# A4:
# Photoplethysmography

**Group 5**
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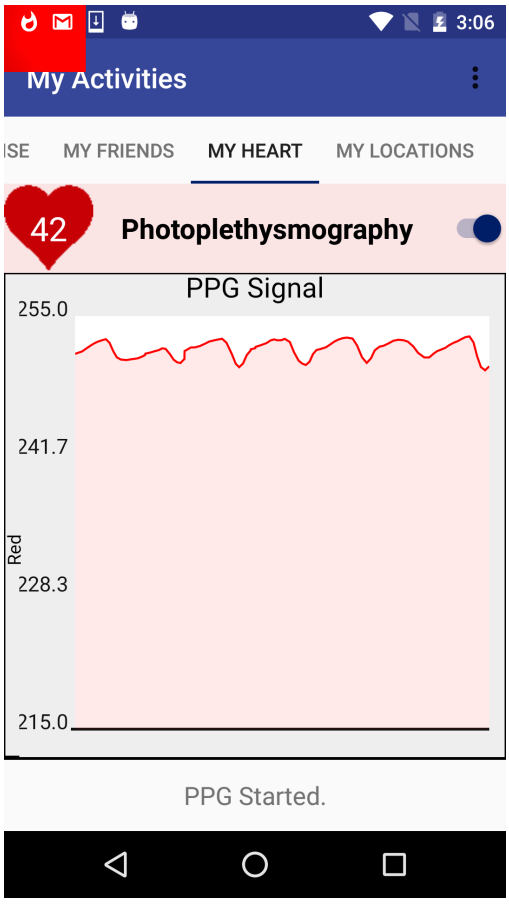
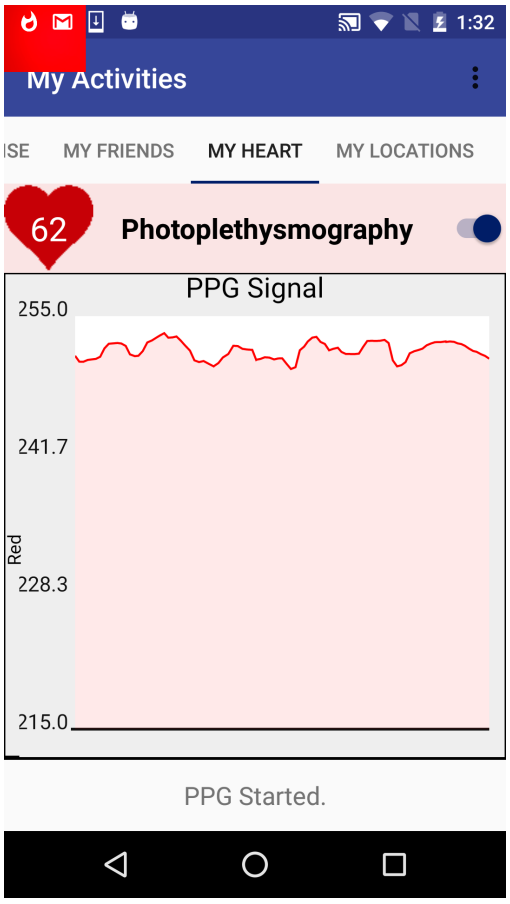
## 1. Smoothed and Unsmoothed PPG Signal Displayed on Android UI




