IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Live Yoga Pose Classification Using Image Processing And LR Algorithm

Prof. Rupal More [1], Pallavi Late[2], Yukta Taral [3], Nilima Ahire[4], Bhagyashri Baviskar [5]

[1]Assistant Professor [2 3 4 5]Student

[1 2 3 4 5]Department of Computer Engineering [1 2 3 4 5]Sandip Institute of Technology and Research Centre, Nashik, India

Abstract: An approach to accurately acknowledge various Yoga pose Assess deep learning algorithms has been presented during this work. During system, our purpose to access a Yoga pose assessment technique using pose detection to assist the self-learning of Yoga. The system first detects a Yoga pose using multi human joint parts detection only with laptop camera. During this system, we have a tendency to additionally propose AN improved formula to calculate scores which will of all poses. Our application is evaluated on completely different Yoga poses. A hybrid Machine learning model is proposed using Logistic Regression algorithm for Yoga recognition on real-time videos, where Logistic regression is used to extract features from key-points of each frame obtained from Open-Pose.
LR algorithm would be trained on a labelled dataset of correct and incorrect yoga poses, and its output could be used to provide real-time feedback to the practitioner.

Keywords:- - Logistic Regression, Anaconda navigator platform, Deep Learning , Yoga Pose detection, etc.

I. Introduction

Yoga is a physical, mental, and spiritual practice that originated in ancient India. The word "yoga" comes from the Sanskrit word "yuj," which means to join or unite.
yoga helps people to practice yoga more easily and regularly, improving their physical and mental health and wellbeing. It provides a convenient and accessible way to practice yoga, and allows people to personalize their practice to meet their specific needs and goals.

The first step in the project scope is the development of the proposed system. This involves designing and developing the software that will use image processing, deep learning, and LR algorithms to classify yoga poses in real-time.
It is accustomed bring harmony to each body and mind with the help of posture, meditation and varied alternative respiration techniques It bring peace to the mind. Due to increase of stress in the modern lifestyle, yoga has become popular throughout the world. There are various ways through which one can learn yoga. Most people prefer self-learning but it is hard for them to find correct parts of their yoga poses by themselves.

LR algorithm is used in order to identify and fix a person's yoga pose. To extract from the photos the Open Pose (a pre-trained model) key points of the human joint locations, after which the deep learning model is trained using these key points. To determine if a person is performing a yoga pose correctly or not, we want to build a special deep learning model.
The primary objective of live yoga pose classification using Image processing, Deep learning and LR algorithm is to develop a software system that can classify yoga poses in real-time using image processing, Deep learning and LR algorithm technique and provide feedback to practitioners on the correctness of their poses.

Yoga is the best medicine to live healthy life as it helps to reduce stress, tension, depression etc. Human pose estimation is a challenging problem in the discipline of computer vision. To automatically detect a person’s pose in an image is a difficult task as it depends on a number of aspects such as scale and resolution of the image, illumination variation, background clutter, clothing variations, surroundings, and interaction of humans with the surroundings. There are a

number of yoga asanas, and hence creating a pose estimation model that can be successful for all the asanas is a challenging problem. Overall, developing a yoga pose classification system using machine learning and image processing can make yoga practice more accessible, efficient, and effective for practitioners and teachers.

The system aims to provide real-time feedback to practitioners on the correctness of their poses, helping them to adjust their posture and alignment and improving the effectiveness of their practice.
The system aims to provide a user-friendly interface that is easy to use and understand, allowing practitioners to interact with the system and view feedback on their performance.

The system aims to automate the process of pose classification using image processing, deep learning, and LR algorithm techniques, reducing the need for manual intervention and increasing the accuracy and efficiency of pose classification.

The system should have a user interface that allows the user to interact with the system, select the yoga pose they want to perform, and view feedback on their performance. The user interface may include features such as video playback, progress tracking, and goal setting. Overall, the project scope for Live Yoga Pose Classification Using Image Processing, Deep Learning and LR Algorithm involves the development of a software system that uses advanced technologies to classify

Yoga poses in real-time and proves feedback to practitioners, enhancing the safety and effectiveness of their yoga practice.

II. Literature Survey

Paper [1] : Implementation of Machine Learning Technique for Identification of Yoga Poses

Yash Agrawal; Yash Shah; Abhishek SharmaIn 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. Recognition of posture is a challenging task due to the lack availability of dataset and also to detect posture on real-time bases. 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.

