Workout Buddy

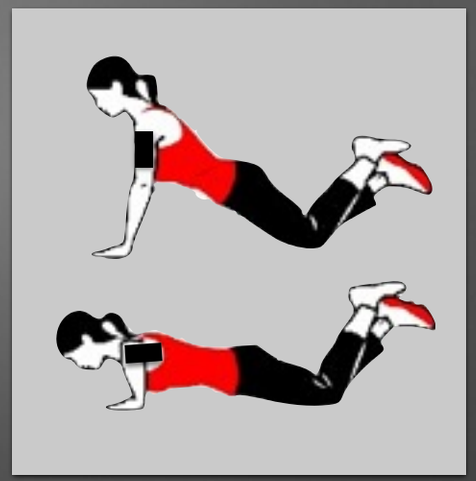
A personal trainer at your fingertips

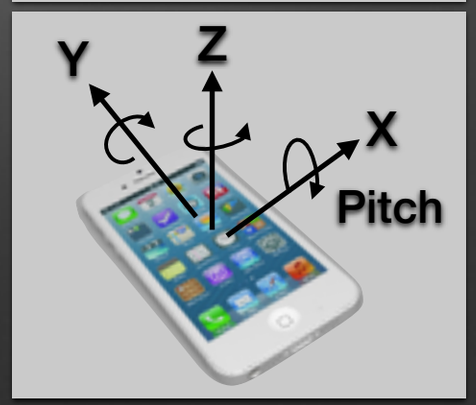
Kelly Wiseman

- Uses very accessible data source - your iPhone sensor data

Data

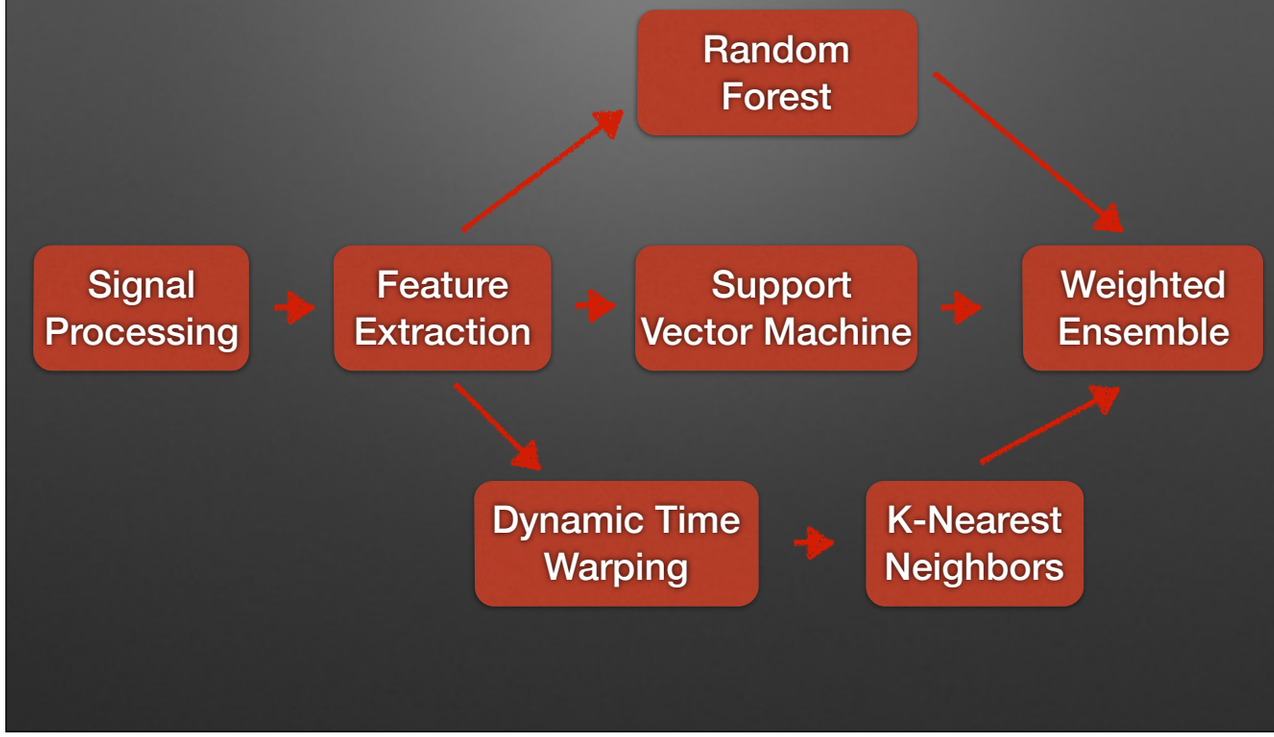
- Sample users:
  - 30 unique users, 54 sample pushup sets
  - Variety of stances
- Sensor data:
  - iPhone accelerometer and gyro sensor data



