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E TRAINER: POSTURE CORRECTION AND PERSONALISED DIET RECOMMENDATION SYSTEM

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Abstract — The E-Trainer application is a pioneering tool that integrates advanced technologies to provide users with personalized fitness and nutrition guidance. By harnessing computer vision technologies such as CV2, MediaPipe, and NumPy, combined with AIML for conversational interactions, E-Trainer functions as a virtual exercise trainer capable of detecting and estimating exercises in real-time. Through the analysis of human posture captured by the device's camera, the app constructs a skeletal representation to assess exercise accuracy, delivering feedback both visually on-screen and audibly through Natural Language Processing (NLP).

Key functionalities of E-Trainer include real-time exercise monitoring, where the app tracks the user's performance and maintains an exercise count displayed on the screen. Additionally, the application offers diet recommendations based on user input and nutritional values, utilizing machine learning techniques such as logistic regression implemented with scikit-learn. By incorporating datasets containing foods tailored to various health objectives, including weight maintenance, loss, and gain, E-Trainer provides personalized dietary advice to support users in achieving their fitness goals.

KEY WORDS - Personalized Fitness, Artificial Intelligence And Machine Learning Algorithms, CV2, Numpy, Mediapipe.

I.INTRODUCTION

Physical activity is the most essential prerequisite for maintaining or improving overall health. The truth is that people find it very hard to exercise. Above all, the general public is unaware of safe and convenient physical exertion and remains the most critical barrier. Secondly, we must allocate time and the necessary mental strength to maintain a regular workout. Additionally, it is complicated since people frequently lack time due to their hectic working lives. Finally, a personal coach makes a substantial difference since exercise quality and client compliance dramatically use them, as demonstrated by multiple investigations. Personal instruction includes individual guidance, inspiration, and is particularly useful when it comes to recovery, such as repairing muscle following surgery. Sadly, there are not many specialized trainers available, and when there are, the cost is frequently unaffordable for long-term use. Concerns over privacy and possible humiliation can also discourage people from using personal training services. In addition, whether using the equipment at home or at a gym, the possibility of incorrect and perhaps harmful usage is greatly decreased when a trainer is present. This paper introduces the E-Trainer, program created to completely change the way we think about diet and exercise. With the use of technologies like MediaPipe[2], CV2, NumPy, and AIML, E-Trainer provides customers with a comprehensive solution for bettering their food and exercise routines.

Two features of E-Trainer are designed to maximize fitness engagement and encourage healthier living. Fundamentally, E-Trainer functions as a computerized fitness

instructor, utilizing computer vision techniques to identify and evaluate the workouts that users complete in real time. The program creates a skeletal image of a person by evaluating their posture as it is caught by the camera. It then offers feedback on how well the exercise is executed. Users get instant insights into their performance with this feedback, which is presented both audibly through Natural Language Processing (NLP) and visibly on-screen.

E-Trainer goes beyond tracking workouts to include dietary recommendations. Through the use of machine learning techniques—specifically, logistic regression with scikit-learn the software makes individualized diet recommendations based on users' caloric needs and food preferences. Through the integration of datasets that include foods appropriate for a range of health goals, such as weight gain, loss, and maintenance, the program guarantees that users are provided with helpful and relevant dietary recommendations. Using the device's camera to detect human posture is the first step in the process, which then generates a skeletal representation and estimates exercise. The software keeps track of how many exercises you complete during the session and shows it to you simply on the screen. Users can also enter their nutritional values and dietary preferences, which enables the app to deliver customized diet suggestions depending on each user's needs and objectives. In summary, E-Trainer offers customers an intuitive and approachable tool to maximize their health and well- being. It is a revolutionary method to managing fitness and nutrition. E-Trainer is here to help you every step of the way, whether your goal is to make better food choices or enhance your exercise technique. With E-Trainer, welcome to a new era of individualized diet and fitness support.

