Stochastic Modeling for Engineers
HW Project Number 3: Estimation

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1. Refer to Example 6.30 in [LeGar08] (Diversity Receiver).

   (a) Perform a simulation of the received signals by generating 10^5 samples of X, N_1 and N_2 and creating the resulting received signals $(Y_1, Y_2)'$. Show by means of the simulation that the estimator,
   $$\hat{X} = 0.4Y_1 + 0.4Y_2,$$
   indeed achieves an MSE of 0.4.

   (b) Consider now estimators of the form $\hat{X}_c = cY_1 + cY_2$ for $c \in [0.2, 0.8]$. Show by means of repeated simulations that the minimal MSE is achieved when $c = 0.4$.

   (c) Generalize the problem to the case of 3 antennas. (Perhaps nicer to assume now that $Var(X) = 3$). Find the LMSE, $\hat{X}(Y_1, Y_2, Y_3)$. Find the MSE of this estimator.

2. Do Exercise 6.90 from [LeGar08]. This exercise refers to Example 6.31.

Good Luck.