Paper [2] : Recognition Of Yoga Poses Using EMG Signals From Lower Limb Muscles

Pradchaya Anantamek; Narit Hnoohom

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 analysing the motion of four lower-limb muscles of both legs. Recognition was performed with three machine learning algorithms. 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.

Paper [3] : Real-Time Yoga Pose Detection using Machine Learning Algorithm

Jothika Sunney

Yoga is an ancient art that provides physical and mental fitness. Yoga incorporates self-learning, but incorrect postures can cause serious muscle and ligament damage. During Covid-19, the importance of self-learning yoga practices has increased, and many people include yoga as part of their routines. A yoga pose detection system based on human pose estimation techniques and Machine Learning can assist people in practicing yoga correctly by themselves. The major challenge with current yoga pose detection methods is that most of them are computationally expensive and unsuitable for real-time applications. This research proposes a computationally inexpensive approach for real-time yoga pose detection by combining the Mediapipe Framework and Classification algorithms. An artificial intelligence based system was built based on Mediapipe's Blazepose model and XgBoost Classifier to predict yoga postures in real-time. A publically available dataset of Five Yoga poses was analyzed in this study (down-dog pose, goddess pose, tree pose, plank pose, and warrior pose).

Paper [4] : Yoga Posture Recognition By Detecting Human Joint Points In Real Time Using Microsoft Kinect

Muhammad Usama Islam , Hasan Mahmudy, Faisal Bin Ashrafz, Iqbal Hossainx and Md. Kamrul Hasan

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 have used Microsoft Kinect to detect different joint points of human body in real time and from those joint points we calculate various angles to measure the accuracy of a certain yoga poses for a user. Our proposed system can successfully recognize different

Paper [5] : Real-time Yoga recognition using deep learning

Santosh Kumar Yadav , Amitojdeep Singh, Abhishek Gupta, Jagdish Lal Raheja

An approach to accurately recognize various Yoga asanas using deep learning algorithms has been presented in this work. A dataset of six Yoga asanas (i.e. Bhujangasana, Padmasana, Shavasana, Tadasana, Trikonasana, and Vrikshasana) has been created using 15 individuals (ten males and five females) with a normal RGB webcam and is made publicly available. A 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 keypoints of each frame obtained from OpenPose and is followed by LSTM to give temporal predictions. To the best of our knowledge, this is the first study using an end-to-end deep learning pipeline to detect Yoga from videos. The system achieves a test accuracy of 99.04% on single frames and 99.38% accuracy after polling of predictions on 45 frames of the videos. Using a model with temporal data leverages the information from previous frames to give an accurate and robust result. We have also tested the system in real time for a different set of 12 persons (five males and seven females) and achieved 98.92% accuracy. Experimental results provide a qualitative assessment of the method as well as a comparison to the state-of-theart.

Paper [6] : Yoga Asana Identification: A Deep Learning Approach

Josvin Jose , Shailesh S

Yoga is a healthy practice that originated from India, to rejuvenate a man in his physical, mental, and spiritual wellness. Moving with the brisk technology advancements, there is a vast opportunity for computational probing in all social domains. But still, the utilization of artificial intelligence and machine learning techniques for applying to an interdisciplinary domain like yoga is quite challenging. In this work, a system that recognizes a yoga posture from an image or a frame of a video has been developed with the help of deep learning techniques like convolutional neural networks (CNN) and transfer learning. We have considered images of 10 different asanas for training the model as well as evaluating the prediction accuracy. The prediction model backed with transfer learning shows promising results with 85% prediction accuracy and this system can be considered as an initial step to build an automated yoga image and video analysis tool.

Paper [7] : yoga pose detection and classification using machine learning techniques.

Utkarsh Bahukhandi , Dr. Shikha Gupta

Yoga is an ancient art with a long history associated with India. It helps in making a person physically fit and provides mental peace at the same time. With the introduction of Covid-19, it is difficult to perform yoga in classes and if performed without guidance it may cause some serious injuries. Here we develop a system that identifies different yoga poses performed by users. The system uses open-source data containing 6 different yoga poses videos performed by 15 different volunteers. The system has two phases first to extract the data points data from the video dataset using the media pipe pose estimation library and the second phase is preprocessing the obtained data, training, and testing the data using classification-based machine learning algorithms. The machine learning algorithm used is logistic regression, support vector machine classifier, random forest classifier k nearest neighbors classifier, and naïve Bayes classifier. The system achieves an accuracy score of 94%. The system is developed to work on images, static videos, and live videos with a threshold value so that below a certain score it does not accept the solution.

