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Review Paper on Yoga Pose Detection using Machine Learning

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ABSTRACT

Estimating human stance is a difficult challenge in the world of computer vision. It is concerned with the portrayal of human joints in skeletal form in a photograph or film. Image scale and resolution, illumination variation, backdrop clutter, garment variations, surroundings, and human interaction with the environment all play a role in automatically determining a person's pose in an image. Exercise and fitness are one use of pose estimation that has piqued the interest of many academics. Yoga is an ancient form of exercise with complex postures that originated in India but is today known around the world for its numerous spiritual, physical, and mental benefits. The problem with yoga, like any other exercise, is that it must be done correctly, as any incorrect posture during a yoga session can be detrimental, if not dangerous. As a result, a teacher must monitor the session and help the client improve their posture. Because not everyone can afford a yoga instructor, an AI-based application might be used to identify yoga poses and provide personalised feedback to help people improve their form. Deep learning has benefited human posing estimate significantly in recent years, with considerable gains in performance. Deep learning methods give a more straightforward approach of mapping the structure than manually dealing with the connections between structures. Deep learning was used to identify pull ups, swiss ball hamstring curls, push ups, cycling, and walking. However, using this approach for yoga poses is a relatively novel application. The purpose of this study is to understand more about the various approaches to yoga posture classification and to obtain insight into the following: What exactly is a posed estimation? So, exactly what is deep learning? Deep learning can be used to classify yoga poses in real time, but how? This study makes use of references from conference proceedings, published papers, technical reports, and journals. Figure 1 depicts graphically the concerns discussed in this work. The first section of the project discusses the history and relevance of yoga. The second portion goes deeper into posture estimation and the many types of pose estimation methods, as well as discriminative methods.

Keywords: Machine learning, Yoga pose detection, Logistic regression

I. INTRODUCTION

The cardiac disease is the leading killer of human being. Hence, the cardiac diseases get the more attention of researchers in recent years [1, 2]. The left ventricle (LV) is the biggest chamber of heart, and the function indexes from LV have important indication significance for cardiac diseases, such as myocardial hypertrophy, myocardial ischemia, heart failure and so on. In recent years, more and more researches focus on the LV, especially in the field of computer-aided medicine [3-5]. The related LV function indexes, such as the end-diastole volumes (EDV), the end-systole volumes (ESV), and the eject fraction (EF), can be estimated from cardiovascular MR (CMR) images.

In the actually clinical diagnosis of cardiac diseases, the CMR is an important imaging modality and widely used because of its special advantages such as non- invasive detection, low radiation doses and high imaging quality [6]. Generally speaking, CMR is considered as gold standard in cardiac disease diagnosis. Hence, in this paper, the main modality of this research is CMR. Based on the CMR, the LV function estimation method is mainly classified into two kinds: the method based on LV segmentation and the method based on direct volumes prediction without segmentation. Generally, the current clinical diagnosis adopted manual or semi-automatic LV segmentation method. Though, the manual and semi-automatic methods are relative accurate compared to fully automatic LV segmentation methods. However, this task is time-consuming and tedious. Besides, the subjective variances exist during the processing of manual and semi- automatic segmentation. Hence, the fully automatic LV segmentation methods are still the research hot recently. However, the automatic LV segmentation is still an open and challenging task, due to characteristics of intensity level in homogeneity and complex topological structures across different slices. Before 2011, the paper [7] reviewed the related LV segmentation algorithms detailed. After 2011, the paper [8] reviews more methods in new views.

Compared with LV segmentation methods, the direct LV volumes prediction methods without segmentation are popular in recent years, especially along with the wide use of deep learning technology in the field of medical images processing [9, 10]. The research group of Li Shuo proposed a series of methods for direct LV function indexes prediction method based on machine learning technologies [11-13], for example, the method based on adapted Bayesian formulation, the method based on linear support vector machine , and the method based on multi- scale deep networks and regression forests.

II. LITERATURE SURVEY

Yash Agrawal*, Yash Shah*, Abhishek Sharma[1]Implementation of a Machine Learning Technique for Yoga Pose Recognition Yoga has been a part of many people's lives around the world in recent years. As a result, scientific study of y postures is required. Pose recognition approaches have been found to be effective in identifying postures and assisting people in performing yoga more effectively. Because of the scarcity of datasets and the need to detect posture in real time, recognising posture is a difficult task. To solve this challenge, a big dataset containing at least 5500 photos of ten distinct yoga poses was created, and a tf-pose estimation Algorithm was used to design a skeleton of a human body in real-time. The tf-pose skeleton is used to extract angles of joints in the human body, which are then employed as a feature in various machine learning models. Eighty percent of the dataset was utilised for training and twenty percent was used for testing. Using a Random Forest Classifier, this dataset is tested on several Machine Learning classification models and obtains an accuracy of 99.04 percent.

