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THE AI YOGA TRAINER USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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***Abstract*: People of all ages can benefit from the physical and mental health benefits of yoga. Yoga poses must be performed correctly especially, without an instructor to avoid any harm to the bones, muscles, and ligaments. Thus, the usage of Artificial Intelligence and machine learning with the help of image processing will help to give feedback to the performer even without a live instructor. The proposed system is intended to instruct users to perform the yoga pose correctly and also correct them if they do it incorrectly. The feedback is given to the user in form of text and audio which can help the practitioner to prevent injuries and also increase the benefits of performing the yoga pose. The data set of different Yoga poses is created by taking various images from the internet. With the help of OpenCV and media pipes, the data points are figured out from each image from the webcam. This is now loaded into a Convolution neural network-based deep learning model (CNN)which helps to identify errors in the pose and produce the error percentage and gives the user the required feedback in the form of text or audio desired output whose classification accuracy is about 95%.**

Keywords: Real-time pose identification, Yoga, Activity recognition, Media pipes, and Human pose estimate

I. INTRODUCTION

Yoga, which has its roots in India, is a type of spiritual, mental, and physical exercise that promotes harmony between the physical body and the mind (mental). It is one of the earliest fields of study that leads to improvements in physical or psychological aspects of health. Regular Yoga practice has the advantages of increased flexibility, stamina, sleep quality, muscle strength, cardiovascular health, and posture as well as chronic pains. However, it has been demonstrated that poor yoga postures can lead to fractures, strain and sprains, joint dislocation, nerve damage, and stroke. In particular, a 2007 study of 34 nations discovered that inappropriate yoga practice frequently results in neck injury. Thus, we can use AI to incorporate a live instructor into our proposed system.

Artificial intelligence (AI), a subset of machine learning (ML), is seen as a key technology of the Fourth Industrial Revolution. DL technology originated from the artificial neural network (ANN). It is extensively used in many different application fields, including healthcare, image identification, text analytics, cyber security, and many more. Automatic feature extraction is made possible by deep learning algorithms. Through this, we can estimate the errors in a pose and give users the required feedback.

The usage of deep learning with yoga will help people from all age groups to perform yoga poses in the right way. Thus, a cost-free, easy-to-use, application that can be used from anywhere, can be built using these technologies.

II. LITERATURE SURVEY

[1] This paper focuses on the notion of identifying different yoga postures and addressing the issue of poor posture with the aid of a precise model. It was developed to provide accurate post-estimation for the yoga poses. With OpenPose a model was created that helps in estimating the human pose. The results areobtained using the 2D and 3D points which are then determined if the accuracy of the model is increased when more features are added to the dataset.

[2] This study examines a range of posture estimating technologies and comes to a recommendation for the most effective approach for an Android app. It provides a pose estimation method for an android application. Tensorflow was used to achieve this method as it contains many libraries that provide privacy and faster analysis. The methodology was incorporated in additionto the speech-to-text and text-to-speech Google modules.

[3] An application powered by artificial intelligence might be helpful for identifying yoga poses and provide individualised feedback to assist people improve their poses. It is an algorithm used to calculate yoga position inaccuracy. A TensorFlow Move Net thunder modelwas proposed that provides an accurate pose estimation that is used to find pose problems in a person. This detection of body parts is done using images or video sequences. To estimate the error an algorithmic approach was proposed.

[4] In this paper, the model used is convolutional neural networks (CNN). This model was used to identify human joints to help identify pose errors. This system allowed him to achieve 95% accuracy in posture recognition. Performance parameters for this model. Themodel can be computed for six different Posses. Calculated values are precision, recall and F1 score. Wewere able to achieve a minimum F1 score of 0.72.

[5] This approach was illustrated by collecting six yoga asanas as a dataset. Since the model accurately classifies yoga poses, the poses performed are further modeled using a deep learning model. This is a hybrid deep learning consisting of a CNN layer used to get key points and an LSTM to make predictions. The system achieved 99.04% accuracy on individual images.

[6] In this paper the TL MobileNet DA model was selected as the best model showing overall value 98.43% accuracy, 98.30% sensitivity, 99.88% specificity, and a Matthews correlation coefficient of 0.9831. This study presented a yoga posture coaching system Real-time recognition of the movement of the user's yoga posture, You can choose yoga posture tips and guide them to avoid bad postures.

[7] This paper is about the growing concept of DL (deep learning) in the ML space (machine learning). And about the CNN algorithm, which is very popular in the conceptof deep learning. Deep learning enables learning and ensures that classification is achieved. Deep learning is asubset of machine learning that uses multilayer neural networks to perform classification. This overview is a starting point for the DL community interested in the DLspace. In addition, researchers are permitted to determine more appropriate directions of work to provide more precise alternatives in this area.