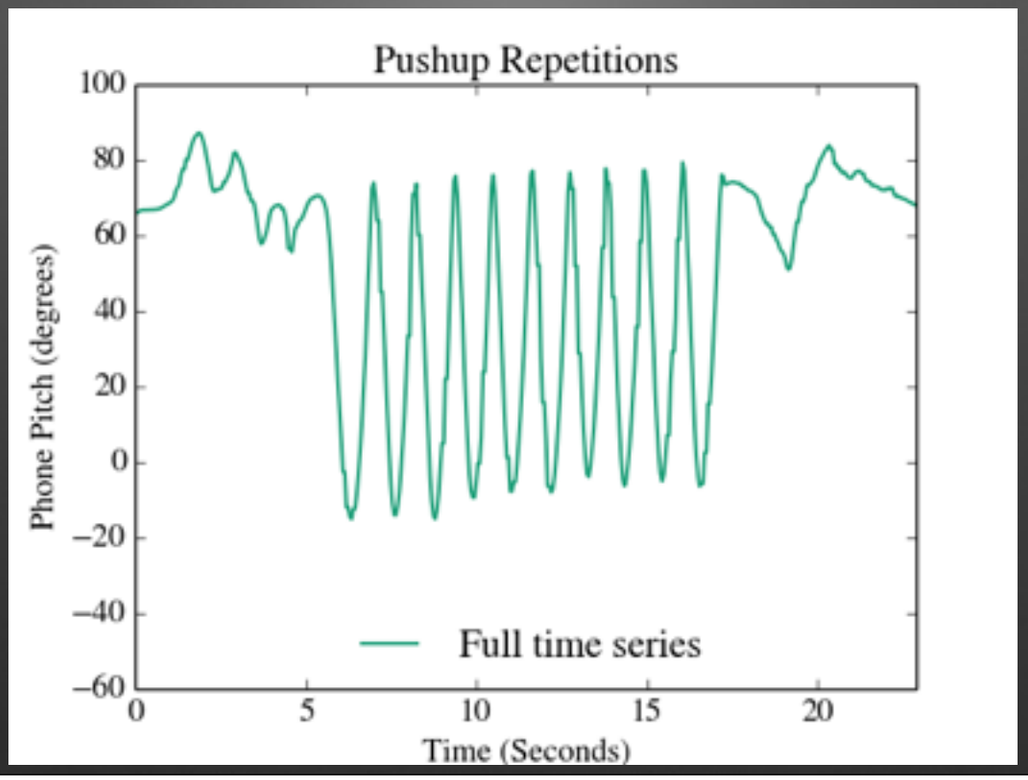


- Start by analyzing pushups - but other exercises that involve arm movement can be added in the future
- Challenge is ensuring product is robust to right/left arm, multiple types of stances - need to choose the right features
- Pitch is the most useful sensor component for identifying pushup reps - expect 90° rotation for optimal pushup

