AIP Assignment 3

Badrinath Singhal

March 2024

Question 1

To compute the minimum mean squared estimate (MMSE) of x given y, we need to use the conditional expectation:

$$\hat{x} = \mathrm{E}[X|Y = y]$$

Given $Y = X + Z$, where X follows a Laplace distribution with $\sigma_x = 1$ and Z follows a Gaussian distribution with mean 0 and $\sigma^2 = 0.1$ we can calculate the MMSE estimate using Bayesian estimation.

However, since the Laplace distribution does not have a closed-form expression for conditional expectation given Y, we'll need to compute it numerically. One common approach is to use numerical optimization techniques like iterative algorithms or grid search. The resultant graph can be seen in fig 1

Question 2

We applied all varitions of gaussian filter for denoising and we got best parameter as **Filter Length = 3**, **Sigma = 1** with MSE as 89.47

MSE error for adaptive denoising is 41.9822. The results can be seen in

For SureShrink, we estimated best t for each patch and did pathwise denoising using Sure shrink estimate, by offsetting the path values and multiplying with sign function. MSE error for estimated and original value is 51.068

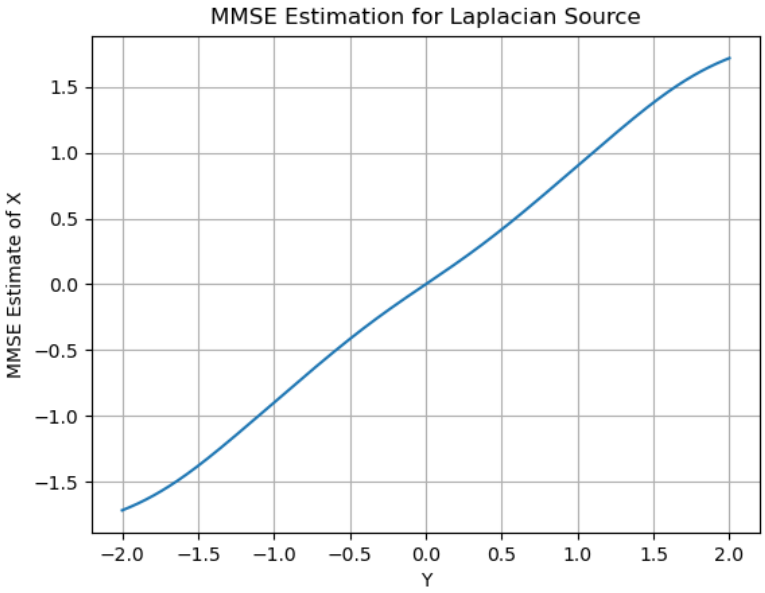

Figure 1: MMSE estimation for Laplacian source

(a) Original Image

(b) Segmentation using NCut

Figure 2: Original and Adaptive MMSE

(a) Original Image

(b) Segmentation using NCut

Figure 3: Original and Sure Shrink estimate