II. LITERATURE SURVEY

A rising number of people are interested in using technology, especially artificial intelligence (AI) and machine learning (ML), to create cutting-edge systems for tracking fitness, monitoring activity, and making dietary recommendations. This overview of the literature examines numerous research projects in these fields, emphasizing significant discoveries, approaches, and developments. Human Pose Estimation in an Intelligent Fitness Trainer.

A smart gym trainer that makes use of human pose estimation technology is presented in this research[1]. Using AI and computer vision, the system provides in-the-moment workout coaching. Pose estimation is essential for tracking users' motions so that coaching and customized feedback may be provided. A machine learning-based system for exercise posture detection is presented in Machine Learning-Based Exercise Posture detection System Using MediaPipe Pose Estimation Framework [2]. By utilizing the MediaPipe pose estimation architecture, the system is able to precisely monitor motions of the body and identify various poses used during exercise. This improves user efficacy and engagement by enabling automated workout monitoring and feedback provision. Computer-based artificial intelligence models to help in the detection, assessment, and intervention of children's physical fitness through exercise.[3] model for determining children's levels of physical fitness and assessing fitness-related therapies. The system uses AI algorithms to determine an individual's level of fitness, suggest tailored exercise programs, and measure the efficacy of such programs. This strategy has the potential to encourage children to lead active lives and to counteract sedentary habits. iFitness: A Motion Detection System for Physical Fitness Using Deep Learning for SeniorsiFitness, a motion detection system designed specifically for senior citizens, is presented by [4] The system can recognize and evaluate a variety of physical fitness motions, including walking, stretching, and balancing exercises, thanks to deep learning algorithms. With the use of this technology, elderly people can stay active and avoid developing age-related health problems. Using Edge Machine Learning to Create a Novel Fitness Tracker [5]presents a fitness tracker that uses edge machine learning features. The tracker may offer real-time feedback on fitness activities without requiring constant internet connectivity by utilizing inbuilt processing and analysis. This improves user privacy and makes it possible to track physical activity levels easily. The idea of an intelligent personal trainer that uses expert systems and fuzzy logic is presented in The Intelligent Personal Trainer [6] The system's goal is to offer customized exercise advice based on each user's unique traits and interests. Even though it was a more recent contribution, it set the stage for later studies on AI-driven fitness instruction. GymSkill A personalized fitness trainer that uses sensors to track and evaluate physical activity is introduced in the framework for a personal trainer for physical workouts by [7]. Through the use of algorithms for skill evaluation and activity identification, gives users immediate feedback, allowing them to enhance their training methods and efficiently monitor their advancements. Food Recommendation Systems Using Collaborative and Content-Based Filtering Methods[8] investigate meal recommendation systems that use collaborative and content-based filtering methods. Personalized meal suggestions are provided by these systems by an analysis of users' dietary habits and consumption patterns. This encourages better eating habits in addition to increasing consumer enjoyment. A thorough analysis of diet recommendation systems based on different machine learning algorithms is done by Diet Recommendation System based on Different Machine Learners [9]. They pinpoint existing systems' advantages, disadvantages, and possible areas for development by contrasting various strategies. For those working in this sector, including scholars and practitioners, this review offers insightful information. Dietary Guidelines and Exercise Advice provide a method for

