

Assignment -5: Recommendation System

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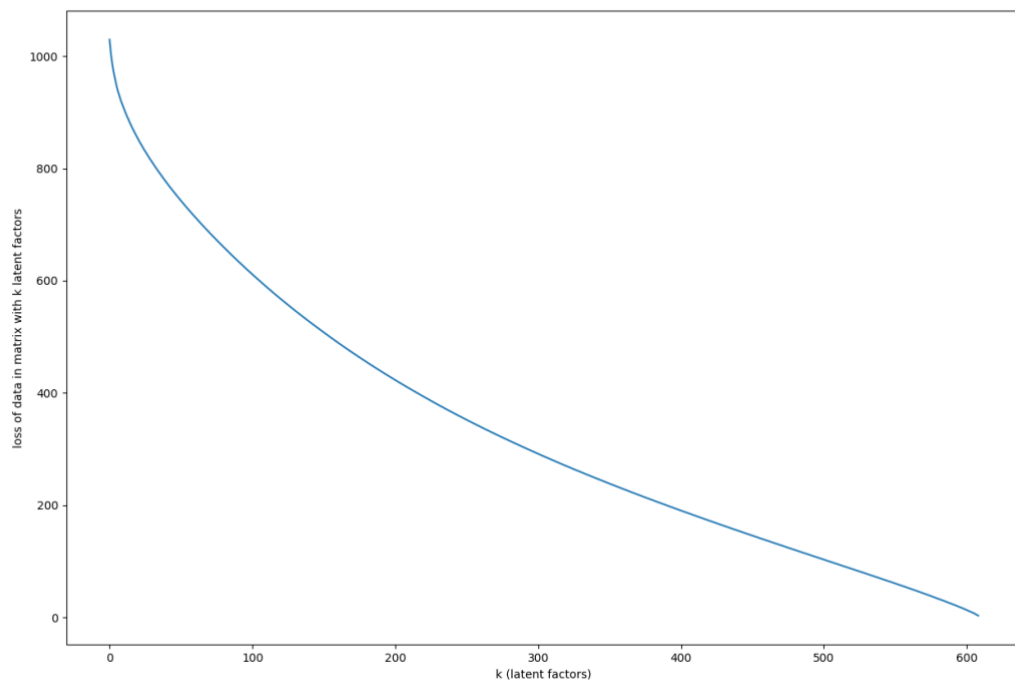
Problem Statement: Recommendation System:

Functions:

There are mainly four functions to be performed, which are as follows:

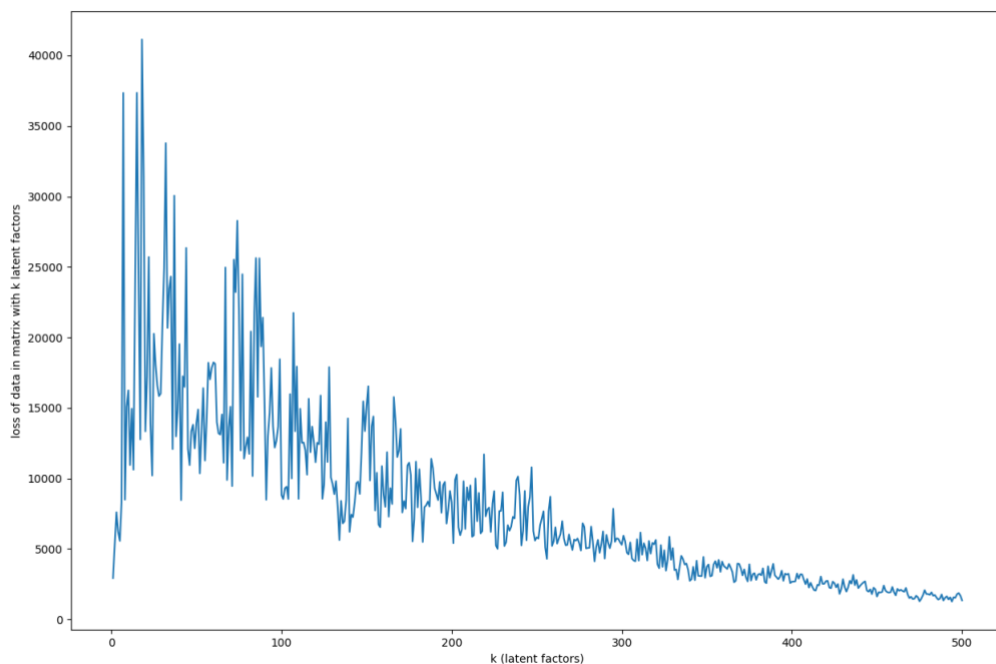
- ***SVD Decomposition:***

- This function returns SVD decomposition with k latent factors and its loss.
- According to Young-Eckart Theorem the loss that occurs by removing some k latent factors is lesser in decomposition.
- In this , we have found the loss corresponding to each latent factor from 1 to 500.
- The graph shows the result below:



- ***CUR Decomposition:***

- a) In this, I have implemented CUR decomposition for 500 latent vectors separately and plot their loss .
- b) This function is two functions
 - a. ***ColumnSelect*** : It select k columns randomly based on probability i.e. kind of column energy.
 - b. ***PseudoInverse*** : It finds the pseudoinverse of $k \times k$ matrix using SVD decomposition
- c) The loss corresponding to their latent factors is shown below:



- ***PQ Decomposition***

- a) In this decomposition , we have trained the model using basic gradient technique.
- b) In this , I have trained on both 30 , 400 latent vectors.
- c) On 400 latent vectors , loss is minimum but it converges in around 2 days for 600 iterations. But loss corresponding to it is minimum.
- d) For 30 latent vectors , It takes around 1.2 hr to completion.
- e) For loss, I have used matrix – $PQ.T$ norm
- f) The model is trained only for 80% of data and tested on 20% of data
- g) The Training Error per Entry is : 0.663
- h) The Test Error per entry is : 0.91