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YOGA GUIDE : YOGA POSE ESTIMATION USING MACHINE LEARNING

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Abstract *- 5000 years ago, the Indus-Sarasvati culture in ancient India created the yoga practice. The term "yoga" refers to a close connection and integration of the mind and the body. Through asana, meditation, and other practices, it is utilized to keep the body and mind in balance throughout all of life's ups and downs. Due to the growing stress levels in the modern lifestyle, yoga has recently attracted interest on a global scale. There are several ways to practice yoga. Yoga can be learned on one's own using resources including the Internet, books, recorded clips, and personal tutors as well as in yoga studios and one-on-one settings.*

A machine learning model is put forth that employs the LR algorithm for yoga pose detection combined with a model for localizing human joints, then goes through a process to identify pose mistakes in order to develop the system. The system provides feedback to the user to help them improve or correct their posture after gathering all the necessary data regarding their pose. We suggest an accurate scoring algorithm that may be used with any position. Our application is tested using various yoga positions in various settings, and its resilience is ensured.

Keywords : Yoga, Open Pose, Pose Assessment, Machine Learning, Classification.

1. INTRODUCTION

The discipline of computer vision and image processing is experiencing a surge in interest in the topic of activity recognition, which is both important and challenging. The main cause of this rise in demand is that the results of this activity recognition are becoming widely used in fields like human computer interaction, healthcare, and, to some extent, sports.

Yoga is becoming more and more popular today just as it was in ancient times because it helps the body and the brain work together physically while also promoting physical and mental well-being. The quarantine and lockdowns served as the inspiration for this artwork. It's challenging for individuals to go outside to exercise, run, and do other things they can to stay fit during these protracted months of lockdown. Yoga is something that can simply be done inside and has many advantages. However, if a person doesn't practice yoga frequently, it can be challenging to perform any yoga pose correctly. People can assess their posture in relation to a perfect yoga stance using the yoga pose detection tool, which also helps identify the pose. The impact of COVID-19 and the ensuing hygienic measures has reached the entire world. Since the pandemic, I've noticed that yoga practitioners, including some teachers, lack motivation—not just for their yoga practice, but for their lives in general.

Those who have maintained a consistent yoga practice, whether through personal home practice or online classes, appear to be lot more upbeat and capable of handling the circumstance in a much better way. We need to accept the circumstance and adjust so we can proceed because there is so much uncertainty in the globe right now. Maintaining a regular yoga practice enables us to avoid getting sucked into the negativity we hear around us and to stay cheerful. Maintaining relationships with others is crucial, but it matters more in how we communicate with them. We are doing good for everyone when we speak kindly to others. Focusing on the bad only serves to further the negative aspects of our life and the planet. Instead of resisting what is, we need to cultivate acceptance in our daily lives.

2. LITERATURE REVIEW

Author	Country	Name	Purpose	Summary
Zeqi Yu and Wei Qi Yan	New Zealand	Human Action Recognition Using Deep Learning Methods.	Human action recognition seeks to recognize and comprehend the behaviors of individuals in films and export pertinent tags. Creating a model for human activities including running, jogging, walking, clapping, hand waving, and boxing is the goal of this project. Actions in a video also possess the qualities in the time domain in addition to the spatial correlation seen in 2D images.	The challenges surrounding estimating a person's pose are covered in this article, along with an overview of significant pose estimation research, covering both deep learning methods and conventional image-based approaches.
R. U. Shekokar, S. N. Kale	India	Deep Learning for Human Action Recognition	A list of the best HAR datasets is given in order to show the variety of the avail- able videos online. Local and Global feature extraction are reviewed. The aim of this project is to develop a model for human actions such as running, jogging, walking, clapping, handwaving and boxing. a video, the best algorithm thus is selected.	Each technique aims to identify the position and the subject's attention in a recording. For the layout, a number of films are provided, each of which shows a different person performing an action.

