1. Group Id: 7

2. Project Title

Yoga Pose Assessment Method for Pose Detection Using deep learning.

3. Project Option

Internal Project

4. Internal Guide

Prof.J.R.Mahajan

5. Sponsorship and External Guide

No external sponsorship or guide

6. Technical Keywords

- Human Activity recognition
- Yoga Posture
- LR
- Yoga Poses

7. Problem Statement

Human pose estimation is a deep-rooted problem in computer vision that has exposed many challenges in the past. Analyzing human activities is beneficial in many fields like video surveillance, biometrics, assisted living, at-home health monitoring etc. With our fast-paced lives these days, people usually prefer exercising at home but feel the need of an instructor to evaluate their exercise form. As these resources are not always available, human pose recognition can be used to build a self-instruction exercise system that allows people to learn and practice exercises correctly by themselves. This project lays the foundation for building

such a system by discussing various machine learning and deep learning approaches to accurately classify yoga poses on prerecorded videos and also in real-time. The project also discusses various pose estimation and key point detection methods in detail and explains different deep learning models used for pose classification. Yoga poses also emphasize alignment correction of hands, wrists, arms, and shoulders. This sense of proper structural alignment is great for improving posture. As poses are adjusted for optimal positioning, students get in the habit of ideal alignment and are able to hold poses correctly and for longer amounts of time.

8. Abstract

An approach to accurately recognize various Yoga Pose Assessment using deep learning algorithms has been presented in this work. In this system, we propose a Yoga Pose assessment method using pose detection to help the self-learning of Yoga. The system first detects a Yoga pose using multi parts detection only with PC camera. In this system, we also propose an improved algorithm to calculate scores that can be applied to all poses. Our application is evaluated on different Yoga poses under different scenes, and its robustness is also. Hybrid deep learning model is proposed using convolutional neural network (CNN) and long short-term memory (LSTM) for yoga recognition on real-time videos, where CNN layer is used to extract features from key-points of each frame obtained from Open-Pose and is followed by LSTM to give temporal predictions.

9. Goals and Objectives

- To design a system that detects human body key points using pose estimation models.
- To classify and assess yoga poses against predefined correct postures.
- To calculate accuracy scores and provides real-time feedback.
- To assists users in improving their posture for a yoga practice.

10. Relevant mathematics associated with the Project

- **Let's be the Whole system S= {I, P, O}**

  I-input

P-procedure

O-output

- **Input (I)**

  I= {Live camera}

  Were,

  Camera -> captures whole body chords

- **Procedure (P),**

  P= {I, Using I System perform operations and detect the yoga pose.}

- **Output(O)-**

  O= {System detects type of yoga pose and give voice alert.}

10.Names of Conferences / Journals where papers can be published

- IJARSCT - International Journal of Advanced Research in Science, Communication and Technology
- IJCRT - International Journal of Innovative Science and Research Technology
- IJIRSET - International Journal of Innovative Research in Science, Engineering and Technology
- IJRDT - International Journal for Research Development in Technology

12. Review of Conference/Journal Papers supporting Project idea

1. Implementation of Machine Learning Technique for Identification of Yoga Poses- Yash Agrawal, et. - In recent years, yoga has become part of life for many people across the world. Due to this there is the need of scientific analysis of y postures. It has been observed that pose detection techniques can be used to identify the postures and also to assist the people to perform yoga more accurately.

To overcome this problem a large dataset has been created which contain at least 5500 images of ten different yoga pose and used a tf-pose estimation Algorithm which draws a skeleton of a human body on the real-time bases. Angles of the joints in the human body are extracted using the tf-pose skeleton and used them as a feature to implement various machine learning models. 80% of the dataset has been used for training purpose and 20% of the dataset has been used for testing. This dataset is tested on different Machine learning classification models and achieves an accuracy of 99.04% by using a Random Forest Classifier.

Gap Identification: In this paper the yoga pose detection is based on image dataset and also the algorithm is Random Forest where in our project we are going to do live yoga pose detection.

2. Yoga-82: A New Dataset for Fine-grained Classification of Human Poses -Manisha Verma,et. - Human pose estimation is a well- known problem in computer vision to locate joint positions. Existing datasets for learning of poses are observed to be not challenging enough in terms of pose diversity, object occlusion and viewpoints. To handle more variety in human poses, we propose the concept of fine-grained hierarchical pose classification, in which we formulate the pose estimation as a classification task, and propose a dataset, Yoga-82§, for large-scale yoga pose recognition with 82 classes. Yoga82 consists of complex poses where fine annotations may not be possible. To resolve this, we provide hierarchical labels for yoga poses based on the body configuration of the pose. The dataset contains a three-level hierarchy including body positions, variations in body positions, and the actual pose names. We present the classification accuracy of the state-of-the-art convolutional neural network architectures on Yoga 82. We also present several hierarchical variants of Dense Net in order to utilize the hierarchical labels.

   Gap Identification: In this paper they got less accuracy so we are going to work on accuracy.

3. Recognition of yoga poses using emg signals from lower limb muscles- Pradchaya Anantamek: - Exercise with yoga postures is very popular nowadays because yoga exercises can help to increase flexibility and muscle strength and improve the respiratory system.

However, the correctness of the yoga postures is difficult to check, and thus, practitioners may not be able to benefit from the exercises fully. This paper presents a yoga posture recognition system to verify the correctness of the lower muscle movements while practicing yoga. The study included ten subjects, five males and five females. Data were collected during five yoga postures. This paper focuses on the use of Electromyography signals for analyzing the motion of four lower-limb muscles of both legs. The results showed that the Random Forest, Decision Tree algorithm has the highest accuracy in recognizing yoga postures in comparison with other algorithms and that the yoga posture recognition model is accurate at 87.43 percent.

