. Real-Time Feedback Loop:

A closed-loop feedback mechanism is adopted in the system. The metrics that are measured as the user does an exercise are compared to biomechanical ideals. Deviations (e.g. caving in by knees) will cause instant visual and audio feedback, so the user can fix his or her form immediately.

V. SYSTEM DESIGN

The system is modular and client-server in the form of a migration and maintenance architecture (See the figure 1).

A. System Architecture

Client-Side (Frontend): Capture Module: 6 Interfaces with the WebRTC API and functional as a Webcam. Rendering Module: This will render the skeletal overlay and feedback indication onto an HTML5 Canvas. Interaction Layer: Processes user inputs (choosing exercise, voice switches) and real-time statistics (reps, form grade). Server-Side (Backend): API Layer: RESTful surprisingly it works with session state, user authentications, and data storage (Flask). Analysis Engine: The main unit of computation (Enhanced Exercise Analyzer) which is used to receive landmark data and calculate angles, identify phases and analyze form. Data Layer: User profile and high-resolution workout history is stored on the SQLite database.

B. Data Flow

Input: Video is recorded using browser. Preprocessing: The essential landmark locations are obtained and transmitted to the backend with the help of the JSON payloads. Processing: The backend calculates the joint angles, the state machine of the exercise and creates feedback. Storage Part: Aggregate data (total reps, average accuracy, calories) on session completion is stored to the database. Output: Finished outputs are given back to the client to be viewed and audio produced.

C. AI Integration

Pose Detection: based on the use of pre-trained Convolutional Neural Network (CNN) of MediaPipe. Generative AI: With the addition of Google Gemini API, the system will be capable of generating customized, natural language exercise reports as well as actionable insights on the basis of historical performance data.

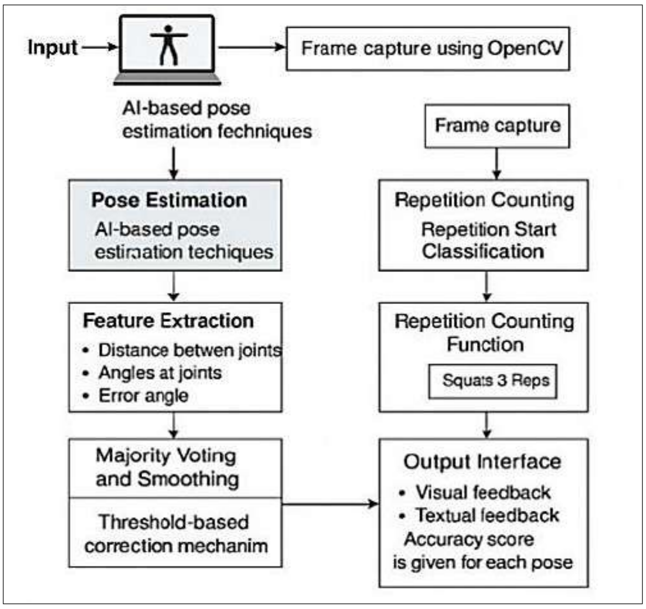

Figure 1: Architecture of the system.

D. System Flowchart

The AI-assisted workout analysis system has a well-organized sequence of user-system interactions as the workflow in Figure 2. When the user opens the application, the process starts by checking his/her authentication. In the event that the user is not logged in, he/she will be redirected to the login/Registration screen. On the other hand, authenticated users can get direct access to the Home Dashboard.
When inputting the dashboard, the user chooses the type of exercise he/she desires and then activates the camera module. This setup starts the video acquisition pipeline and gets the pose estimation subsystem ready to process in a real-time.
When the camera is also activated, the system goes into the state of Workout Active. In this stage, the application executes in a loop of continuous monitoring comprising of two main processes:

- Pose Detection, which is the processing of live video frames to detect skeleton landmarks and predict movement.
- AI Feedback Generation, which is the system-level assessment and provision of corrective or reinforcement

feedback in real-time, and the repeated updating of repetition counts. This process continues until a user opens up the session.

When a stop command is transmitted the system completes the workout process by summing the performance measures such as the total repetitions, the form accuracy and estimated energy used. Such data is then saved in the database as a long-term tracking and analytics.

