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Yoga Posture Detection and Correction

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ABSTRACT: **Yoga is becoming increasingly popular due to its positive effects on the body and mind. Although many individuals engage in yoga practices, it is important to receive proper instruction from an experienced teacher to avoid potential health issues. The proposed solution aims to address this issue by developing a web-based application that uses a camera to capture the user's yoga poses. The captured images are then processed by a TensorFlow Move Net model which identifies 17 key body points. This information is then fed into a Classification model which verifies the accuracy of sthe pose and if necessary, provides correction through a Correction model. The user will be alerted to any corrections through both visual and audio cues.**

I. INTRODUCTION:

People require a lifestyle that is healthy. Healthy diet, exercise, stress reduction, and weight control are all components of a healthy lifestyle. By engaging in healthy physical activities, people can easily maintain a healthy lifestyle. Exercise is included in this list of beneficial physical activities. Exercises come in a variety of forms, including yoga, aerobics, strength training, and balancing training. Exercises can be performed by traveling to a class or instructor, using their own knowledge, or by watching videos. Most people prefer to perform workouts on their own using an instruction manual or internet tutorials because they don't have much free time in their daily routine.

Yoga is a 5000-year-old Indian discipline and practice that is used to create psychophysical balance. In addition to enhancing strength, balance, and flexibility, it helps restore mental poise. It's important to perform yoga poses correctly because the wrong alignment can be harmful or inefficient. Automated self-training methods can help athletes avoid injuries and improve performance. Yoga is a unique kind of physical activity that improves physical fitness and reduces tension and anxiety. Studies have indicated that it improves heart rate, respiration, and metabolism. Yoga is becoming more and more popular every day because of its physical, mental, and spiritual advantages. Many people attempt yoga poses without the supervision of a trained teacher, which can lead to serious health problems like pain, soreness, and muscular injuries, or weariness if executed incorrectly. As a result, performing yoga poses correctly is essential. According to medical professionals, poor posture can cause both acute and chronic discomfort. Finding common and precise yoga postures is the main objective of computer vision-based yoga pose identification and correction. As a result, an instructor must be present to supervise the lesson and ensure proper posture. Thus, without the need for a teacher, the authors suggest an AI-based program that can recognize yoga poses and offer tailored feedback to help with posture. The project will be a publicly accessible web application that offers real-time stance identification and individualized feedback to help users perform yoga correctly. A wide range of users will be able to access the application, which will simply need an internet connection and be intended to recognize yoga poses with high accuracy, dependability, and user-friendliness. In order to improve the yoga experience and help practitioners of all levels perfect their form and technique, the system will also make use of augmented reality models. AR models have been created for every yoga pose, which helps users practice the poses as efficiently as possible by letting them watch how the pose is done and then try to mimic the proper form.

II. LITERATURE REVIEW

Researchers F. Rishan, B. De Silva, S. Alawathugoda, S. Nijabdeen, L. Rupasinghe, and C. Liyanapathirana [1] studied the creation of a smartphone-based system that records the user's motions using the camera on the device. The system is composed of two primary modules: a classification model trained to detect six distinct yoga poses, and a pose estimation module that uses OpenPose, a computer vision library, to identify 25 essential body points. The created model has an astounding 99.1% accuracy rate.

A. Chaudhari, O. Dalvi, O. Ramade, and D. Ambawade [2]used a CNN model and deep learning techniques to classify yoga poses. In order to ascertain the user's position, they employed a CNN classifier in place of keypoints and skeleton annotations. The 28,478 images in the Yoga-82 dataset, which features 82 distinct yoga poses, were used to train the model. To determine the user's position, the model takes 15 main body points out of the real-time video that the device camera records. The model finds problems and notifies the user if any are detected by comparing the user's derived key points to the asana's pre-set reference key points. Using data from the Yoga-82 dataset, the program can classify five yoga poses with a 95% accuracy rate.

