



Mini Project 1

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1 Question 1

You will use demo_brain_2D.mat. (5 pts)

Set TVWeight = 0.

a. Run the code and compute:

1. MSE between the ground truth image, undersampled image (im_dc) and between the ground truth image and reconstructed image (im_res).
2. Also, display, ground truth image, im_dc , im_res and error images (ground_truth – im_dc) and (ground truth – im_res)

The mean-squared error between undersampled image and ground truth is 0.0039.
The mean-squared error between reconstructed image and ground truth is 0.0027

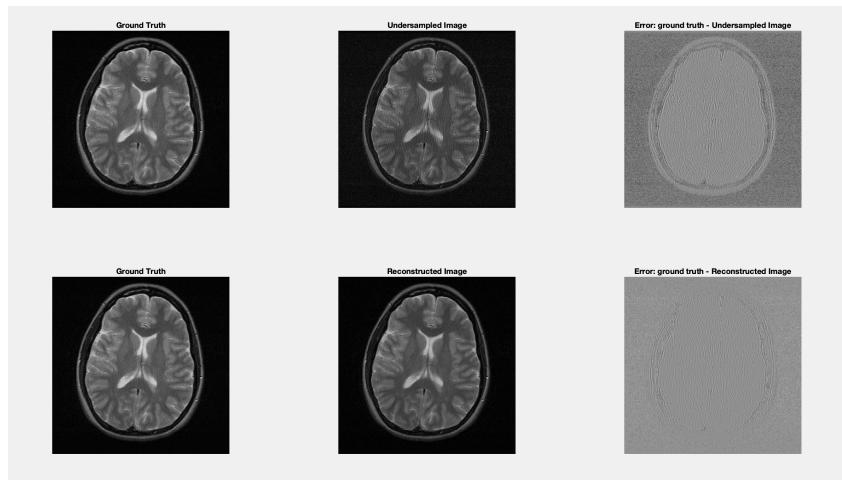


Figure 1: Plot for ground truth, undersampled image, reconstructed image and their corresponding error image

b. Run the code with following values for xfmWeight, compute and plot MSE between ground truth image and im_res for each case.

xfmWeight = [0.000005, 0.00005, 0.0005, 0.005, 0.05, 0.5, 5].

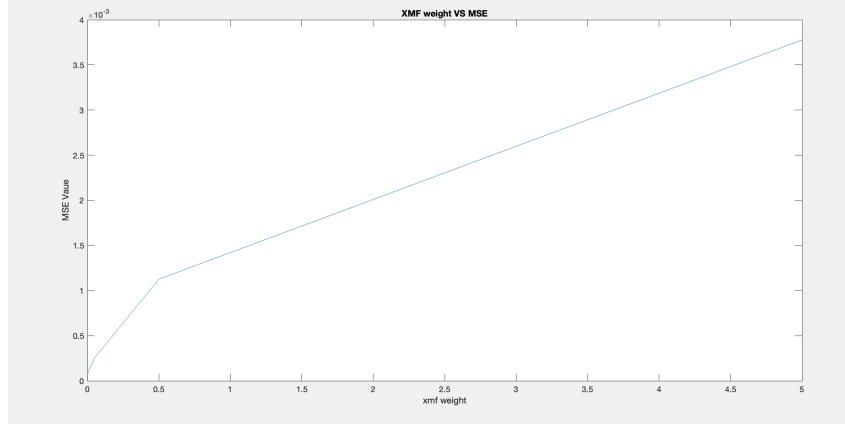


Figure 2: plot for MSE VS XfmWeight

Make an argument why MSE differs for each value of xfmWeight?

The level of sparsity in the solution is determined by the xmfweight. Increasing the xmfweight leads to more sparse solutions, resulting in lower quality reconstructed images and ultimately, an increase in the Mean Squared Error (MSE) between the ground truth and reconstructed image.

