# PRML ASSIGNEMENT1

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January 30, 2022

## 1 Motivation

In this assignment,we are will be given an image and covert it into a 2d matrix using numpy functions,we can see the matrix as a diagonal matrix after applying many elementary functions to it in SVD and EVD, and we observe the variations as a function of our change.

## 2 EVD and SVD

**1) EVD**

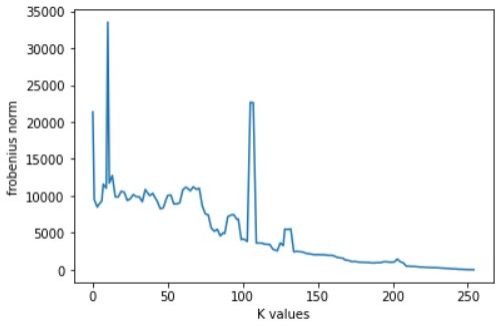
In eigen value decomposition we have AX=X$\wedge$ ,where X is an eigen vector and delta has eigen values in the form of diagonal matrix, In our experiment we will take the input image in the form of matrix and compute it's eigen vector and eigen values and now we will sort out the eigen values and also we ensure that the eigen vector will also be in the same order with the corresponding eigen values,we keep first k values same and make all the remaining eigen values as zero and we use this eigen values and form the new matrix and observe the change in the matrix as a function of k.

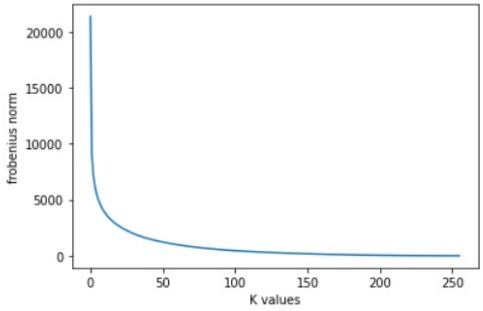
**2) SVD**

In Singular value decomposition we have $A = U\Sigma V^T$ ,where U and V are orthogonal matrices,here we multiply with V on both sides and we get AV=U$\Sigma$,here we can find every column of U as follows

$U_i = AV_i/|AV_i|$ and using this we can find $\Sigma$. Now we modify the sigma making all diagonal elements greater than k as 0 and by using this new sigma we make new matrix and we find the changes that occured through frobenius norm and plot it as a function of k .

# 3 Experimental Results




We will observe spikes in evd as delta contain imaginary values and there will be no spikes in svd because sigma doesnot contain any imaginary values.

# 4 Inferences

- Frobenius norm will be decreasing with increasing k values and it is not monotonic for EVD .
- In case of svd it is monotonically decreasing and also it is concave upwards which tells that decrease in the norm is maximum at the start.
- For a same value of k we can observe that the error is less in svd, which implies that for a given k image is more clear for svd than evd.