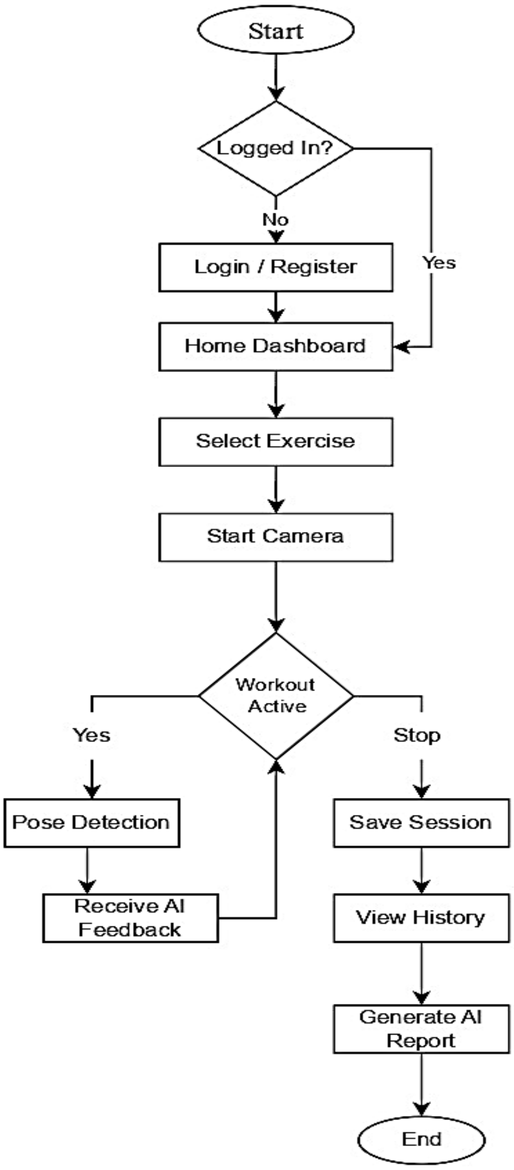

Figure 2: System Flowchart.

At that point, the user would be taken to the interface of the workout history, where an overview of the session is provided.

Lastly, the user can ask AI to create a performance report. To react, the system examines the past exercise data and session-wide measurements to create a custom report comprising of insights and recommendations on improvements, created through the combined Gemini AI model. The final phase of the work process is the report generation.

E. Algorithms Used

The fundamental intelligence of the system is based on state-based logic and geometric algorithms.

Joint Angle Calculation-

In order to be able to analyze the form, it is calculated that the angle th at a joint (e.g., knee) is formed by three important points A, B, C (e.g., hip, knee, ankle). The angle

$$\theta = \arccos\left(\frac{BA \cdot BC}{|BA||BC|}\right) \times \frac{180}{\pi}$$

is obtained by calculating a dot product of vector BA and BC: The calculation is done on all the applicable joints in the chosen exercise.

F. Phase Detection State Machine.

An exercise tracking is done by a Finite State Machine (FSM). States: Neutral - Transition - Bottom (Point of maximum inflection)- Transition -Standing (Return to start). Logic: Transitions occur when the key joint angle crosses certain angles (e.g. <90deg for squat depth) and stays stable for a buffer time period (smoothing).

Counting Algorithm Repetition Counting Algorithms Counting is a counting algorithm that uses repetitions to compute the count of repetition counts in a sequence or array.<|human|>Counting Algorithm Repetition Counting Algorithms Counting is a counting algorithm that computes the number of repetitions counts within a sequence or array by means of repetition.

Repetition is only increased in case the state machine passes through an actual cycle:

Start in Standing state.

Go through Bottom state (confirming depth).

Return to Standing state.

Pattern Matching The order of detected phases is matched against a canonical pattern (eg. ['standing', 'bottom', 'standing']) to weed out noise and partial reps.

Form Scoring Moving Quality

The S = "Form Score" is a dynamic value with an initial value of 100, which is penalized by the errors that are detected: Sfinal = 100 - S (wi x Ei).

Where Ei is an error which is detected (e.g.,k nees inward) and wi is the penalty weight. To measure Movement Quality the variance in such a sliding window of frames is estimated as the difference in velocity (smoothness) of the limb and the position of the limb (stability).