A. Sharma, Y. Agrawal, Y. Shah, and P. Jain [3]used the YOGI dataset, which included 10 yoga postures and 5 2hand mudras, to create a self-assisted method for recognizing yoga positions. There were 500 photos of each mudra and 400–900 photos of each position in the dataset. Skeletons of the hands and body were made, and the angles at which the joints were formed were utilized as features in deep learning and machine learning models to extract features. Using XGBoost and Random Search CV, the system was tested for five hand yoga postures on the YOGI dataset, and it achieved an accuracy of 99.2%. Ten yoga positions and five hand mudras may be instantly recognized and corrected by the system.

III. METHODOLOGY

A. Dataset : Data from multiple sources can help to increase diversity and representativeness of the data; if we rely on data from a single source, it may not capture the full range of variability that exists in the population or phenomenon of interest; by combining data from multiple sources, we can obtain a more comprehensive and accurate picture of the underlying phenomenon. Using a variety of sources enhances the generalizability of the results and enables more thorough analysis. The sources include web searches for open source datasets, Yoga-82, and Kaggle. The five asanas that were initially implemented from the dataset that was chosen are Adho Mukha Svanasana, Padmasana, Utkatasana, Utthita Trikonasana, and Vrikshasana. Because these five asanas are regarded as safe and approachable for practitioners of varying ability levels, the authors selected them for initial adoption. Yoga practitioners are typically familiar with these poses, which are frequently taught in classes. They are therefore a suitable place to start when creating and evaluating the pose detection and correction system. By identifying the 17 critical locations, the Tensorflow MoveNet model transforms the images into a length array with a size of 51.

B. Image processing : Image preprocessing is the process of making changes to the raw data before feeding it into the deep learning system. Pre-. processing aims to improve the picture data by eliminating superfluous distortions and highlighting important aspects of the image that are necessary for further processing. The dataset will only contain landmark points with scores greater than a predetermined threshold of 0.1; images that do not meet this criterion will not be processed further.

C. MoveNet Model: MoveNet is a real-time multi-person pose estimation model developed by Google Research. It's designed to accurately detect human poses in images and videos, including keypoint localization for various body parts such as the shoulders, elbows, wrists, hips, knees, and ankles. The MoveNet model is based on deep learning techniques, specifically convolutional neural networks (CNNs), and it's optimized for efficiency to run on various devices, including mobile phones and embedded systems. MoveNet is implemented using TensorFlow, Google's open-source machine learning framework, which makes it accessible for developers to use and integrate into their projects.

D. Keras Neural Network Model: Keras is a high-level neural networks API written in Python. It's widely used for building and training deep learning models due to its user-friendly interface and flexibility. Keras provides a simple and intuitive way to design neural networks, allowing developers to quickly prototype and experiment with different architectures. The core concept of Keras is Models, which aggregate layers into objects and reflect the real neural network model. The Sequential model and the more sophisticated Functional model are the two model types available in the collection. The Functional model is an adaptable API that facilitates the specification of numerous input and output structures and helps the construction of complicated models. In order to recognize yoga poses from an array, we used a Keras Functional model for Deep Learning in this study.

E. AR Model: An augmented reality (AR) model refers to a digital representation or simulation of objects or environments that blends virtual elements with the real world in real-time. These models are designed to enhance the perception of reality by overlaying computer-generated images, videos, or 3D objects onto the user's view of the physical world. The AR model is a fantastic way to improve

the yoga practice and help practitioners of all levels perfect their form and technique. The authors have created augmented reality models for every yoga pose, which help users do the poses as optimally as possible by letting them watch how the pose is done and then try to replicate the proper form.

