The aim of assignment is to implement an algorithm for respiratory rate (RR) estimation from electrocardiogram (ECG) and photopletysmogram (PPG) signals. Method of RR estimation can be 1) or 2), we can choose whatever one we want.

1) Linear filtration of PPG and ECG to get baseline wander (BW) signal, in which fluctuations in the rhythm of RR can be expected. You can then consider the BW as an estimate of the respiratory curve. The cycle lengths of the respiratory curve estimation obtained can be estimated in both the time and frequency domains. a) In the time domain, you can start from positional local extremes or autocorrelation positions of BW signal (for ECG or PPG), or mutual correlations of BW signal obtained from ECG and PPG. b) In the frequency domain, BW spectral signals (ECG or PPG) can be used to expect more pronounced extremes of respiratory rates; It is also possible to use mutual BW signals obtained from ECG and PPG.

2) Methods which use QRS detectors in ECG signals and extremes detectors in PPG signals. a) Amplitude modulations (AM) = Spline interpolation of the value of the extremes of the R waves in the ECG and extremes in PPG. b) Frequency modulations (FM) = based on heart rate variability (HRV).

We have to implement a function. Inputs should be PPG and ECG vectors and output should be variable breathVAL, which is one number which corresponds to estimated respiratory rate.

Database BIDMC PPG and Respiration Dataset from Physionet should be used. It consists of 53 records in length of 8 minutes. Each record consists of ECG signal (lead II) and PPG signal (sampling frequency of ECG and PPG signals is 125 Hz). https://physionet.org/content/bidmc/1.0.0/