[8] In this research paper, we used Kinect and AdaBoost classification with 94.78% accuracy using CNN and Stacked Autoencoder (SAE) method for Yoga discrimination system. The approach presented in this study is based on: deep learning to detect wrong yoga poses, Advise users to improve their poses. Yoga poses go wrong. In the proposed system, users would You can choose and upload the poses you want to practice A recorded video of their yoga practice. +eResearch extract the angle of surveillance activity, Functions when scaling. In some cases the key point is When rotated, theangle does not change. gives good results. In this systemthe angle with the floor are taken into account, but not between joints. Rotate the key point slightly, then changethe angle. When To achieve these properties, we train a multi-layer perceptron. Accuracy on the test dataset is 0.9958.

III. PROPOSED METHODOLOGY

The proposed system automatically extracts the user's posture from the webcam and monitors 33 major body points from the camera image of the user performing asanas to determine the pre-defined acceptable It is intended for comparison with a collection of similar yogapostures. The procedure he consists of four stages. Theyare:

- Pose extraction through Webcam
- Key-point extraction
- Application of ML Algorithm
- Error estimation and feedback.

A. Pose extraction through Webcam

The initial step is to extract the pose from the webcam. Any traditional webcam is used to capture real-time video of the practitioner practicing a yoga pose. This feed from the webcam is then used for key-point extraction.

B. Key-point extraction

A webcam collects real-time images while performing poses. From now on, we use media pipesto extract 33 body points from the stream as shown in the image. The extracted points are saved in a CSV file and compared to set point values in the training data based on the positions and angles between them.

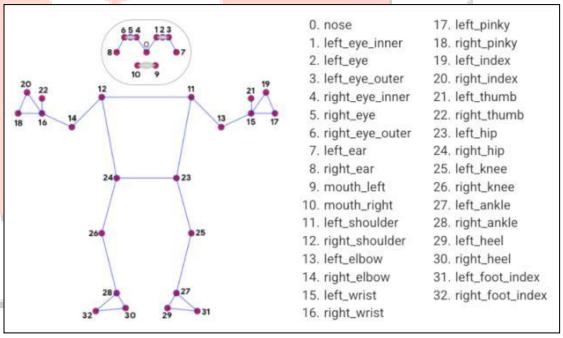

Fig. 1. 33-Key points identified by the model.

C. Application of ML Algorithm

It uses ML techniques to predict errors andclassification techniques to provide feedback. This is effectively done with the help of CNN. Convolutional Neural Networks (CNNs) performwell in computer vision problems such as image classification and object detection, especially for large data sets. The first step in identifying the wrong part of a particular pose is identifying the pose itself. This is done via a CNN classifier fordifferent yoga poses by creating pose key points andskeletal annotations from a CSV file.

Fig. 2. The model detects the key points and angles

D. Error Estimation and Feedback

The model then compares key points derived from: User image to a predefined set of reference keys Thepoint of building the ideal body for this asana. or Position of each key point If an adjacent keypoint istested and an error occurs or if a mismatch is detected, a text message and A voice message is displayed to guide the user Make necessary adjustments to the current pose Fix the error.

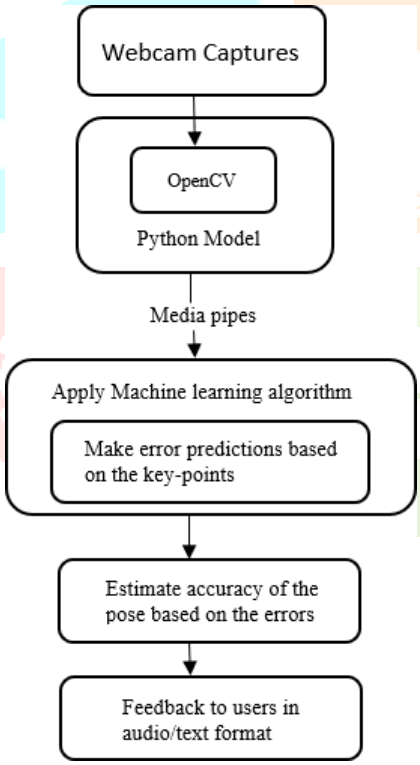

Fig.3. Flow chart of Yoga trainer with AI

IV. EXPECTED OUTCOMES

The proposed system is expected to correctly recognize yoga poses performed by a user in front of a webcam. Depending on the pose the user performs, the data points which is detected using media pipes are collected and stored as a CSV file. CNN is usedto match the input data with the training data which is the data collected of correct yoga poses through which the pose's accuracy and the pose errors are calculated. The required feedback is given to the user to perform the yoga in a beneficial way through voice assistance or text.

V. CONCLUSIONS

The proposed system can guide the user to perform yoga beneficially. The proposed system consists of a pipeline for pose detection and localization of the human body. After the error has been detected it uses bot technology along with voice assistant or normal text format to give the necessary feedback. The main focus is to help people perform yoga postures more accurately without an external instructor or trainer. Key points are obtained from the pose estimation module that is media pipes and joints are consideredas key points. Based on these key points the datasetis trained for accurate yoga poses.

The system is expected to deliver satisfactory results. There are a few improvements required based on our analysis and are working on them. Youcan also improve how the system works by adding modules for other yoga poses.

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