

CoachCV

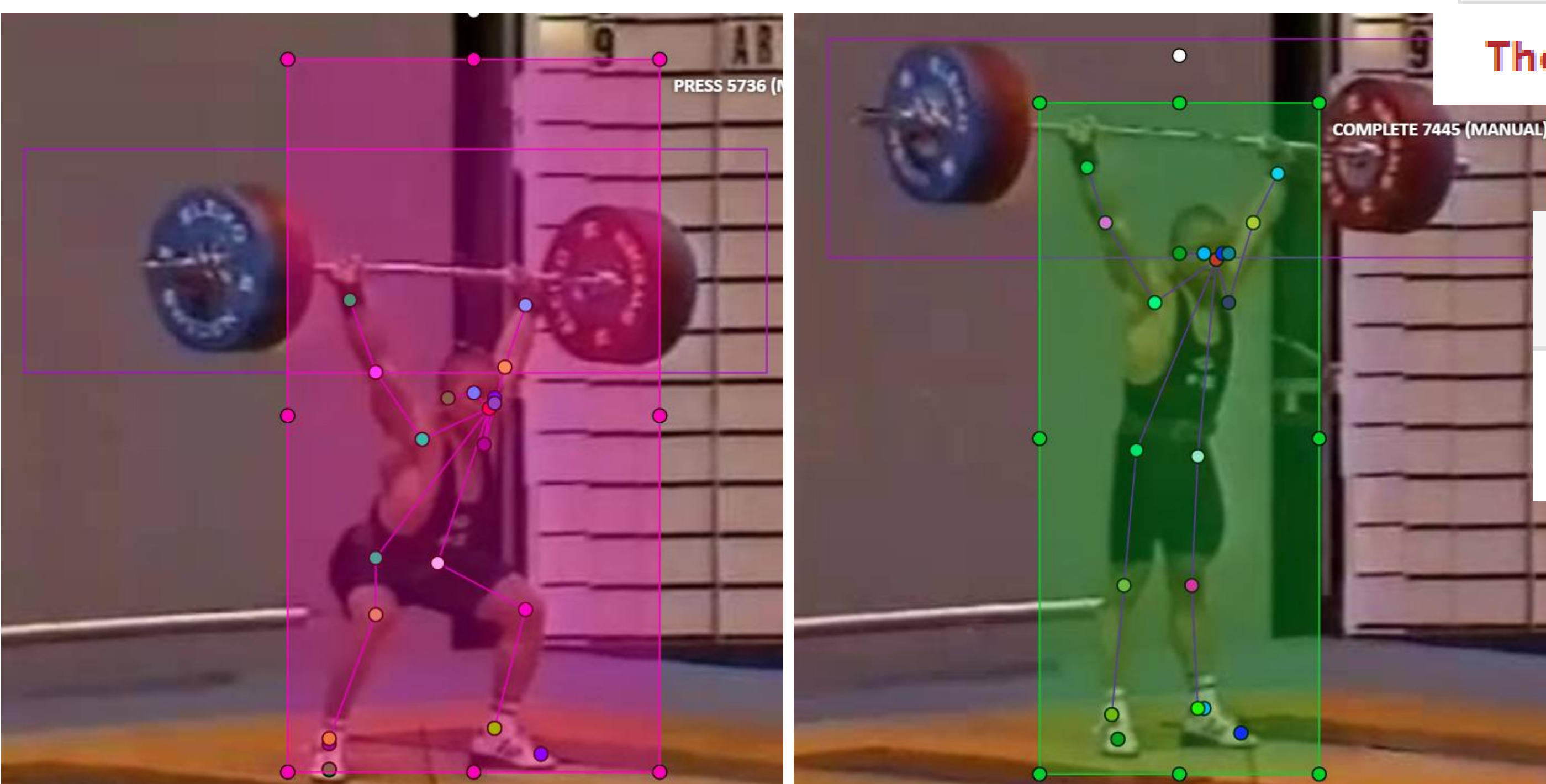
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Business Problem

- The quality of training for all sports varies significantly based on the local availability of qualified coaches and the level of community or organizational support.
- The goal of CoachCV is to provide a personal coaching experience for athletes using object detection and pose estimation on input videos.

Methodology

- Video files are collected for the activity of interest (i.e. weightlifters performing the “Clean and Jerk” lift) and annotated frame by frame using Computer Vision Annotation Tool (CVAT.ai).
- Annotated frames and ground truth labels are trained on a “You Only Look Once” (YOLOv8) object detection model designed by Ultralytics to detect each key aspect of the Clean and Jerk.



- For the Clean and Jerk, frames were annotated with, 1. the location of the barbell, 2. a human pose estimated skeleton of the athlete, and 3. bounding box around the athlete that is labelled to indicate which element of the lift the athlete is currently performing (i.e. “Setting”, “Cleaning”, “Holding”, “Pressing”, “Complete”, “Release”).
- YOLOv8 model was trained on the annotated frames to learn how to detect each element of the lift.

Architecture

- User sets up camera in front of workout area and takes a video of themselves performing the activity.
- Video is input into a YOLOv8 model trained on CoachCV annotated data.
- Model outputs a vector with key indicators. The vector is then entered into a coaching framework.
- Coaching framework provides feedback to user based on input video.

Results

- Coaching framework is designed to detect if each element of the lift is present and in the correct order.
- Framework provides feedback based on which elements of the lift are present or missing.

```
print(colored(result_message, 'red', attrs=['bold']))
```

The end of your lift looked great, but I don't think I saw the beginning

```
print(colored(result_message, 'red', attrs=['bold']))
```

Oh man! That wasn't right , I hope you are okay. Next time, put less weight on the bar

```
print(colored(result_message, 'red', attrs=['bold']))
```

Great lift. Keep up the great work.

Business Impact

- The same methodology for data collection and annotations can be followed for other sports and events with new coaching frameworks.
- CoachCV aims to provide either a replacement or a supplement for traditional coaching in both Olympic and non-Olympic events using augmented intelligence and computer vision.