Yoga Pose Detection Using Deep Learning

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Abstract— **An abstract i.e. idea behind this yoga pose detection project using deep learning or neural network learning is that yoga popularity is increasing day by day because of its benefits. Doing yoga helps us physically, mentally as well as spiritually. Because of this many people nowadays are doing it regularly. The main idea of this project is to help the people to recognize which yoga pose they are doing with the help of this detection technique. Yoga which involves 8 rungs and limbs of it, which includes Yama, Niyama, Asana, Pranayama, Dharana, Dhyana and Samadhi. To easily help people understand which pose they are performing via images, video recording by classifying it, we are implementing this project because of this people will incline towards doing more as they will get help to identify which pose they are doing very easily.**

Keywords— **CNN, Deep learning, Feature Extraction, Yoga Pose Detection**

I. INTRODUCTION

There is no doubt that nowadays sport, yoga, workout is becoming people's lives. We are having many benefits of doing it. Here we are using real time detection which can use both video and images for detection. We need to place the camera in some distance to capture the images or videos perfectly. Here we will be having a static home page where we can do registration if we want and then we can login by using user name and password credentials. If we are using video for detection the video can be a recorded video i.e. mp4 file by using recorded video path or simply put zero in my video section to on the camera i.e. webcam to use a real time video detection. Here when the video is on it will detect the pose only if the background is white and give output as the name description of the pose. Here the webcam needs to cover the complete body for the pose detection. Here we are using CNN (convolutional neural network) algorithm for video and image processing. We need to train the model as per requirement i.e., can be trained for 6 poses in one go. So, when the video will be on, it can detect at max 6 poses coming in the video. Here we are using HTML, CSS as front end and Python Flask framework as back end. We also know that video is a collection of frames. So, video detection is simply image (i.e., frames) detection. For classification purpose, the input image is used by the feature extraction networking. The extracted feature signals are utilized by the neural network for classification. For this we need a dataset. CNN feature extraction will have multiple layers and each layer will shortlist some key points and put forward the shortlisted key points to next layer and same in the next layer, it will do the same. Resulting at last it into a recognized image.

II. LITERATURE SURVEY

1. "AI Human Pose Estimation: Yoga Pose Detection and Correction" -by Rutuja Gajbhiye, Snehal Jarag, Pooja Gaikwad, Shweta Koparde 2. Publishing year of this IEEE research paper - 5 May 2022. The Paper is about Yoga Pose Detection and Correction which introduce us about various implementation methods for detection of yoga pose. the dataset is collected first and after that preprocessing is done on that data. The paper has contributed in our knowledge about SVM algorithm and various python libraries like OS, Time, Keyboard, Array and Mediapipe which helped us to study about various methods and libraries which can give us most possible accuracy

2. "Yoga Pose Detection and Validation" -by Ayush Gupta, Dr. Ashok Jangid. Publishing year of this IEEE research paper - 21 September 2021 10. The Paper has introduced Yoga pose detection and validation. In this paper OpenPose is used to for key point detection in human body in preprocessing. The SVM and Random Forest algorithms are used here for training of classification model 4. This research paper inspired us to use various algorithms for feature extraction and image classification like OpenPose, PoseNet or CNN can be used for feature extraction and for image classification SVM, Random Forest or CNN can be used according to their accuracy percentage.

3. "Yoga Pose Detection and Validation" -by Ayush Gupta, Dr. Ashok Jangid. Publishing year of this IEEE research paper - 21 September 2021 10 3. The Paper has introduced Yoga pose detection and validation. Here OpenPose is used as key point detector in human body for preprocessing. The SVM and Random Forest algorithms are used here for training of classification model 4. This research paper inspired us to use various algorithms for feature extraction and image classification like OpenPose, PoseNet or CNN can be used for feature extraction and for image classification SVM, Random Forest or CNN can be used according to their accuracy percentage.

4. "richYoga: An Interactive Yoga Recognition System Based on Rich Skeletal Joints" -by Yu-Hsuan Lo, Shih-Wei Sun, Chun-Cheih Yang Hsuan Ho. Publishing year of this research IEEE paper- 2021. Author introduced this research paper based on the idea of a real-time yoga recognition using deep learning. Here the author is using convolutional neural network (CNN) and long short-term memory (LSTM). What we are doing different compared to this research paper is that instead of OpenPose we are using feature extraction and classification using CNN. Feature extraction will be used first to extract the features via layers and then classify the images via classification using CNN.

5. "Implementation of Machine Learning Technique for Identification of Yoga Poses" -by Yash Agrawal*, Yash Shah*, Abhishek Sharma. Author introduced this research paper based on the idea of Gesture Recognition. Proposed method is for YOGI - Yoga Gesture Identification dataset. Here in this research paper an application of machine learning and artificial intelligence that is Computer vision which takes information

from digital images and videos and makes meaningful decisions based on that information. As in this paper author is using gesture recognition technology which is a technology that uses sensors to read and interpret hand movements as commands. What we are doing different compared to this research paper is that instead of gesture recognition and computer vision i.e., an application of ML.

