**Synopsis**

**1.Introduction**

The project provides a solution to count repetitions of a physical exercise in real time. The method uses pose estimation to track athletes, recognize their performed exercises, count the repetitions, and analyze the performance of the repetitions. OpenPose is a real-time network that detects human poses and extracts their 3D skeleton key points from an input video or an external camera. The method uses these key points to track poses on frames and recognize the performed exercise. In order to effectively count and analyze repetitions, each exercise has different pre-selected parameters; upper and lower range of motion, major joint, and type of motion. The method measures, filters, and smooths the angles of the major joint for the performed exercise. Then, it counts the repetitions of the exercise, and detects the number of correct and incorrect repetitions, and locates their frames.

**2.Project concept**

**2.1 Abstract**

Human pose estimation is one of the important researches in the field of Computer Vision for the last few years. In this project, pose estimation and deep machine learning techniques are combined to analyze the performance and report a feedback on the repetitions of exercises performed in real time. Involving machine learning technology in the fitness industry could help the judges to count repetitions of any exercise.

The proposed method divides respectively into three phases; pose tracker to identify and track user, exercise recognition to detect the name of the appeared exercises, and counter to count and indicate the correct and incorrect repetitions.

**2.2 Objectives**

Create an Android application which will use your phone’s camera to count the number of repetitions you do for a single exercise and check how correctly you do them.

**2.3 Literature review**

We made use of the following research papers :

---Action Quality Assessment Across Multiple Actions : In this paper, they carried

out experiments to see if knowledge transfer is possible in

the action quality assessment (AQA) setting. Action quality assessment (AQA) is the process of quantifying how “well” an action was performed or computing

a “score” representing the execution quality of an action.

---Live Repetition Counting : This paper talks about how when given an input video capturing a scene in which the same action is repeated multiple times in consecutive cycles, how we can count the number of repetitions.

---Recognizing Exercises and Counting Repetitions in Real Time : This research paper provides a solution to count repetitions of a physical exercise in real time. The method used in this paper is pose estimation to track athletes, recognize their performed exercises, count the repetitions, and analyze the performance of the repetitions.

**2.4 Problem definition**

Due to the lockdown in the pandemic , everyone had to stay at home and weren’t able to access the gym. This caused people to seek the help of various apps available in the app store to help them out. Like everyone else, we too wandered through the App store to find an app that would fulfill our needs. After researching a lot we found out that there were plenty of apps that would suggest the user a new workout plan and these workout plans would instruct the user on how to perform the suggested workout using images or a video.

However no attempts are made to recognise and correct the form of the user while performing these exercises. There are also no systems available that accurately count the no of reps that the user has performed.

We quickly realised that without any proper assistance and guidance from a personal trainer, people are at a risk of injuring themself even while performing basic exercises like a pushup or a bicep curl.

With this information in mind we went through various research papers that could perform either of these task and we finally deduced two main ideas to tackle this problem.

**2.5 Scope**

The main idea of our project is pose estimation, pose correction and counting the number of times a particular action is repeated. Although we will be working with a limited number of exercises, our project, when modified correctly, can be used by Judges in Olympics, trained athletes, bodybuilders etc. This also has wide application in accordance with the upcoming VR technologies. The basis of the project can be implemented in such a way that the action quality assessment can be used to create virtual simulation of surgeries or some simulation where the user needs to perform a specific task in quite accurate manner.

**2.6 Technology stack**

1. Android (Kotlin): It will be used to create the android application that will detect video.
2. Python : Language which will be used to write the project.
3. Computer Vision: A technology that allows computers to deduce meaningful information from digital images, videos and other visual inputs.
4. Video Database: The input data that we are going to use to train our model on.

**2.7 Benefits for the environment and society**

The project focuses mainly on how effectively the user performs his/her exercise which helps them minimize the casualties that are associated with an improper form of their exercise. The project also helps the user count the repetition of each of their exercises helping them to achieve the best of their capabilities.