

AI Coach for Gym

Team 8

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Overview

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Task Description

A computer vision model that can categorize wall-sit exercise into correct and incorrect.

Demo

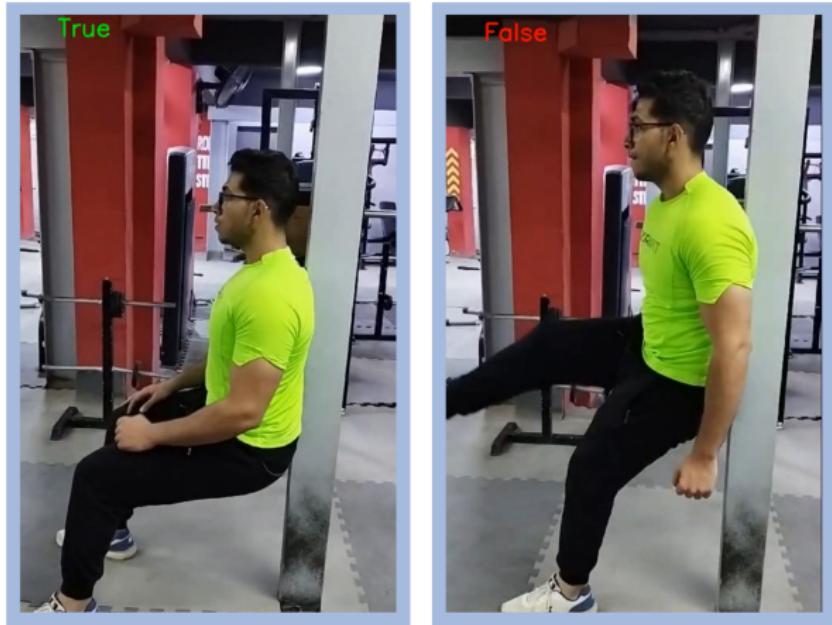


Figure 1: Demo
Github Repository – Demo Video

Contribution

- Two models have been built
 - The first was based on the landmark data.
 - The second was based on the angles that were extracted from the landmarks. (used)
- Some of the data were made by us.
- Data was passed to MediaPipe for Landmark Detection to extract keypoints (body joint locations).
- Angles between relevant joints were calculated based on the detected landmarks.
- Error analysis:
 - Confusion matrix
- The trained model was used for categorization on real-time video data, and also video data.

Data

- The dataset used to train the model consists of 42 images.
- Most of the data is from Google Images, the rest of the data were made by us.
- Images format is BGR.
- The dataset is categorized into two folders: "Correct" and "Incorrect".



Figure 2: Correct and Incorrect data

Data

During training:

- Images format is converted to RGB.
- Each image is converted into 10 images by doing several data augmentation techniques (flipping, zooming).

Project Architecture

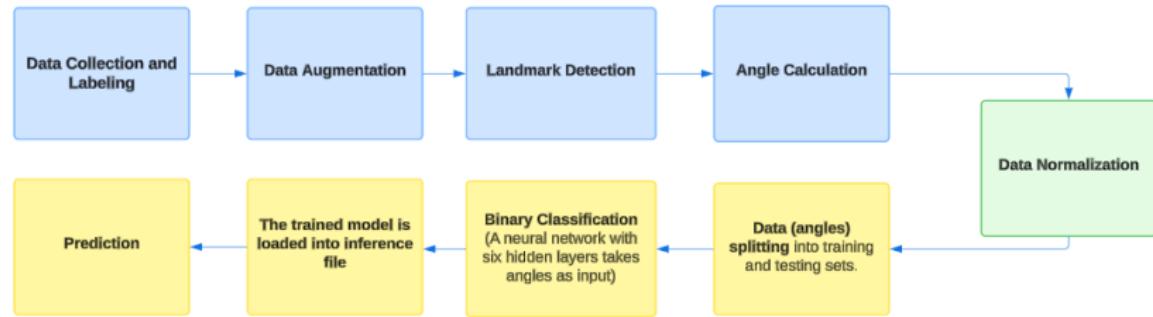


Figure 3: Project Architecture

Methods

- Integrates MediaPipe's pose library to detect landmarks corresponding to body joints.
- Hyperparameters:
 - Optimizer: adam
 - Loss Function: binary cross-entropy
 - Metric: accuracy
 - Epochs: 150
 - Early Stopping: is used to prevent overfitting.

Methods: Layers

- Input Layer: Takes a flattened array of 20 angles (representing joint angles) as input.
- Hidden Layers:
 - Six dense layers with 512 units each using "ReLU" activation function.
 - Dropout layer with a rate of 0.25 is included to prevent overfitting.
- Output Layer: Has one neuron with a sigmoid activation function.

Results

The measure is accuracy

- The model achieves 99.9% accuracy on the training data.
- The model achieves 98.9% accuracy on the test data.

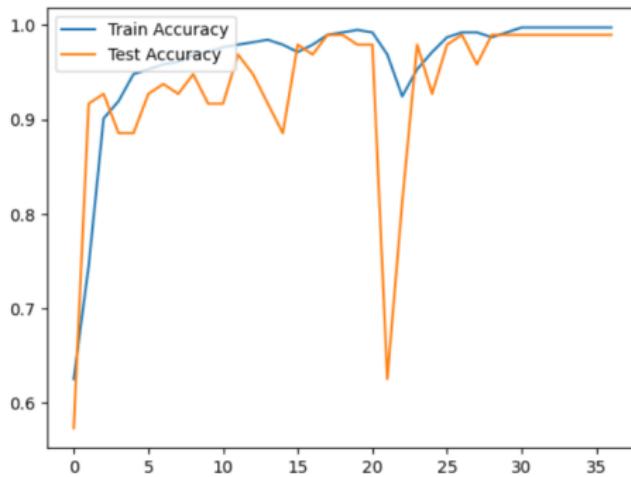


Figure 4: Results

Results

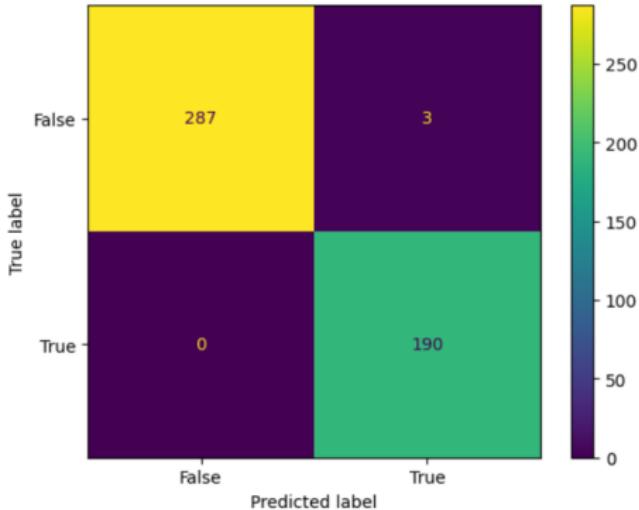


Figure 5: Confusion Matrix

Thank you