Paper [8] : Sitting Posture Recognition Based on OpenPose

Kehan Chen

Sedentary and poor sitting posture can damage the health of adolescents. Therefore, it is very practical to effectively detect the sitting posture of students in the classroom and to warn the bad sitting posture. This paper proposed an in-class student sitting posture recognition system based on OpenPose, which uses the monitor in the classroom to detect the sitting posture of the students, and uses OpenPose to extract the posture feature. Keras deep learning framework is used to construct the convolutional neural network, which is used to train the datasets and recognize sitting posture of students. Experiments show that the accuracy is more than 90% after 100 epoch training.

Paper [9] : A Survey on Live Yoga Pose Detection Using Machine learning

Prof. Jayashree Mundada, Harsh Garg, Rahul Jadhav, Nikita Marne, Mansi Dhake

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. Recognition of posture is a challenging task due to the lack availability of dataset and also to detect posture on real-time bases. To overcome this problem a large dataset has been created which contain at least 5500 images of five different yoga poses and used logistic regression Algorithm. 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.

III. 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. 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.

Key Point Detection: -
Human pose estimation 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 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.

Data Collection :-
We are working on total 8 yoga poses which are Vajrasan,Shavasaan,Gomukhasan,Bhadraasan,Dhanura-asan,Shirshasan, Sarvangasan and Chakrasan. We are collected 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.

IV. Discussion

We address the machine drawback of novel human pose synthesis. Given a picture of someone and a desired pose, we have a tendency to manufacture an outline of that person therein create, retaining the looks of each the person and background. we have a tendency to give a standard generative neural network that synthesizes unseen poses exploitation coaching pairs of pictures and poses taken from act videos. For hard the results from the experiments, we have designated the main angles that differs the poses and calculated each angle for each experiment exploitation LR algorithm.

Research Paper Studies	Year	Model	Accuracy %
Yoga posture recognition by detecting Human joints points in real time using Microsoft kinect	2017	Microsoft kinect	97%
Real-time yoga recognition using deep learning	2019	CNN(Convolutional neural network)	99.04%
Sitting posture recognition based on openPose	2019	CNN(Convolutional neural network)	90%
Recognition of yoga poses using EMG signal from lower limb muscles	2019	Random Forest	87.43%
Implementation of machine learning technique for Identification of yoga poses	2020	Random Forest	99.04%
Yoga Asana Identification A deep learning approach	2021	CNN(Convolutional neural network)	85%
Yoga pose detection and classification using machine learning technique	2021	Logistic Regression	94%
Live yoga pose detection using machine learning	2022	Random Forest	99.04%
Our Approach	2023	Logistic Regression	99.06%

V. modeling and analysis

Our approach aims to automatically recognize the user's Yoga poses of real time. 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 Blaz Pose concept to detect the joints. 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 poses is predicted as output are discussed.