(a) Smoothed PPG Signal




(b) Unsmoothed PPG Signal

Figure 1: Smoothed and Unsmoothed PPG Signals

2. **PPG Signal on Visualization.html**

   (a) **Stationary**

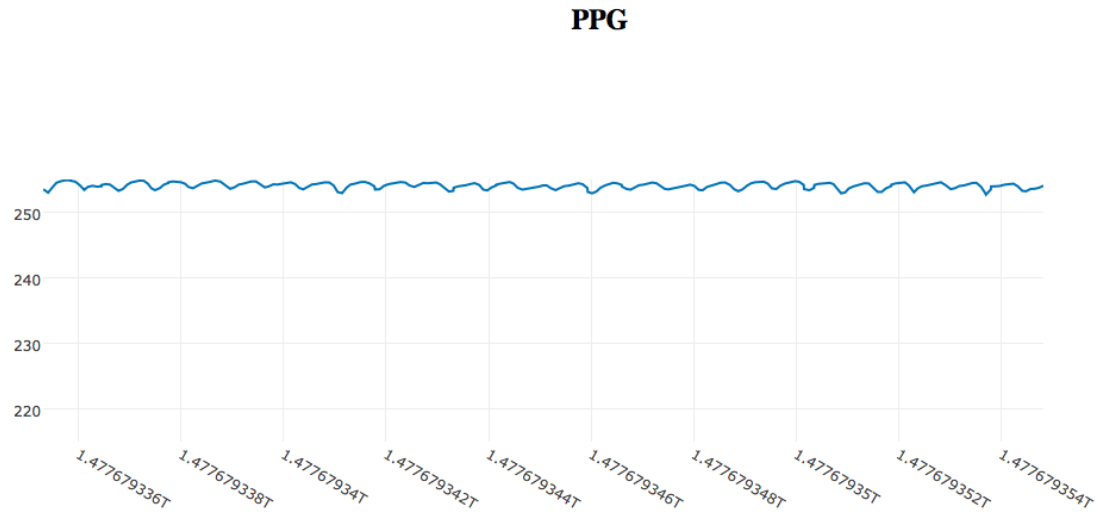



Figure 2: Sedentary PPG

   (b) **After Vigorous Exercise**

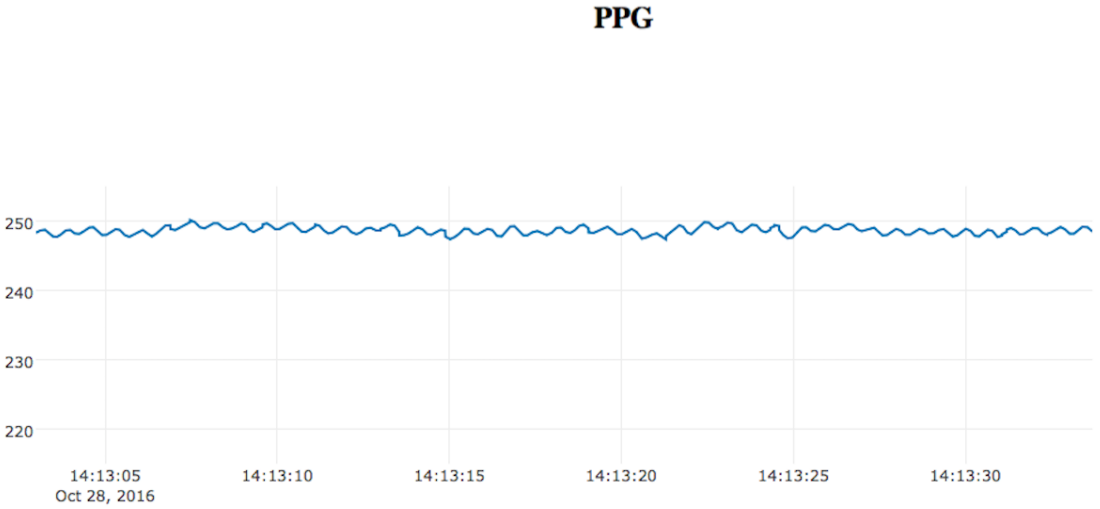



Figure 3: Jumping Jacks PPG

3. **Computing HRV**

Heart-rate variability (HRV), the changes in the beat-to-beat heart rate, is an indicator of an individual's cardiovascular condition. HRV has been shown to predict heart attack-related death, depression and congestive heart failure. Heart rate variability can be calculated by taking the standard deviation of the time intervals between beats. To compute it on our phones, we could take the difference between successive timestamps of detected heartbeats, then compute the standard deviation of these differences.

We implemented this for the HRV Estimation extra credit.

**Source**

- Huang, R., & Dung, L. (2016, January 29). Measurement of heart rate variability using off-the-shelf smart phones. *BioMedical Engineering Online.*

4. **Member Roles & Contributions**

- Thai: extracted PPG signal from camera frames, sent sensor readings to server and UI, helped implement heart-rate detection algorithm
- Susie: chose smoothing parameters, smoothed PPG signal, took screenshots of UI and visualization page, completed report
- Colin: helped implement heart-rate detection algorithm, implemented HRV computation for extra credit