IV. SYSTEM DESIGN AND OUTPUT

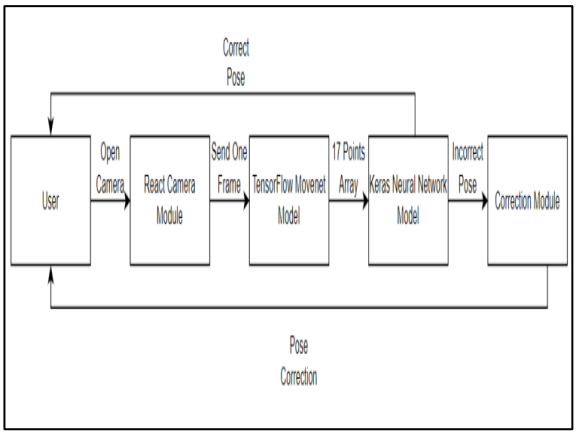

Fig.1.Data Flow Diagram

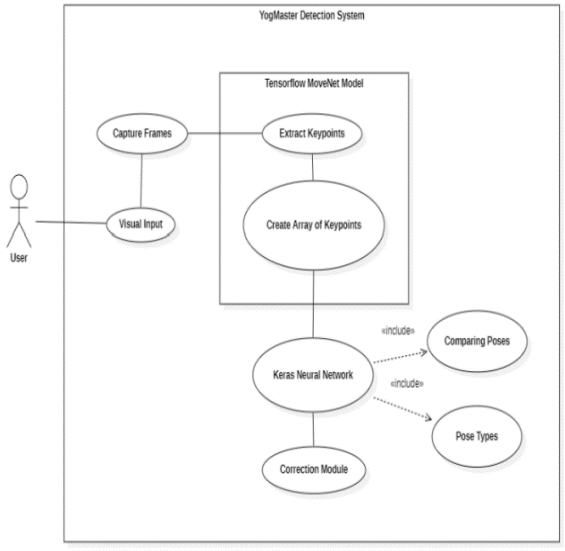

Fig.2.Use Case Diagram

Outputs:

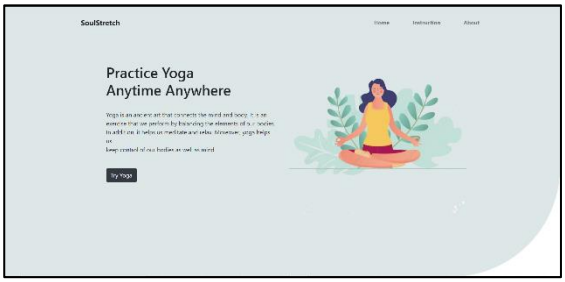

Fig.3. Homepage

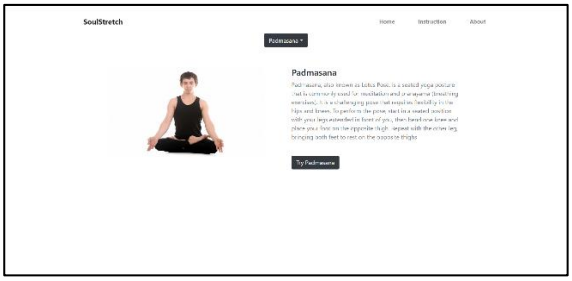

Fig.4.Yogapose padmasana

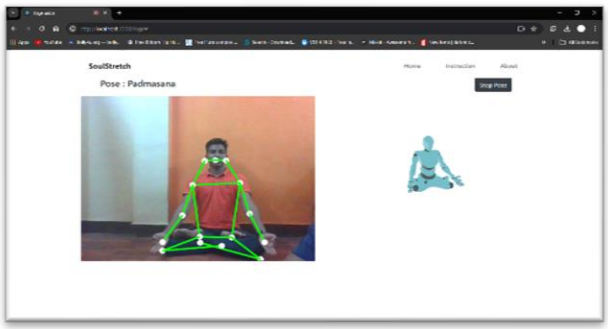

Fig.5.Demo Pose

V. CONCLUSION

In order to detect real-time user key points and fix them if they are erroneous, a model has been used in this project to extract 17 body key points from the image and store them in an array. On PCs and laptops, the framework can be utilized for continuing forecasting and self-preparation. The suggested model divides yoga asanas into multiple categories; however, because there are so many different yoga postures, developing a posture estimation model that works for every asana is difficult. The authors used a machine learning model that effectively identifies the unique characteristics of each stance to categorize yoga

poses from photos. The random forest classifier, a popular machine learning technique that can handle both continuous and categorical data, was first employed by the authors. The model did not perform as well as it could have, with just a 95% accuracy rate and occasional false positives. The scientists investigated neural network models, which are well-known for their ability to handle complex data and function well in classification tasks, in an effort to increase the model's accuracy. The authors chose a Keras-based neural network model that demonstrated an amazing accuracy rate of 99.47% after evaluating the model using the filtered dataset.

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