VI. SNAPSHOTS: SYSTEM IMPLEMENTATION

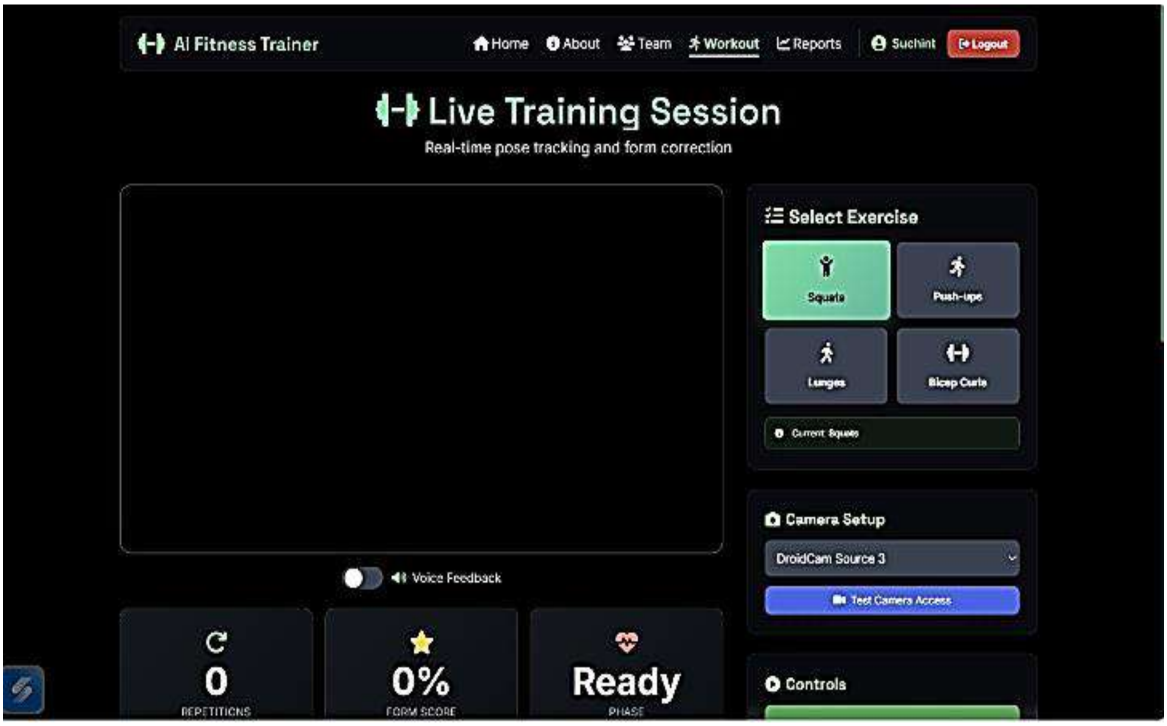

Figure 3: AI Trainer Homepage.

The AI Fitness Trainer platform is an interactive and easy to use system that provides AI-based monitoring of workouts. In this case Figure 3 presents the home page of the AI-Based Personalized Fitness Trainer: Real-Time Pose Estimation and Form Correction Using Computer Vision, which presents the platform and its key aspects. Figure 4 shows the live training screen according to which the users can choose exercises and observe the real-time pose tracking and counting of the reps. The workout screen with live feedback and last workout history is shown in Figure 4. Figure 5 puts emphasis on region of AI-driven insights that produces tailored analysis and recommendations. In Figure 6, the progress dashboard demonstrates the total reps, workouts, form score, and visual charts. Figure 7 illustrates the most significant aspects that the system offers, such as real-time detection, smart rep counting, and progress analytics.