VI. 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.

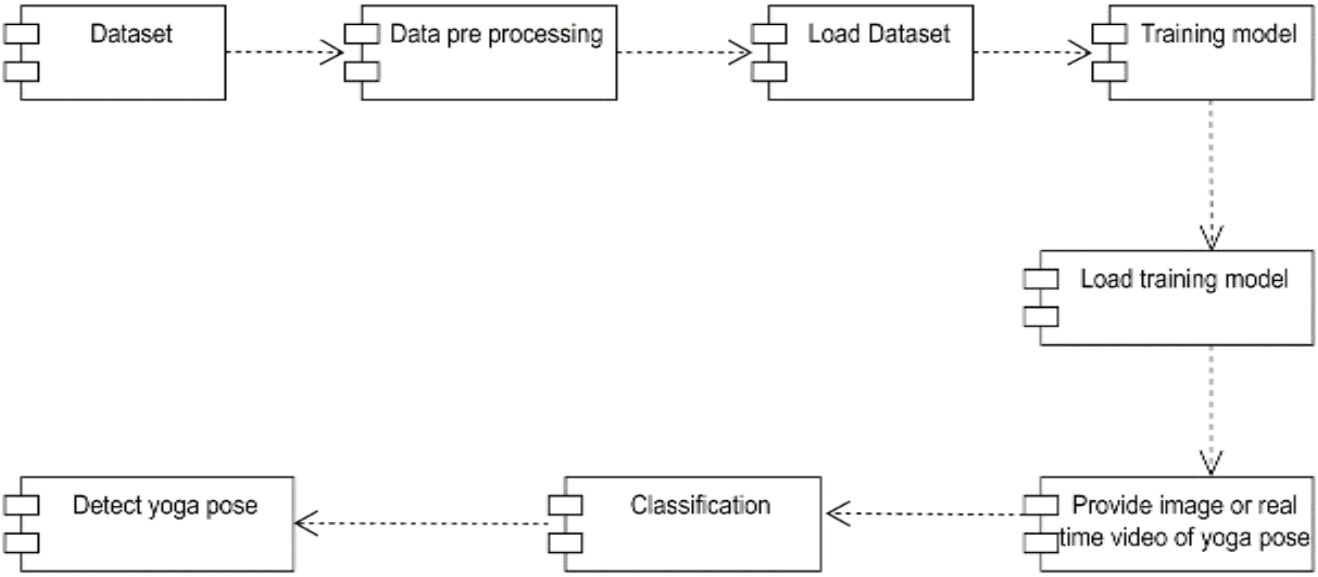
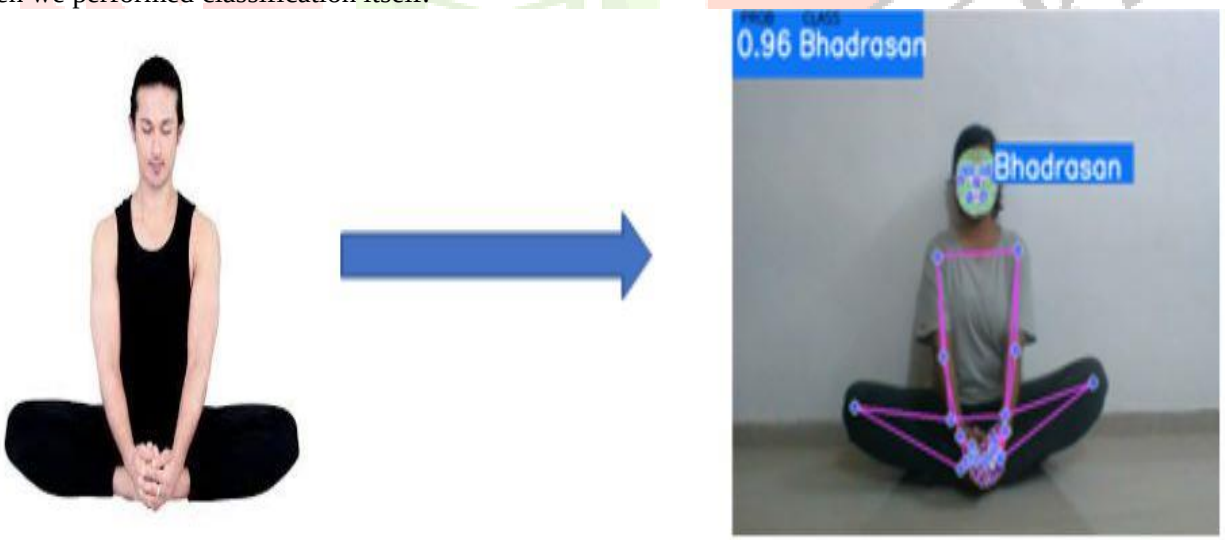


Fig:- Component Diagram of Live Yoga Pose

VII. Feature Extraction:-

Feature extraction is done using Mediapipe and OpenCV library. 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.



VIII. Modelling:-

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 .

