

EE622: Biomedical Signal Processing

Assignment-4

Please implement your programs using Python

1. Given an input speech signal “inputSpeech1.wav”, segment the speech and non-speech regions. The sampling frequency for "inputSpeech1.wav" is 32KHz.

Ref: Rabiner, Lawrence R., and Marvin R. Sambur. "An algorithm for determining the endpoints of isolated utterances." *Bell System Technical Journal* 54.2 (1975): 297-315.

2. Evaluate the clinical component distortion (CCD) measure for the filtered ECG signals. The CCD measure is evaluated by comparing the diagnostic features of original ECG and filtered ECG signals. First, you have to evaluate two diagnostic features such as R-wave amplitude and RR-interval for original ECG and filtered ECG. Then, the CCD measure is defined as the Mahalanobis distance between the diagnostic features of original ECG and filtered ECG.

Diagnostic features of original ECG, $\alpha = [\text{RR-amp}, \text{RR-interval}]$

Diagnostic features of filtered ECG, $\beta = [\text{RR-amp}, \text{RR-interval}]$

$$\text{CCD} = (\alpha - \beta)^T D (\alpha - \beta),$$

Where D is the diagonal weight matrix and it is given by

$$D = \begin{bmatrix} 0.75 & 0 \\ 0 & 0.25 \end{bmatrix}$$