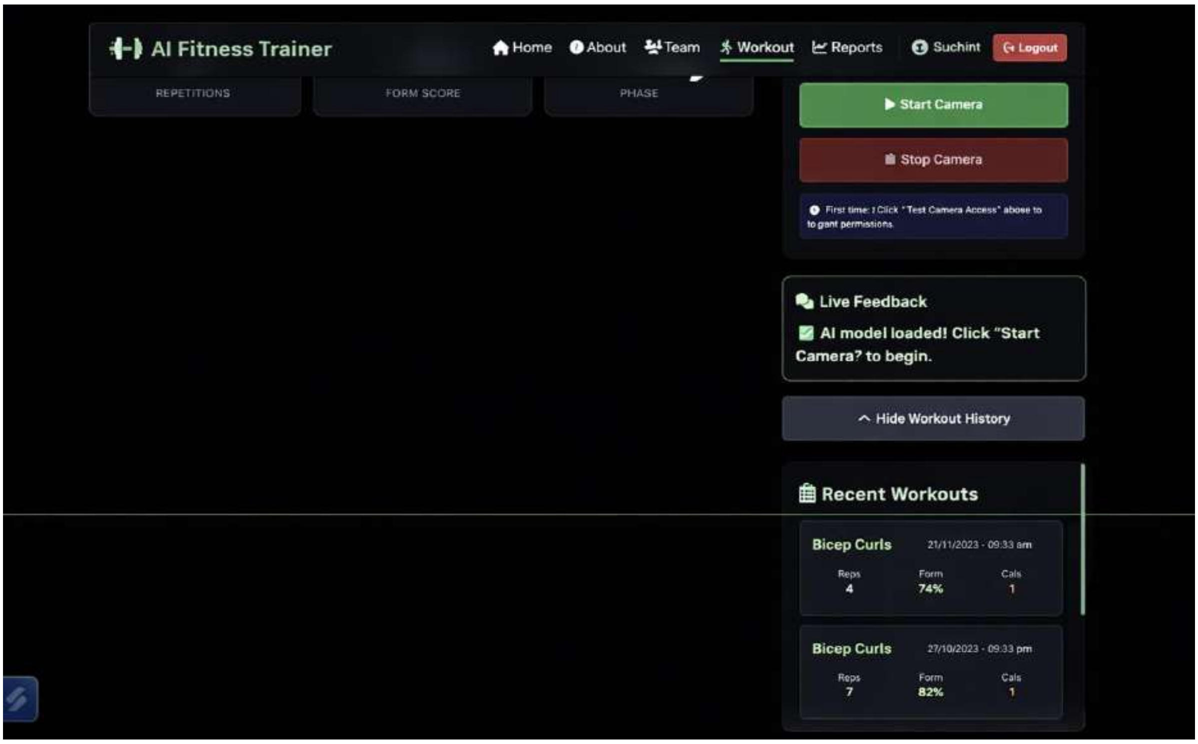

Figure 4: Live Workout Screen

