

### SMAI-2020-Homework 4

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#### 2 Subjective Question [2 marks]

Consider the tutorial notebook 'LSI and SVD.ipynb' and answer the following questions based on your observation.

1. Briefly explain the plot of the singular values  $s$  (or in other words, what can we say about the singular values based on its plot).
2. Are the  $U$  and  $V_h$  matrix orthonormal? How will you verify this?

Answer :

1: The  $S$  matrix plot of singular values decreases with  $K$ : rank. As the range increases, the magnitude of singular values drops which makes them insignificant.

In SVD reducing the number of dimensions is intended. We thus find only significant dimensions. We do this by looking at the corresponding eigenvalues.

2. Yes,  $U$  and  $V_h$  matrices are orthogonal.

We can verify this using  $U^T U = I$  or  $V^T V = I$ , where  $I$  is the Identity matrix.