2 Question 2

- a.** Generate and plot 8 Masks for different 8 pctg above using samplingPattern.m.(Note: You might get some error for some values of pctg. If you get an error, try changing/increasing radius argument slightly) I used the value p = 10 and

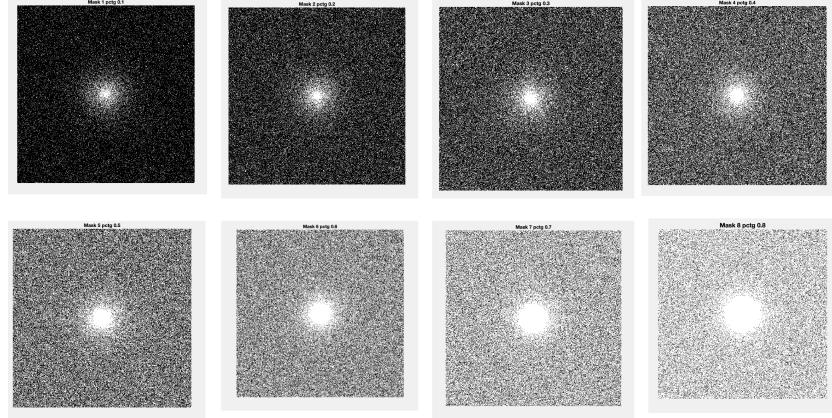


Figure 3: sampling mask with increasing pctg value

- b.** Use those 8 masks to mimic undersampling k-space for brain2.mat and brain512.mat images. Reconstruct for each undersampling mask and each image using demo_brain_2D.mat. Plot: Undersampling rate vs MSE for each case. Undersampling Rate for each mask case = Numbers of 1s in the mask/total numbers of pixel in an image.

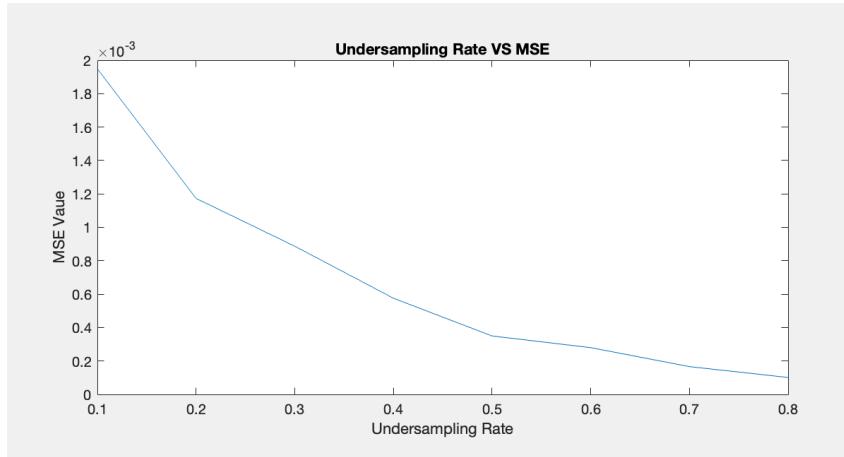


Figure 4: undersampling rate vs mse for brain512.mat

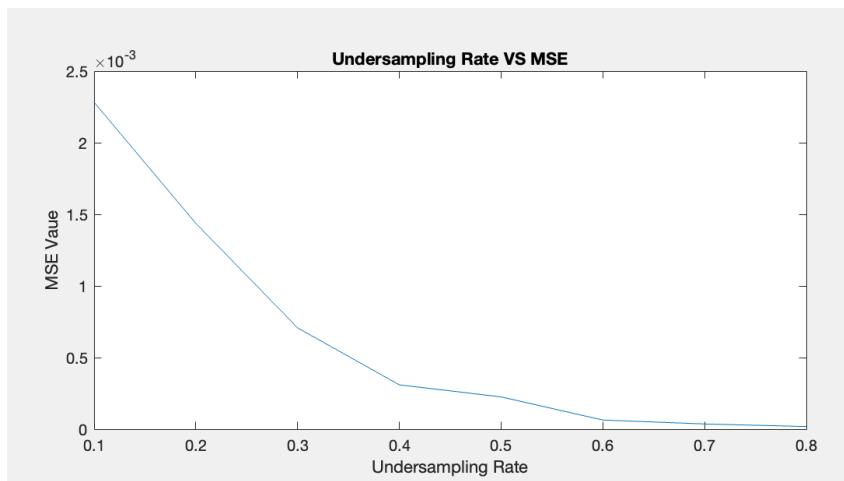


Figure 5: undersampling rate vs mse for brain2D.mat