making exercise and diet recommendations based on machine learning algorithms using ML[10]. To improve health and fitness outcomes, the system analyzes nutritional requirements, fitness goals, and health factors to offer individualized suggestions. The food and exercise components of wellbeing are both addressed by this integrated approach. In conclusion, new developments in AI, ML, and computer vision have opened the door to creative approaches to diet counseling, exercise tracking, and fitness tracking. These systems make use of data-driven methodologies to offer tailored advice and assistance to those who want to enhance their health and well-being. To improve these systems' precision, usability, and efficacy in practical contexts, more study is necessary. trAIner An AI Fitness Coach Solution This[11] study introduces trAIner, an AI-powered fitness coach solution meant to deliver tailored coaching to users. The device analyzes users' workout form in real-time using webcam pose estimation technology. Workout efficacy is increased by trAIner, an artificial intelligence system that analyzes form, gives feedback, and provides voice-guided directions. A digital exercise trainer designed to manage, monitor, and record exercise sessions is shown in Personal Digital Exercise Trainer for Managing, Monitoring, and Recording the Exercise ,[12] study presents features like session recording, heart rate monitoring, and feedback systems are integrated with the system. Through the use of wireless connectivity and digital recording, users may track their workouts and get instant feedback on how they performed. A proposal for an intelligent fitness trainer system that makes use of human posture estimation technology is presented in Intelligent Fitness Trainer System Based on Human posture Estimation ,[13] introduces the technology offers real-time feedback on form and posture as well as individualized training recommendations based on users' body movements. This method lowers the danger of injury while increasing the effectiveness of training. A human position estimation-based AI fitness trainer system is presented in AI Fitness Trainer Using Human position Estimation ,[14] presents the device that examines users' actions during workouts and provides tailored coaching and feedback by utilizing sophisticated algorithms. This technology-driven strategy encourages users to stick to their exercise regimens and improves the user experience. Diet Recommendation with Predictive Learning Approaches ,This [15] study focuses on predictive learning-based diet recommendation systems. These systems use random forests, clustering techniques, and support vector machines to evaluate user input and provide individualized meal plans. This tailored strategy supports the maintenance of a healthy lifestyle and the accomplishment of nutrition goals. A machine learning model for diet advice awareness is proposed in [16],this study presents diet recommendation awareness machine learning model. Based on user choices and health objectives, the system creates individualized food suggestions using clustering algorithms and data modeling approaches. This strategy encourages informed dietary decisions and raises knowledge of good eating practices.

III.PROPOSED METHODOLOGY

[1] Data Collection and Preprocessing: Data collected through real time video captured by device camera.

[2] Exercise Detection and Estimation: Utilize computer vision libraries such as OpenCV and MediaPipe to detect human posture and create skeletal representations. Implement algorithms to estimate the exercise being performed by analyzing the skeletal structure. Track and maintain exercise counts on the screen to provide real-time feedback to the user.

[3] Feedback Mechanism: Incorporate Natural Language Processing (NLP) techniques to provide feedback to the user. Display feedback on the screen indicating the accuracy of exercise performance. Use voice output to verbally communicate feedback to the user.

[4] Virtual Exercise Trainer: Design the application to act as a virtual exercise trainer by monitoring the user's exercise performance. Provide guidance and corrective feedback to help users improve their exercise technique.

[5] Diet Recommendation: Integrate machine learning algorithms, specifically logistic regression using scikit-learn, to recommend diets to users. Train the model on a dataset containing food items categorized for maintaining ideal weight, weight loss, and weight gain. Allow users to input their dietary preferences and nutritional values. Utilize the trained model to recommend personalized diet plans based on the user's preferences and caloric requirements.

[6]User Interaction: Enable users to interact with the application by inputting their exercise routines and dietary choices. Provide a user-friendly interface for inputting and receiving feedback. Incorporate features for users to track their progress and set goals.

