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PROJECT #5
Linear Algebra
Project Report:

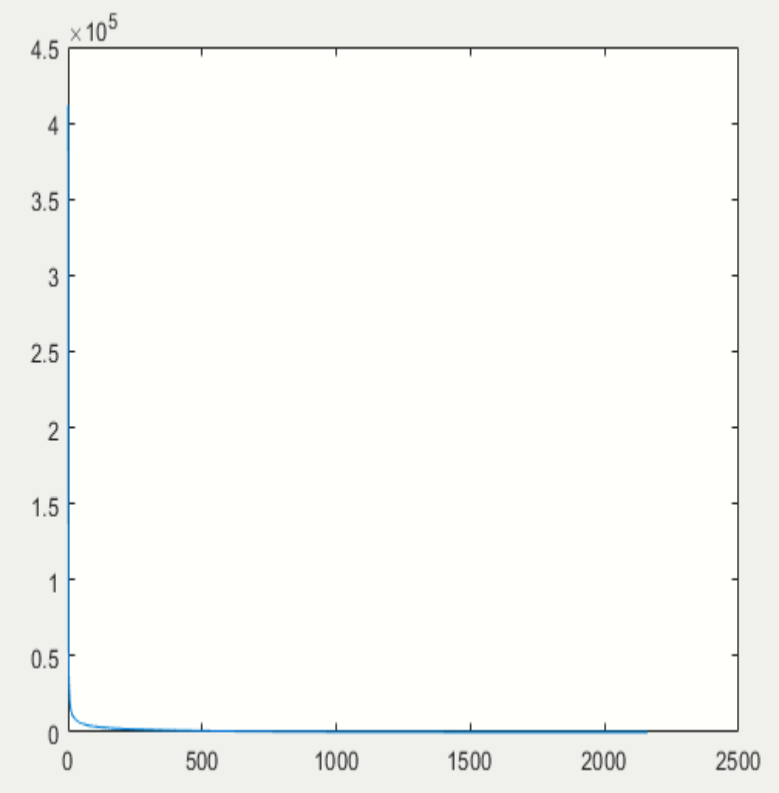
- ## Introduction:

  - Basically, this project is related to singular value decomposition (SVD). We have to choose any 5 images and then compute their (SVD).

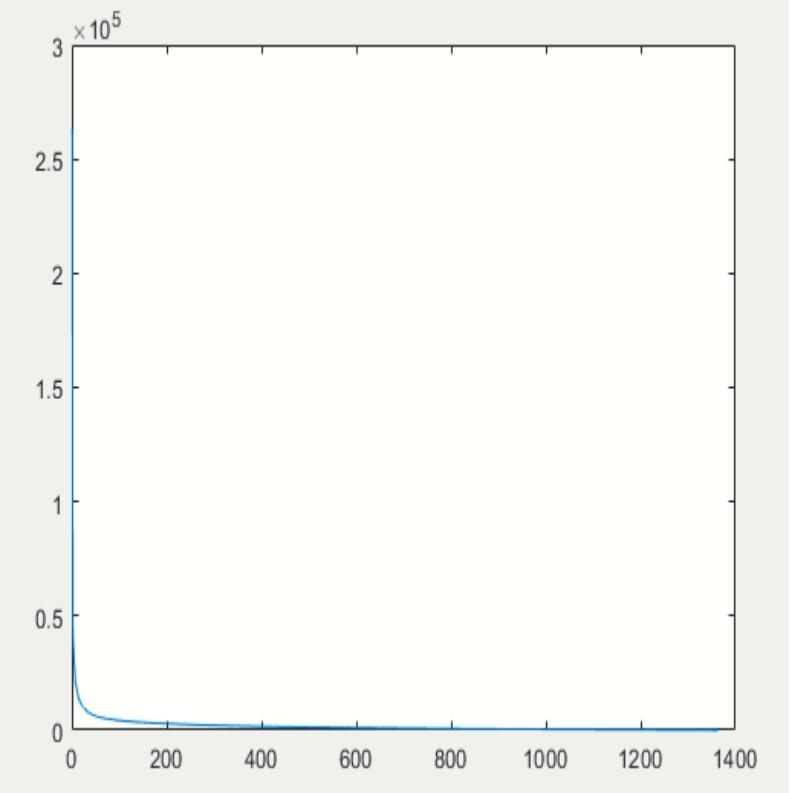
- ## Description & Simulation:

  - I've taken 5 images of different resolutions and read them individually by **imread("name")** command. After that I have converted each image into gray scale and then printed the on the screen using (**imshow()**).
  - The grayed image has to be converted into double to perform SVD on it so I have converted each image into **double** and computed **SVD**.
  - Initialized a new variable and assign it singular values of matrices respectively as **New=diag(S).**
  - Then I've plotted that variable (Consist of singular values).
  - For **reconstruction** of images by ignoring first 5 singular values I've used **nested loop** and do zero (0) the first 5 diagonal values of the singular matrix of all the images. Then initialized a new variable let say it was X and **X=U*S*V'**. This X is the reconstructed image.
  - To calculate the mean square error between the reconstructed image and the original image we have to use this statement.
    error=immse(original image, reconstructed image). This error is the mean square error between these two images.