Modeling Approach

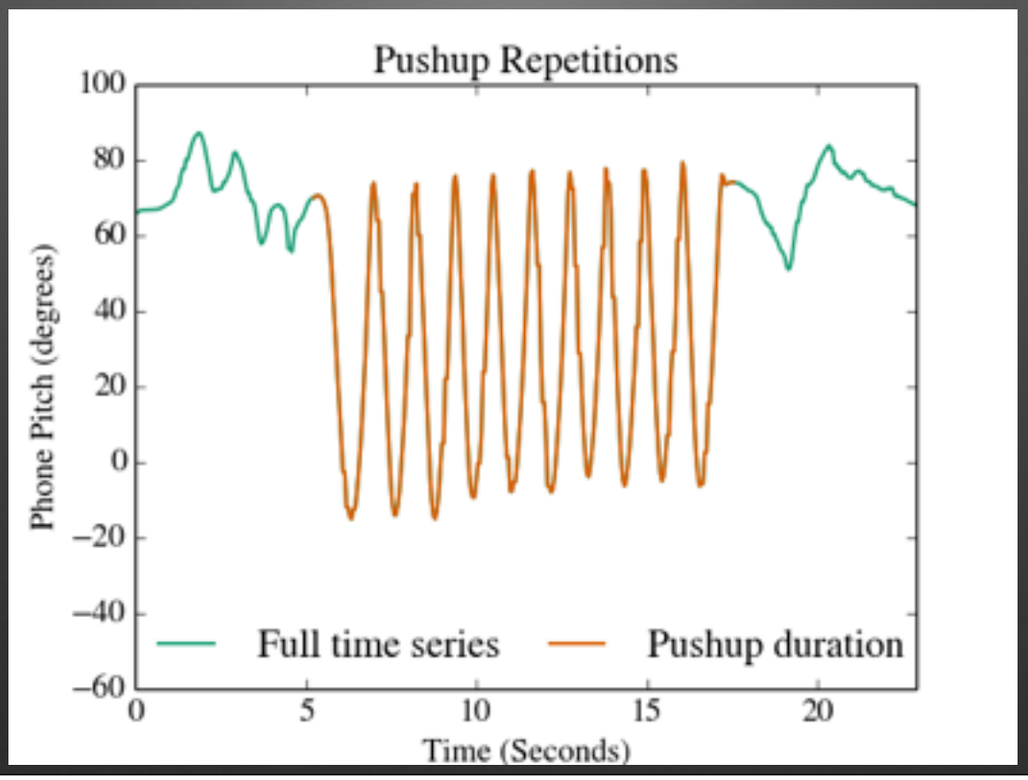


Signal Processing



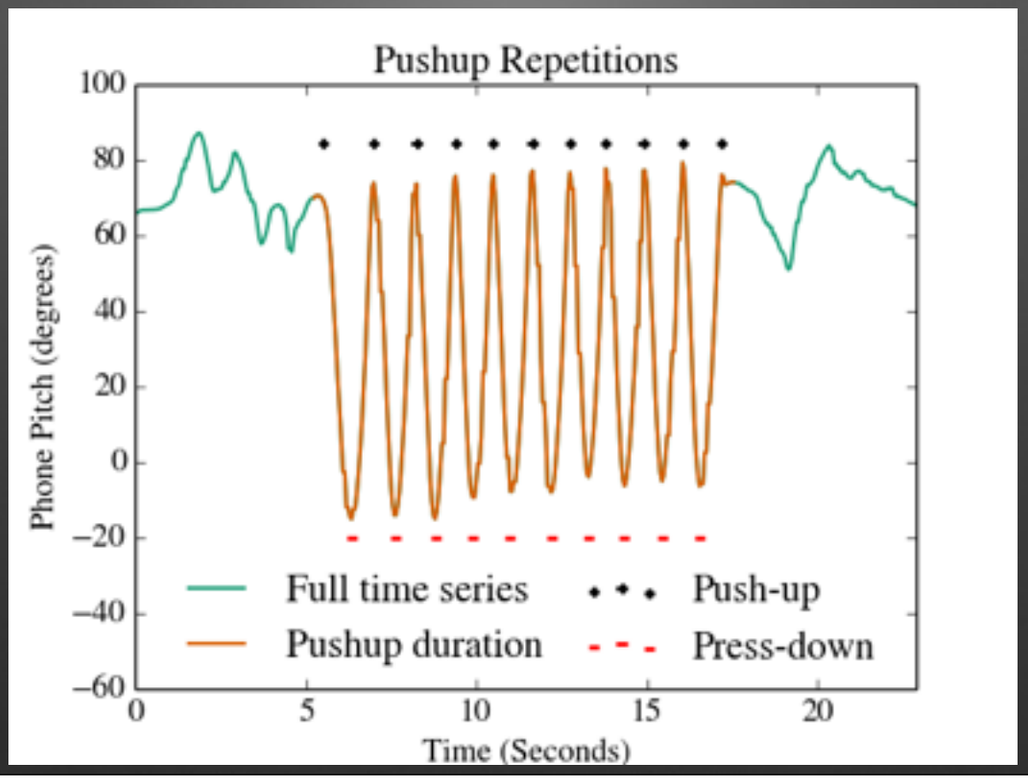
- Raw pitch time series

Signal Processing



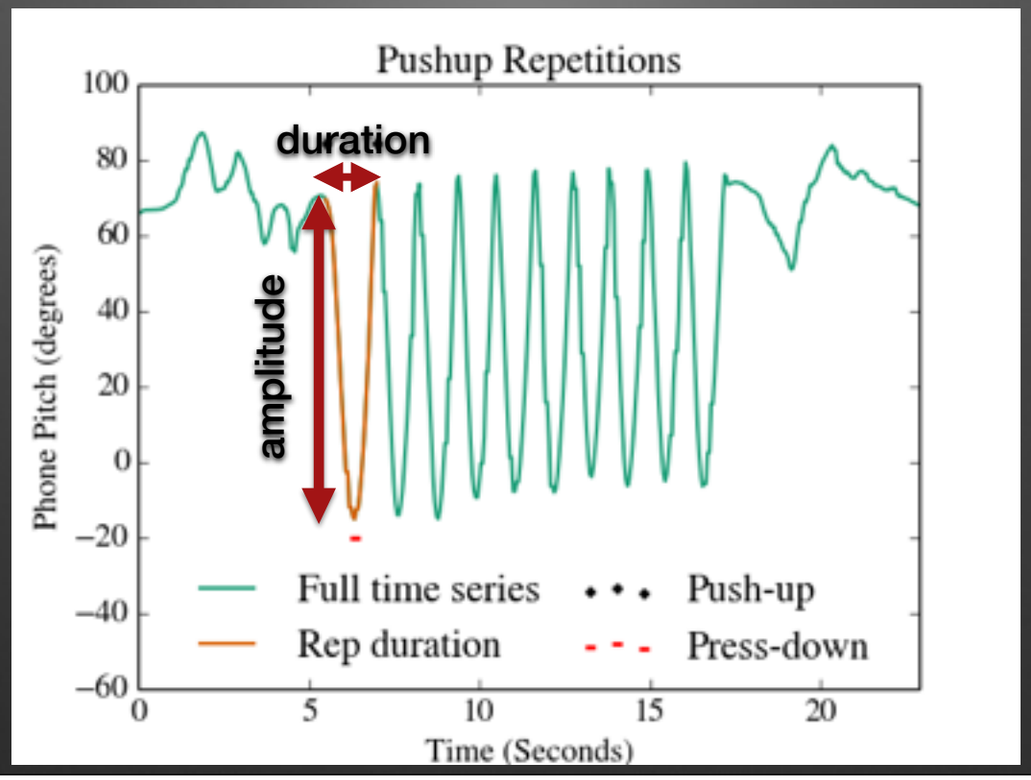
• I extracted the pushup duration window by first bandpass filtering the time series, and then filtering by varying correlation thresholds for key feature pairs

