

# Yoga Posture Correction using Machine Learning under Varying Poses

*Kavita R Singh, Nimisha Padole, Radhika Karade, Srushti Agarkar and Sayali Deshpande*

Department of Computer Technology, Yeshwantrao Chavan College of Engineering, Nagpur,  
Maharashtra, India.

singhkavita19@yahoo.co.in, nimishapadole@gmail.com, radhikakarade11@gmail.com, srushti1607@gmail.com,  
sayali.deshpande2000@gmail.com

## **Abstract:**

Yoga's popularity is growing on a daily basis since the covid-19 has had such a significant impact on everybody's lives. The basis for this is the numerous physical, mental, and spiritual benefits that yoga may provide. Many people are following this trend and practise yoga without the help of a professional. However, doing yoga incorrectly or without sufficient direction can be harmful to one's health. Till date very limited literature is present on this challenging issue. The issues are that the presented approaches demonstrate low accuracy in similar positions, the existing datasets consist of limited yoga poses, and the user has to be in the specified range of the camera . To overcome the mentioned issues, in this paper, we are proposing a yoga posture correction using a deep learning model to support users and customers with the proper guidance for yoga. The main objective of the proposed work is to include more positions and try to give better accuracy for similar poses, as previous models only have limited positions and the accuracy for the similar position is low.

## **Introduction:**

The application provides the yoga posture detection and correction intended use of the application is to correct improper postures of the yoga. The application will aim to guide the user to do yoga in a safe way and achieve the best results from yoga. Some people can do yoga regularly and they really feel very happy in daily life. There are various ways through which one can learn yoga,yoga can be learnt by attending the classes at a yoga center or through home tutoring it can also be self-learned with the help of some electronic devices like, computer, video and books. Most people prefer self learning but it is hard for them to find the incorrect parts of their yoga poses and themselves.Every year many people are affected from various types of musculoskeletal disorders due to accidents or aging problems yoga can promote positive physical change.

## **Literature:**

### **HISTORY OF YOGA**

Humans are prone to musculoskeletal disorders with aging and accidents. To prevent this problems some form of physical exercise is needed. Yoga, which is a physical exercise, has gained tremendous significance in the community of medical researchers. Yoga has the capacity to completely cure diseases without any medicines and improve physical and mental health. vast body of literature on the medical applications of yoga has been generated which includes positive

body image intervention, cardiac rehabilitation, mental illness and much more. Yoga comprises various asanas and exercises which represent physical static postures. The application of pose estimation for yoga is challenging as it involves complex configuration of postures and yoga.

#### HUMAN POSE ESTIMATION

Human posture recognition has made much advancements in the past years. It has developed from 2D to 3D pose estimation and from single person to multi person pose estimation. It uses pose estimation to build a machine learning application that helps detect shoplifters whereas it uses a single RGB camera to capture 3D poses of multiple people. Human pose estimation algorithms can be majorly organized in two ways. Algorithms prototyping estimation of human poses as a geometric calculation are classified as generative methods on other hand algorithms modelling human pose estimation as an image processing problem are classified as discriminative methods.

OpenCV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection.

#### LEARNING BASED – DEEP LEARNING:

One important learning-based method is deep learning which is built upon Artificial Neural Networks (ANNs). ANN is analogous to the human brain where the units in an ANN represent the neurons in the human brain, and weights represent the strength of connection between neurons. Deep learning provides an end-to-end architecture that allows learning of key information from images automatically. One popular deep learning model which has been widely used for pose estimation is Convolutional Neural Network (CNN).

#### **Proposed method :**

As the covid-19 has made a huge impact on our life, the popularity of yoga is increasing daily. The reason for this is the physical, mental benefits that could be obtained by practicing yoga. Many are following this trend and practicing yoga without the training of an expert.

However, practicing yoga in an improper way will lead to bad health issues such as strokes, nerve damage etc. So, practicing proper yoga postures is an important factor that is to be considered. We will include more positions and try to give accuracy for similar poses because previous models only have limited positions and the accuracy for the similar position is low.

The proposed Yoga Posture Correction System mainly consists of two components. They are,

- Keypoints Detection using OpenCV
- Higher Probability Prediction & Comparison

The overall workflow of the system is as follows. The user's movements are captured and streamed in real-time to the system using a media streaming server. Then the system detects the joints or the keypoints of the user with the use of a pose estimation, either OpenCV. After keypoints are detected by the pose estimation methods, those are sent to the yoga pose detection module. Using the keypoints data obtained from the previous components it was possible to predict the user's yoga pose before the user reaches the final

phase of the asana, using the movements that's required to be done to reach that stage, as the current model is able to detect keypoints only.