Manisha Verma1 , Sudhakar Kumawat2 , Y Nakashima[2]Yoga-82:Newdataset for finer position

classification Determining a person's joints is a challenge in computer vision. Existing pose-learning datasets lack posture variation, object occlusion, and view angles. The use of pose-annotated mode limited. We propose using "fine-grained hierarchical pose classification" to classify people's poses. The Yoga-82 dataset helps with larger-scale pose recognition. Yoga82 poses are too complex for detailed annotations. Yoga positions are categorised by body type to avoid confusion. The dataset includes body positions, variations, and true pose names. On Yoga-82, we test sophisticated convolutional neural networks' categorization accuracy. We propose manyhierarchical DenseNet versions to use hierarchical labelling.

Pradchaya Anantamek Recognition Of Yoga Poses Using Emg Signals From Lower Limb Muscles[3] Yoga positions are popular because they promote flexibility, muscle strength, and the immune system. Correct yoga poses are difficult to assess, thus practitioners may not benefit fully. This paper proposes a yoga posture detection algorithm to check lower muscle motions. Five men and five women were studied. Five yoga postures were analysed. This research analyses four lower-limb muscles of both legs using Electromyography signals. Three machine-learning algorithms conducted recognition. The Random Forest Decision Tree algorithm has the highest accuracy in recognising yoga postures, at 87.43%.

Guha Balakrishnan,Amy Zhao Synthesizing Images of Humans in Unseen Poses[4] This solution solves the computational problem of producing new human poses. We use a photograph of the person, as well as the appearance of both the person and the background, to build a picture of them in a specific position after selecting that position. We present a modular generative neural network that can generate previously unknown poses by using training pairings of images and stances generated from human action videos. These photos and stances were used to train the network. Our system first separates a scene into numerous layers consisting of body components and backdrops, then repositions and improves individual body parts, and then combines the reworked foreground with a background that has holes repaired in them. In order to train these subtasks concurrently, only a single target image is used as the supervised label, and a variety of distinct modules are utilised. An adversarial discriminator is utilised by our network in order to compel it to generate realistic details that are dependant on position. We give data from picture synthesis for three different action classes, namely tennis, golf, and yoga/workouts. These findings demonstrate that our method generates accurate results both inside and across action classes. Additionally, we are able to produce coherent videos of movements by stringing together a variety of poses.

Munkhjargal Gochoo , Tan-Hsu Tan.Novel IoT-Based Privacy-Preserving Yoga Posture Recognition Sys-tem Using Low-Resolution Infrared Sensors and Deep Learning In recent years, [5] More males and older folks than ever practise yoga. Home yoga practitioners need an IoT-based training system. Some studies have proposed high-accuracy RGB/Kinect camera-based or wearable device-based yoga posture identification algorithms. However, the former has a privacy concern and the latter is impracticable for long-term use. This research offers an IoT-based yoga posture identification system using a DCNN and a low-resolution infrared sensor-based wireless sensor network (WSN). The WSN contains three nodes (x, y, and z-axes) with 88 thermal sensor modules and Wi-Fi modules for connecting the deep learning server. 18 volunteers performed 26 yoga postures in two 20-second bouts. Then, the.csv files are preprocessed and turned to grayscale posture photographs. For DCNN model validation, 93 200 posture photos are used. F1-scores of models trained with xyz (all 3-axes) and y (just y-axis) posture photos were 0.9989 and 0.9854, respectively. The server took 107 ms to classify a single posture image. The suggested IoT-based yoga posture detection system

has enormous potential in privacy-preserving yoga instruction.

III. PROPOSED WORK

Problem statement: It was working on Image/Videos input only.

Techniques	Description
1. Logistic Regression	**Logistic regression** is another technique borrowed by machine learning from the field of statistics. It is the go-to method for binary classification problems (problems with two class values

System Architecture:

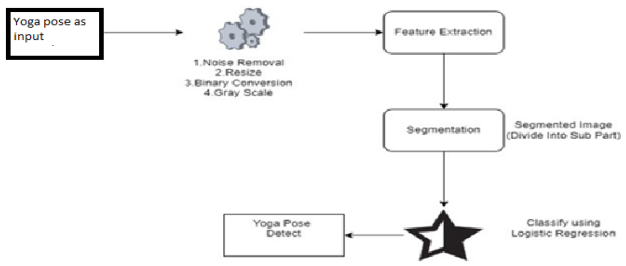

Fig: I

Pre-processing: Although geometric transformations of images (e.g. rotation, scaling, translation) are known as pre-processing methods, the goal of pre-processing is an enhancement of the image data that suppresses unwanted distortions or improves certain image features necessary for further processing. - Possessiveness Image processing is the use of a digital computer to run an algorithm on digital images.

Segmentation: It entails segmenting a visual input to facilitate image analysis. If we want to remove or identify something from the rest of the image, such as detecting an object in the background, we can divide the image into segments that can be processed further. This is often referred to as segmentation. Segments contain objects or parts of objects and are made up of groups of pixels known as "super-pixels."