III. PROPOSED SYSTEM ARCHITECTURE
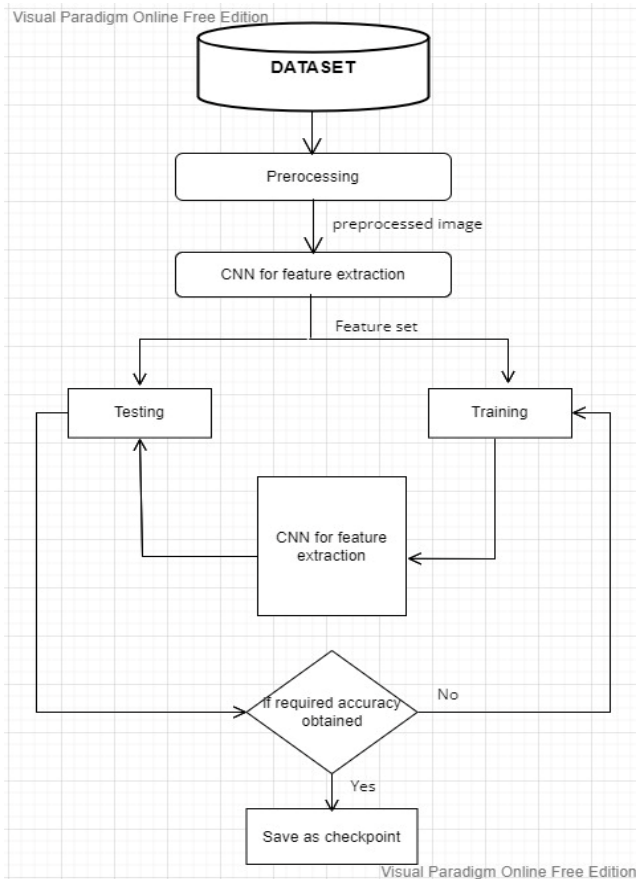
IV. METHODOLOGY USED

A. Dataset

Dataset is very essential part of any project as it contains bulk of similar records or images. using it, we test and train the data model. As we are using deep learning i.e. a part of Machine learning. Deep learning requires very large dataset to perform well and give us a very good and accurate results or outputs. we collected a dataset from kaggle's website. It has 6 different yoga poses to train the model. Following are some images from database of different poses.

B. Normalising the Inputs

Here we are normalizing data because it improves the accuracy of the model very much. normalizing means to fix the range of the image. As, generally image has the range between 0 to 255. As this range is quite large, we limit this range of the image by division method to -1 to 1. As 0 means black and 255 means white and colors basically represents an image. To limit this range of (0,255) to (-1,1), we divide the original range i.e. 0 to 255 by 127 and then subtract it by 1.

C. Data Augmentation

We augment the images by performing scales, rotation, sheering or basically we can say we are pre-processing the images before it goes for training and testing.

D. Feature Extraction

In CNN networks images are taken as input and features are extracted by one layer and utilized by other layer. Extracted features are passed forward to classify images in CNN network. The next step after this is image classification. Here we extract features of images by:
1. Convolution
2. Non-Linearity
3. pooling

E. Image classification using CNN

After the feature extraction using CNN we need to classify the images or videos (i.e., collection of frames). CNN uses various layers to classify the images. Here we classify images by using:
1. Flattering
2. Fully connected neural network
3. Softmax

Image classification process in CNN
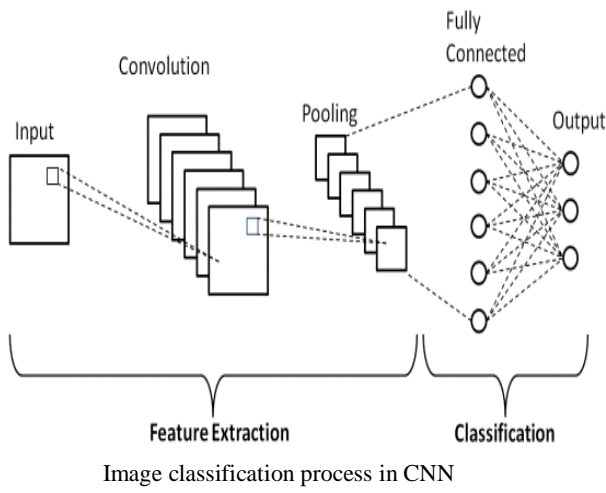
F. Input to the Project

We are giving input to this yoga pose detection project as

1. Image- We can give input as image i.e., the image of the pose that the user is doing

2. Real time video- We can open webcam to capture real time video

G. Expected Output

We are expecting the output of this yoga pose detection project is that we are getting a recognized image or video of the pose of the yoga of the user with the description of the name of that yoga pose and Accuracy.

