IJITCE

ISSN 2347- 3657

International Journal of Information Technology & Computer Engineering

Email : ijitce.editor@gmail.com or editor@ijitce.com

International Journal of Information Technology & Computer Engineering

ISSN 2347–3657
Volume 12, Issue 1, 2024

Deep learning approach to build a yoga AI trainer and pose detector

S. VARSHA REDDY, Department Of IT, SICET, Hyderabad
MALGIREDDY NIKHITHA, LAKKAKULA SIRI HASINI, GANGAVATH SRINIVAS, KUNCHAM YADAGIRI
UG Student, Department Of IT, SICET, Hyderabad

ABSTRACT

Yoga is a new way to look at the disciplines of our lives, such as physical, mental, and spiritual practices. Yoga started many years ago. Because of the many benefits of yoga, medical professionals and many celebrities suggest doing yoga for a healthy lifestyle. Taking care of your body, mind, and breath is a simple definition of yoga. However, depending on the COVID-19 situation, everything happening from home in this situation it is important to maintain your health. You need to do exercise daily. To do the exercise properly an instructor is needed at home that you cannot do in the COVID-19 situation. It is injurious to our health to do yoga poses without an instructor. So here we are going to represent a proposed model for yoga pose detection using a machine-learning algorithm to identify and detect the yoga pose form. Our system works on 8 yoga poses. We have developed a GUI-based desktop application using the Tkinter library. The input is preprocessed in the form of an image, the object is detected, and the core of the human body is identified using the media pipe and OpenCV library. For training and testing data, we use CSV files downloaded from Kaggle. We use logistic regression models for training and testing. The system gets an accuracy score of 100%.

Keywords: Media Pipe, Opencv, Machine Learning, Logistic Regression.

I. INTRODUCTION

Human pose recognition is an extremely troublesome and difficult task within the discipline of computer vision. It deals with the localization of human joints in a picture or video to make a skeletal illustration. To mechanically discover a user's activity in a picture may be a troublesome drawback because it depends on a variety of aspects like scale and determination of the image, illumination variation, background muddle, venture variations, and interaction of humans with the environment. The matter with yoga is that, rather like the other exercise, it's of utmost importance to apply it properly as any incorrect posture throughout a yoga session is often unproductive and probably damaging. This results in the requirement of getting an educator to supervise the session and proper posture.

Since not all users have access or resources to an educator, an artificial intelligence-based application can be wont to determine yoga poses and supply customized feedback to assist people to improve their poses. In recent years, human pose estimation has benefited greatly from machine learning and large gains in performance are achieved. Machine learning approaches give an additional simple approach of mapping the structure rather than having to wear down the dependencies between structures manually. This project focuses on exploring the various approaches for yoga pose classification and seeks to realize insight into the following: what's cause estimation? What's Machine learning? However, will machine learning be applied to yoga pose detection in real-time?

This project uses references from conference proceedings, revealed papers, technical reports, and journals. The second section talks about cause estimation and explains different kinds of cause estimation ways thoroughly and goes one level deeper to elucidate descriptive ways – learning primarily based (machine learning) and model. Totally different cause extraction ways are then mentioned in conjunction with machine learning primarily based models - logistical regression and python library like MediaPipe, OpenCV for cause estimation. We have a tendency to develop interfaces primarily based on desktop applications in which the user has to register first after successfully registering and login it opens a bnew window on which the user takes edges of our system there is a facilitated button provided for reference purposes by clicking on recognize button it opens the camera and determine the yoga posture show the name of yoga pose and probability.

II. METHODOLOGY

Human Pose Estimation:–

Human posture recognition has created vast advancements within the past years. it's evolved from second to 3D create estimation and from a single person to multi-person create estimation. It uses pose estimation to

ISSN 2347–3657
Volume 12, Issue 1, 2024

make a machine learning application that helps find shoplifters whereas uses one RGB camera to capture the 3D poses of multiple folks in the time period. Human pose estimation algorithms may be wide organized in 2 ways. Algorithms prototyping estimation of human poses as a geometrical calculation are classified as generative ways whereas algorithms modeling human creation estimation as a picture process drawback are classified as discriminative methods. in a different way of classifying these algorithms relies on their methodology of operating and therefore the major work behind that approach. Algorithms ranging from a higher-level generalization and moving down are known as top-down ways, whereas algorithms that begin with pixels and move upwards are known as bottom-up ways.

Keypoints detection:-

Human pose estimation from video plays an essential role in varied applications like quantifying physical exercises, language recognition, and full-body gesture management. For instance, it will type the premise for yoga, dance, and fitness applications. It also can change the overlay of digital content and data on prime of the physical world in increased reality. MediaPipe pose estimation give answer for hi-fi body pose following, inferring thirty-three 3D landmarks and background segmentation mask on the complete body from RGB video frames utilizing our BlazePose analysis that conjointly powers the Machine learning Kit pose Detection API.