IX. System methodology:-

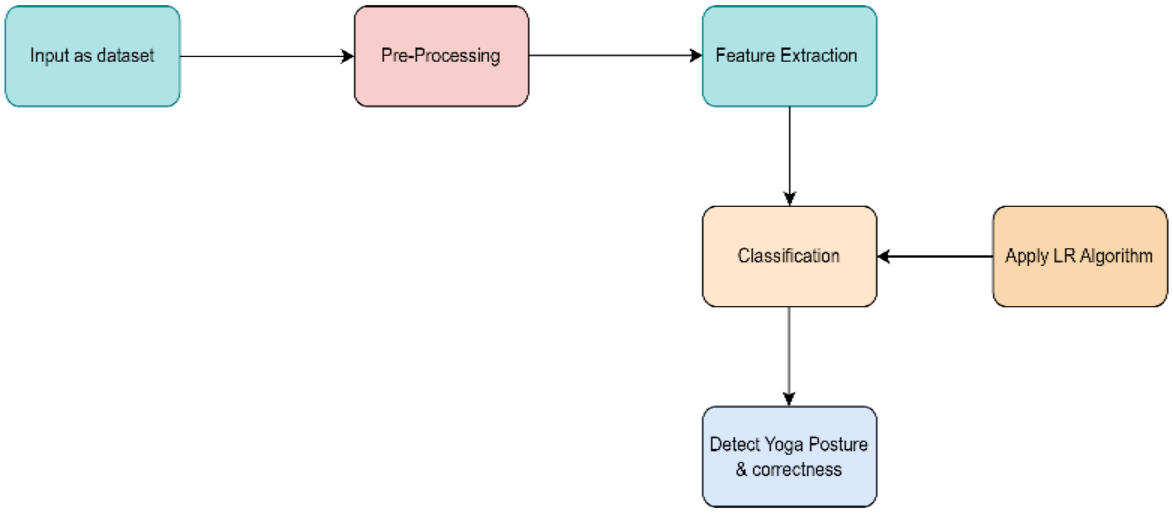


Fig:- System Architecture of Live Yoga Pose

In this system, the system is able to identify poses performed by the user and also guide the user visually. This process is required to be completed in real-time in order to be more interactive with the user. This system accepts input in the form of textual dataset. While doing data processing using trained dataset we're employing modules like pre-processing, feature extraction, and classification, using different Deep Learning algorithms as Logistic Regression. System accepts the input in the form of textual dataset and then pre-processed the dataset in which the system extracts the features in the extraction section. Then in the classification.

A system model for we have a tendency to square measure giving an input as dataset then perform the pre-processing step afterward we are going to extract the feature extraction as points of human joints then we have a tendency to will apply LR (Logistic Regression) formula through which sight yoga posture properly.

X. Result

We have worked on total 8 aasans which are Vajrasan, Bhadrasan, Gomukhasan, Shavasan, Chakrasan, Shrishasan, Sarvangasana and Dhanurasan. 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.