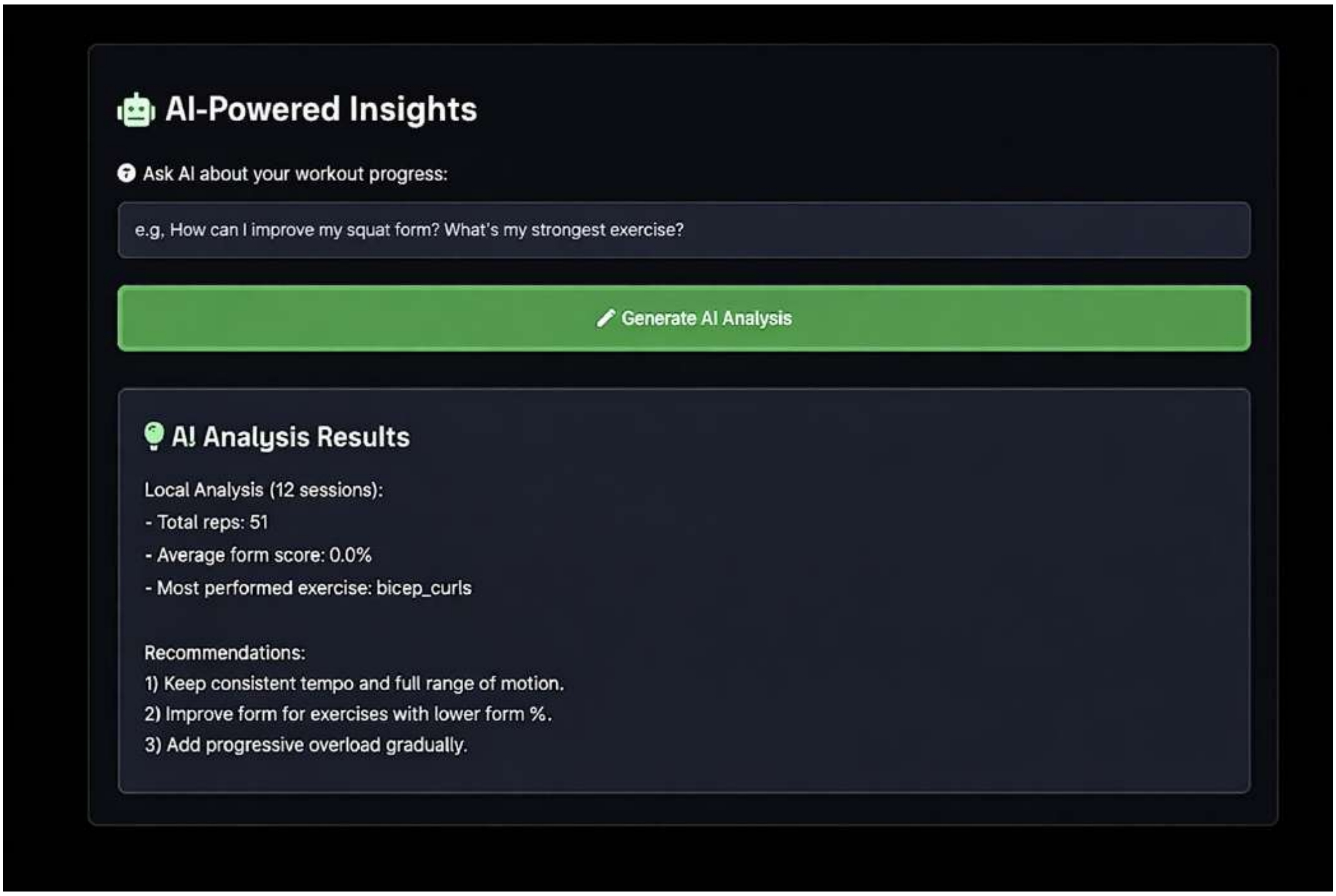

Figure 5: Realtime Feedback Panel.

