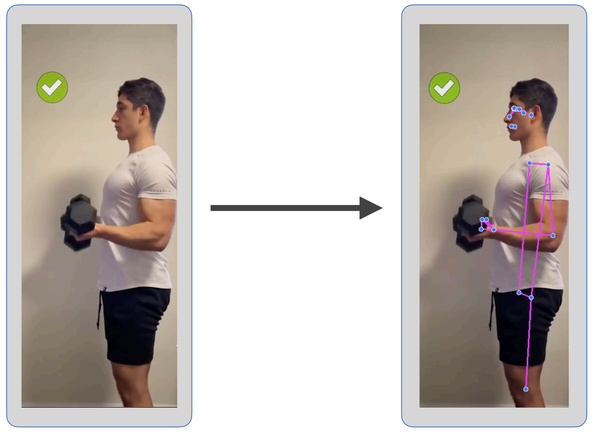
Exercise Pose Correction and Identifying Exercise Dynamic Strength Potential

Armaan Punj[1]; Mayank Goel, PhD[2]
[1]University of North Carolina at Chapel Hill, [2]Carnegie Mellon University

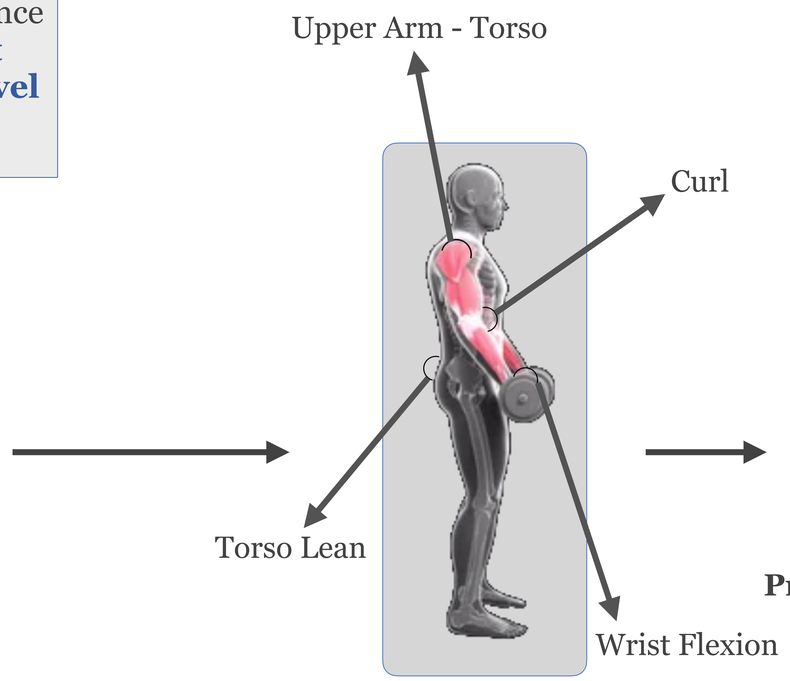
Problem Space

Among the biggest **challenges** strength-trainers face, especially those new to strength and resistance training, is knowing **how to properly conduct unfamiliar exercises and their strength level relevant to an exercise.**

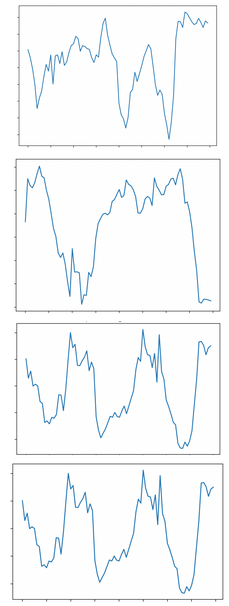


Video Input

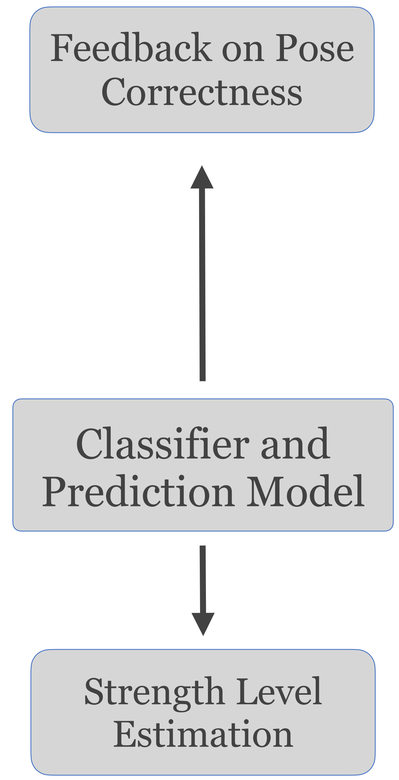
Extract 3D Pose Landmarks



Calculate Key Joint Angles



Process Time Series Data



Challenges

Using a Computer Vision and Machine Learning-based system, we aim to:

1. **Classify exercise pose correctness using varying-length time series classification**
2. **Identify improvements for incorrect form**
3. **Predict strength level for given number of repetitions**

System

1. Collect Video Input from User
2. Utilize pre-trained pose estimation model to collect 3D Joint Landmarks
3. Calculate angles between joint vectors
   - *Elbow-Wrist-Index Angle*
   - *Shoulder-Elbow-Wrist Angle*
   - *Hip-Shoulder-Elbow Angle*
   - *Knee-Hip-Shoulder*
4. Classify (*kNN & DTW, Shapelet Classification*) pose correctness and identify improvements based on angle patterns
5. Use joint angle patterns, movement speeds, and pose correctness patterns of input video to estimate how much weight can be lifted at *x* repetitions

Future Steps

1. Continue refining classification system
2. Conduct user study on active strength trainers to train model to detect the point of failure during exercise
3. Build strength level prediction model
4. Experiment with pre-trained pose estimation models

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