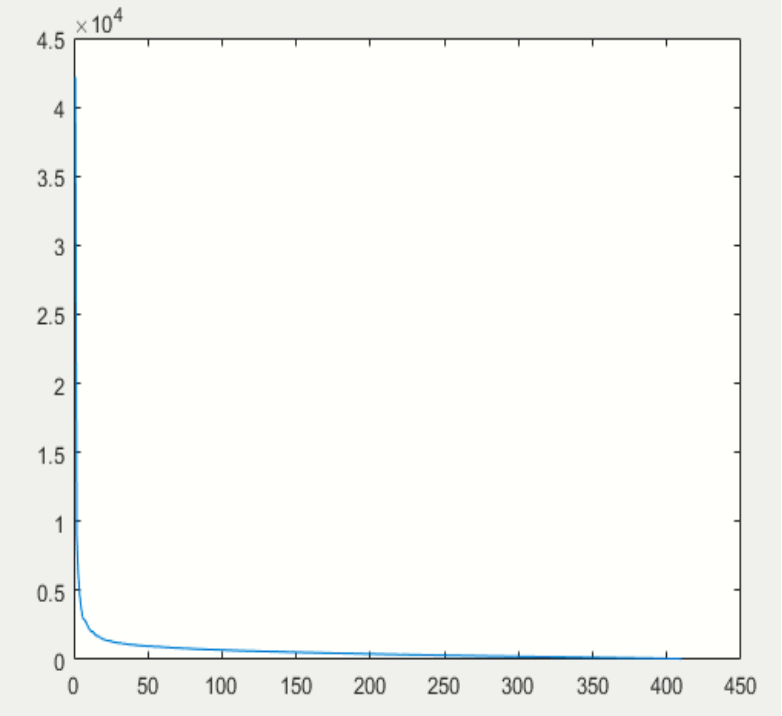
- Singular values of image1.



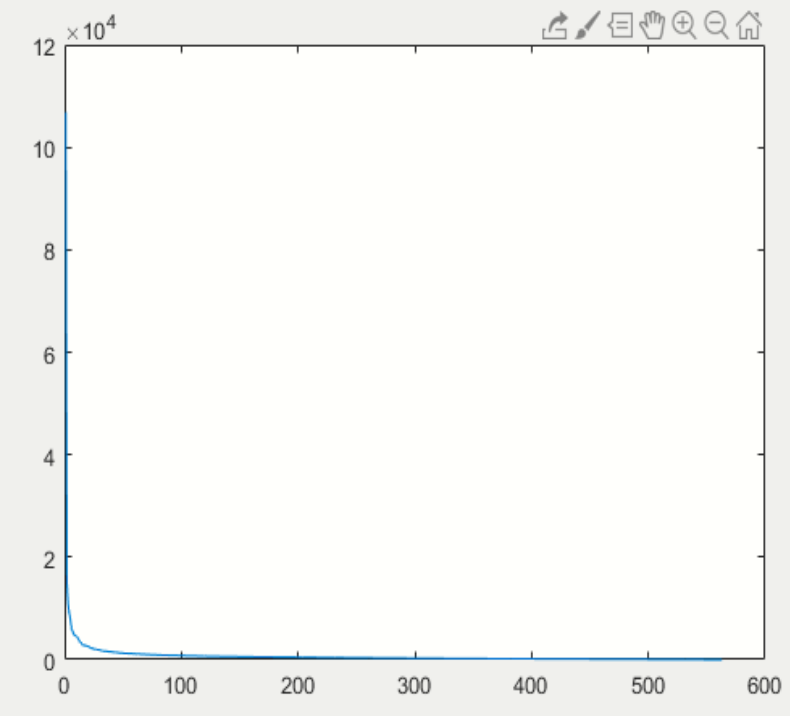
- Singular values of image2.



