HACETTEPE UNIVERSITY

GEOMATİCS ENGINEERING

GMT342 DIGITAL IMAGE PROCESSING

HOMEWORK – 6

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Step – 1 Obtaining Eigen values and transformation matrix:

I used pca function for calculating this. Latent means eigen values and coeff means eigen vector which is also known rotation or transformation matrix.

```
I=double(imread('17_ms.tif'));

X=reshape(I,size(I,1)*size(I,2),size(I,3));
[coeff,score,latent] = pca (X);
```

Eigen values:

	1
1	5.0825e+03
2	582.4685
3	546.1475
4	21.0582
5	14.4982
6	2.3033

Transformation Matrix:

	1	2	3	4	5	6
1	0.1973	-0.4870	-0.1954	-0.2536	-0.6444	-0.4541
2	0.2713	-0.4519	-0.1101	-0.0474	-0.1111	0.8339
3	0.4166	-0.4004	-0.2446	-0.0322	0.7217	-0.2905
4	0.3722	-0.1667	0.8933	0.1637	-0.0329	-0.0886
5	0.5861	0.5509	-0.0287	-0.5883	-0.0425	0.0650
6	0.4815	0.2588	-0.3018	0.7480	-0.2207	-0.0431

Step – 2 Calculating % percentange and cumulative of eigen values:

Formula below here calculating it. Code has comments to Show this part of homework.

$$\%_p = \frac{eigenvalue\lambda_p \times 100}{\sum_{p=1}^{7} eigenvalue\lambda_p}$$

Result:

Percentage of the eigen values:

```
81.3334    9.3210    8.7397    0.3370    0.2320    0.0369
```

Cumulative percentage of the eigen values:

```
81.3334   90.6544   99.3942   99.7311   99.9631  100.0000
```

Step – 3 Obtaining Principal Components:

Principal Components:
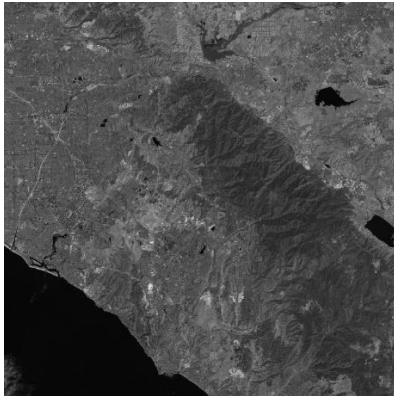
Pc1	Pc2	Pc3
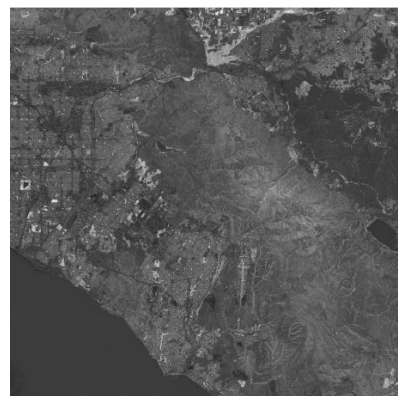
Pc4	Pc5	Pc6

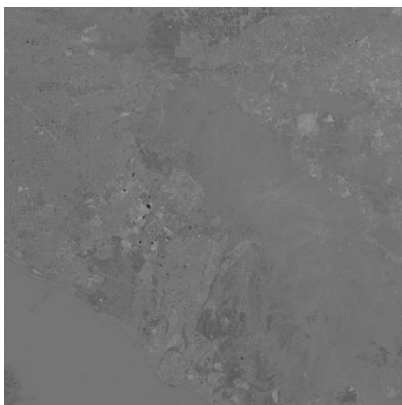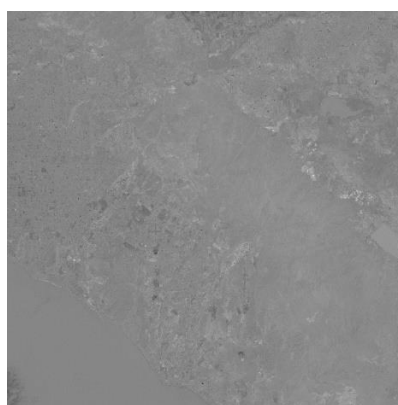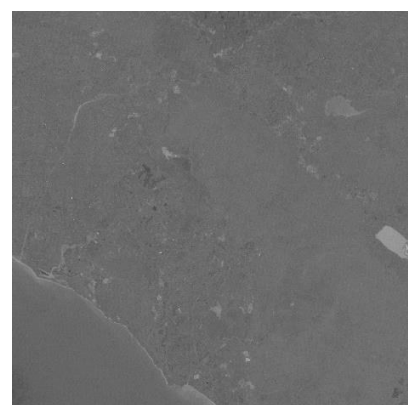**Answer Of The Question:**

Step – 4 Deciding which componets will be merged:

```
81.3334    90.6544    99.3942    99.7311    99.9631   100.0000
```

In cumulative sum of the first three PC values is 99.3942 so Merging first three PC is enough to reach more than %99 correlation so I merge the first three PC and created a image named 'ilk_3.tif'