Bardia Esmaeili, Alireza Akhavan Pour, Alireza Bosaghzadeh	Iran	An Ensemble Model For Human Posture Recognition	The label of a video will be the action taken on that specific video. The model needs to learn this relationship before it can forecast the label of an input (a video) that he has never seen. Technically, even though these acts are described, the model would still need to learn to differentiate between different human behaviors.	In the past ten years, advances have been made in both human body pose estimation (HBPE) and human body posture recognition (HBPR). Many content identification programmers may be able to perform the following tasks, including learning human movement patterns when we are able to develop patterns that will direct us (humans) to perform a variety of activities. Active object tracking can identify an object, such as a vehicle or a human, from a CCTV picture.
Wu Wen , Yong Yang, Jingyi Du, Lixiang Liu, Jiahao Wang	China	Gymnastic Posture Detection Based on Deep Learning	In this study, we suggest an ensemble model for identifying human body posture. The cornerstone and core component of our suggested paradigm is deep convnets. To categorize postures, we use deep neural networks in two different ways. They are first employed in an entire training scenario. The right posture movements of the gymnast can be assisted by attitude detection.	The challenges surrounding estimating a person's pose are covered in this article, along with an overview of significant pose estimation research, covering both deep learning methods and conventional image-based approaches.

Table 1: Literature Review

3. METHODOLOGY

3.1 Supervised Learning

In supervised machine learning methods, the underlying algorithm is first trained using a labelled training dataset. To divide them into similar categories, the trained algorithm is then fed the unlabeled test dataset.

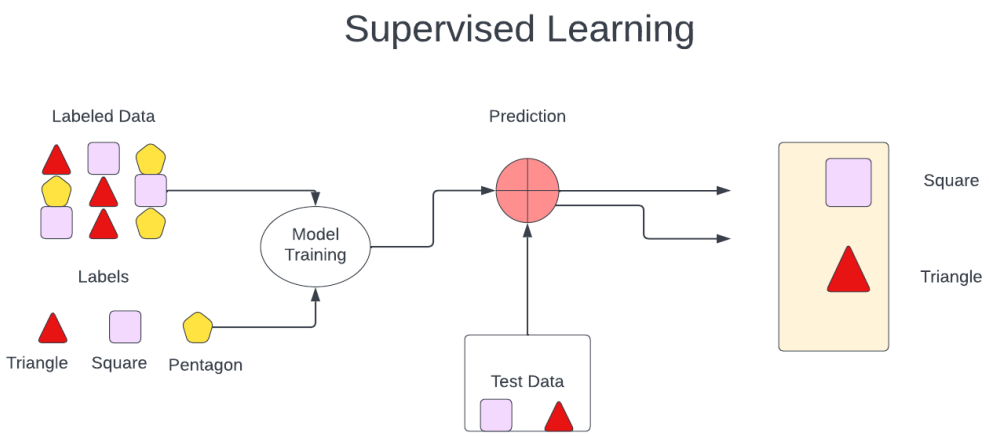

Figure 3.1 : Supervised Learning

3.2 Algorithm

3.2.1 Logistic Regression

A strong and recognized technique for supervised classification is logistic regression (LR). It can be viewed as an extension of conventional regression and can only model a dichotomous variable, which often indicates whether an event will occur or not. The likelihood that a new instance belongs to a particular class can be determined with the use of LR. Given that the result represents a probability, it falls between 0 and 1. As a result, a threshold must be set to distinguish between two classes in order to use the LR as a binary classifier. For instance, if an input instance's probability value is greater than 0.50, it will be assigned to "class A"; otherwise, "class B." A categorical variable with more than two values can be modelled using the LR model in a more general way. This generalized version of LR is known as the multinomial logistic regression.

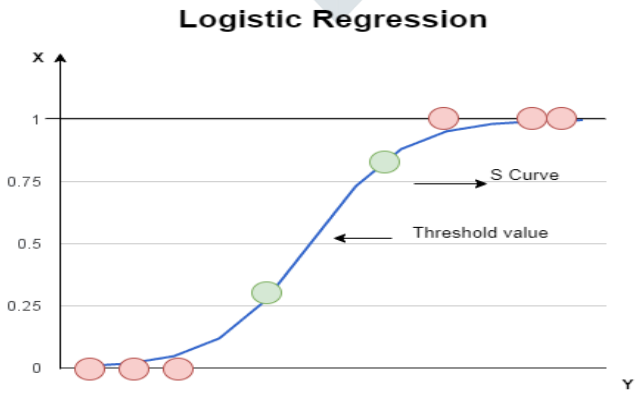

Figure 3.2.1(1) : Logistic Regression

4. LEARNING APPROACH

4.1 Data Set

A set of data used to train the model is known as a machine learning dataset. To educate the machine learning algorithm how to make predictions, a dataset is used as an example. The typical data kinds are as follows: a text file images, data a recording a video file Data in numbers.

4.2 Data Acquisition

Before data can be saved, cleaned, pre-processed, or used for other operations, it must be acquired from pertinent sources. It involves locating pertinent business data, converting it into the necessary business form, and feeding it into the specified system.