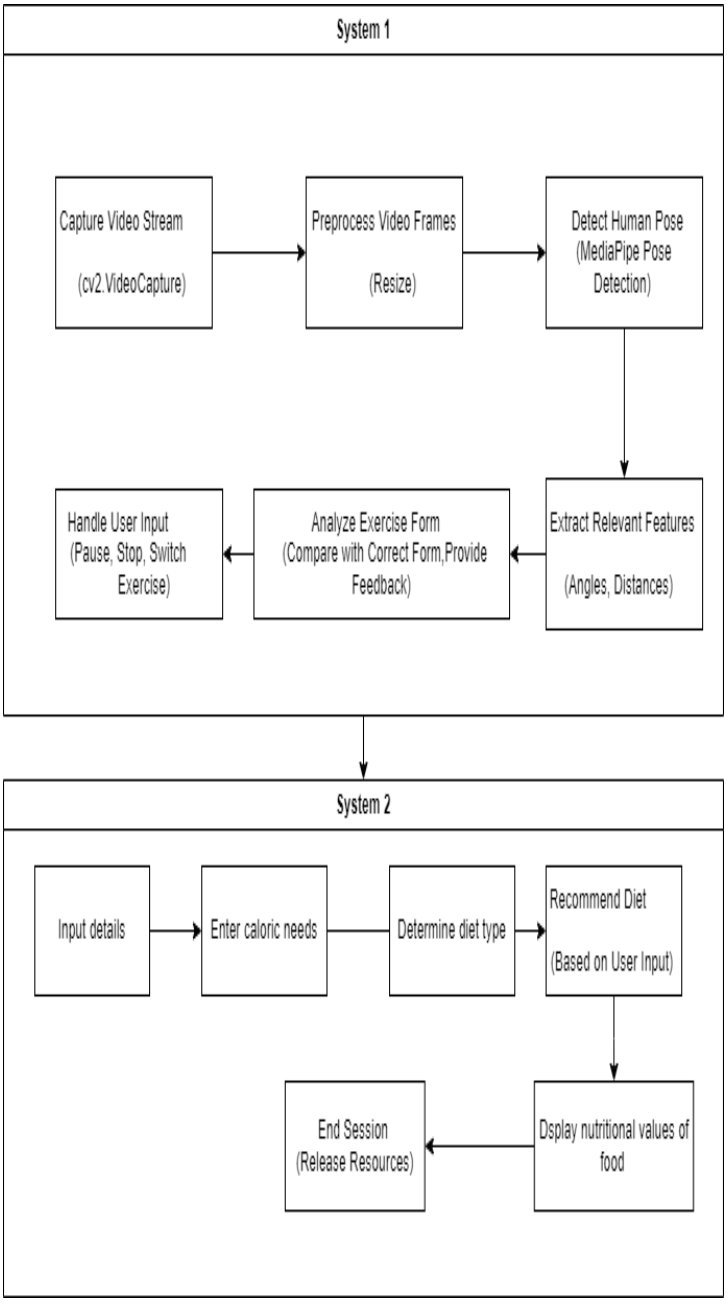

Fig.1. System Architecture

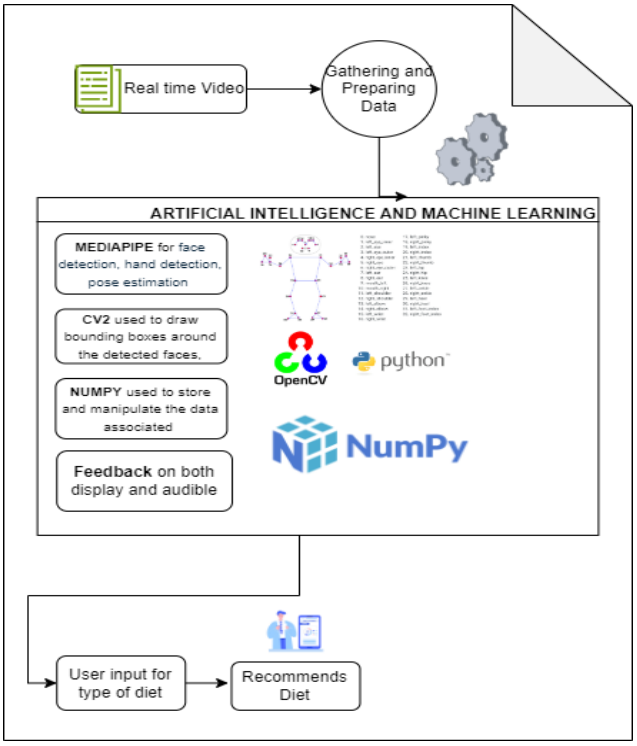

Fig. 2. Proposed Architecture

IV.RESULTS

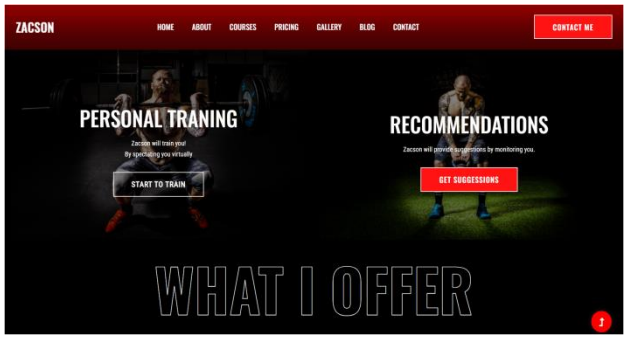

Fig.3.UI of the System easy-to-use Interface