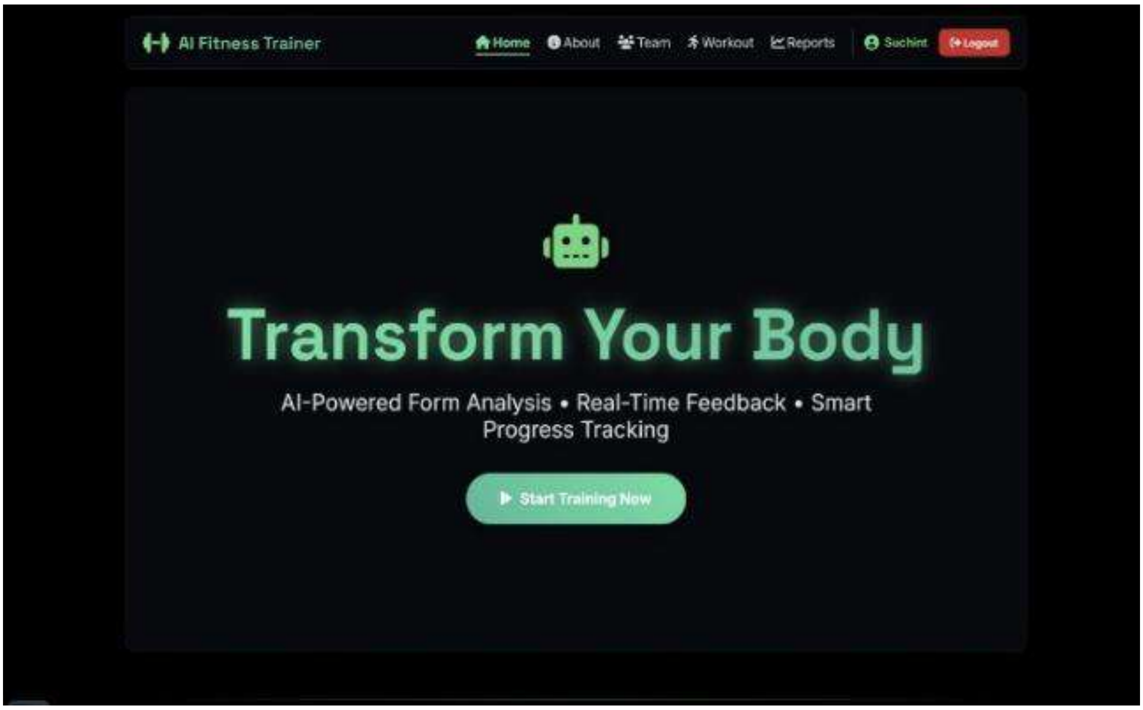

Figure 6: AI Analysis Results

In the above figure 6, represents the homepage (landing screen) of the AI Fitness Trainer application. It highlights the main value proposition—"Transform Your Body" and emphasizes key features such as AI-powered form analysis, real-time feedback, and smart progress tracking. The "Start Training Now" button serves as a call to action, encouraging users to begin their fitness training using the AI-based system.

Figure 7: User Progress Stats

In the above figure 7 shows an AI Fitness Trainer – Progress Dashboard it summarizes a user's workout performance at a glance. It highlights a key metrics such as total workouts (5), total repetitions (30), average form score (47.6%), and calories burned (6). The dashboard also includes an exercise distribution chart showing how workouts are split between exercises (e.g., bicep curls and squats) and a progress timeline graph that tracks changes in repetitions and form score over time.

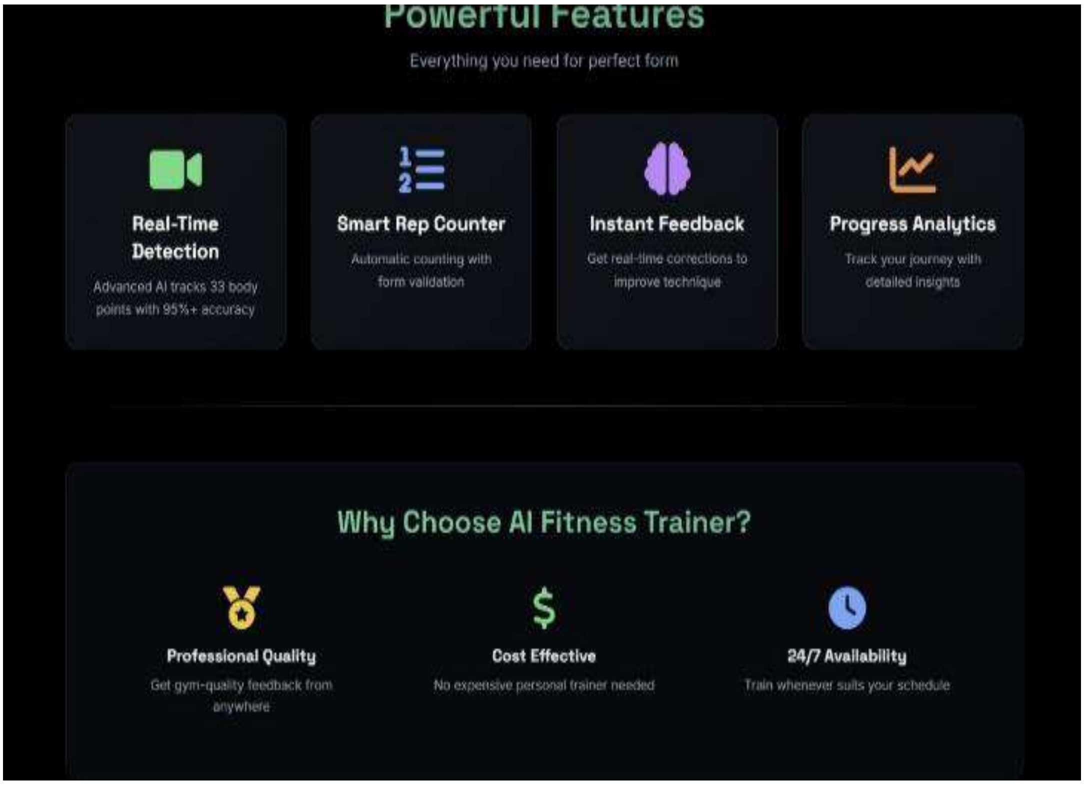

Figure 8: Platform Key Features

In the above Figure 8 highlights the key features and benefits of the AI Fitness Trainer. Its capabilities such as real-time movement detection, smart repetition counting, instant feedback for form correction, and progress analytics. In the lower section we explains why to choose the system, emphasizing professional-quality guidance, cost-effectiveness, and 24/7 availability, making it a convenient and efficient alternative to a personal trainer.

