EECS240: Random Processes
Computer Project #2

Due Mar. 11, 2021

Write computer programs for the following projects. Include your approach and the results of your programs in your report (only pdf is accepted). Also, you should submit an electronic version of your programs such that I can run them.

1. Consider an autoregressive (AR) random process $Y_n = \alpha Y_{n-1} + X_n$ where X_n is a White Gaussian noise with zero mean and variance σ_X^2

   - Plot some sample realizations of the above AR random process when $\sigma_X^2 = 1 - \alpha^2$, for example for $\alpha = 0.3$ and $\alpha = 0.95$.
   - Simulate and plot the autocorrelation $R_Y(k)$ for $\alpha = 0.3$ and $\alpha = 0.95$.
   - Simulate and plot the power spectral density $S_Y(f)$ for $\alpha = 0.3$ and $\alpha = 0.95$.

2. Consider the random process $X_n = \cos(0.2\pi n + \Theta)$ where Θ is a uniform random variable between $(-\pi, \pi)$. Draw one plot that contains 100 different realizations of X_n versus n (all in one plot). Use a dot to represent every (n, X_n) pair in the 2D plane.