AI Virtual Personal Fitness Coach - Project Report

Introduction

With growing interest in fitness and health, AI-based solutions can help individuals track their form and posture effectively. This project builds a real-time AI Virtual Fitness Coach that uses pose estimation to guide users through workouts by analyzing body movements via webcam.

Abstract

This project implements a virtual fitness coach using Python, OpenCV, and MediaPipe. The system captures live webcam footage, detects the human body pose using key landmarks, and provides real-time feedback on exercise form. It identifies and counts correct repetitions, making it a helpful tool for solo home workouts. The coach currently supports a basic exercise like bicep curls or squats.

Tools Used

- Programming Language: Python 3.7+
- Libraries:
  - OpenCV: For video processing
  - MediaPipe: For human pose estimation
  - NumPy: For mathematical operations
  - Streamlit (optional for UI deployment)
- IDE: Jupyter Notebook / VS Code
- Hardware: Webcam-enabled laptop/PC

Steps Involved in Building the Project

1. Installation of Dependencies

2. Pose Estimation Setup

3. Landmark Detection

4. Angle Calculation

5. Repetition Counter

6. Real-time Feedback

Conclusion

The AI Virtual Personal Fitness Coach enables users to perform fitness exercises correctly with the help of computer vision. It offers a simple, effective, and accessible way to stay fit, especially for people working out at home. Further improvements can include supporting more exercises, real-time audio feedback, and posture correction warnings.