VII. CONCLUSIONS

The article "The development of AI-Based Personalized Fitness Trainer: Real-Time Pose Estimation and Form Correction Using Computer Vision" represents the program that effectively uses the concepts of Artificial Intelligence (AI) and Computer Vision to improve the accuracy and safety of the workout monitoring. Using pose estimation methods with models such as MediaPipe, the system is able to identify human body keypoints, exercise repetitions and provide real-time feedback on whether a person is in the correct position only using a web camera. This will do away with the reliance on wearable gadgets and allow a completely contactless fitness tracking experience. The suggested solution does not only assist the users in having appropriate form when exercising, but also reduces form-based injuries brought about by improper movements. With its web-based user interface, it has simplified and lowered the cost of smart fitness coaching to people who exercise either at home or in the gym. Despite the fact that the issues related to lighting conditions, the range of exercises, and the limitations of real-time processing remain in place, the system provides a strong basis of the further advancements in the field of AI-based fitness monitoring. All in all, it is a big leap towards developing a smart, user-friendly, and data-driven fitness system that will encourage healthy and productive exercise habits.

VIII. SCOPE FOR FUTURE WORK

The suggested Personalized Fitness Trainer: Real-Time Pose Estimation and Form Correction Using Computer Vision offer a good base of AI-based fitness tracker and real-time posture estimations. However, the system has numerous aspects that can be improved. The future work can be based on interconnecting 3D pose estimation with multiple camera angles or depth sensors that will enhance the precision of such complicated motions of the body. The use of wearable and IoT gadgets like smartwatches or fitness bands can be integrated further to provide a more detailed data analysis through the integration of biometric and visual data. It can be suggested to add personalized AI-based coaching and voice feedback to make the system more interactive and user-friendly by providing real-time tips and encouragement. Enhancing the applicability of the system by accommodating a large variety of exercises such as yoga, physiotherapy sessions, etc., would increase its use. Moreover, the creation of a mobile application will contribute to the improvement of the accessibility because people will be able to do the workouts at any time, no matter the location. The combination of cloud-based data analytics, gamification, and AR/VR based training modules can ultimately evolve into an intelligent, holistic, and integrated system of fitness that facilitates effective, safe and enjoyable exercise experiences.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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ABOUT THE AUTHORS

Dr. Suchetha N V has completed her B.E in the year 2011, MTech in the year 2015 from VTU Belagavi, and Ph.D. in the year 2024 from VTU Belagavi. Her areas of interest are Image Processing and Deep Learning. She has published 13 international research papers. She is the life member of Kannada Sahitya Parishad.

Sagar D Patgar received his B.E. degree in Computer Science and Engineering from Visvesvaraya Technological University (VTU), Belagavi. His areas of interest include Deep Learning, Machine Learning, Web Development and Artificial Intelligence (AI). He was a student in the Department of Computer Science and Engineering at SDM Institute of Technology, Ujire.

Skandan M J received his B.E. degree in Computer Science and Engineering from Visvesvaraya Technological University (VTU), Belagavi. His areas of interest include Deep Learning, Machine Learning, Web Development and Artificial Intelligence (AI). He was a student in the Department of Computer Science and Engineering at SDM Institute of Technology, Ujire.

Suchint M Shetty received his B.E. degree in Computer Science and Engineering from Visvesvaraya Technological University (VTU), Belagavi. His areas of interest include Deep Learning, the Internet of Things (IoT), and Artificial Intelligence (AI). He was a student in the Department of Computer Science and Engineering at SDM Institute of Technology, Ujire.

Nikhil M C received his B.E. degree in Computer Science and Engineering from Visvesvaraya Technological University (VTU), Belagavi. His areas of interest include Deep Learning, the Internet of Things (IoT), and Artificial Intelligence (AI). He was a student in the Department of Computer Science and Engineering at SDM Institute of Technology, Ujire.