

MATLAB exercise

Estimation techniques

Overview: In this exercise, you will construct several estimators and compare the results. You will implement a Bayesian MMSE estimator, and an MLE estimator for a few different scenarios. Put your code in a MATLAB publisher file, you will be graded as follows:

80%: Technical Correctness of the code

10%: Quality of figures, meaning they should be annotated fully (legends, axes labels). You should also make judicious use of overlaid plots, or subplots, as appropriate. In general you should be striving to use only a few, well-annotated plots.

10%: Quality of comment in code. Your code should be well commented, with a few paragraphs describing your solution, referring to figures, as appropriate. The overall goal here is a single document that contains both your code and all necessary information so that someone with a general EE background could understand the document.

Scenario 1:

Implement the Bayes MMSE and Linear MMSE estimators from examples 8.5 and 8.6. Simulate this system by random draws of Y and W , and then estimating Y from the observations $X = Y + W$. Verify that your simulation is correct by comparing theoretical and empirical values of the MSE. Report your results in a table.

Scenario 2:

Implement the linear estimator for multiple noisy observations, similar to example 8.8 from the notes. Extend this example so that it works for an arbitrary number of observations. Use Gaussian random variables for Y and R . Set $\mu_Y = 1$. Experiment with a few different variances for both Y and R . On one plot, show the mean squared error of your simulation compared to the theoretical values for at least 2 different pairs of variances.