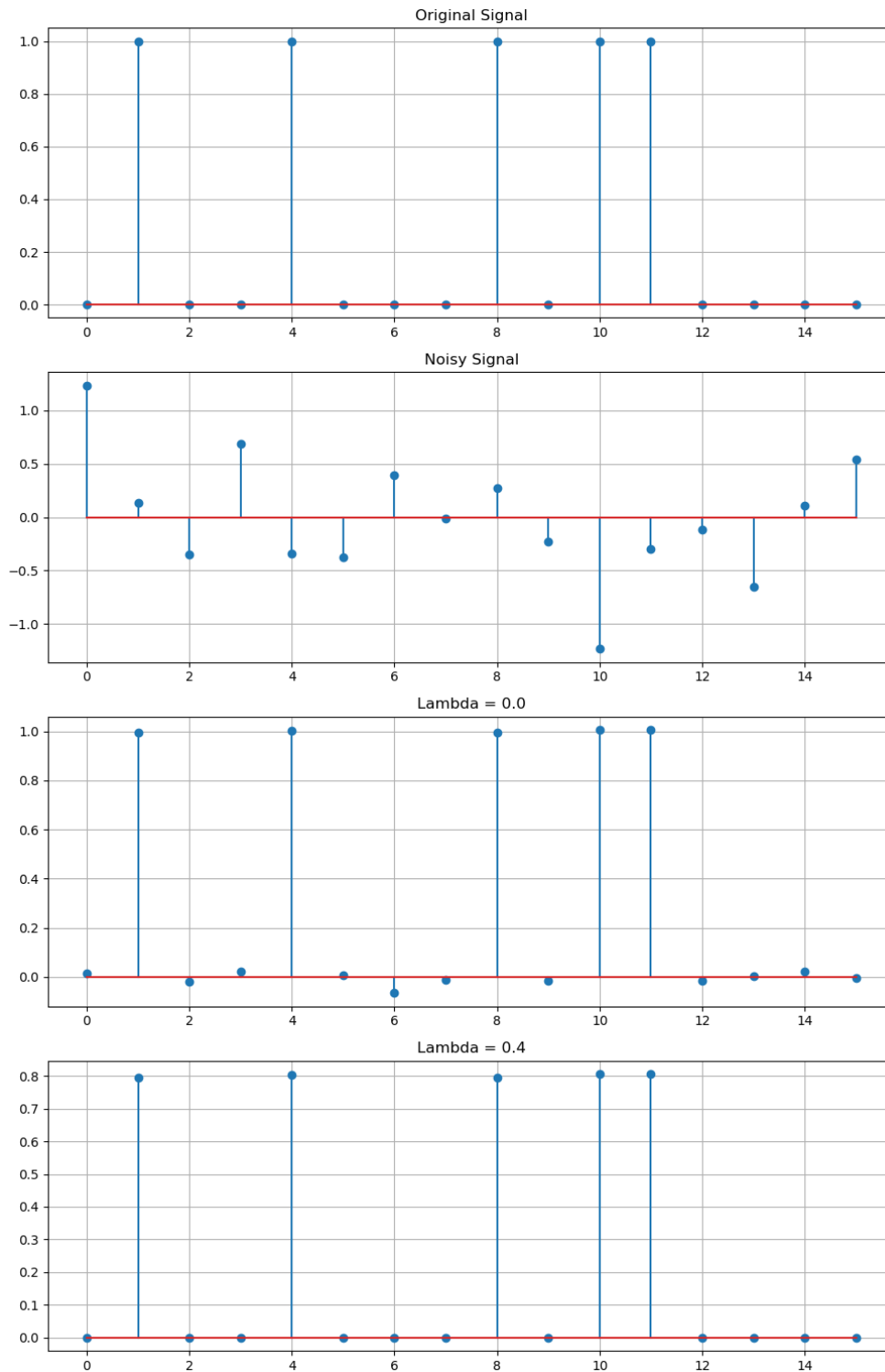


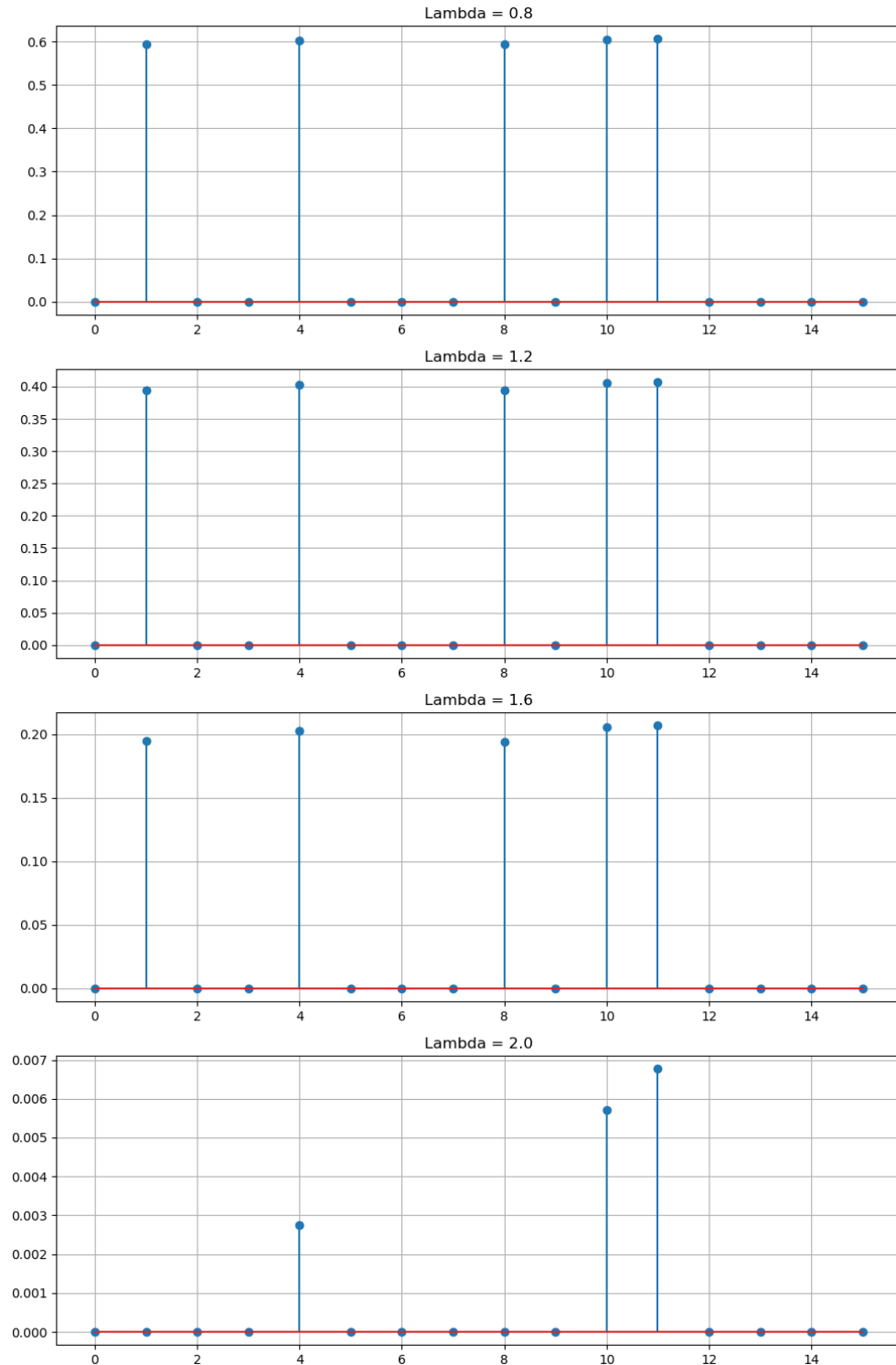
# Computer Assignment 3

Image and Video Processing

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## 1D ISTA





We can observe that, as the Lambda value increases, the recovered signal attenuates. For the lambda value of 0.0, the signal can be recovered but we can also observe a small amount