Feature Extraction from PPG Signal

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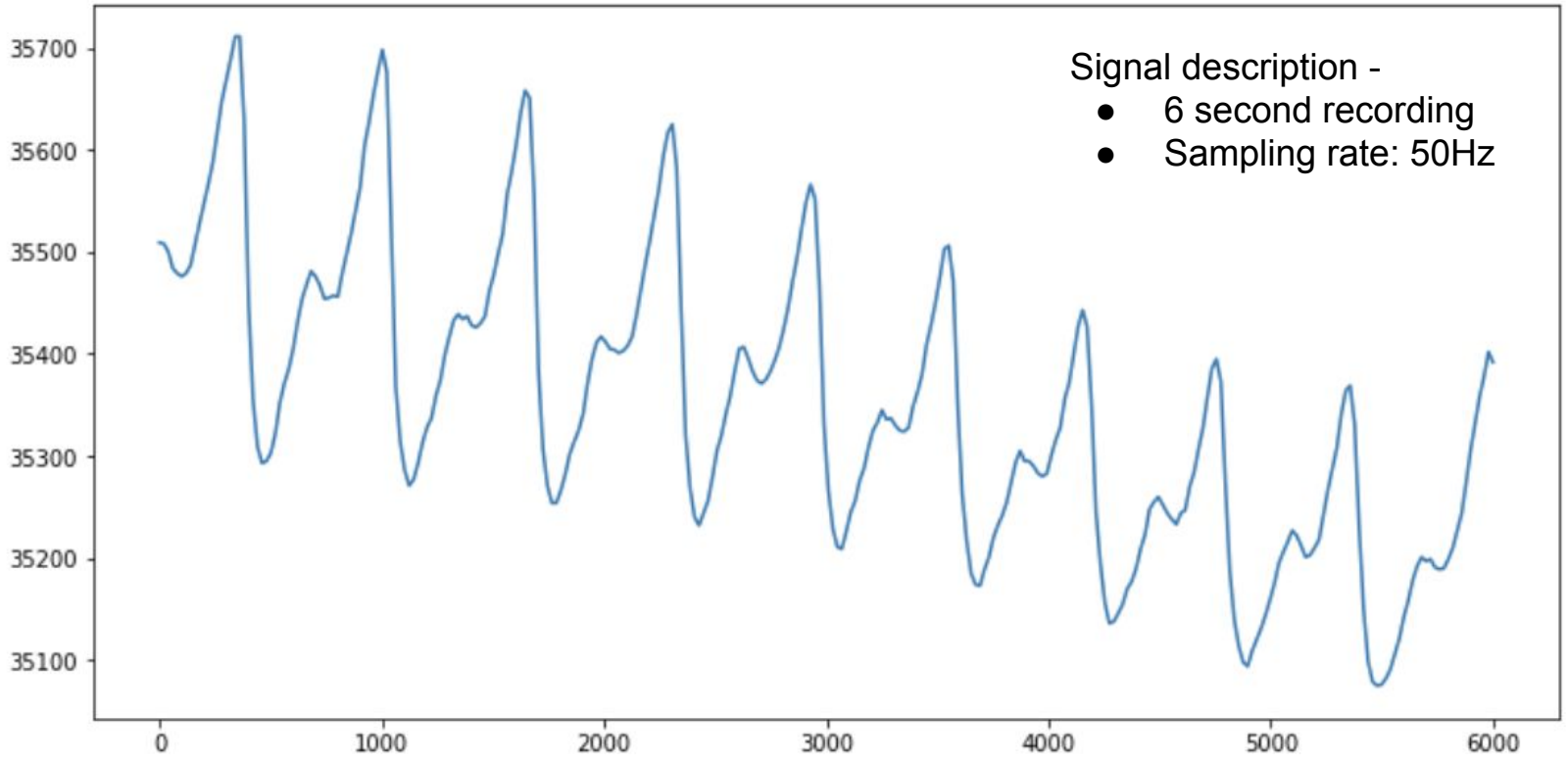
Steps