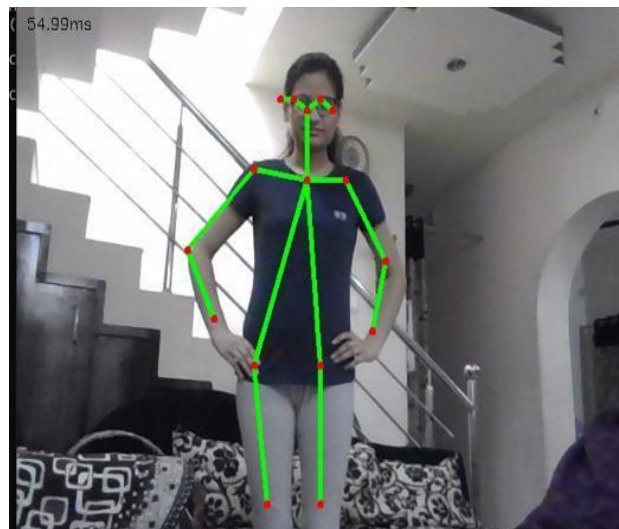


Fig 1

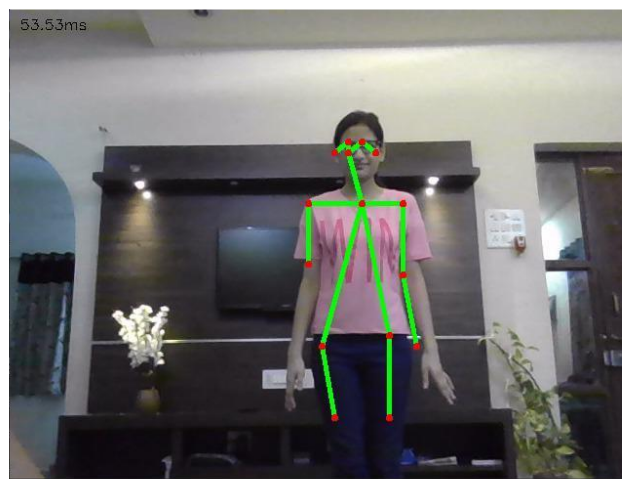


Fig 2

**Expected outcome :**

The Yoga application is able to capture user movements using the camera, and then check their positions or guide them accordingly. After which the algorithm will match the data with the given data set and tell the user if there are any improvements required in the position .

The system consists of two main modules, a pose estimation module which uses OpenPose to identify keypoints in the human body, and a pose detection module which consists of a Deep Learning model, that is used in order to analyze and predict user pose or asana .

This will help users to practice yoga in the correct way and get benefits for a healthy life.

### **Conclusion:**

In this paper we proposed a Yoga identification system using a traditional RGB camera. Openpose is used to capture the user and detect the keypoints. The end to end deep learning based framework eliminates the need for making the handcrafted features allowing for addition of new asanas by just retaining the model .We applied the time -distributed CNN layer to detect patterns between key points in a single frame and the LSTM to memorize the pattern found in recent frames using LSTM for the memory of previous frames make system even more robust by minimizing error due to false keypoint detection.

### **Reference:**

1. <https://www.semanticscholar.org/paper/Implementation-of-Machine-Learning-Technique-for-of-Agrawal-Shah/6a3f8d0afbde0c43c63220674fe476a3442b6235>
2. [https://www.researchgate.net/publication/350313866\\_Detection\\_of\\_sitting\\_posture\\_using\\_hierarchical\\_image\\_composition\\_and\\_deep\\_learning](https://www.researchgate.net/publication/350313866_Detection_of_sitting_posture_using_hierarchical_image_composition_and_deep_learning)
3. [https://www.researchgate.net/publication/346659912\\_Yoga\\_Pose\\_Detection\\_and\\_Classification\\_Using\\_Deep\\_Learning](https://www.researchgate.net/publication/346659912_Yoga_Pose_Detection_and_Classification_Using_Deep_Learning)
4. [https://www.researchgate.net/figure/System-architecture-openPose-followed-by-CNN-and-LSTM-model\\_fig3\\_346659912](https://www.researchgate.net/figure/System-architecture-openPose-followed-by-CNN-and-LSTM-model_fig3_346659912)
5. Patent link: <https://patents.google.com/patent/WO2003092824A1/en>
6. IEEE Explore <https://ieeexplore.ieee.org/document/9310832>

**Keywords:** Yoga, Posture Correction, Machine Learning, OpenCV.