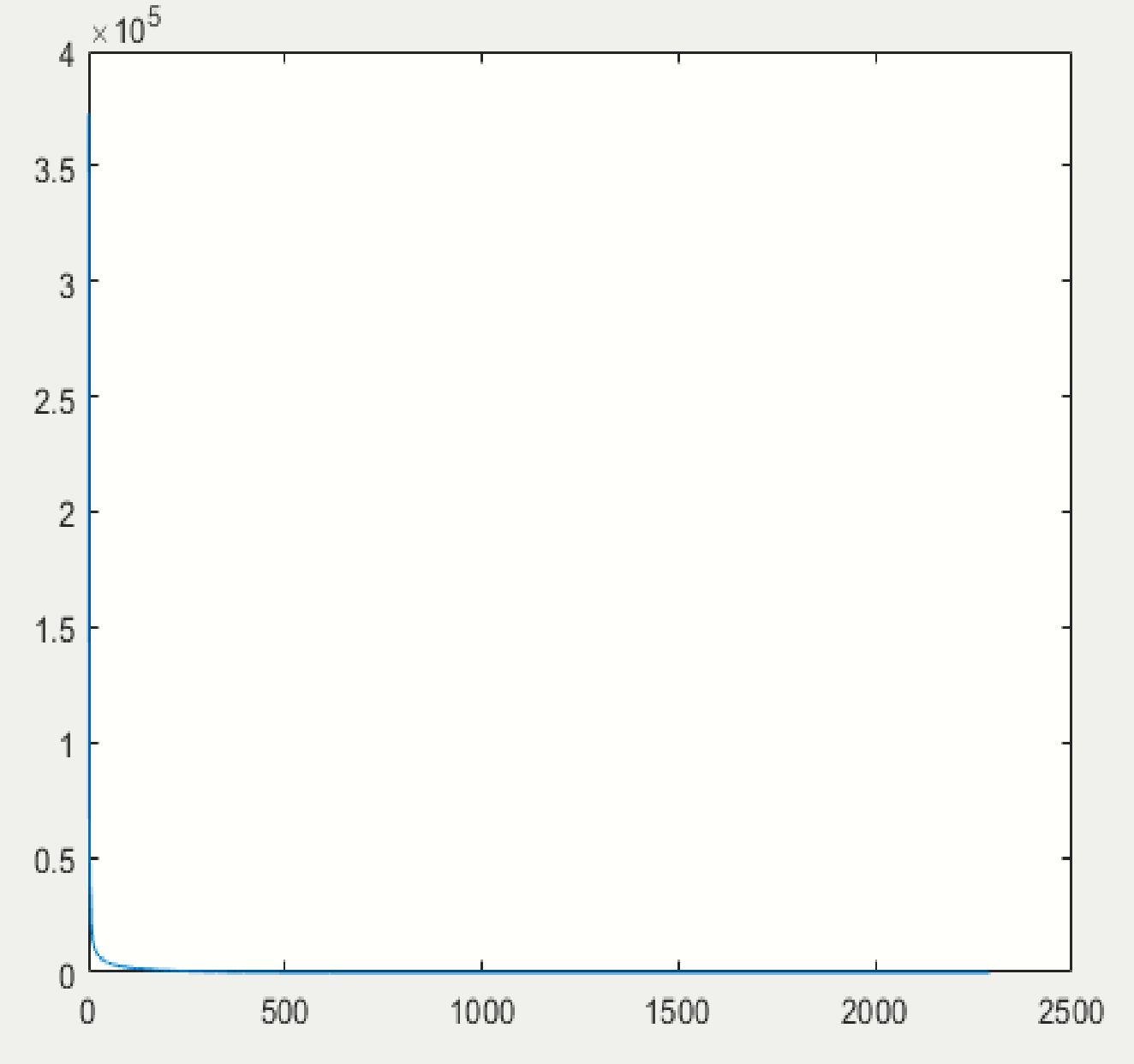
- Singular values of image3.



- Singular values of image4.



- Singular values of image5.



✓ CODE

```
A1=imread("image1.jpg");
A2=imread("image2.jpg");
A3=imread("image3.jpg");
A4=imread("image4.jpg");
A5=imread("image5.jpg");
B1=rgb2gray(A1);
B2=rgb2gray(A2);
B3=rgb2gray(A3);
B4=rgb2gray(A4);
B5=rgb2gray(A5);
C1=double(B1);
C2=double(B2);
C3=double(B3);
C4=double(B4);
C5=double(B5);
[U1, S1, V1]=svd(C1);
[U2, S2, V2]=svd(C2);
[U3, S3, V3]=svd(C3);
[U4, S4, V4]=svd(C4);
[U5, S5, V5]=svd(C5);
D1=diag(S1);
D2=diag(S2);
D3=diag(S3);
D4=diag(S4);
D5=diag(S5);
plot(D1);
plot(D2);
plot(D3);
plot(D4);
plot(D5);
for i=1:5
   for j=1:5
      S1(i,j)=0;
      S2(i,j)=0;
      S3(i,j)=0;
      S4(i,j)=0;
      S5(i,j)=0;
   end
end
```

- ✓ RC1=U1*S1*V1';
- ✓ RC2=U2*S2*V2';
- ✓ RC3=U3*S3*V3';
- ✓ RC4=U4*S4*V4';
- ✓ RC5=U5*S5*V5';
- ✓ error1=immse(C1,RC1);
- ✓ error2=immse(C2,RC2);
- ✓ error3=immse(C3,RC3);
- ✓ error4=immse(C4,RC4);
- ✓ error5=immse(C5,RC5);

➢ Results Obtained

- Grayed images.
- Singular Value Decomposition.
- Graph of Singular values.
- Reconstructed images using SVD.
- Mean square error between original and reconstructed images.