1. Remove the nan and inf values from the data
2. Detrending
3. Band pass filtering
4. Cubic Interpolation
5. Detect the peaks
6. Remove the rejected peaks
7. Feature extraction

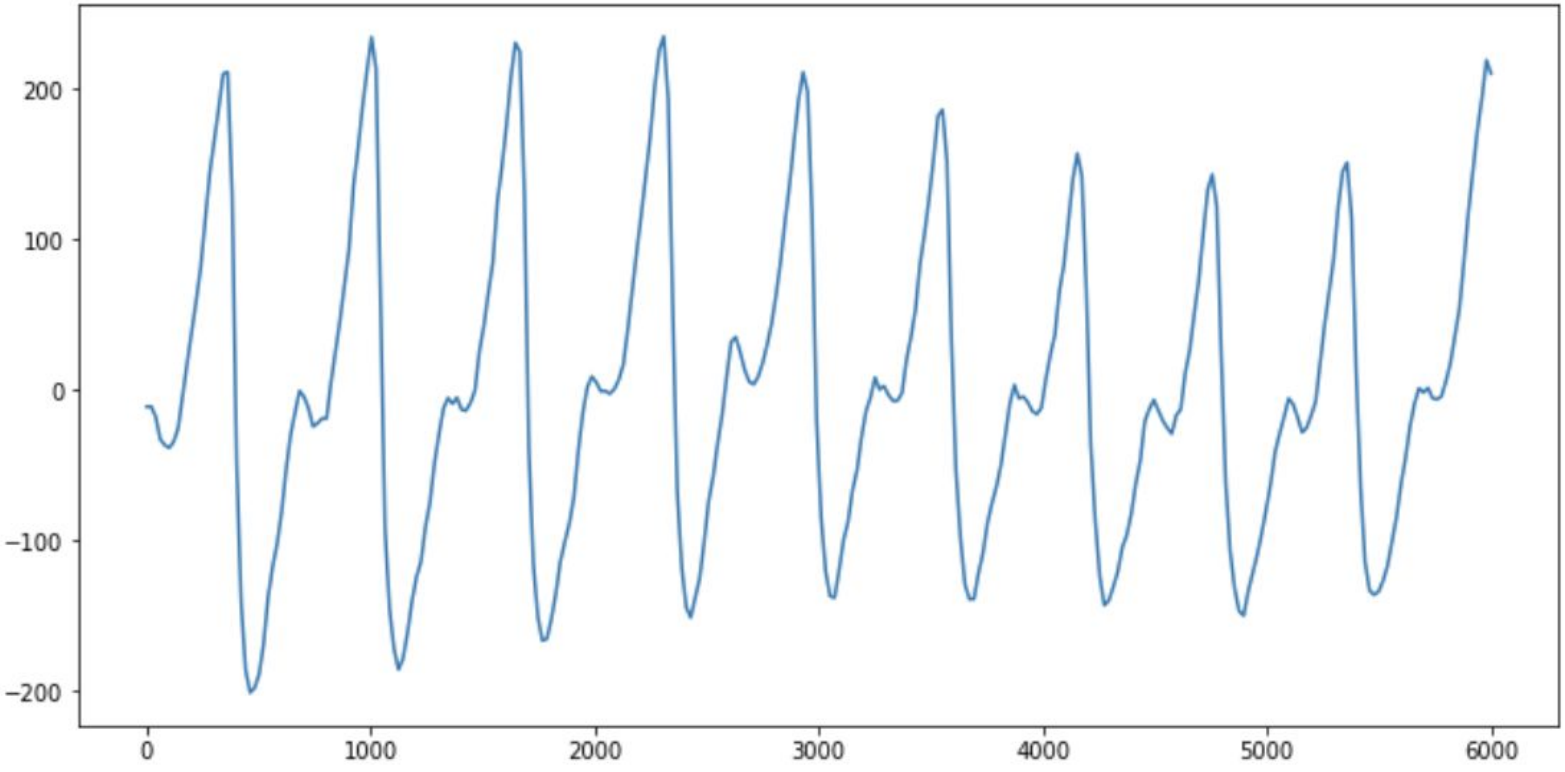
Original Signal



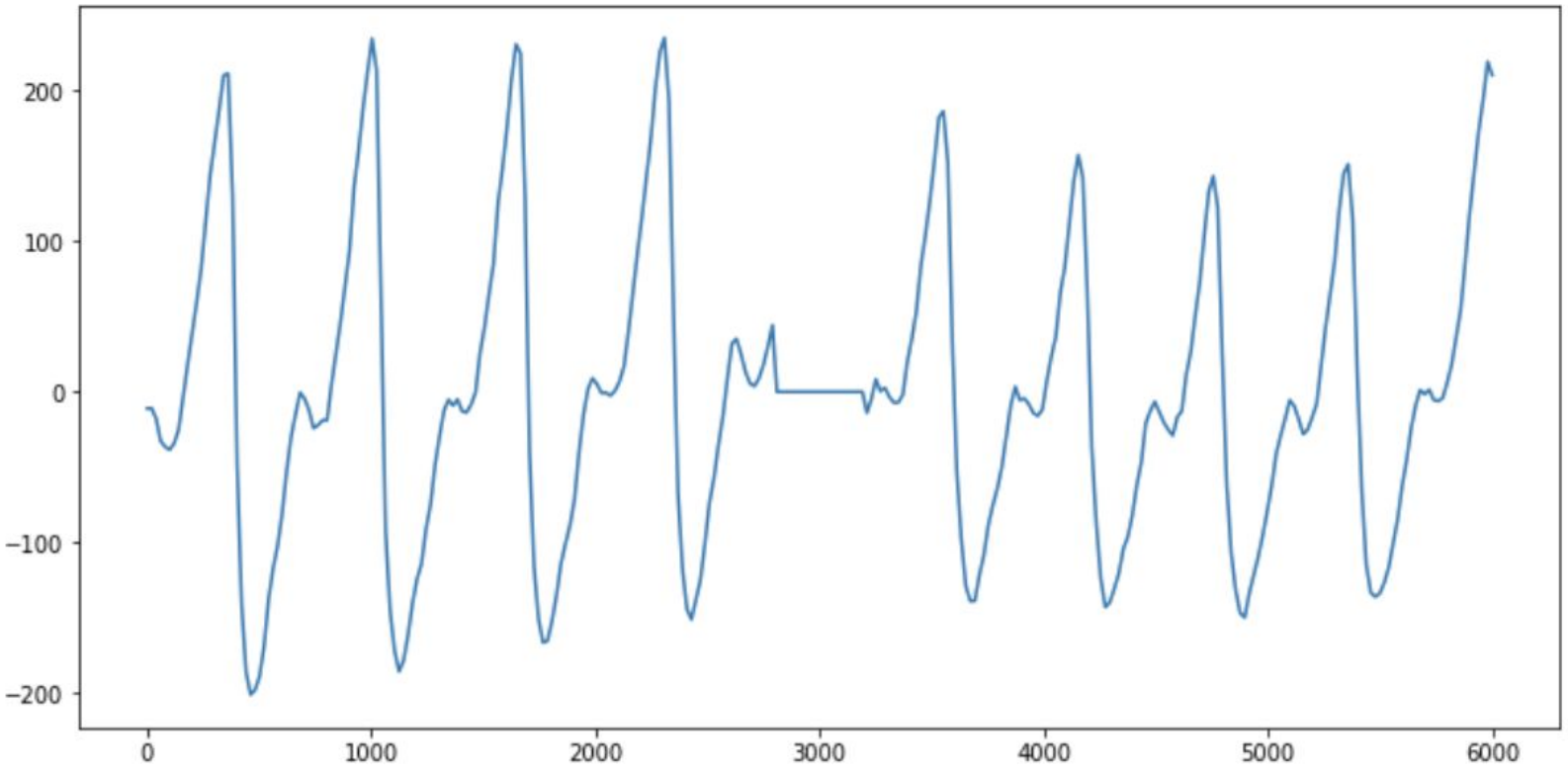
Signal description -

- 6 second recording
- Sampling rate: 50Hz

