FOUNDATION

a private lifting coach anywhere, anytime for everyone

Data-X, Fall 2018

Manoj Adhikari, Arthur Cheng, Owen Duvall
Emily Hill, Denny Hung, Timothy Kwee

2018 Training Landscape

SELF TEACH

Time sink Error prone

PERSONAL TRAINER

Expensive Schedule

ONLINE COACH

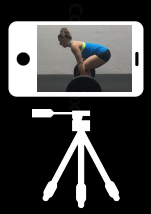
Clunky Delayed

Objective

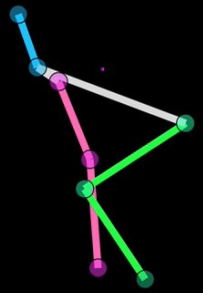
Automated Trainer

Build a low-cost, highly accessible automated trainer that:

1) Reviews footage and detects pose
2) Provides real-time feedback and cues for the very next set



Video input

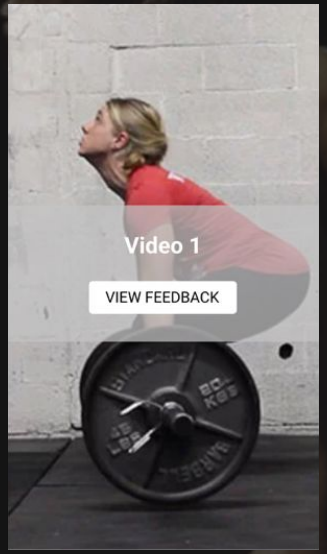


Detection
Lift
Pose
Rep
Flaw

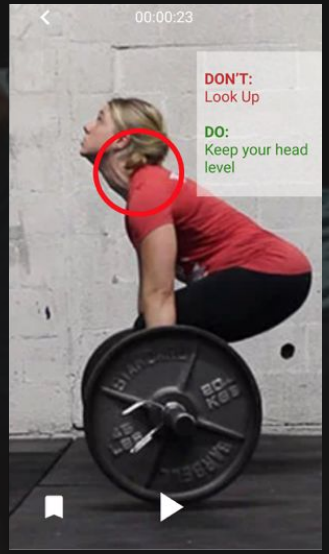
Feedback output

Weightlifter Perspective

A



B



C

A Weightlifter records lift

B Weightlifter submits their video for **feedback analysis**

C Simulating human coach feedback, FOUNDATION **recognizes lift type**, **points out flaws** and **gives cues** on how to improve technique

Technical Components

Data

- Training data set comprised of 150,000+ videos downloaded from Instagram, based on tags.
- Clean video annotations to include accurate macro and micro lift type labels.

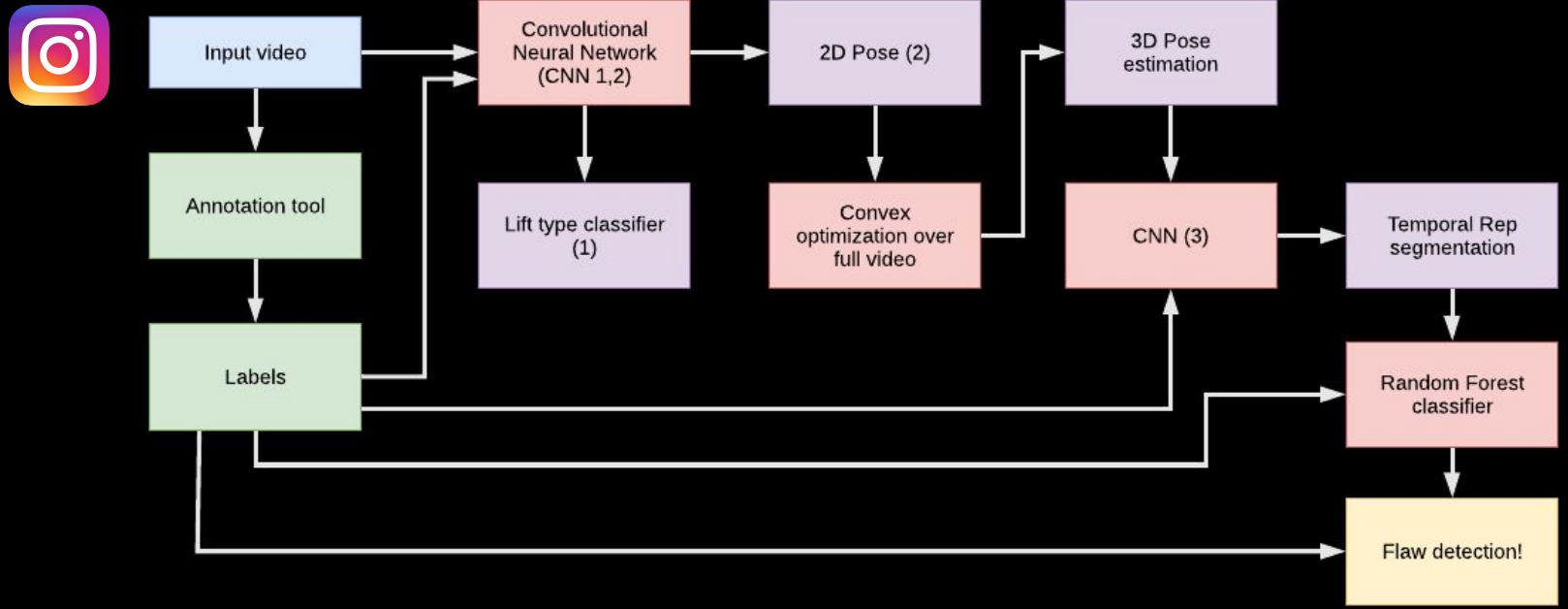
Models

- Recognize which lift type is present in the video.
- Recognize human pose in video, as 2D key-points on a skeleton.
- Estimate 3D pose in video from 2D key-points to normalize pose representation.
- Identify the start and the end of a repetition.
- Detect flaws in the lifter's repetitions and provide real time feedback and/or corrections.

Delivery

- Create a mobile app as the interface to submit videos and receive feedback.

Architecture



Next steps...

User Input Framework (TK, DH)

- Finish data annotation. (Everyone)
- Go through papers about each type of classification. (Everyone)
- Modify main data structure to hold annotated data. (MA, DH)

Lift Type Detection (MA, TK)

2D Pose Detection (EH, OD)

3D Pose Estimation (OD, AC)

Rep Detection (DH, EH)

Flaw Detection (AC, MA)