1. **Generating a Noise Signal:**
2. Consider the given Electrocardiogram (ECG) signal of length , having sampling frequency
3. Generate and add a white Gaussian noise with mean zero and variance to the above signal (**Hint:** use “’’ MATLAB keyword)
4. **Signal Denoising Using Graph Spectral Filtering:**
5. Denoise the signal by minimizing the following constraint

For minimizing, consider a node graph with weighted adjacency matrix

Where , by considering

The optimal solution of the constrained optimization problem is

Where and are the eigenvalues and eigenvectors of above Laplacian matrix (). is the GFT coefficients of noise signal evaluated on . Assume .

1. Plot the denoised signal.
2. Repeat the above question with variance and
3. Write your observations on the performance of the filter