Gap Identification: In this paper accuracy achieve by an algorithm is so less so in our project we are going to work on more accuracy.

4. Synthesizing Images of Humans in Unseen Poses- Guha Balakrishnan, et. -We address the computational problem of novel human pose synthesis. Given an image of a person and a desired pose, we produce a depiction of that person in that pose, retaining the appearance of both the person and background. We present a modular generative neural network that synthesizes unseen poses using training pairs of images and poses taken from human action videos. Our network separates a scene into different body part and background layers, moves body parts to new locations and refines their appearances, and composites the new foreground with a hole-filled background. We use an adversarial discriminator to force our network to synthesize realistic details conditioned on pose. We demonstrate image synthesis results on three action classes: golf, yoga/workouts and tennis, and show that our method produces accurate results within action classes as well as across action classes. Given a sequence of desired poses, we also produce coherent videos of actions.

   Gap Identification: In this Paper they work on images for identifying yoga poses, in our system we are going to work live yoga pose detection.

5. Novel IoT-Based Privacy-Preserving Yoga Posture Recognition System Using Low-Resolution Infrared Sensors and Deep Learning - Munkhjargal Gochoo, et. - In recent years, the number of yoga practitioners has been drastically increased and there are more men and older people practice yoga than ever before. Internet of Things (IoT)-based yoga training system is needed for those who want to practice yoga at home. Some studies have proposed RGB/Kinect camera-based or wearable device-based yoga posture recognition methods with a high accuracy; however, the former has a privacy issue and the latter is impractical in the long-term application. Thus, this paper proposes an IoT-based privacy-preserving yoga posture recognition system employing a deep convolutional neural network (DCNN) and a low-resolution infrared sensor based wireless sensor network (WSN). The WSN has three nodes (x, y, and z-axes) where each integrates 8×8 pixels' thermal sensor module and a Wi-Fi module for connecting the deep learning server.

   Gap Identification: In this paper they use different type of networks and sensors, in our project we are not going to make pure software python application for yoga pose detection.

6. Implementation of Computer Vision in Detecting Human Pose - Ian Gregory: - Developing strong core muscles are important for children. Children with strong core muscles allow them to do any kinds of activities that mostly in volve physical movement. There are certified trainers that will coach the students along the way. However, mistakes could be made during the coaching because of different trainer's justification and whether the coaching processes were done correctly. Therefore, a solution is proposed to develop a computerized pose detector package which allows the trainers to improve the coaching with the students. The result is promising where the standardized pose could be implemented and compared to observed students' poses, however it is found that due to the uniqueness of the poses, it generates several unidentified results.

   Gap Identification: As compare to this paper we are going to improve accuracy of yoga pose detection system.

7. Yoga Posture Recognition by Detecting Human Joint Points in Real Time Using Microsoft Kinect - Muhammad Usama Islam, et. - Musculoskeletal disorder is increasing in humans due to accidents or aging which is a great concern for future world. Physical exercises can reduce this disorder. Yoga is a great medium of physical exercise. For doing yoga a trainer is important who can monitor the perfectness of different yoga poses. In this paper, we have proposed a system which can monitor human body parts movement and monitor the accuracy of different yoga poses which aids the user to practice yoga. we calculate various angles to measure the accuracy of a certain yoga poses for a user. Our proposed system can successfully recognize different yoga poses in real time.

   Gap Identification: In this paper they used Microsoft Kinect for detecting yoga pose detection. In our system we are not using Microsoft Kinect.

8. A Proposal of Yoga Pose Assessment Method Using Pose Detection for Self- Learning- Maybel Chan Thar, et. - Nowadays, Yoga is popular around the world. A lot of people are participating in it by themselves through watching TV/videos or teaching each other. However, it is not easy for novice people to find the incorrect parts of their Yoga poses by themselves. In this paper, we propose a Yoga poses assessment method using pose detection to help the self-learning of Yoga. Then, it calculates the difference of the specified body angles between the pose of an instructor and that of a user. Then, it calculates the difference of the specified body angles between the pose of an instructor and that of a user, and suggests the correction if larger than the given threshold. The total angle difference values are calculated averagely and defined as performance class level in Table. For evaluations, we applied the proposal to three persons with three Yoga poses of basic and easy Yoga poses for beginners and confirmed that it found the incorrect parts of each pose.

   Gap Identification: In this paper the execution time for the system is high so we are going to minimize execution time in our system.

13. Plan of Project Execution

Schedule		Project Activity
July	1st week	Project Topic Searching
	2nd week	Project Topic Selection
	3rd week	Synopsis Submission
August	1st week	Presentation on Project Ideas
September	2nd week	Submission on Literature Survey
October	1st week	Documentation For Paper Publishing
	3rd week	Design of Mathematical Model
	4th week	Paper is Publish
November	1st week	Report Preparation and Submission
December	3rd week	1st Module Presentation
	4th week	Discussion and Implementation Of 2nd Module
January	1st week	Preparation for Conference
	2nd week	Study of Algorithm
	3rd week	Discussion about Modification
	4th week	1st and 2nd Module Presentation
	5th week	Discussion on Flow of Project and Designing New Module
February	1st week	Modification of Module
	2nd week	Designed Test Cases for Our Module
	3rd week	Work on User Interface
March	1st week	Integration of All Modules
April	1st week	Final Report
May	1st week	Demo Presentation
June	1st week	Final Presentation

Guide Name & Sign

Prof.J.R.Mahajan

Students Name & Sign

Snehal Shelke

Sakshi Thombare

Rohan Sakhare

Kale Kaushal