Yoga Pose Detection using Deep Learning

IEEE BASE PAPER TITLE:

Yoga Pose Recognition using Deep Learning

IEEE BASE PAPER ABSTRACT:

Yoga pose detection holds significant importance in various aspects of the yoga practice and its integration with technology. The importance of yoga lies in its ability to promote physical health, mental well-being, stress reduction, improved focus, emotional balance, resilience, spiritual growth, and a holistic approach to life. With the increasing popularity of yoga, there is a growing need for technological advancements to support practitioners and instructors in monitoring and refining their practice. The paper begins by outlining the significance of automated yoga pose detection, highlighting the potential benefits it offers in providing real time feedback, enhancing self-correction, and optimizing performance. It explores the existing literature on computer vision and machine learning techniques applied to human pose estimation and their applicability to yoga pose detection. Based on a thorough review of state-of-the-art methodologies, the research paper proposes a yoga pose detection that combines multiple modalities, including RGB images, depth maps, and skeletal joint data. The proposed system leverages deep learning algorithms, such as convolutional neural networks (CNNs) and long short-term memory (LSTM), to precisely recognize and continuously monitor yoga poses. Moreover, the paper discusses the challenges associated with pose variation, occlusion, and complex body movements within yoga practice. It explores strategies for data augmentation, model optimization, and

performance evaluation to ensure robustness and accuracy of the proposed detection system. The practical implications of the research are discussed, emphasizing the potential for widespread adoption of yoga pose detection systems in various settings, including yoga studios, fitness centers, and home practice environments. The paper concludes by outlining future research directions and the potential for integrating the proposed system with emerging technologies, such as augmented reality (AR) and virtual reality (VR), to enhance the yoga experience and facilitate remote instruction. Overall, this research paper contributes to the advancement of automated yoga pose analysis, offering a comprehensive framework that can revolutionize the way yoga is practiced, taught, and evaluated, ultimately promoting accessibility, precision, and effectiveness in the pursuit of physical and mental well-being.

OUR PROPOSED PROJECT ABSTRACT:

Yoga is a popular exercise that enhances both physical and mental well-being through various postures. Advances in artificial intelligence (AI) and machine learning (ML) have created the opportunity to develop systems that can automatically detect and classify yoga poses from visual input. This project, "Yoga Pose Detection using Deep Learning" aims to accurately identify yoga poses through image and webcam inputs, leveraging advanced machine learning techniques and deep learning methodologies. Leveraging Python for backend development, HTML, CSS, and JavaScript for frontend design, and Flask as the web framework, the application seamlessly integrates deep learning models for robust pose detection.

Two distinct approaches are employed: the VGG16 convolutional neural network model for static image-based detection, and the Support Vector Classifier (SVC) within the Mediapipe framework for real-time webcam-based detection. The

VGG16 model, trained on a dataset of 1,081 images and tested on 470 images, demonstrates impressive accuracy with a training score of 98% and a testing score of 96%. For dynamic detection using a webcam, the SVC model achieves a training accuracy of 92.3% and a testing accuracy of 81.2%.

The dataset, comprising 1,551 images of five yoga poses—downdog, goddess, plank, tree, and warrior2—was sourced using Bing's API. Although the images may contain some inaccuracies such as watermarks or text, they provide a diverse and realistic training set. The dataset is organized into train and test subdirectories, each with five subfolders corresponding to the yoga poses.

Our application offers two modes of operation: image-based detection using the VGG16 model and webcam-based detection using the SVC model in Mediapipe. This dual-mode functionality enhances user experience, allowing for flexibility in pose detection methods. The high accuracy rates of our models ensure reliable performance, making this application a valuable tool for yoga practitioners and enthusiasts seeking to improve their practice through technology.

SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System : Pentium i3 Processor.
- Hard Disk : 500 GB.
- Monitor : 15’’ LED.
- Input Devices : Keyboard, Mouse.
- Ram : 8 GB.

SOFTWARE REQUIREMENTS:

- Operating System : Windows 10 / 11.
- Coding Language : Python 3.10.9.
- Web Framework : Flask.
- Frontend : HTML, CSS, JavaScript.

REFERENCE:

Prachi Kulkarni, Shailesh Gawai, Siddhi Bhabad, Abhilasha Patil, Shraddha Choudhari, “Yoga Pose Recognition using Deep Learning”, 2024 International Conference on Emerging Smart Computing and Informatics (ESCI), IEEE CONFERENCE, 2024.