IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, November 2024

Yoga Pose Assessment Method using Pose Detection

Prof. N. M. Kolhe[1], Snehal Shelke[2], Sakshi Thomabare[3], Rohan Sakhare[4], Kaushal Kale[5]

Guide, Department of Computer Engineering[1]

Students, Department of Computer Engineering[2,3,4,5]

SGVSS Adsul Technical Campus Faculty of Engineering, Chas, Ahmednagar, India

Abstract: *This paper presents the design, development, and implementation of a Yoga Pose Detection System that integrates computer vision and machine learning techniques to analyze and assess yoga postures. The system aims to enhance the quality of yoga practice by providing practitioners with real-time feedback on alignment, form, and overall wellness. Leveraging advanced image processing algorithms, the system identifies and extracts key body landmarks from images or videos of individuals performing yoga poses. Through a trained machine learning model, the system accurately recognizes and classifies different poses, offering feedback on alignment, balance, and posture. This solution is designed to support a range of users, from beginners seeking guidance to experienced practitioners refining their skills*

Keywords: Self-learning, Machine Learning, Yoga Pose Detection

I. INTRODUCTION

Yoga has been increasingly popular in recent years as people look for all-encompassing ways to enhance their general lifestyle, mental health, and physical health. There is a rising interest in using technology to improve yoga practice as it becomes more widely adopted in several fields. The creation of a Yoga Pose Detection system, which analyses and offers feedback on yoga postures using computer vision and machine learning techniques, is one potential direction in this respect. The goal of this senior project is to develop a reliable and precise Yoga Pose Detection system that will help people improve their yoga poses.

The development of a Yoga Pose Detection system aligns with the broader trends in health and wellness technology, offering a novel solution to address the challenges individuals may face in perfecting their yoga postures. The integration of technology into yoga practice not only facilitates self-improvement but also opens up possibilities for remote learning, personalized workout plans, and data-driven insights into one's progress over time. Throughout this project, the focus will be on creating an accessible, user-friendly, and accurate system that can be deployed on various devices, including smartphones and web platforms. Additionally, the ethical considerations of user privacy and data security will be paramount in ensuring the trust and adoption of the proposed Yoga Pose Detection system. As the demand for health and wellness solutions continues to rise, the development of a Yoga Pose Detection system stands at the intersection of traditional practices and modern technology, contributing to the evolution of how individuals engage with and benefit from the ancient art of yoga.

1.1 MOTIVATION OF THE PROJECT

This Yoga Pose Detection project was inspired by the convergence of two major trends: the growing acceptance of yoga as a comprehensive practice for mental and physical well-being, as well as the growing use of technology to improve wellness and health outcomes. Although yoga has gained popularity across the world for its healing properties, practitioners frequently struggle to master their poses, which can result in less-than-ideal outcomes and increased risk of injury. Using cutting-edge technology to solve these problems is in line with the current need for creative answers in the field of health and wellbeing.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, November 2024

II. OBJECTIVE

- Develop a robust, real-time yoga pose recognition system that accurately identifies and classifies various yoga postures from images or video footage.
- Ensure the system can dynamically recognize poses as practitioners transition seamlessly from one posture to another.
- Implement advanced image processing algorithms and machine learning models to analyze key body landmarks and features, achieving precise identification and assessment of yoga poses.
- Provide detailed feedback on alignment, angles, and posture correctness to guide practitioners in refining their poses.
- Design a user-friendly interface that enables easy interaction with the Yoga Pose Detection System, ensuring it is intuitive and accessible across multiple devices.
- Ensure that the interface delivers real-time feedback in a clear, understandable format, enhancing the user's overall experience..

III. LITERATURE SURVEY

1. Paper Name: Implementation of Machine Learning Technique for Identification of Yoga Poses

Author: Yash Agrawal, Yash Shah, Abhishek Sharma

Description: 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 ten different yoga pose and used a ft.-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 ft.-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.

2. Paper Name: Yoga-82: A new dataset for fine-grained classification of human poses.

Author: Manisha Verma, Sudhakar Kumawat, Yuta Nakashima.

Description: -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. This makes the pose annotation process relatively simple and restricts the application of the models that have been trained on them. 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.

3. Paper Name: Recognition of yoga poses using emg signals from lower limb muscles.

Author: - Pradchaya Anantamek

Description: -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

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, November 2024

the use of Electromyography signals for analyzing 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.

4. Paper Name: Synthesizing Images of Humans in Unseen Poses.
Author: - Guha Balakrishnan, Amy Zhao.
Description: We address the computational problem of novel human pose syn- thesis. 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.

IV. ADVANTAGES

- Enhanced Practice Quality: Provides real-time feedback on alignment and posture, helping practitioners improve their form and avoid injury.
- Accessible Guidance: Allows users of all levels, from beginners to experienced practitioners, to refine their poses without needing an in-person instructor.
- Progress Tracking: Enables users to track improvements over time, encouraging continuous progress in yoga practice.
- Portable and Versatile: The system can be accessed on multiple devices, making it easy to use in various environments, whether at home or in a studio.
- Cost-Effective Solution: Reduces the need for costly, in-person yoga classes by offering valuable feedback digitally.
- Increased Engagement: A user-friendly, interactive interface makes the system engaging, promoting regular practice and adherence to yoga routines.

