Recommendation System
Assignment – 6 Report

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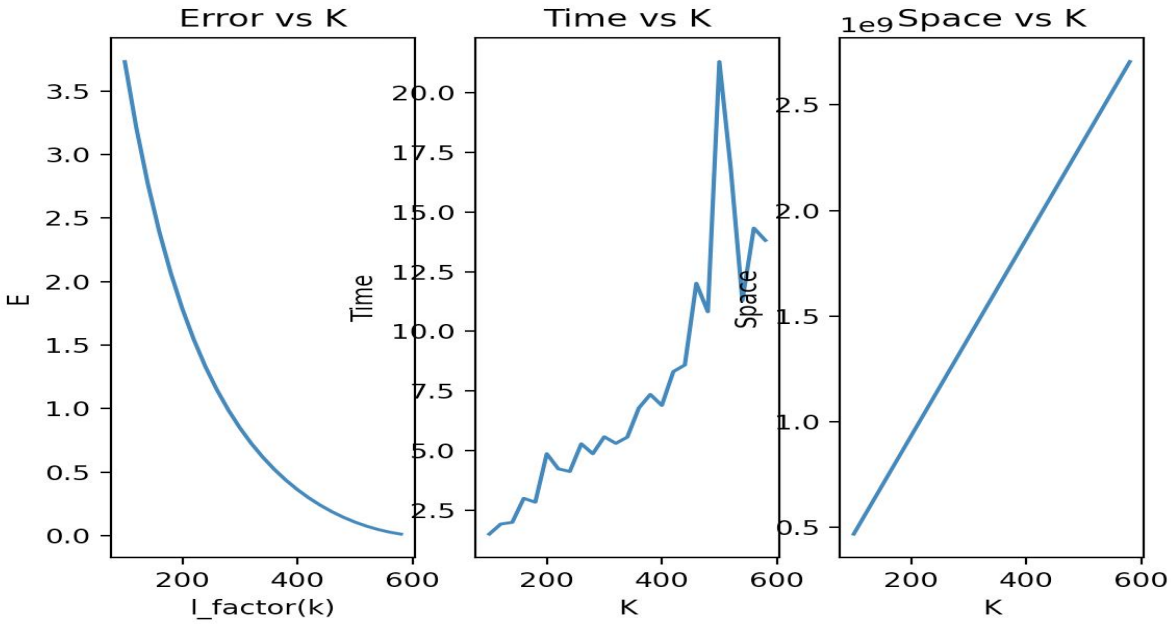
The SVD and CUR decomposition is done in this assignment and PQ decomposition is applied on the matrix factorization. The implementation functions along with the observations can be described as below: -

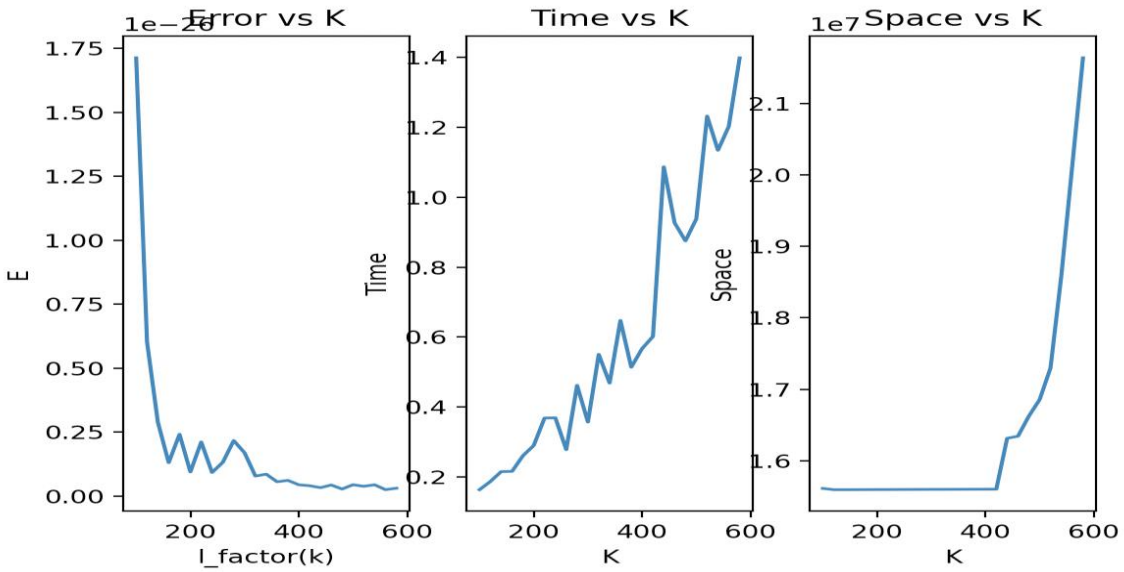
**SVD:** Plots the graph of MSE vs number of latent factors, takes input a range and the matrix which must be in sparse format that is coordinate format of SciPy sparse module.




The error reduces significantly after 500-600 latent variables. The latent variables gives us the intuition that only few variables can give us relevant information and not all users need to be taken count of.
SVD took around 10-12min for implementation.

**CUR_method:** It takes sparse matrix as input and variable k. and returns a sparse matrix which is made up of randomly selected K rows and K columns according to energy distribution of each row and column.

**CUR:** takes latent range and matrix as input and prints a plot of MSE from CUR decomposition vs number of latent variables.




We can observe that there are many such latent variables where the error is more compared to SVD as the CUR matrix is sparse and thus gives additional error. It took less than 50sec to implement.

**S_gradientD:** The function takes train matrix and test matrix, k as number of latent variables, regression lambda, learning rate starting point, tolerate count. This function plots training and testing error w.r.t to iterations. To make the code run faster, the function calculates gradient and does the update in matrix form only, rather than iterating with for loop over users and movies.