

HUMAN POSE ESTIMATOR FOR FITNESS APPLICATIONS



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MOTIVATION

In the current generation, the contemporary needs of users require a highly interactive, personalized, and accessible fitness solution that adapts to the demands of modern life. With the ever-growing emphasis on physical fitness, there is an increasing need for a reliable and durable personalized fitness guide that provides proper feedback and guidance. Incorrect limb positioning during workouts, whether minimal or heavy, can lead to severe injuries, ranging from muscle cramps to bone dislocations. These challenges have inspired us to develop a creative solution that allows users to access fitness guidance anytime and anywhere, ensuring safer and more effective workouts.

PROBLEM STATEMENT

As fitness becomes increasingly important in today's health-conscious society, users seek interactive and personalized applications that provide effective workout guidance. However, many traditional fitness apps fail to offer real-time feedback on exercise form, leading to improper techniques that can result in injuries such as muscle strains and bone dislocations. The challenge is to develop a “Human Pose Estimator for Fitness Applications” that integrates Natural Language Processing (NLP) to enhance user experience. This application should accurately analyze users' body positioning and offer immediate corrective feedback while understanding voice and text commands. By providing a reliable, accessible, and personalized fitness guide, the project aims to empower users with safe workout practices and tailored fitness plans, ultimately improving their performance and commitment to achieving their health and fitness goals.

PROPOSED PIPELINE

- User Input:Voice/Text Commands
- Pose Estimation (Image Processing):Pose Detection, Posture Analysis
- Command Recognition, Dialogue Management
- Real-Time Feedback Generation: Pose-Based Corrections, Natural Language Generation (NLG)
- Personalized Workout Plans: User Data Integration, Progress-Based Adaptation
- User Interaction and Guidance: Conversational Agent
- Feedback and Improvement: User Feedback Analysis, Iterative Learning.

TIMELINE

Week 1: Project Setup & Research

- Set up the development environment (e.g., Python, OpenCV, TensorFlow, or PyTorch for deep learning)
- Research NLP tools and frameworks .
- Plan out the data requirements for pose estimation and NLP tasks (e.g., pose datasets and conversational data)

Week 2: Pose Estimation Model Implementation

- Implement and test the human pose estimation system.
- Test the model on sample videos or pictures to detect and track key body points (e.g., joints).
- Analyze the model's performance in detecting various poses and exercise movements.

Week 3: Movement Analysis and Form Evaluation

- Develop logic to analyze exercise movements and evaluate form correctness.
- Implement logic for form correction by defining ideal joint positions for each exercise.
- Test form evaluation on basic exercises (e.g., squat, lunges).

Week 4: Real-Time Feedback Generation

- Implement real-time form correction by providing visual or text-based feedback (e.g., flagging incorrect posture).
- Add visual cues like highlighting misaligned joints .

TIMELINE

Week 5: Pose Estimation Model Implementation

- Implement and test the human pose estimation system.
- Test the model on sample videos or live camera feeds to detect and track key body points (e.g., joints).
- Analyze the model's performance in detecting various poses and exercise movements.

Week 6: Real-Time Feedback Generation

- Implement real-time form correction by providing visual or text-based feedback (e.g., flagging incorrect posture).
- Add visual cues like highlighting misaligned joints .

Week 7 and week 8: Multimodal Integration and Final Testing

- Integrate pose estimation with NLP feedback (e.g., voice-based corrections based on real-time form analysis).
- Perform rigorous testing on various exercises and environments.
- Fix any bugs or issues that arise from integrating both components.

EXPECTED OUTCOME/APPLICATION

WE ARE CURRENTLY ONLY DOING BACKEND APPLICATION AND WE WILL
DEVELOP AN UI FOR THE APPLICATION IF TIME PERMITS

- REAL-TIME FORM CORRECTION AND INJURY PREVENTION

This can provide real-time descriptive feedback on body alignment, helping users maintain correct form during exercises, reducing the risk of injury and user can receive instant verbal cues when and how to correct the posture.

- PERSONALIZED EXERCISE PLANS

This can evaluate the users current physical ability allowing for tailored exercise programs

- DYNAMIC EXERCISE GUIDANCE

Users can provide verbal feedback on how they feel during the workout, and the NLP-enabled system can adjust exercises accordingly.