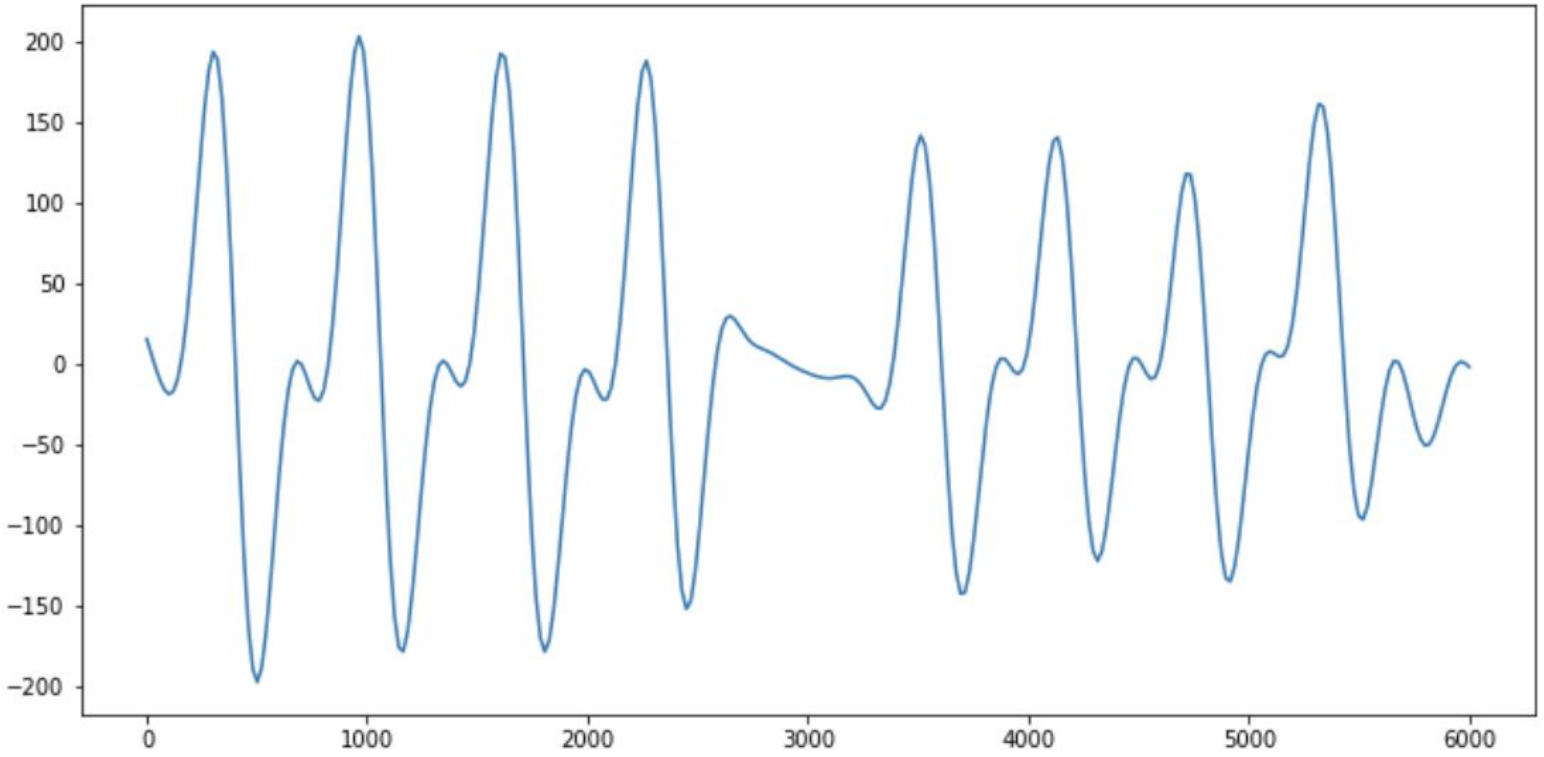
Signal after detrending



Inserted noise at 3 sec



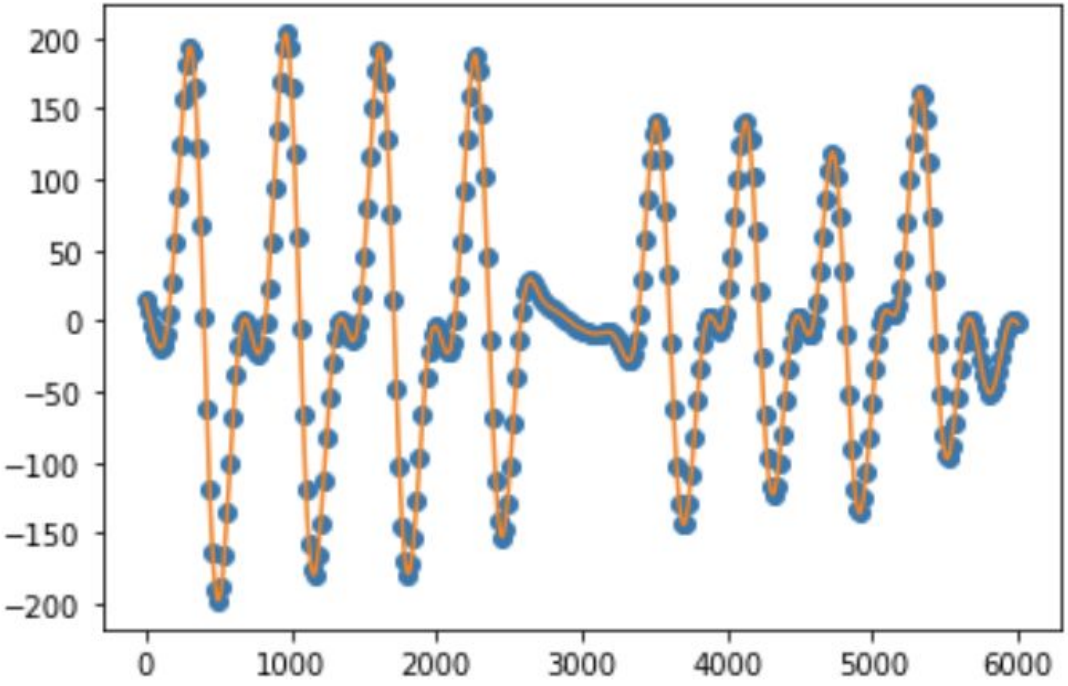
Bandpass filtering



Bandpass filtering description

- Butterworth bandpass filter with cut off frequency : 0.8 Hz - 3 Hz .
- Reason : Human heart rate ranges from 48 bpm -180 bpm. Hence we filter out the frequencies below and above this range.