of noise in the signal. Comparing rest of the plots, we can see that lambda value of 0.4 seems to be optimum for value to recover the signal.

## 2D ISTA

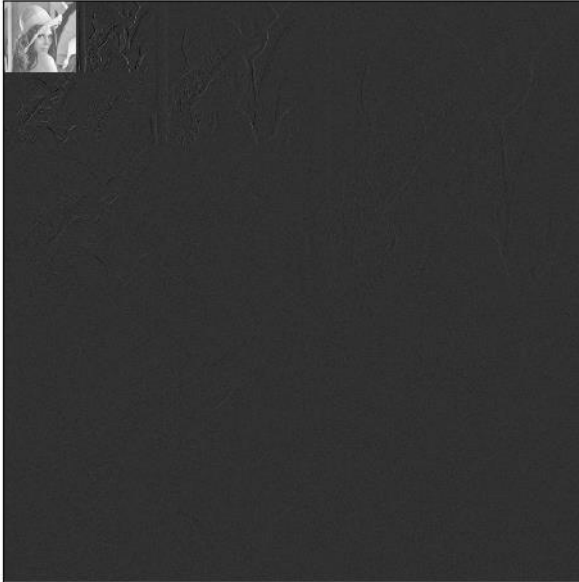
Original Image



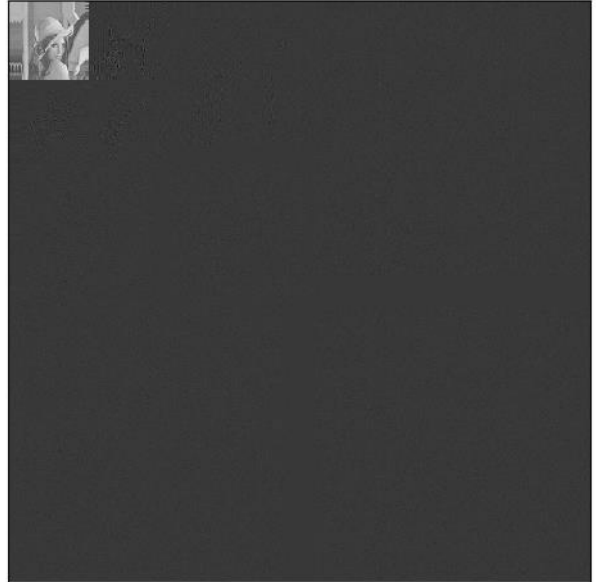
Noisy Image



Haar Wavelet transform of noisy image



DB8 Wavelet transform of noisy image



Applying Haar wavelet transform:

$\text{Lambda} = 50.0$  - Wavelet = haar

Wavelet transform of denoised image



Denoised image



$\text{Lambda} = 75.0$  - Wavelet = haar

Wavelet transform of denoised image

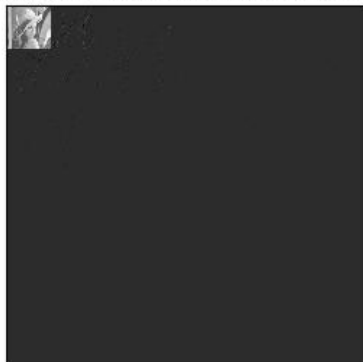


Denoised image



$\text{Lambda} = 100.0$  - Wavelet = haar

Wavelet transform of denoised image



Denoised image



Applying DB8 wavelet transform:

$\text{Lambda} = 50.0$  - Wavelet = db8

Wavelet transform of denoised image

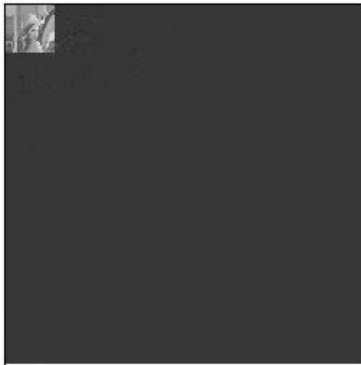


Denoised image



$\text{Lambda} = 75.0$  - Wavelet = db8

Wavelet transform of denoised image



Denoised image



$\text{Lambda} = 100.0$  - Wavelet = db8

Wavelet transform of denoised image

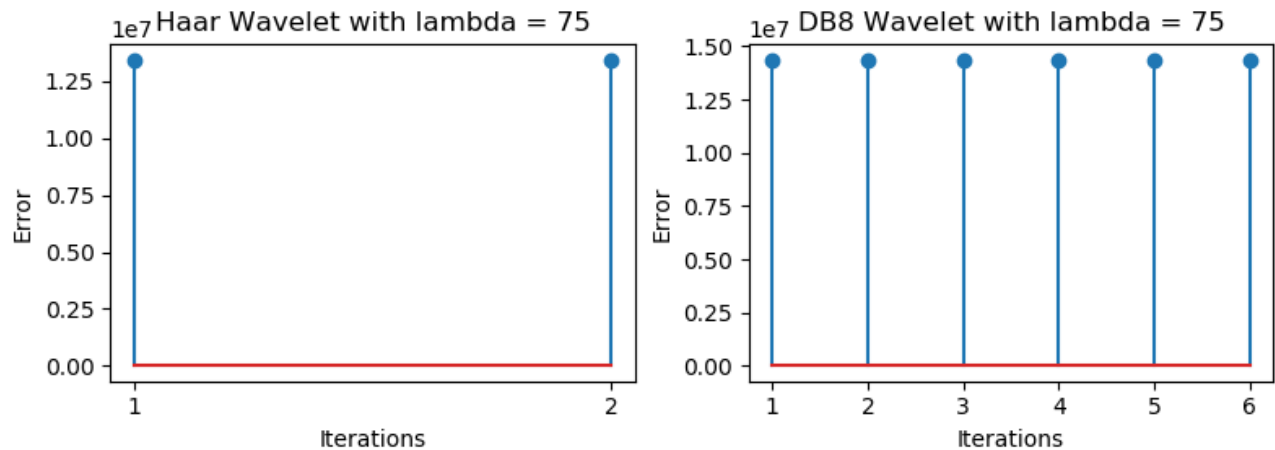


Denoised image



On inspection of the above figures, we can observe that for lambda level 50, the majority of noise is present in the image for both the wavelet transforms. For the Haar wavelet, if we increase the lambda level to 100, we can see pixilation of the image. Even though the noise is removed, the quality of the picture is lost. For the DB8 wavelet transform at lambda level 100, we can observe the image to be blurry and too smooth. Some of the features in the image can be lost if the lambda level is too high. The lambda value of 75 appears to give the best result for both the wavelets. Although a small amount of noise is present, the features in the image are still preserved.

Error vs iteration number for lambda = 75:



#### *Advantages of Haar:*

- Computationally cheap
- Very simple
- Uses non overlapping windows
- Detects edges better

#### *Disadvantages of Haar:*

- Slightly pixelates the image
- Does not preserve the texture

#### *Advantages of DB8:*

- Averages over more pixels to give better result
- Gives a smoother result

#### *Disadvantages of DB8:*

- Computationally expensive
- Complex
- Smooths out the edges