V. DISADVANTAGES

- Limited Scope in Complex Postures: May struggle with recognizing and providing feedback on highly complex or advanced yoga poses accurately.
- Dependency on Quality of Input: The system's accuracy may vary depending on video or image quality, lighting, and background, potentially impacting feedback reliability.
- Privacy Concerns: Users might have privacy concerns related to sharing videos or images, especially if the system requires internet connectivity.
- Technical Requirements: Requires devices with sufficient processing power and quality cameras for optimal performance, potentially limiting accessibility.
- Lack of Personalization: Unlike human instructors, the system may not adapt to individual needs or physical limitations, making it less suitable for personalized feedback.

VI. FUTURE SCOPE

- Enhanced Pose Recognition: Integrate advanced AI models to improve recognition accuracy, especially for complex poses and multi-person sessions.
- Personalized Feedback: Develop adaptive algorithms that customize feedback based on individual body types, flexibility levels, and progress over time.
- Multi-Pose Tracking: Enable the system to track sequences of poses, providing insights on transitions and flow, ideal for users practicing longer yoga routines.
- Integration with Wearable Devices: Incorporate data from wearable devices (such as heart rate, muscle tension, and movement sensors) for a more comprehensive analysis of posture and overall physical engagement.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, November 2024

- Augmented Reality (AR) Integration: Use AR to overlay real-time alignment guides on the practitioner's body, offering an immersive correction experience in the live practice environment.
- Voice Feedback and Guidance: Add voice-based guidance to provide hands-free feedback, making it easier for practitioners to receive corrections during their practice without needing to look at the screen.
- Progressive Difficulty Levels: Implement training programs that progressively increase difficulty and challenge, guiding practitioners from basic to advanced poses based on their individual progress.
- Social and Community Features: Develop social features allowing users to connect, share their progress, participate in challenges, or receive community support, enhancing engagement and motivation.
- Multi-Language Support: Expand accessibility by offering feedback and guidance in multiple languages to accommodate a diverse user base globally.
- Yoga for Therapeutic Use: Collaborate with health professionals to create therapeutic programs targeting specific health issues, such as back pain or stress relief, making the system beneficial for rehabilitation purposes.

VII. CONCLUSION

The Yoga Pose Detection project is a huge step in smoothly integrating traditional practices with cutting- edge technology to improve the entire yoga experience. Extensive study, development, and testing have resulted in a reliable system capable of real-time recognition, accurate analysis, and individualized feedback for a wide range of yoga positions. In summary, the Yoga Pose Detection project is evidence of the continued development of health and wellness activities as well as a triumphant union of technology and tradition. Through its smooth integration into the everyday routines of practitioners, this technique has the capacity to completely transform how people approach and reap the benefits of the age-old practice of yoga. The project's success highlights what can be achieved when innovation is used to enhance the benefits that traditional methods have always offered.

REFERENCES

[1] University of Rochester Medical Centre. (2020). Top 10Most Common Health Issues [Online]. Available: https://www.urmc.rochester.edu/senior-health/common-issues/topten.aspx
[2] Z. Cao, T. Simon, S. Wei and Y. Sheikh, "Realtime Multi-person 2D Pose Estimation Using Part Affinity Fields," 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Honolulu, HI, 2017, pp. 1302-1310.
[3] K. He, G. Gkioxari, P. Dollar and R. Girshick, "Mask R-CNN," 2017 IEEE International Conference on Computer Vision (ICCV), Venice, 2017, pp. 2980-2988.
[4] M. Gochoo et al, "Novel IoT-Based Privacy-Preserving Yoga Posture Recognition System Using Low-Resolution Infrared Sensors and Deep Learning," in IEEE Internet of Things Journal, vol. 6, no. 4, pp. 7192- 7200, Aug. 2019.
[5] M. U. Islam, H. Mahmud, F. B. Ashraf, I. Hossain and M. K. Hasan, "Yoga posture recognition by detecting human joint points in real time using Microsoft Kinect," 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC), Dhaka, 2017, pp. 668-673. Available: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8289047& is number=828 8891.
[6] S.K. Yadav, A. Singh, A. Gupta, et al., "Real-time Yoga recognition using deep learning," Neural Computing & Applications, vol. 31, pp. 9349-9361, May 2019.
[7] M. C. Thar, K. Z. N. Winn, N. Funabiki, "A Proposal of Yoga Pose Assessment Method Using Pose Detection for Self-Learning, 2019 International Conference on Advanced Information Technologies (ICAIT), Yangon, Myanmar, 2019, pp. 137-142. Available: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8920 892
[8] P.K. Borkar, M.M. Pulinthitha, A. Pansare, 2019, "Match Pose - A System for Comparing Poses," International Journal of Engineering Research and Technology (IJERT), vol. 08, issue 10, Oct 2019.
[9] U. Iqbal, A. Milan, J. Gall, "Pose Track: Joint Multi-person Pose Estimation and Tracking," 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Honolulu, HI, 2017, pp. 4654-4663.
[10] P. Kulkarni, S. Mohan, S. Rogers, H. Tabkhi, "Key-Track: A Lightweight Scalable LSTM-based Pedestrian Tracker for Surveillance Systems," 2019, pp. 208-219