F. Real-Time pose detection Results
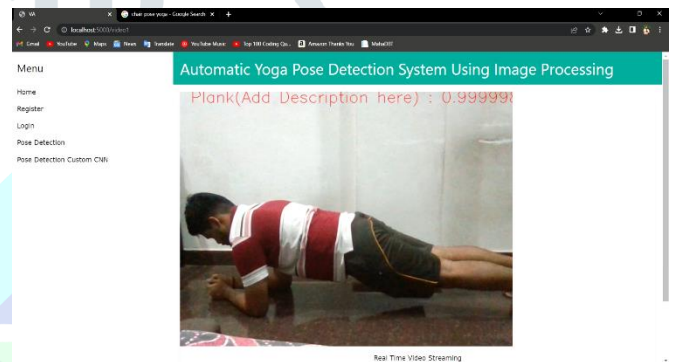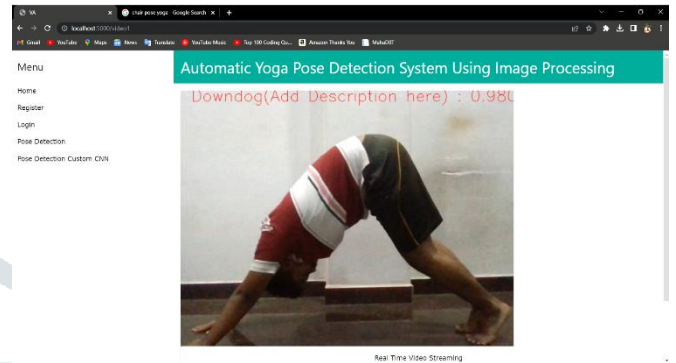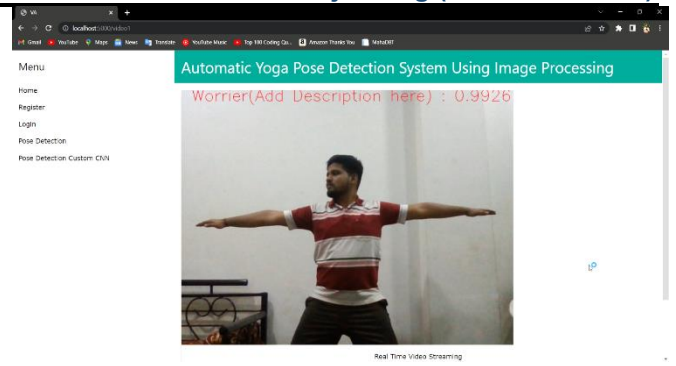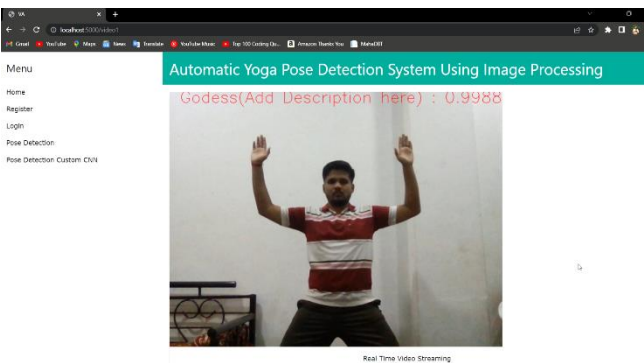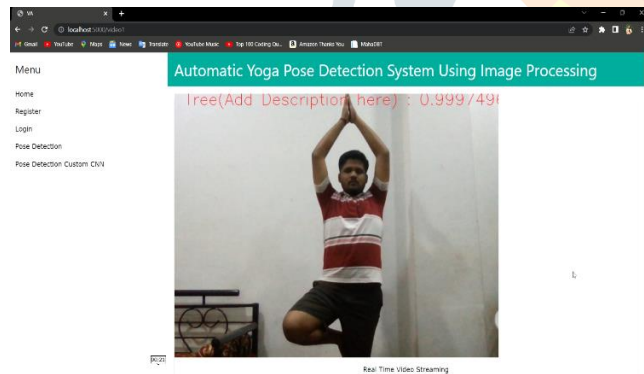
V. APPLICATIONS

This application is made for the new comers who know how to do the yoga pose but does not know name and description of that pose. As, if anybody know the name of the pose, they can search that pose on the internet. But for doing the pose user must ensure that he is doing it correctly. Here our web-app also displays the accuracy of your pose in real time via webcam.

VI. FUTURE SCOPE

The future of image detection is now in a learning phase and in process of proving its importance. It is much like the original Industrial Revolution, it has the potential to free the people from stressful jobs of recognizing the pose as that can be done in more efficiently and effectively manner by machines. Here we are using CNN (convolutional neural network) which is new in market, trending technology and performing very well nowadays and in a big demand because it has a very bright future.

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