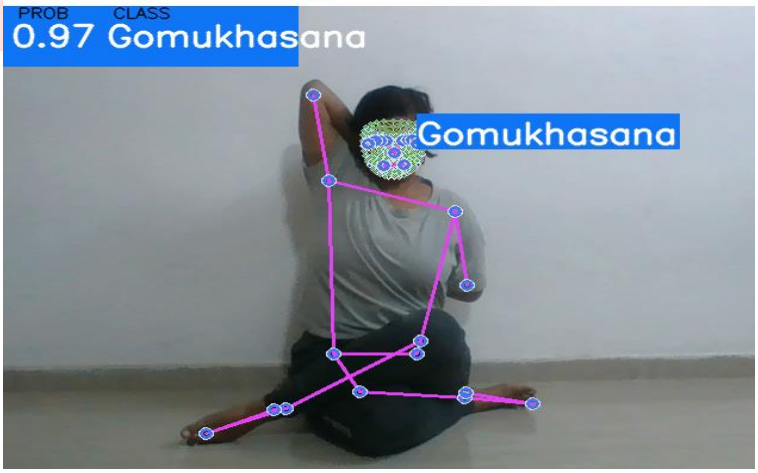


Fig:- Gomukhasana

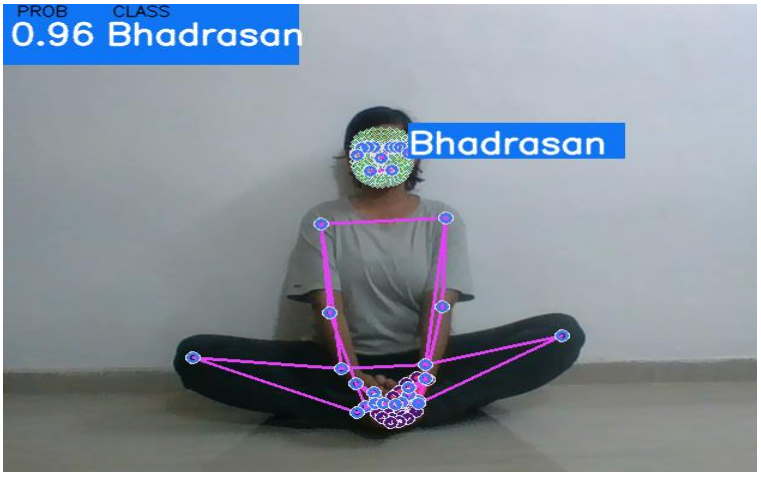


Fig:- Bhadrasan

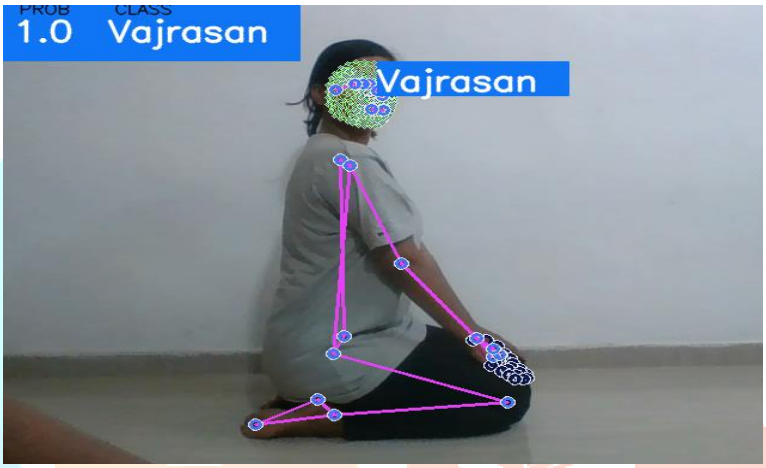


Fig:- Vajrasan

XI. Conclusion

yoga is a powerful practice that can help individuals achieve greater health, wellness, and inner peace. Studies have been done on yoga posture detection; though, recognition of posture is yet difficult because of the lack of a real-time dataset. In this paper, we have clarified a brief analysis of the impact of Yoga on the healthcare system and mental health in our daily life. Using a PC camera, the approach first detects a pose. The difference of the specified body angles between an instructor's pose and that of a user is then calculated. If it exceeds the specified threshold, the procedure proposes that the portion be corrected. It is predicted that people will be able to practice Yoga anywhere, including at home, as a result of this plan.

Increases the knowledge about yoga poses. The health benefits presented by yoga have attracted many people to adopt it to enable them to lead healthy lifestyles. Because of increasing anxiety in the modern lifestyle, yoga is being admired throughout the world. Many people go for self-learning but it is difficult for them to find mistaken parts of their yoga postures by themselves.

Then, human pose recognition, along with the human body models and methodologies, is presented. The practice of yoga has been shown to help improve mood and reduce symptoms of anxiety and depression. Regular practice can help increase levels of serotonin, a neurotransmitter that regulates mood and promotes feelings of well-being. Many people go for self-learning but it is difficult for them to find mistaken parts of their yoga postures by themselves. In this paper, we have discussed yoga posture recognition in the proposed system.

XII. Future Scope

The presented model right now identifies yoga postures. There are many yoga poses, and hence implementing a posture estimation model that can be accurate for all the postures is difficult problem. We can try to Develop an Android/iOS app rather than a website since it will be more user-friendly. As our system detects single person yoga detection in future it can be explored to multi-person pose detection too.

The system might be implemented using the cloud, which offers great computing power for processing (in the case of neural networks) and can store a lot of data for comparison.

XIII. Reference

[1] V. Akuhota and S. F. Nedler, ”Core Strengthening,” American Academy of Physical Medicine and Rehabilitation , 2004.

[2] R. Szeliski, ”Computer Vision: Algorithms and Applications,” Springer, 2010.

[3] G. Bradski and A. Kaehler, ”Learning OpenCV,” O’Reilly, 2008.

