

Smart Exercise Form Correction Project

Project Title: Form Correctness Detection Using Pose Estimation

Project Description:

This project analyses human exercise posture from video input using MediaPipe Pose Estimation and OpenCV. A rule-based system evaluates posture correctness using biomechanical principles such as joint angles, alignment, and body stability, and provides real-time visual feedback to the user.

Technologies Used: Python, OpenCV, MediaPipe, NumPy

Key Features:

- Real-time pose detection using MediaPipe
- Rule-based posture evaluation without model training
- Visual corrective feedback overlay on video
- Processed output video generation

Logic Behind the Posture Rules:

The posture correction system is based on deterministic, rule-based logic derived from basic human biomechanics. For bicep curl analysis, the elbow joint angle is calculated using shoulder, elbow, and wrist coordinates. If the angle falls within a predefined optimal range, the posture is considered correct; otherwise, feedback is provided. Additional rules evaluate wrist-to-shoulder alignment to ensure controlled movement and shoulder stability to detect body leaning or momentum usage. Each rule independently evaluates posture correctness and contributes to the final feedback.

Challenges Faced:

- Handling inconsistent lighting and video quality affecting pose detection accuracy
- Selecting appropriate threshold values for joint angles and alignment
- Ensuring real-time performance while processing video frames
- Managing library compatibility issues, especially MediaPipe version dependencies
- Designing scalable rule-based logic without overcomplicating the system

Submission Details:

The complete source code, documentation, and output samples are available in the submitted GitHub repository.

Submitted By: Alfitul Museliya S