Interpolation



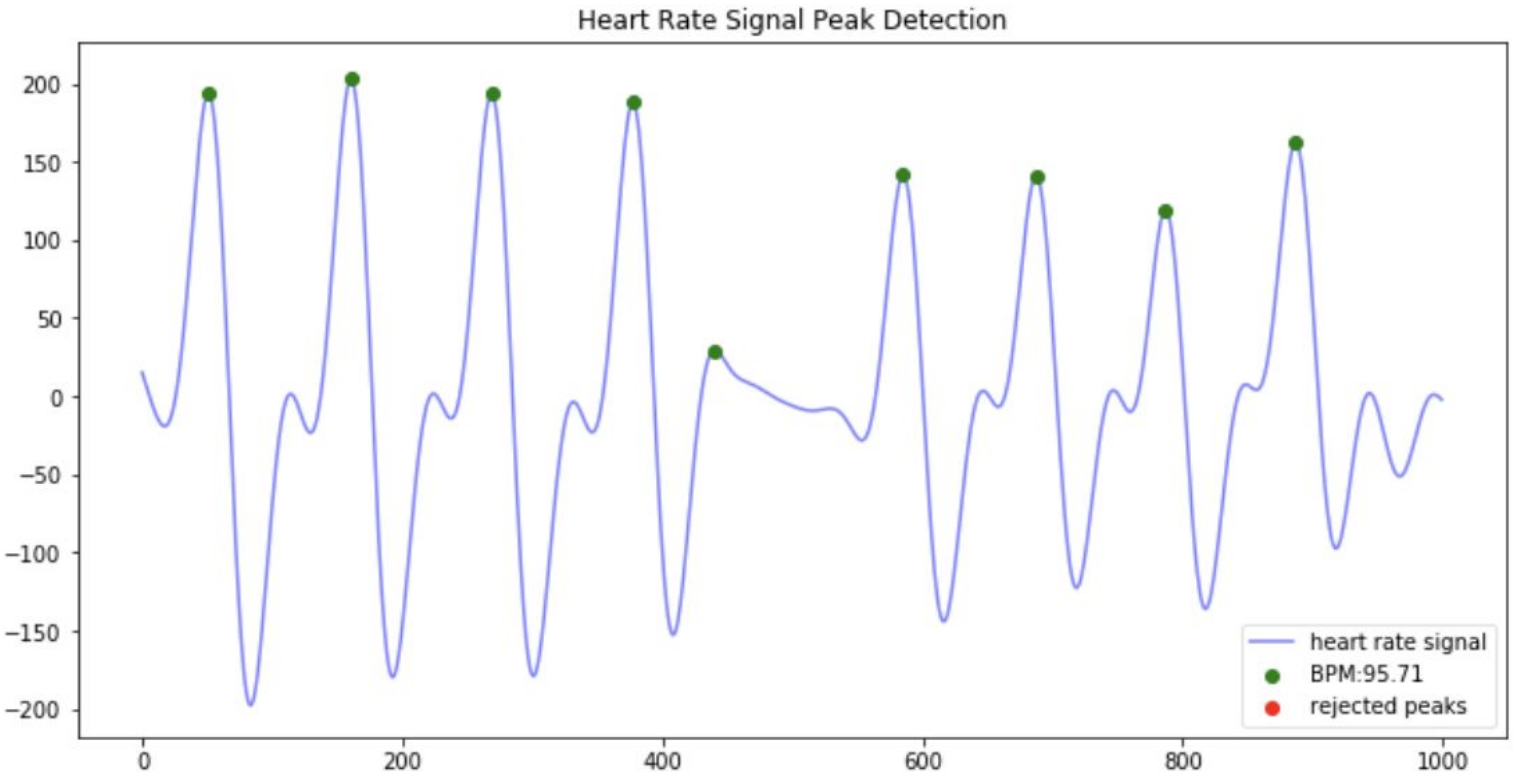
- Blue points : Original data points
- Orange line : Interpolated signal

- New Sampling Rate : 166.67

Interpolation description

- Type : Cubic
- Reason : Resample the signal. Irregularly time sampled signals can introduce additional frequencies.

Peak Detection



Feature Calculation

```
bpm: 95.712861
ibi: 626.875000
sdnn: 123.448813
sdsd: 177.296938
rmssd: 231.133851
pnn20: 0.428571
pnn50: 0.428571
hr_mad: 29.000000
sd1: 163.331265
sd2: 88.770514
s: 45549.952685
sd1/sd2: 1.839927
breathingrate: 0.399042
```

Note

- Since the data was for only 6 secs, the features were calculated for the whole signal. In case of stress detection, we will have a longer duration signal, where, we will do the same analysis by taking small windows of a few minutes.