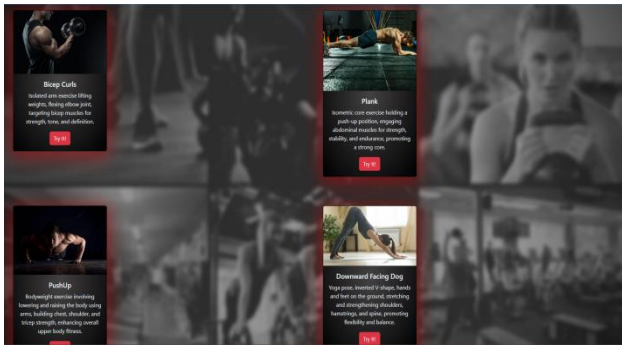

Fig.4. Different Exercise options

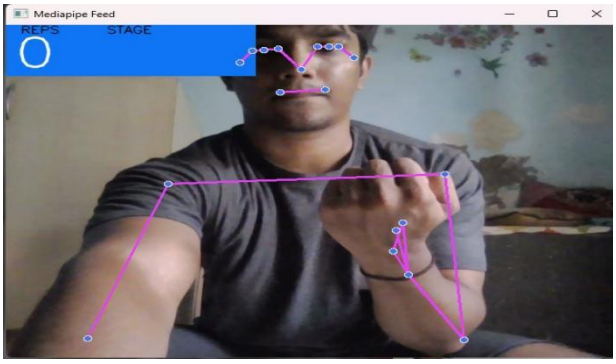

Fig.5.pose detection

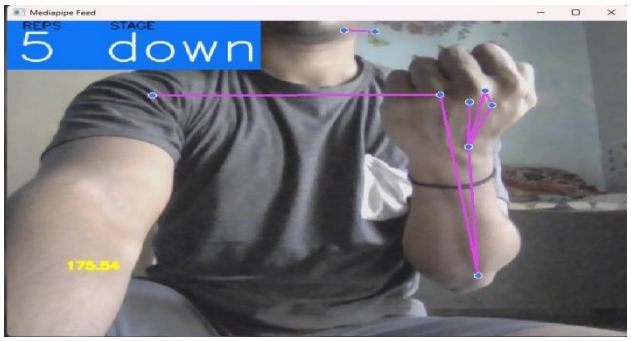

Fig.6.reps count and stage of exercise

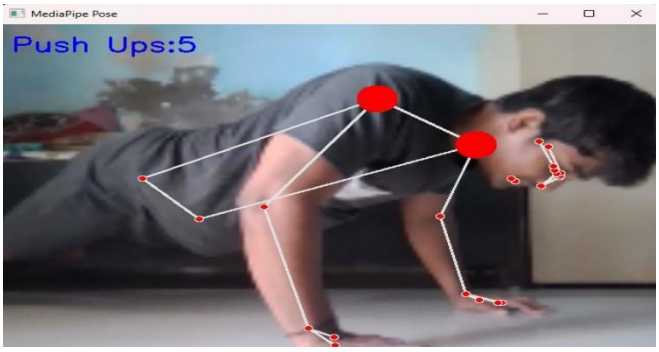

Fig.7.

