

ECE251A – MATLAB HW3

Assume that the WSS random process is generated by the system

$$H(z) = (1 - .9z^{-1} + .81z^{-2}) / (1 - 2.76z^{-1} + 3.809z^{-2} - 2.654z^{-3} + .924z^{-4})$$

driven by zero mean Gaussian white noise with variance 1.

Estimate the PSD of this system/process using AR modeling. That is, generate a realization of the process, compute an estimated AR model of the system from this realization, and then compute the true PSD of this estimated model. Repeat this process for many realizations to see how the PSD estimate changes based on the realization.

Use realization lengths 64, 256, 1024, and 4096, and filter orders 2, 8, and 14 (you may experiment with others too).

For each case, plot

- (a) all the realization PSDs on top of each other on one axes;
- (b) the true system PSD, the mean of the realization PSDs, and the pointwise median of the realization PSDs, all on one axes; and
- (c) the variance of the realization PSDs.

Comment on the behavior you see. (It is obvious that increasing realization length and order should improve or at least maintain the accuracy, so say something more than just this.)