Repetition Detection



- Used peak detection algorithms to extract the press-down and push-up times

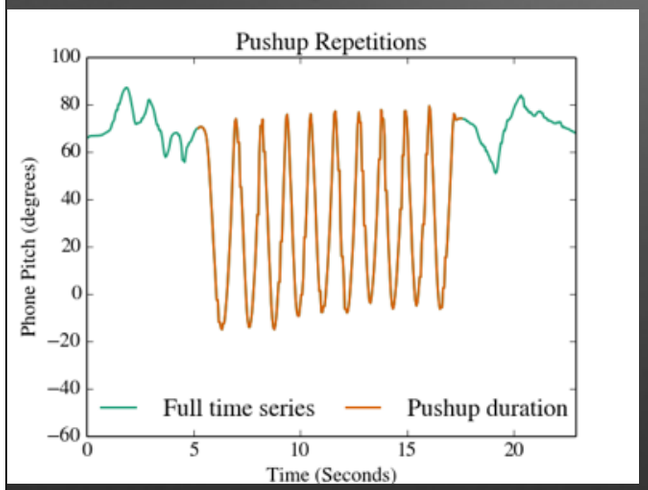
Feature Extraction



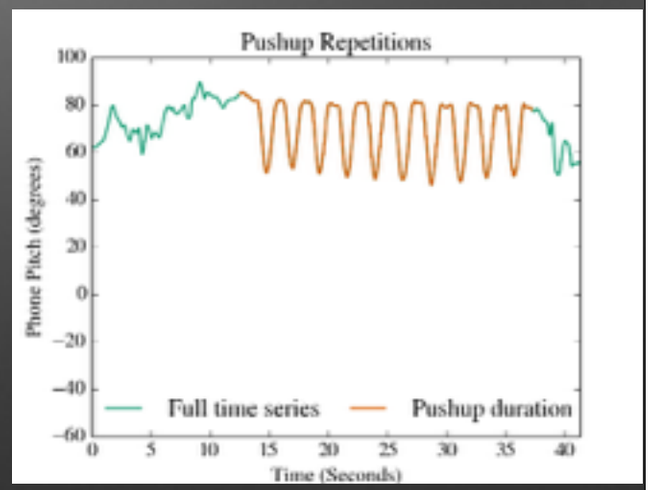
- RF and SVM classifiers use the pitch peak amplitude and repetition duration
- DTW with KNN uses the entire repetition time series (pitch and y-acceleration components)