4.3 Data Pre-processing

Preparing raw data to be used with a machine learning model is known as data pre-processing. In order to build a machine learning model, it is the first and most important stage. It is not always the case that we come across the clean and prepared data when developing a machine learning project. Additionally, any time you work with data, you must clean it up and format it. Therefore, we use a data pretreatment activity for this.

4.4 Data Splitting

The process entails splitting the dataset into two subsets. The training dataset is the first subset, which is used to fit the model. The model is not trained using the second subset; rather, it is given the input element of the dataset, and its predictions are then made and contrasted with the expected values. The test dataset is the second dataset in question.

For fitting the machine learning model, use the train dataset.

Test Dataset: Applied to assess the machine learning mode's suitability.

4.5 Feature Extraction

The technique of turning raw data into numerical features that can be handled while keeping the information in the original data set is known as feature extraction.

In this project, the camera on the devices records the user's live footage, which the model then processes to pull the body key points from the stream. Each joint point for that particular point is labelled with the index value and the specific x and y coordinates for that joint. The joints value in the x and y directions can be found using these coordinates.

4.6 Classification using Algorithm

The next stage after feature extraction is user pose identification. We employed all the crucial information from the real-time data for pose recognition. Each point's x and y coordinates are utilized to calculate the human body's structure, which is then compared to the structure of each asana's ideal positions that were previously provided to the model. After recognition the user's image, the model outputs the anticipated asana with the accuracy rating.

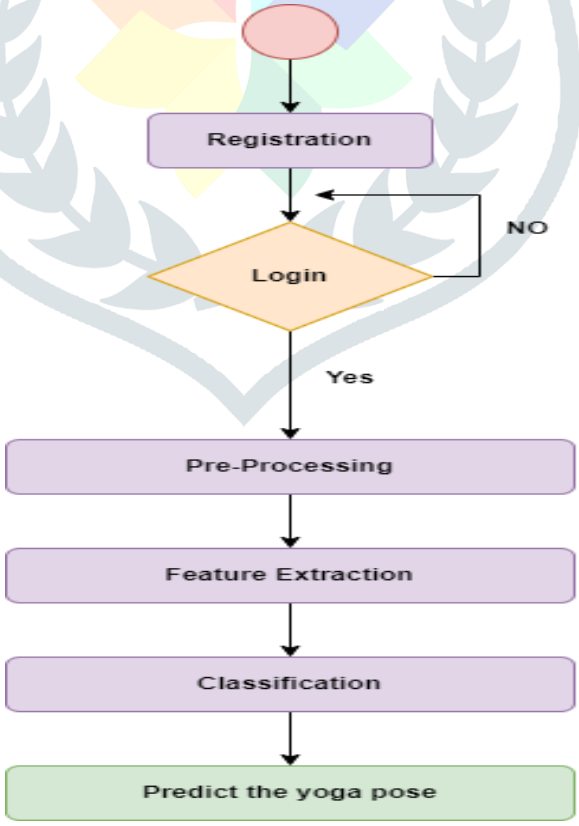

Figure 4.6(1) : Activity Diagram

5. CONCLUSION AND FUTURE SCOPE

In order to support a healthy lifestyle for the community of yoga practitioners, we have proposed a system which is able to guide them to practice yoga more accurately in real time. This proposed system is capable of identifying yoga postures using Machine Learning. When the user practices yoga, a live desktop camera feed is streamed to the server which has multiple modules interconnected to predict and output the asana and the accuracy.

A guide of the predicted pose is shown to the user in real time helping the user reach the stance properly.

We applied the time-distributed LR layer to detect patterns between key points in asingle. Using LR for the memory of previous frames and polling for denoising, the results make the system even more robust by minimizing the error due to false key point detection.

FUTURE SCOPE

After became a yoga instructor, you would usually be self-employed by running your own yoga school. For the Yoga Professionals, there are several job options available both in the government and private sectors. You can also self-employed by opening your own yoga center.

The proposed system is confined to 6 yoga poses, where there are a total of more than 80 yoga poses. The proposed dataset can be expanded by adding required yoga pose key points.

The technology may also be used to make real-time predictions and self-training on a mobile device. There are several instances of real-life applications in which a single individual posture evaluation will not be enough; for example, a pose estimate in crowded environments will need to detect and recognize the pose of each participant. To include many poses and to get model works on many poses (classifying many poses) is challenging enough.

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