Data Collection :-

We are working on total 8 yoga aasans which are Vajrasan, Shavasaan, Gomukhasan, Bhadraasan, Dhanuraasan,Shrishasan, Sarvangasan and Chakrasan. We are collected total 20,000 images dataset in the form of x,y,z and v coordinates which is stored in CSV file format. To run model on machines requires 8GB RAM or above. Software Requirements are Anaconda navigator which having spyder and command prompt it supports windows, linux and Mac-OS operating systems. To give database connection we used DBSqlite server.

III. MODELING AND ANALYSIS

Our approach aims to automatically recognize the user's Yoga asanas from real time videos. The method can be written into four main steps. First, data collection is performed which is a real-time process running in parallel with detection. Second, Mediapipe is used to identify the joint locations using BlazPose concept to detect the joints location which are visible and for the Non visible joints it predicts the coordinates of the joints using the concept of Leonardo's Virtuvian man. The detected keypoints are passed to our model where logistic regression finds patterns and analyses their change over time. Finally, the model and training method of framewise prediction and polling approach for different frames with probability range (0 to 1) with the name of Aasans is predicted as output are discussed.

Preprocessing :- We used Python Imaging library(PIL) for data preprocessing it provides important features such as extensive file format, efficient internal representation, creating thumbnails, converting image files format, applying filters to images. To install PIL library to our system give command pip install pillow.

Figure 1: Preprocessing

Feature Extraction :

Feature extraction is done using Mediapipe and OpenCV libarary.we need to follow the steps at the time of feature extraction 1.we Collect image samples of the target exercises and run pose prediction on them.2.we need to Convert obtained pose landmarks to a representation suitable for the classifier and form a training set using these we converted keypoints in vector format.3.Then we performed classification itself.

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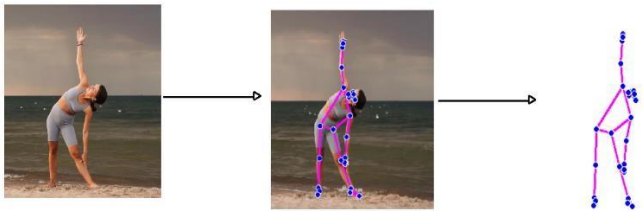


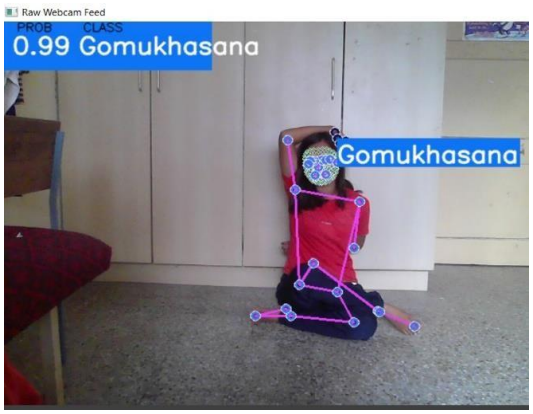
Figure 2: Feature Extraction(Key Point)

Modeling:

All the x, y, and z coordinates of the joint points determine the structure of every single yoga position. We used a logistic regression model to classify data and detect the yoga pose. The x,y, and z coordinates are passed to the model as X(input variable)i.e feature data, and y (output variable) i.e targeted value. We used 70% data for training and 30 % for testing. Our model gives accuracy near 100%.

IV. RESULTS AND DISCUSSION

Our system successfully detects the yoga pose and make predictions accordingly we worked on total 8 aasans which are Vrikshasan, Bhadrasan, Gomukhasan, Shavasan, Chakrasan, Shrishasan, Sarvangasana and Dhanurasan. Our model gives 100% accuracy so from that we say our system does an excellent job. It display the name of asana and the probability range from 0 and 1. If the probability is 1 or near to 1 then it predicts the right yoga pose. If the probability is near 0 or 0 then the system prediction is false. This helps the user to do yoga asanas correctly. We made a desktop application it is user-friendly. To take benefit of our system user needs to successfully register and log in. Here are some snaps of real-time yoga pose detection.



V. CONCLUSION

In this paper, we have proposed a system to recognize Eight major yoga pose by detecting of human joint points using Mediapipe. We have detected the yoga poses considering up to 100% accuracy. Our system may be wont to acknowledge alternative yoga poses from the reference model of each pose. Therefore our planned approach can facilitate to the practice of yoga when you need a trainer.

ISSN 2347–3657
Volume 12, Issue 1, 2024

ACKNOWLEDGEMENT

We thank our guide prof.V.G.Jagtap mam and reviewer prof.Y.R.Khalate sir for their valuable suggestions and guidance. Also, we want to thank our friends which help directly or indirectly to build our project.

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