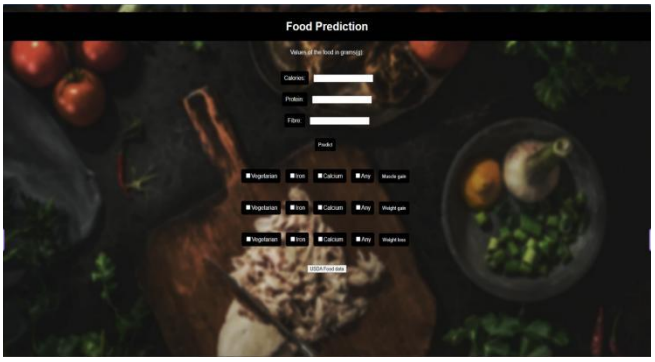

Fig.8. Diet recommendation UI

Fig.9. Recommended diet options

Fig. 6 and 7 visually represents the exercise repetition count and determines the stage of the exercise, providing users with a clear indication of their progress and current position within the workout routine.

In Fig. 8, the diet recommendation user interface (UI) is depicted, showcasing various options available for users to select their dietary preferences. Additionally, users have the option to input specific nutritional values according to their preferences and requirements, enabling a personalized and tailored diet recommendation experience.

In Fig.9, the system presents diet options along with the nutritional values of food included in each option. This allows users to make informed decisions based on the nutritional content of the recommended diet options, ensuring that they align with their dietary goals and preferences.

The results of E-Trainer highlight how well it supports users' diet and exercise regimens. By utilizing its capabilities for real-time exercise identification and performance evaluation, the application provides insightful feedback regarding the accuracy with which users execute their workouts. This feedback, which is conveyed by voice cues and on-screen prompts, promotes increased accountability and mindfulness throughout workouts, which improves adherence and performance. Moreover, consumers highly praise E-Trainer's diet guidance tool, attesting to significant improvements in their eating habits and general well-being. Through the provision of customized diet plans based on personal preferences and dietary requirements, the program enables users to make educated food choices and maintain a well-balanced diet in line with their fitness goals.

V.CONCLUSION

In conclusion, the E-Trainer app represents a significant advancement in the field of fitness and health ,Combining computer vision technologies such as OpenCV, MediaPipe, and NumPy under Artificial Intelligence Machine Learning, this app provides a comprehensive solution for users looking to

improve their exercise and eating habits. The main feature of this application is its ability to detect and evaluate the exercises performed by the user in real time.Through an analysis of the user's posture as recorded by the camera, the application generates a skeletal representation and furnishes details regarding the precision of the movements. This feedback, which is shown both visibly on the screen and audibly using natural language processing (NLP), essentially transforms the app into a virtual trainer that can watch over and mentor users while they work out.

The E-Trainer app also includes extra features centered around diet advice made with machine learning techniques, particularly logistic regression with scikit-learn. The software generates personalized diet plans based on the user's calorie requirements and dietary preferences. The app makes sure users receive current, relevant nutritional recommendations by including data sets covering foods appropriate for a range of health goals, such as weight gain, loss, and maintenance. All things considered, the E-Trainer software offers a thorough and intuitive way for people to maximize their control over nutrition and exercise.

With the ongoing advancement of technology, the Exercise Detection and Correction Application employing AIML has the potential to improve not only the health of individuals but also the general well-being of society.

VI.FUTURE SCOPE

The app's accuracy and adaptability can be increased by continuously improving and growing its activity detection features. More advanced algorithms and the use of cutting-edge computer vision techniques may make it possible to identify a wider variety of activities more accurately. By expanding on the current feedback systems, the app can change to give users more specialized and individualized advice. The software might provide personalized workout recommendations, form corrections, and motivational prompts depending on user progress and goals by evaluating performance data over time. With integrating wearable biometric sensors like accelerometers or heart rate monitors you may be able to get more information about user performance and health indicators while working out. The app's feedback system might easily integrate this data, giving users a more thorough grasp of their workout intensity and physiological reactions. The app's usefulness can be increased by incorporating a broader range of food preferences and nutritional factors into its dietary suggestion system. Users can receive diet plans that are relevant to them and customized to meet their goals by include information on dietary limitations, cultural preferences, and dietary needs.

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