User Signal Comparison

Expert



Novice



- You can see it's much harder to separate the noise from the signal for the novice user than for the expert user

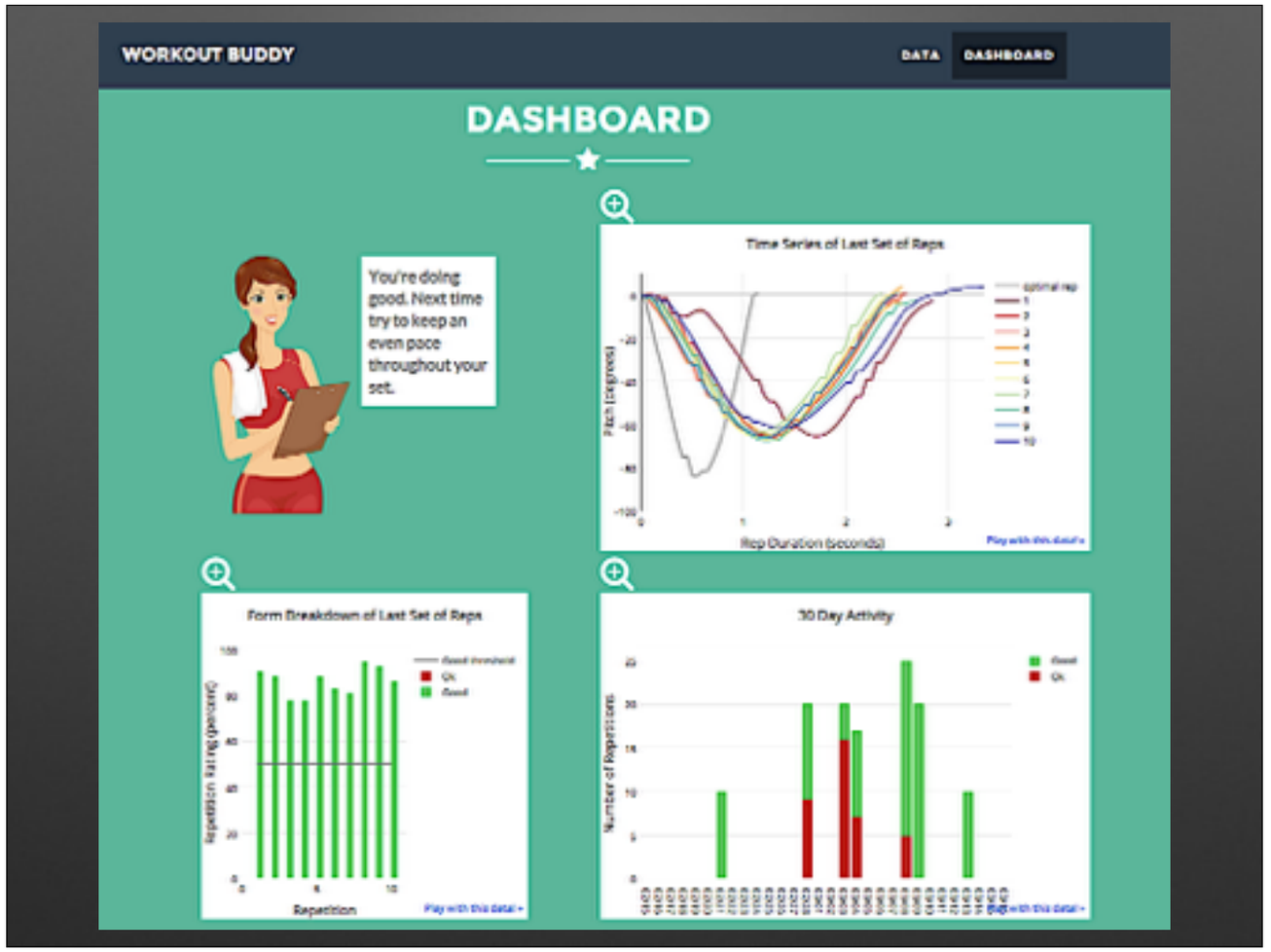
Classification Results

89 ± 4% accuracy

88 ± 4% precision

98 ± 3% recall

- 70/30 train/test stratified-shuffle split, with 5 iterations and 4 random seeds (20 cross-validations)



- Dashboard visualizations provide detailed information about your latest pushup set, and your past month's workout history

Questions?