Feature Extraction: Features in an image may be complex structures such as points, edges, or objects. The aim of feature extraction is to reduce the number of features in a dataset by generating new ones from existing ones (and then discarding the original features). The new reduced collection of features should then be able to summarize the majority of the details in the original set of features. feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

Classification: Because of their high precision, LRs are used for image detection and recognition. The classification convolutional neural network has a three-dimensional structure, with each collection of neurons analyzing a particular region or "function" of the picture. Each group of neurons in a LR focuses on a different part of the picture. The algorithm examines smaller portions of the images. The final result is a vector of probabilities that predicts how likely each feature in the image is to belong to a class or group.

IV. LIABRARY AND LANGUAGE

PIL Library:

The Python Imaging Library or PIL is an amazing Python library used for image processing. This library provides so many features for working on images using Python. It is used as an image processing tool with other Python image processing libraries like OpenCV.

The PIL or Python Imaging Library is often confused with Pillow. Pillow is a fork of the PIL library in

Python. Some of the important features that this library offers you for image processing are:

1. extensive file format support
2. efficient internal representation
3. creating thumbnails
4. converting image files format
5. applying filters to images
6. also provides some powerful image processing capabilities

Python Language:

Python is an object-oriented, high-level programming language with combined dynamic semantics mainly for web and app development. It is very attractive in the field of Rapid Application Development because it deals with dynamic typing and dynamic binding options. Python is comparatively simple, so it's easy to learn since it needs a distinctive syntax that focuses on readability.

Developers can read and interpret Python code much stress-free than other languages. In turn, this decreases the cost of program maintenance and development because it allows teams to work collaboratively without substantial language and experience obstacles. Python supports the use of modules and packages, which mean that programs can be intended in a modular style and code, can be reused across a variety of projects Python available to almost any person. Python can also be used to process text, display numbers or images, solve scientific equations, and save data.

V. TECHNOLOGIES

Computer Vision:

Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects and then react to what they “see.”

VI. RESULTS AND DISCUSSION

With the help of Logistic Regression the circle point find out the person’s body angles and with the body angles it will find out which yoga position is particular person is doing.

pre-processing is an enhancement of the image data that suppresses unwanted distortions or improves certain image features necessary for further processing.

The aim of feature extraction is to reduce the number of features in a dataset by generating new ones from existing ones (and then discarding the original features). The new reduced collection of features should then be able to summarize the majority of the details in the original set of features.

The classification convolutional neural network has a three-dimensional structure, with each collection of neurons analyzing a particular region or "function" of the picture.

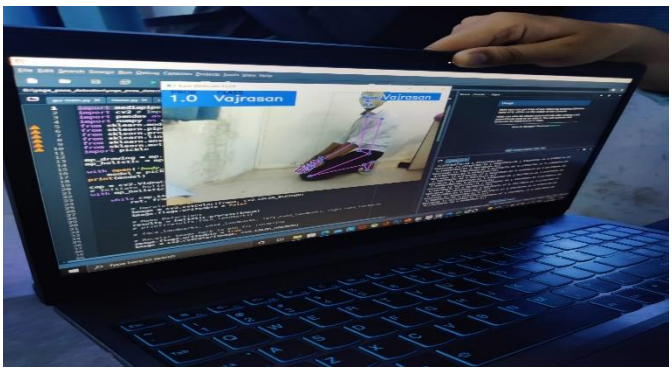

Fig: 2 Output 1

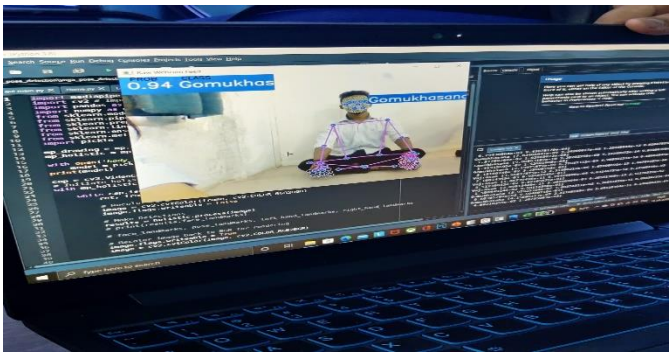

Fig :3 Output 2

VII. CONCLUSION

In the last few years, numerous studies have been conducted on human pose estimation. The human posture estimate problem differs from other computer vision challenges because the human body has a set structure. Athletes can benefit from sports and fitness by avoiding injuries and improving workout performance. Self-instruction approaches for yoga, according to have the ability to popularise the practise while also ensuring that it is performed correctly. Deep learning approaches appear to be promising as a result of all of the recent research. The Logistic Regression model, which has been tested on a large dataset, can be used to reliably classify yoga poses.

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