

# A Survey on Live Yoga Pose Detection Using Machine learning

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**Abstract:** 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.

Yoga is an ancient science and discipline originated in India 5000 years ago. It is used to bring harmony to both body and mind with the help of asana, meditation and various other breathing 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. Yoga can be learnt by attending classes at a yoga center or through home tutoring. It can also be self-learned with the help of books and videos. Most people prefer self-learning but it is hard for them to find incorrect parts of their yoga poses by themselves. Using the system, the user can select the pose that he/she wishes to practice. He/she can then upload a photo of themselves doing the pose. The pose of the user is compared with the pose of the expert and difference in angles of various body joints is calculated. Based on this difference of angles feedback is provided to the user so that he/she can improve the pose.

**Keywords:** Yoga, Computer Vision, Machine Learning, Classification, Pose, Self-Learning, logistic regression , Pose Classification.

## I. INTRODUCTION

Detecting human postures assessment is a difficult issue in the control of computer vision. It manages confinement of human joints in a picture or video to shape a skeletal portrayal. To consequently recognize an individual's posture in a picture is a troublesome errand as it relies upon various perspectives, for example, scale and goal of the picture, enlightenment variety, foundation mess, dress varieties, environmental factors, and connection of people with the environmental factors. One type of activity with multifaceted stances is yoga which is a deep rooted practice that begun in India however is presently celebrated overall due to its numerous profound, physical and mental benefits. The issue with yoga anyway is that, much the same as some other exercise, it is of most extreme significance to rehearse it accurately as any erroneous stance during a yoga meeting can be ineffective and conceivably inconvenient. This prompts the need of having a teacher to manage the meeting and right the person's stance. Since not all clients approach or assets to a teacher, a computerized reasoning based application may be utilized to recognize yoga presents and give customized input to assist people with improving their structure.

Yoga is originated in ancient India and it is a group exercise associated with mental, physical and spiritual strength. Yoga and sports have been attracting peoples from so many years but from the last decade, a large number of people are adopting yoga as part of their life. This is due to the health benefits. It is important to do this exercise in right way especially in right posture. It has been observed that sometime due to lack of assistance or knowledge people don't know the correct method to do yoga and start doing yoga without any guidance, thus they injure them-self during self-training due to improper posture.

Yoga should be done under the guidance of a trainer but it is also not affordable for all the peoples. Nowadays people use their mobile phones to learn how to do yoga poses and start doing that but while doing that they don't even know that the yoga pose they are doing is in the right way or not. To overcome these limitations, many works have been done. Computer vision and data science techniques have been used to build AI software that works as a trainer. This software



tell about the advantages of that pose. It also tell about the accuracy of the performance. Using this software one can do yoga without the guidance of a trainer.

To use machine learning, logistic regression and modules of Large number of image dataset has been created which contain 5 yoga pose (**Bhadrsan, Dhanurasan, Gomukhasan, Shavasan, and Vajrasan**). Several machine learning models has been used to calculate and test accuracy of the model.

**II. RELATED WORK**

The systems is a need in current age of development as today’s generation is so conscious about their health and yoga is an easy and interesting way to be healthy, A tremendous assemblage of writing on the clinical uses of yoga has been created which incorporates positive self-perception mediation, heart restoration, psychological sickness and so forth Yoga contains different asanas which speak to actual static stances.

The utilization of posture assessment for yoga is trying as it includes complex setup of stances. Researches have been done on yoga pose detection and correction. Some researchers have used Logistic regression to form a human posture. To avoid this problem we have used machine learning algorithms have been used. Using this one can find the coordinates of the joints and use that as a feature to detect the posture of a body.

Machine Learning is a sub-area of artificial intelligence, whereby the term refers to the ability of IT systems to independently find solutions to problems by recognizing patterns in databases. In other words: Machine Learning enables IT systems to recognize patterns on the basis of existing algorithms and data sets and to develop adequate solution concepts.

Therefore, in Machine Learning, artificial knowledge is generated on the basis of experience. In order to enable the software to independently generate solutions, the prior action of people is necessary.

For example, the required algorithms and data must be fed into the systems in advance and the respective analysis rules for the recognition of patterns in the data stock must be defined.

