

November 24, 2023

Mathematics and Information, Exercise sheet 10

Problem 1: (10 points)

In the course, we computed the singular value decomposition of the matrix

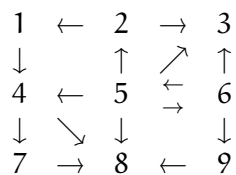
$$A = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \end{pmatrix}$$

and used it to replace A by a nearby matrix of rank two.

- Do the same using the QR decomposition!
- How does the resulting matrix rank the relevance of the five web pages for the query *ranking of web pages*?

Problem 2: (10 points)

Compute the Google matrix and the importances (or weights) of the nine pages of the following *mini web*:



(Of course this should be done with the help of a computer.)