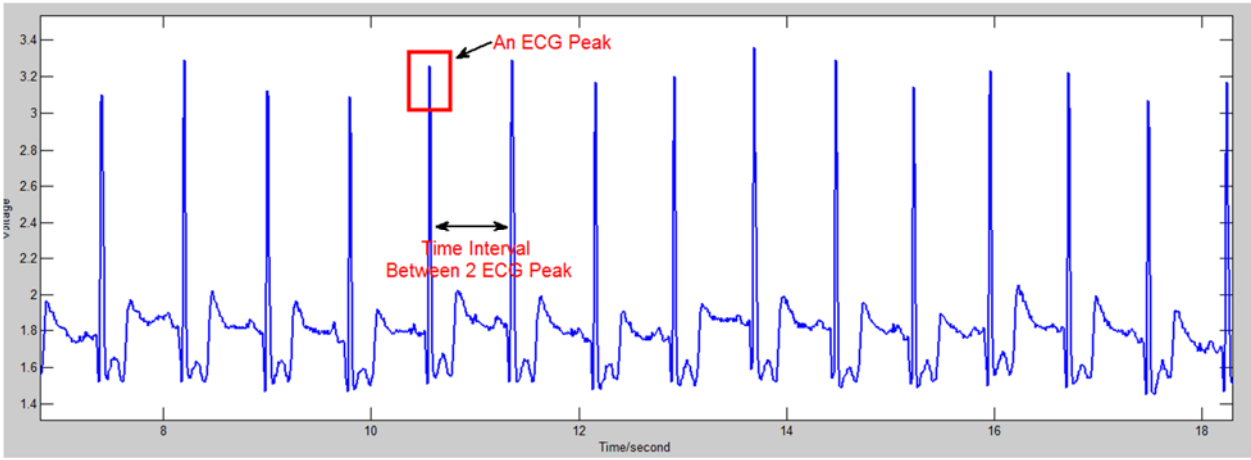
1. *Heartbeat Calculation Algorithm*

An example of raw ECG signal is shown as below:



We obtain the heart beat rate by calculating the sum of 20 time intervals for 20 ECG peaks (***notice that one ECG peak indicates a heartbeat. The unit of heart beat rate is BPM, Beat per Minute***). We can derive the number of ECG peak in just one second ($\frac{20\ ECG\ peaks}{Sum\ of\ 20\ Time\ Intervals}$), and multiply it by 60 (1 minute = 60 seconds). Therefore, a Heart Beat Rate for the latest 20 ECG peaks is obtained using the formula below:

$$\text{Heart Beat Rate} = \frac{20}{Sum\ of\ 20\ Time\ Intervals} * 60$$

In order to make the heart beat rate to be more precise, we continue average the 5 recent heart beat rate.

$$\text{Heart Beat Rate} = \frac{Sum\ of\ 5\ recent\ Heart\ Beat\ Rate}{5}$$

2. *Breathing rate calculation algorithm*

We calculate the breathing rate using the same mechanism just like the heart rate counting algorithm.

3. *GSR*

It is relatively simple to calculate the GSR, please refer the code below, I have added the comments in it.

```
float Get_GSR (int GSR_value)
 {
        GSR_voltage = GSR_value*5.0/1023;
        GSR_conductance = 2*((GSR_voltage - 0.5) / 100000);// Use the formula to get the conductance, unit is S.

        GSR_resistance = 1 / GSR_conductance;

        GSR_conductance = GSR_conductance*1000000;// Change the unit from S to mS,
        //normally the conductance for human is 0-100 mS.
        if (GSR_conductance > 0)     return GSR_conductance;//return the conductance only it is valid.
        else return 0;

 }
```