Once these two steps have been completed, the system can perform the following tasks by Machine Learning:

- Finding, extracting and summarizing relevant data
- Making predictions based on the analysis data
- Calculating probabilities for specific results
- Adapting to certain developments autonomously
- Optimizing processes based on recognize patterns.

For this, proposed work we have taken the input as a video and here we pass the video to the machine for the prediction. Firstly we train the model with the videos so it will train the model on that basis.

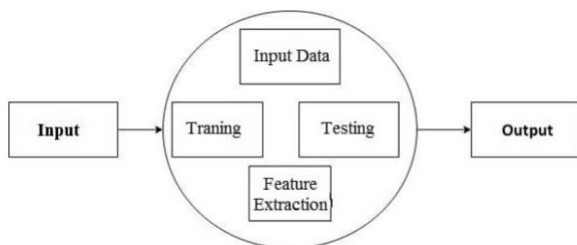


Fig.1. DFD level 1

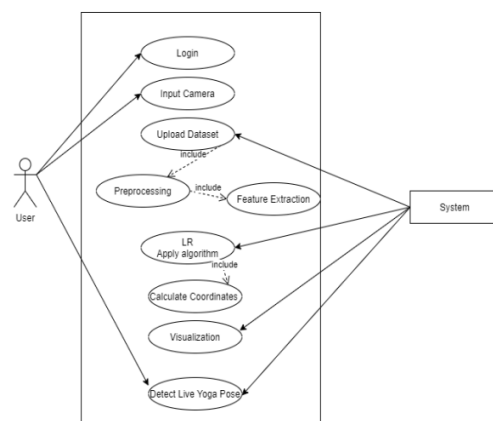


Fig.3. Use-Case Diagram

Mathematical Analysis of Proposed Model :-

Let S be the Whole system S= {I,P,O}

I-input



P-procedure

O-output

Input( I)

I={ dataset }

Where,

dataset – dataset

Procedure (P),

P={I, Using I System perform operations and calculate the output }

Output(O)-

O={output }

Applications:

- To identify accurate yoga pose.
- Learn Yoga poses.
- Promotes self-learning of Yoga.
- Helps to identify yoga poses.
- Automatic yoga posture identification.

### III. CONCLUSION

The system is a complete low cost solution to detect the live yoga pose as the sensor devices are low cost to buy and easy to setup in a given environment, the server is very flexible. The state of art deep learning algorithm is used to detect the yoga pose and this helps the user to identify the posture/ exercise performed by the user is correct or not. And it can also avoid the injuries caused due to incorrect yoga postures.

Human posture assessment has been concentrated widely over the previous years. We are going to work on live camera using a machine learning algorithm. By using machine learning for the memory of previous frames and polling for de-noising, we are going to make the results system even more robust by minimizing the error due to false key point detection. Since the frames of a Yoga Images are sequential.

Future ideas also includes expansion more yoga poses and implement machine learning modules for better performance. In addition to that an audio guidance system will also be included.

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### REFERENCES

- [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-simplified-6cfd88542ab3>. [Accessed 3 April 2020].
- [6]. S.-E. Wei, V. Ramakrishna, T. Kanade and Y. Sheikh, "Convolutional Pose Machines," 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 Assessment 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 Image Processing 2019, 2019.
- [11]. Cruz Bay Publishing, Inc., "Beginners' Yoga Poses" Aug 1995. [Online] Available: <https://www.yogajournal.com/poses/poses-by-level/beginners-poses>. [Accessed: Oct. 1, 2018].
- [12]. SparkFun Electronics, "Myoware", 2016.[Online]. Available: <https://www.sparkfun.com/products/13723>. [Accessed: Oct. 3, 2018].
- [13]. LattePanda Team, "lattapanda", 2016.[Online]. Available: <https://www.lattepanda.com/products/1.html>. [Accessed: Oct. 3, 2018].
- [14]. R H. Chowdhury, MB. I. Reaz and MA Ali. "Surface Electromyography Signal Processing and Classification Techniques", sensors journals., vol.13, pp.12431-12466, 2013.
- [15]. Eibe Frank, Mark A. Hall, and Ian H. Witten (2016). The WEKA Workbench. Online Appendix for "Data Mining: Practical Machine Learning Tools and techniques", Morgan Kaufmann, Fourth Edition, 2016