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**Data Selection-**

The dataset selected for this project has been taken from the Kaggle website and does not involve any ethical concerns. The data consists of images having people in it performing various yoga poses. ‘Tree’, ’Downdog’, ’Goddess’, ’plank’ are the four poses captured in these images. In total, 3742 images in training dataset and 953 images in testing data is available for the modelling purpose. The fundamental part of this data is the key points that will be extracted form the images and will be used in the classification task ahead. Independent variable will be the key points extracted from the images and corresponding label- pose name that is being performed by the person in the image will be the target or dependent variable.

**Data Transformation**

Image Augmentation:

To solve the problem of class imbalance, image augmentation is important step to be completed before proceeding with the modelling. For the chosen dataset, which contains images in it, general augmentation is not appropriate as the image contains the poses, so by performing rotation or zoom in or zoom out, it will change the basic meaning of the pose. To avoid this, slightly changing the points, applying horizontal shift and flip like transformations will be appropriate and keep the actual meaning of the image intact too. After performing the augmentation, dataset headers are also renamed to have proper meaning full names to the columns. After applying these transformations, dataset is ready for the modelling.

**Data Pre-processing and Feature Extraction/Landmark detection:**

To perform pose classification by using image dataset, it is important to extract all the landmark/keypoints from the image for further processing.

NOSE

LEFT\_EYE\_INNER

LEFT\_EYE

LEFT\_EYE\_OUTER

RIGHT\_EYE\_INNER

RIGHT\_EYE

RIGHT\_EYE\_OUTER

LEFT\_EAR

RIGHT\_EAR

MOUTH\_LEFT

MOUTH\_RIGHT

LEFT\_SHOULDER

RIGHT\_SHOULDER

LEFT\_ELBOW

RIGHT\_ELBOW

LEFT\_WRIST

RIGHT\_WRIST

LEFT\_PINKY

RIGHT\_PINKY

LEFT\_INDEX

RIGHT\_INDEX

LEFT\_THUMB

RIGHT\_THUMB

LEFT\_HIP

RIGHT\_HIP

LEFT\_KNEE

RIGHT\_KNEE

LEFT\_ANKLE

RIGHT\_ANKLE

LEFT\_HEEL

RIGHT\_HEEL

LEFT\_FOOT\_INDEX

RIGHT\_FOOT\_INDEX

Above mentioned key points are extracted from the image dataset and stored inside the CSV file to access while modelling.

Machine Learning Model: Most suitable machine learning models applicable for image classification based on landmarks are – Random Forest Classifier, Decision Tree Classifier, SVM, KNN, Gradient Boost Classifier, Naïve Bayes Classifier.

Methodology:

Model Implementation:

After transformation and keypoint extraction, dataset is ready to be used for the model implementation. CSV file containing all the extracted keypoints is used as the dataset for modelling. The dataset contains all the keypoints and target variable as label of that image describing which pose is being performed in that image. The dataset is divided into 80-20% ratio as training and testing dataset. The models mentioned in above section are trained using training data and then pose prediction is done on the testing dataset. The model performance will be evaluated using evaluation metrics described in next section.

Evaluation of the models:

Accuracy:

Confusion Matrix:

Classification Report: