

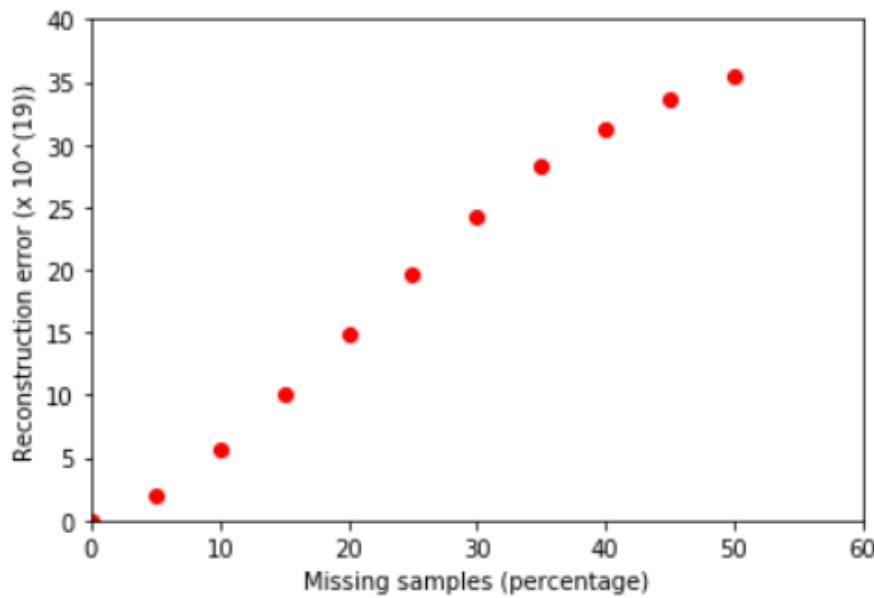
Part 3

Q.1.

Reconstruction error formula = sum of squares of differences in the pixels in the original image and pixels in the reconstructed image.

1. Image: miamibeach.rgb

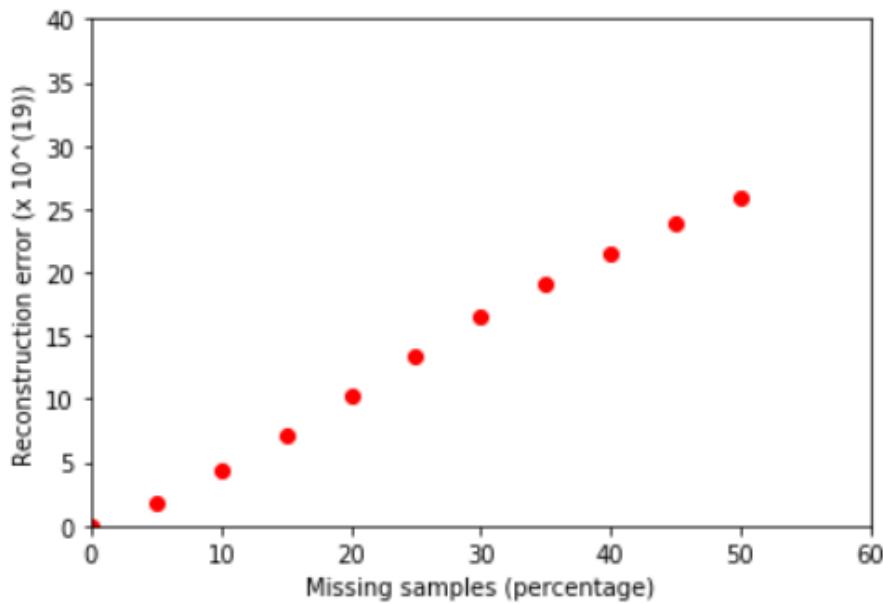
Missing samples (percentage)	Reconstruction error (x 10^(19))
0	0
5	2.04
10	5.63
15	10.14
20	14.79
25	19.66
30	24.27
35	28.33
40	31.28
45	33.61
50	35.40



Reconstructed image for 10% missing samples.

2. Lake-forest.rgb

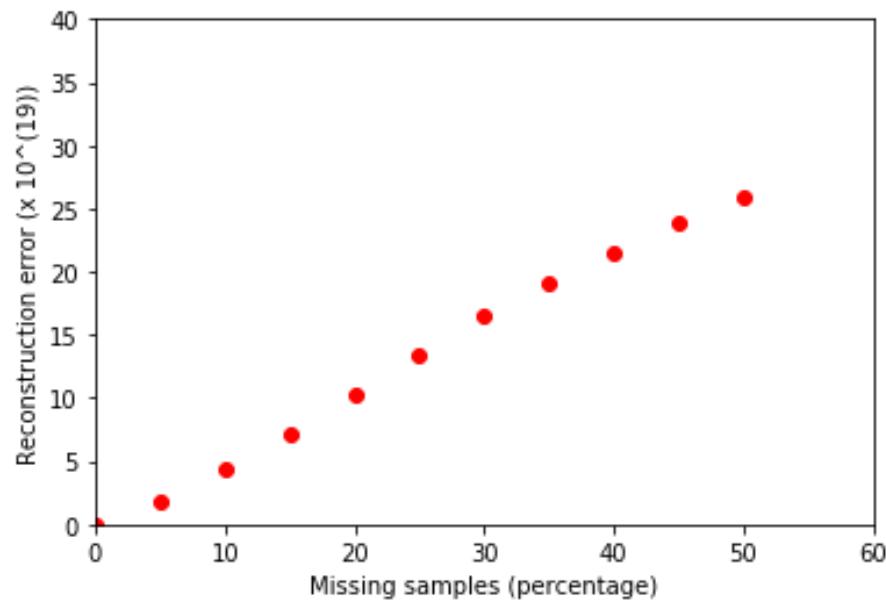
Missing samples (percentage)	Reconstruction error (x 10^(19))
0	0
5	2.13
10	4.91
15	7.81
20	11.09
25	14.03
30	17.06
35	20.05
40	22.55
45	24.78
50	26.96



3. Rubixcube.rgb

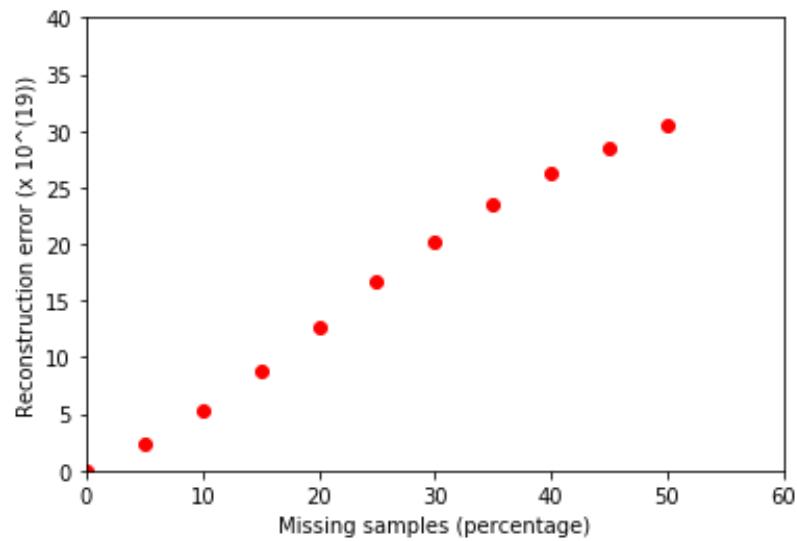
Missing samples (percentage)	Reconstruction error (x 10^(19))
0	0
5	1.88
10	4.32
15	7.15
20	10.29
25	13.31
30	16.45
35	19.10

40	21.56
45	23.82
50	25.89



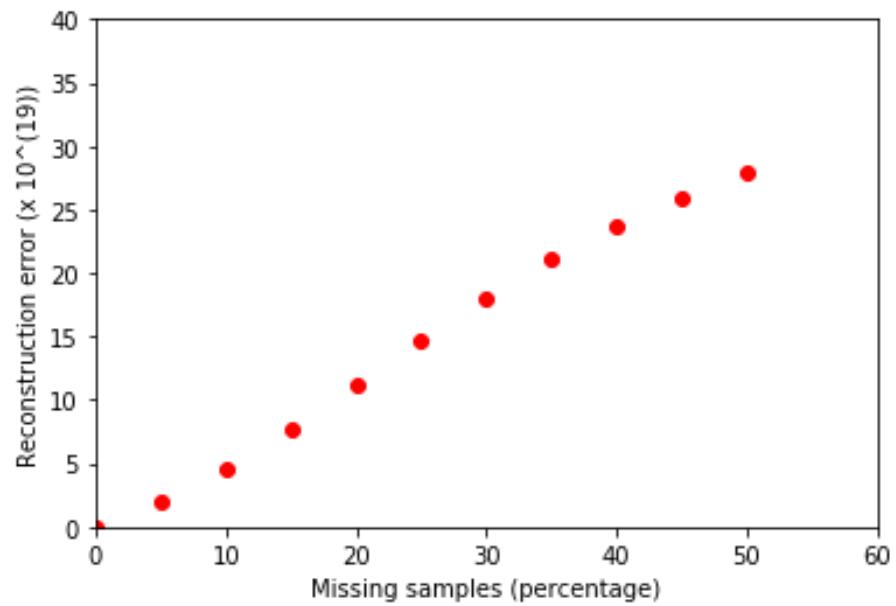
4. Skycloud

Missing samples (percentage)	Reconstruction error (x 10^(19))
0	0
5	2.32
10	5.34
15	8.84
20	12.68
25	16.65
30	20.13
35	23.42
40	26.28
45	28.56
50	30.54



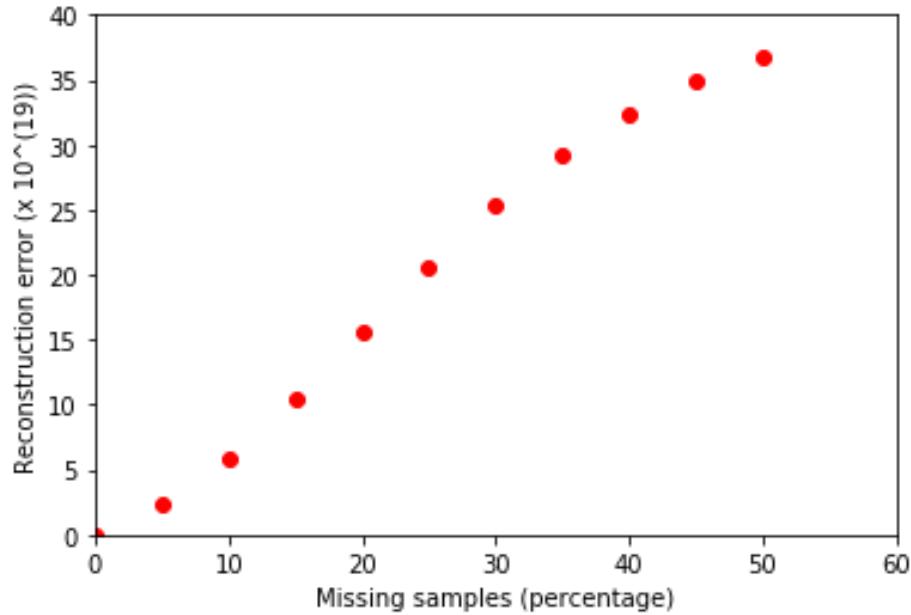
5. Stagforest

Missing samples (percentage)	Reconstruction error (x 10^(19))
0	0
5	1.93
10	4.55
15	7.66
20	11.10
25	14.63
30	18.06
35	21.11
40	23.64
45	25.86
50	27.93



6. Worldmap

Missing samples (percentage)	Reconstruction error (x 10 ¹⁹)
0	0
5	2.3
10	5.87
15	10.41
20	15.54
25	20.59
30	25.29
35	29.16
40	32.39
45	34.89
50	36.79



Q.2. The worldmap image has higher reconstruction errors and the rubixcube image has lower reconstruction errors.

Q.3. The worldmap image will have higher reconstruction error because it has a lot of detail, nuances, and variations, and even textual information which are difficult to capture and reproduce. The rubixcube image has the lower reconstruction error because the pixels are uniform over discrete blocks of region, which is easily reproducible by interpolation or averaging techniques. There are no sharp variations that needs to be captured. As level of low level detail increases, the reconstruction error increases and we need sophisticated techniques to reproduce missing portions of images.

Extra Credit:

A qualitative analysis of the results lets us know that the reconstruction error is approximately equal to half the sampling rate, plus a constant that ranges from [-1 to 12]. i.e. The reconstruction error is only slightly more than half of the % of missing samples. The error is of the order 10^{19} .

We can put the x and y values into a system of linear equations (of the form $y = ax + b$) and solve for values of a and b to get the following:

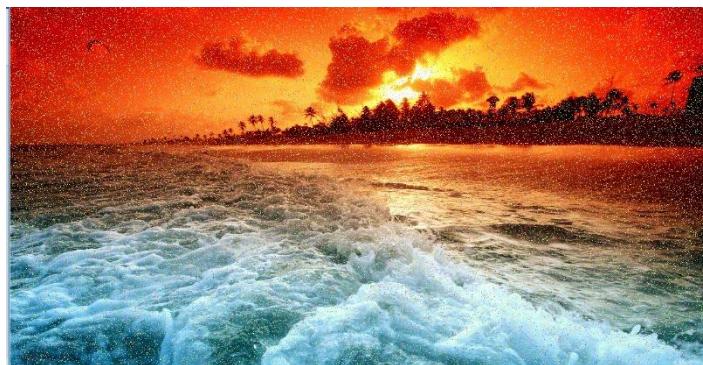
Image	a	b	Actual (15% samples)	Predicted (15% samples)

miamibeach	0.68	1.19	10.14	11.39
Lake-forest	0.52	0.51	7.81	8.31
Rubixcube	0.51	1.12	7.15	8.77
Skyclouds	0.59	3.61	8.84	10.69
Stagforest	0.56	-0.1	7.66	8.4
Worldmap	0.71	1.34	10.41	11.99

This further proves a qualitative analysis that the error (mantissa) is slightly more than half of the percent of missing samples.

Extra – reconstructed images

1. Miamibeach.rgb



10% missing samples



20% missing



30% missing



40% missing



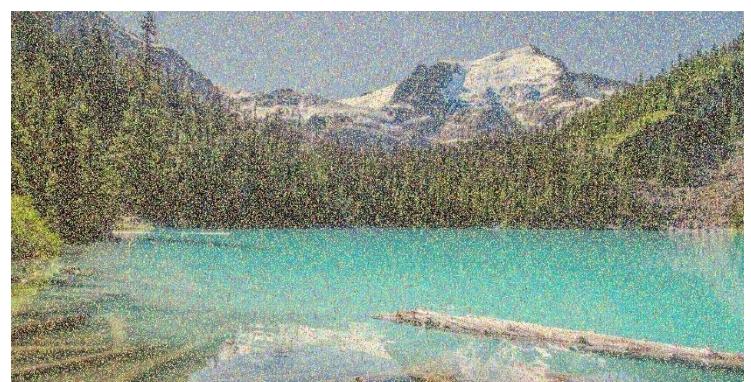
50% missing

2. Lake-forest.rgb



10% missing samples

20% missing



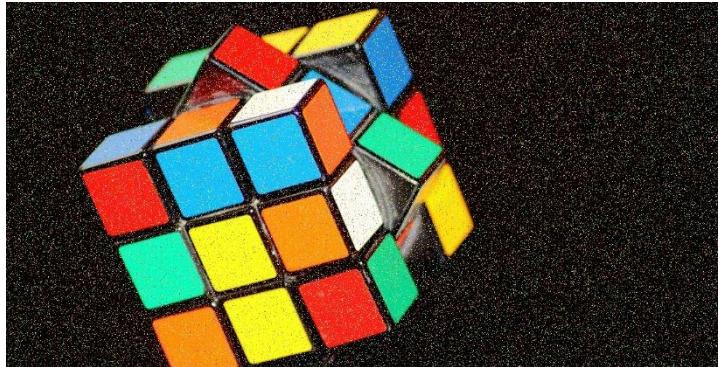
30% missing

40% missing

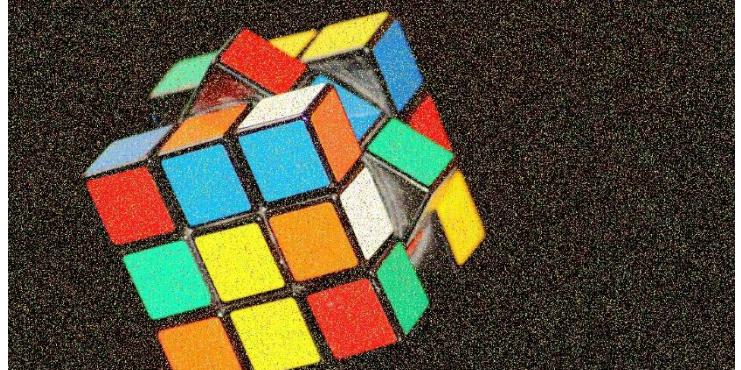


50% missing

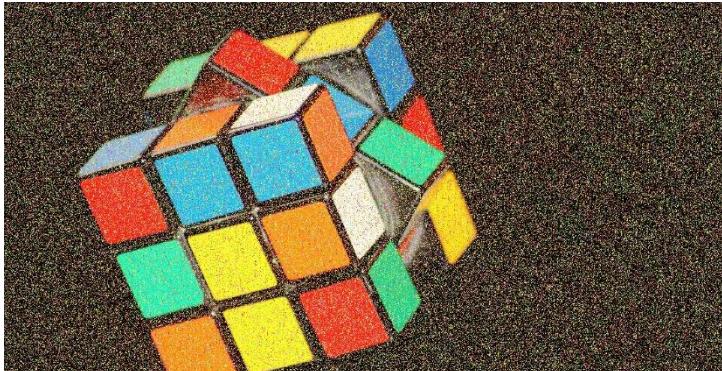
3. Rubix cube



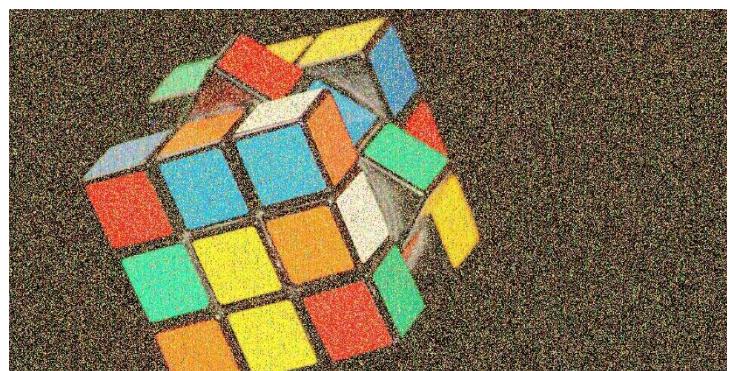
10% missing samples



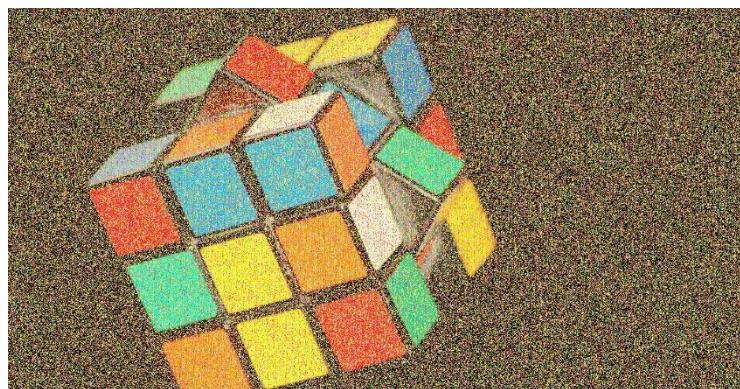
20% missing samples



30% missing samples



40% missing samples



50% missing samples

4. Stagforest



10% missing samples



20% missing samples



30% missing samples



40% missing samples



50% missing samples

5. Skyclouds



10% missing samples



20% missing samples



30% missing samples



40% missing samples



50% missing samples

6. Worldmap



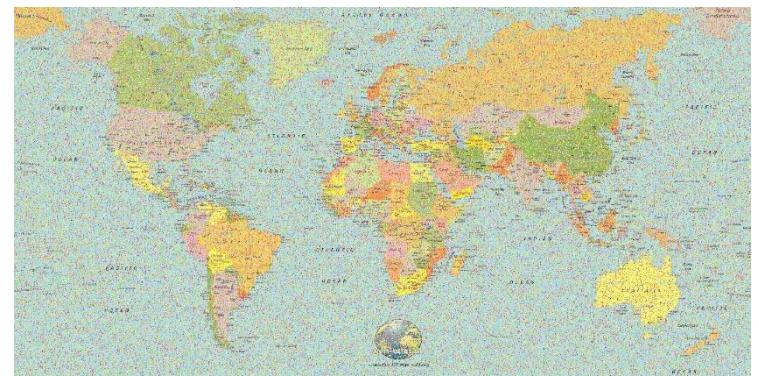
10% missing samples



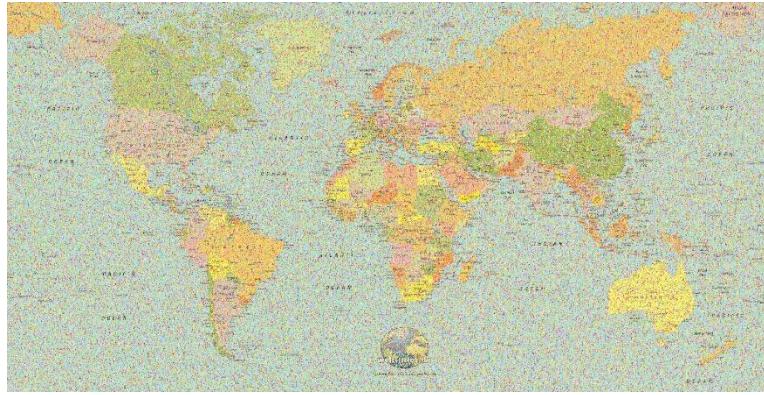
20% missing samples



30% missing samples



40% missing samples



50% missing samples