DSAA

Assignment 4

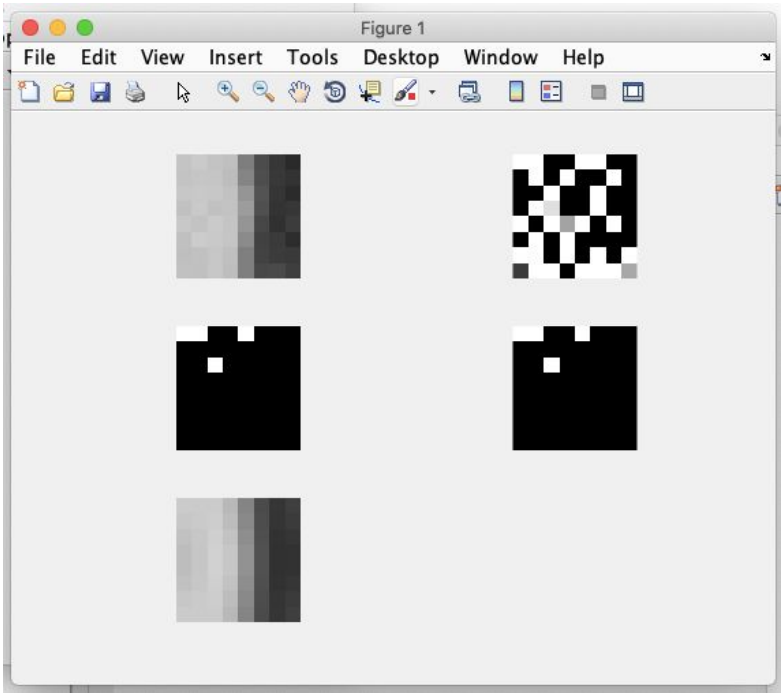
20171213

Q1. 1. a.

It's the same.

```
>> create_mat_dct(8)

ans =

    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536
    0.4904    0.4157    0.2778    0.0975   -0.0975   -0.2778   -0.4157   -0.4904
    0.4619    0.1913   -0.1913   -0.4619   -0.4619   -0.1913    0.1913    0.4619
    0.4157   -0.0975   -0.4904   -0.2778    0.2778    0.4904    0.0975   -0.4157
    0.3536   -0.3536   -0.3536    0.3536    0.3536   -0.3536   -0.3536    0.3536
    0.2778   -0.4904    0.0975    0.4157   -0.4157   -0.0975    0.4904   -0.2778
    0.1913   -0.4619    0.4619   -0.1913   -0.1913    0.4619   -0.4619    0.1913
    0.0975   -0.2778    0.4157   -0.4904    0.4904   -0.4157    0.2778   -0.0975

>> dctmtx()
Not enough input arguments.

Error in dctmtx (line 35)
validateattributes(n,{'double'},{'integer' 'scalar'},mfilename,'n',1);

>> dctmtx(8)

ans =

    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536    0.3536
    0.4904    0.4157    0.2778    0.0975   -0.0975   -0.2778   -0.4157   -0.4904
    0.4619    0.1913   -0.1913   -0.4619   -0.4619   -0.1913    0.1913    0.4619
    0.4157   -0.0975   -0.4904   -0.2778    0.2778    0.4904    0.0975   -0.4157
    0.3536   -0.3536   -0.3536    0.3536    0.3536   -0.3536   -0.3536    0.3536
    0.2778   -0.4904    0.0975    0.4157   -0.4157   -0.0975    0.4904   -0.2778
    0.1913   -0.4619    0.4619   -0.1913   -0.1913    0.4619   -0.4619    0.1913
    0.0975   -0.2778    0.4157   -0.4904    0.4904   -0.4157    0.2778   -0.0975
```

Q1. 2.



Observations: The reconstructed image is little bit smoother as compared to the original.

(420,45) =>

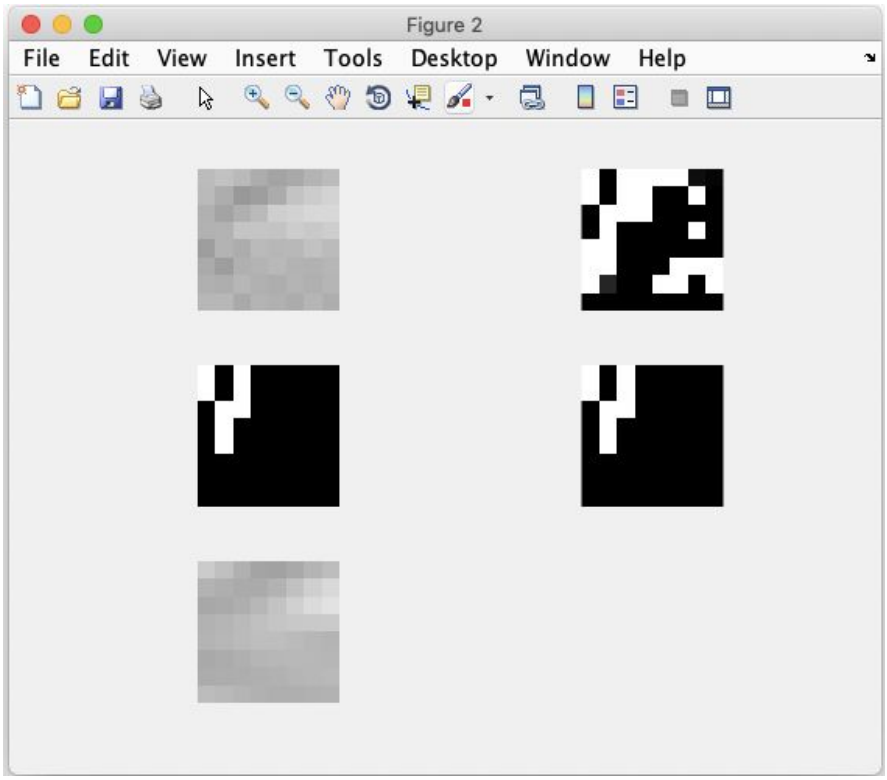
(1,1) : Original

(1, 2): DCT

(2,1): Quantized

(2,2): De-Quantized

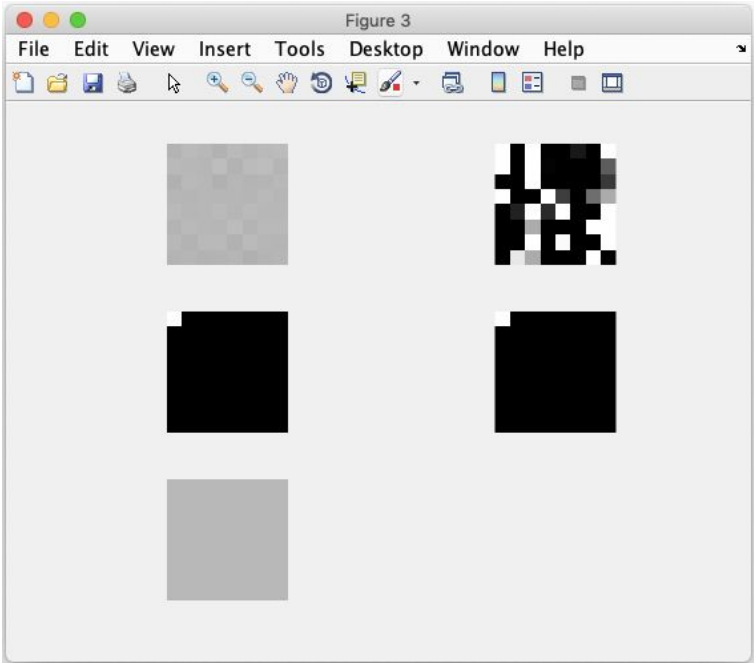
(3,1): Reconstructed



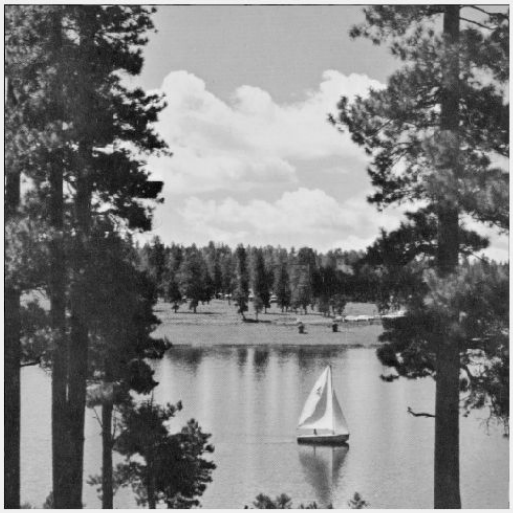
<= (427, 298)

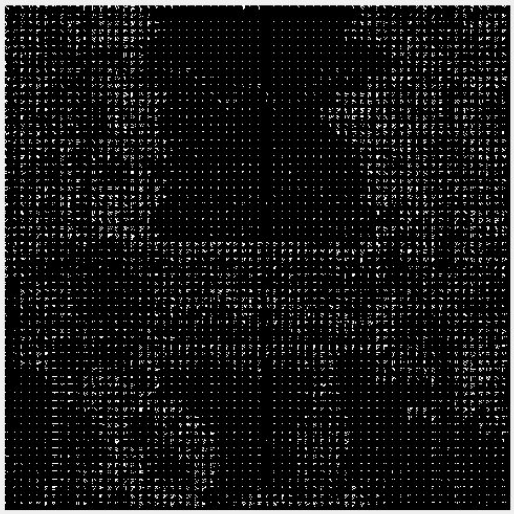
These observations are applied for all.

(30, 230) =>



Q1. 3.

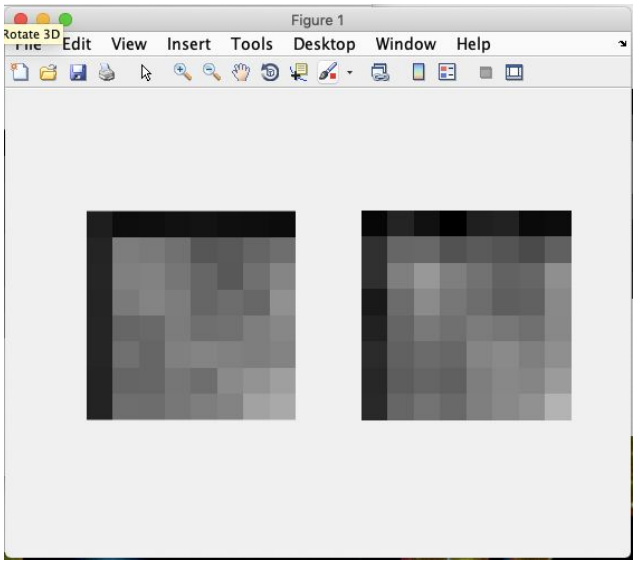


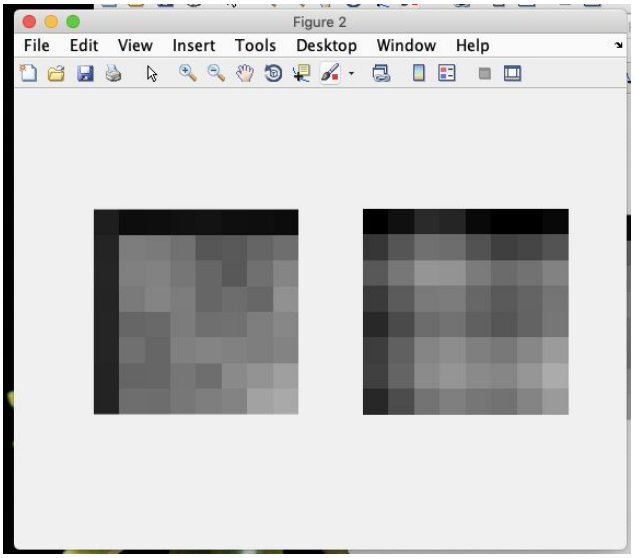


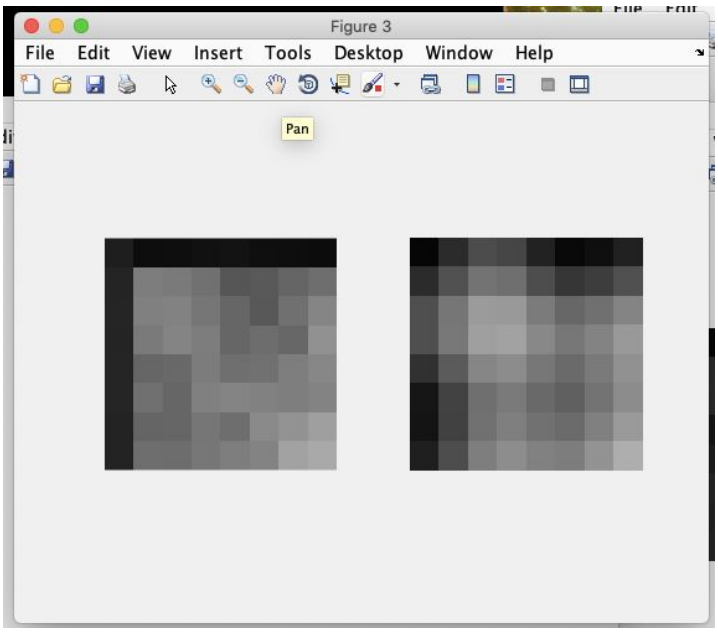
Observations: Similar to Q1.2. , taking quantization of 8x8 sub-blocks. The quantized image after DCT shows some similar features as of the original image, like borders and all.

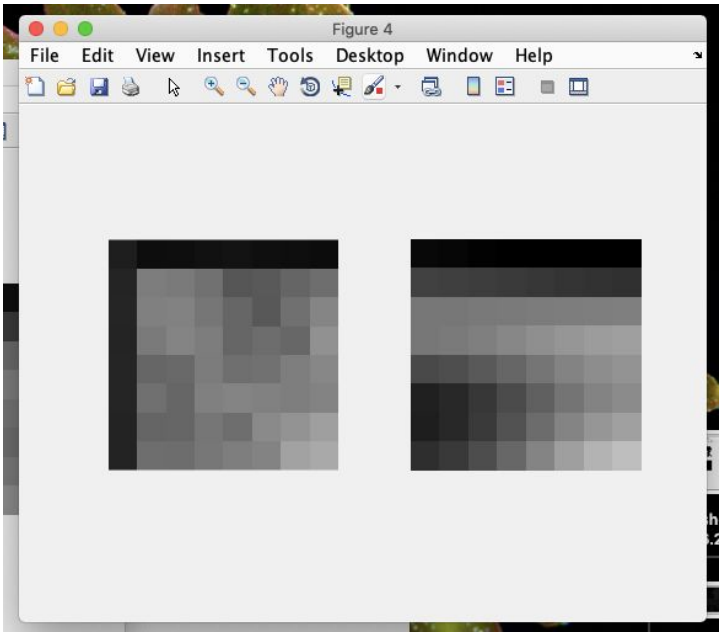
And most of the image is “blackish” i.e. the values are closer to “0”, which will help in compression later.

Q1. 4.









(1,1) : c = 2 , **(1,2) :** c = 8, **(2,1):** c = 10, **(2,2):** c = 15

For c = 2: RMSE = 12.7843 , entropy : -32.7549

For c = 8: RMSE = 20.5354 , entropy : -19.5098

For c = 10: RMSE = 23.8593 , entropy : -20

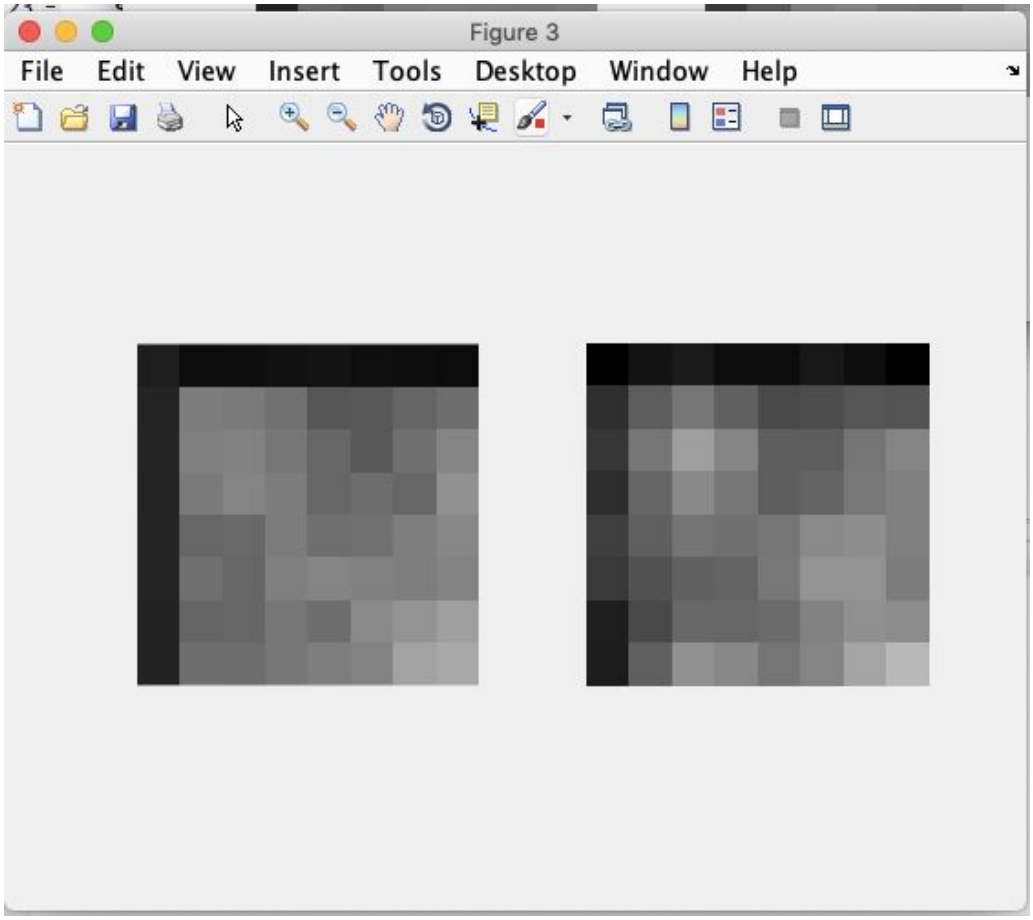
For c = 15: RMSE = 33.6285 , entropy : -34.3645

Observations: Here, as “c” is increasing, RMSE is also increasing and entropy is first decreasing and then increasing again with the minimum occurring at c = 8 in this sample data set.

At around c = 8, in this dataset the distortions are visible.

But considering for c = 3, the distortions are just perceptible (because of lines on the left and upper corner becomes pixelated).

Below image is for : **c = 3 :)**



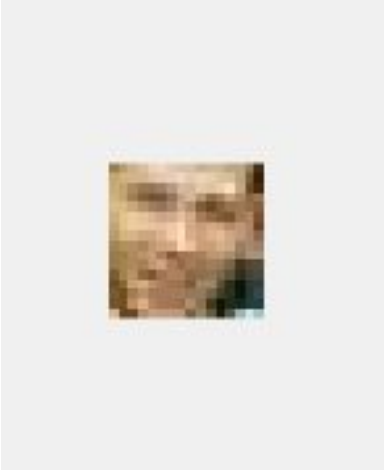
Question - 2)

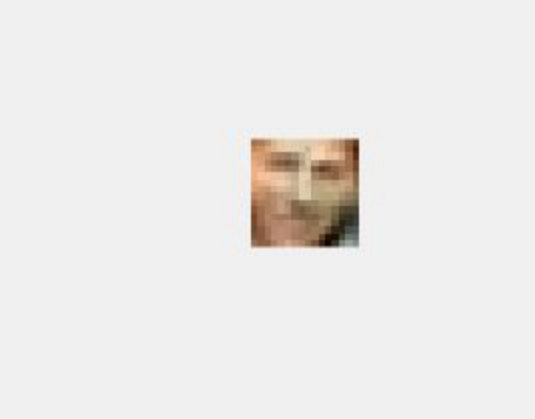
In this question, as said I first resized all the images to be able to calculate the co-variance matrix. Hence, resized to 16x16.

A. constructed 520*728 (dimensions : 16*16*3) as 3 rgb channels.

B. Then found the covariance matrix, then eigen values and eigen vectors.

And took 35 eigen vectors with me maximum eigen values. For reconstructing the images.

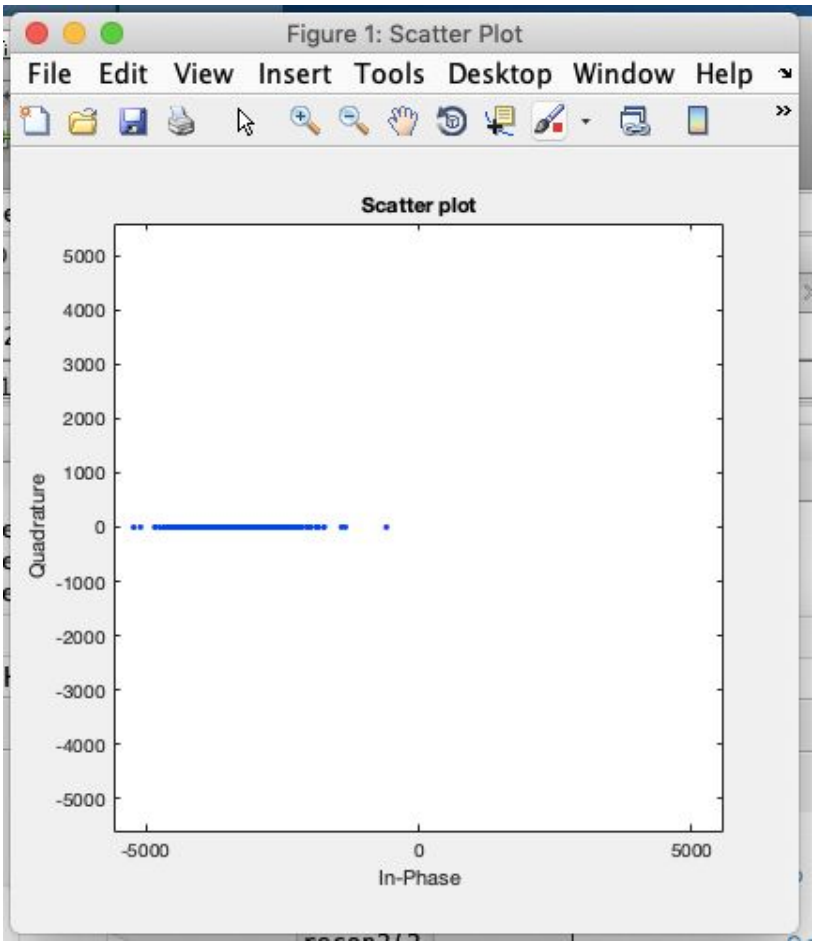


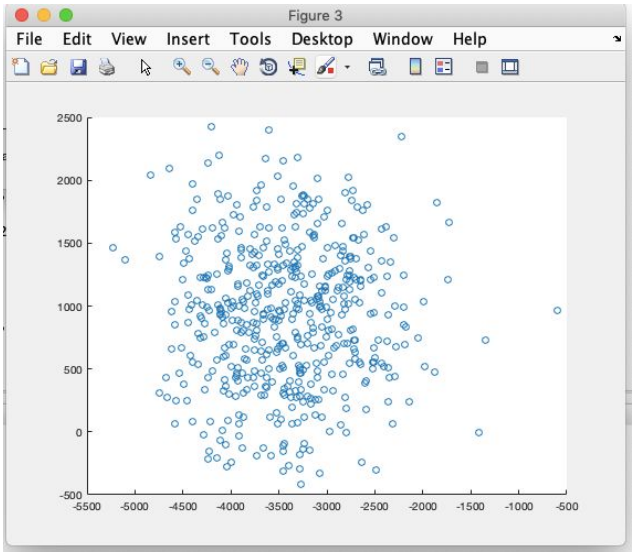


1. For example, the left one is the original 16x16 image and the right one is the reconstructed one.

2. For the second part,

   1 D scatterplot =>





< = 2D scatterplot

3D scatter plot