[4] Z. Cao, T. Simon, S.-E. Wei and Y. Sheikh,
”Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields,” The Robotics Institute, Carnegie Mellon University, 2017.

[5] P. Ganesh, ”Human Pose Estimation : Simplified,” Towards Data Science, 26 March 2019. [Online]. Available: https://towardsdatascience.com/human-pose- estimation- simplified6cfd88542ab3. [Accessed 3 April 2020].

[6] S.-E. Wei, V. Ramakhrisna, T. Kanade and Y. Sheikh, ”Convolutional Pose Ma- chines,” The Robotics Institute Carnegie Mellon University, 2016.

[7] P. K. Borkar, M. M. Pulinthitha and A. Pansare, ”Match Pose - A System for Comparing Poses,” International Journal of Engineering Research Technology (IJERT), vol. 8, no. 10, 2019.

[8] M. C. Thar, K. Z. N. Winn and N. Funabiki, ”A Proposal of Yoga Pose Assess- ment Method Using Pose Detection for Self- Learning,” University of Information Technology Okayama University.

[9] S. K. Yadav, A. Singh, A. Gupta and J. L. Raheja, ”Real-time Yoga recognition using deep learning,” Springer-Verlag London Ltd., 2019.

[10] H. Hanaizumi and H. Misono, ”An OpenPose Based Method to Detect Texting while Walking,” 7th IIAE International Conference on Intelligent Systems and Im- age Processing 2019, 2019

[11] K. Chen, ”Sitting Posture Recognition Based on OpenPose,” IOP Publishing Ltd, 2019.

[12] S. Jin, X. Ma, Z. Han, Y. Wu, W. Yang, W. Liu, C. Qian and W. Ouyang, ”To- wards Multi-Person Pose Tracking: Bottom-up and Topdown Methods,” ICCV2017, 2017.

[13] Jayashree Mundada , Harsh Garg , Rahul Jadhav, Nikita Marne, Mansi Dhake, “A Survey on Live Yoga Pose Detection Using Machine learning”, 2022.

[14] Rashmi Deshpande, Manasi Kanade, Vinod Waghmare, Ajinkya Rodge, Manish Wankhede, “YOGA POSE DETECTION”, JETIR June 2021.

[15] Pallavi Ghorpade, Zarinabegam K. Mundargi, “Review Paper on Yoga Pose Detection using Machine Learning”, 2022.

[16] Rutuja Jagtap, Monali Zanzane, Rutuja Patil, “YOGA POSE DETECTION USING MACHINE LEARNING”, 2022.

[17] Utkarsh Bahukhandi, Dr. Shikha Gupta {\ emYOGA POSE DETECTION AND CLASSIFICATION USING MACHINE LEARNING TECHNIQUES 2021}.

[18] Shruti Kothari, "Yoga Pose Classification Using Deep Learning" (2020). Master's Projects. 932.

[19] Josvin Jose and S Shailesh,” Yoga Asana Identification: A Deep Learning Approach”, 2021
IOP Conf. Ser.: Mater. Sci. Eng. 1110 012002

[20] Daniil Osokin “Real-time 2D Multi-Person Pose Estimation on CPU: Lightweight OpenPose-2018”.

[21] Ross A, Touchton-Leonard K, Yang L and Wallen G 2016 International Journal of Yoga Therapy ISSN 1531-2054

[22] Giacomucci A 2019 Yoga E-learning platform: Practice with frequency and motivation — UX Case Study

[23] Haque S, Rabby A S A, Laboni M A, Neehal N and Hossain S A 2019 Communications in Computer and Information Science vol 1035 (Springer Verlag) pp 186–193 ISBN 9789811391804 ISSN 18650937

[24] Classification of yoga pose using machine learning techniques Author: J. Palanimeera, K. Ponmozhi https://doi.org/10.1016/j.matpr.2020.08.700

[25] Toshev A, Szegedy C. DeepPose: Human Pose Estimation via Deep Neural Networks [J]. 2013.

[26] Y. Agrawal, Y. Shah and A. Sharma, "Implementation of Machine Learning Technique for Identification of Yoga Poses,"

[27] Muhammad Usama Islam, Hasan Mahmud, Faisal Bin Ashraf, Iqbal Hossain, Md. Kamrul Hasan, “Yoga posture recognition by detecting human joint points in real time using microsoft kinect”