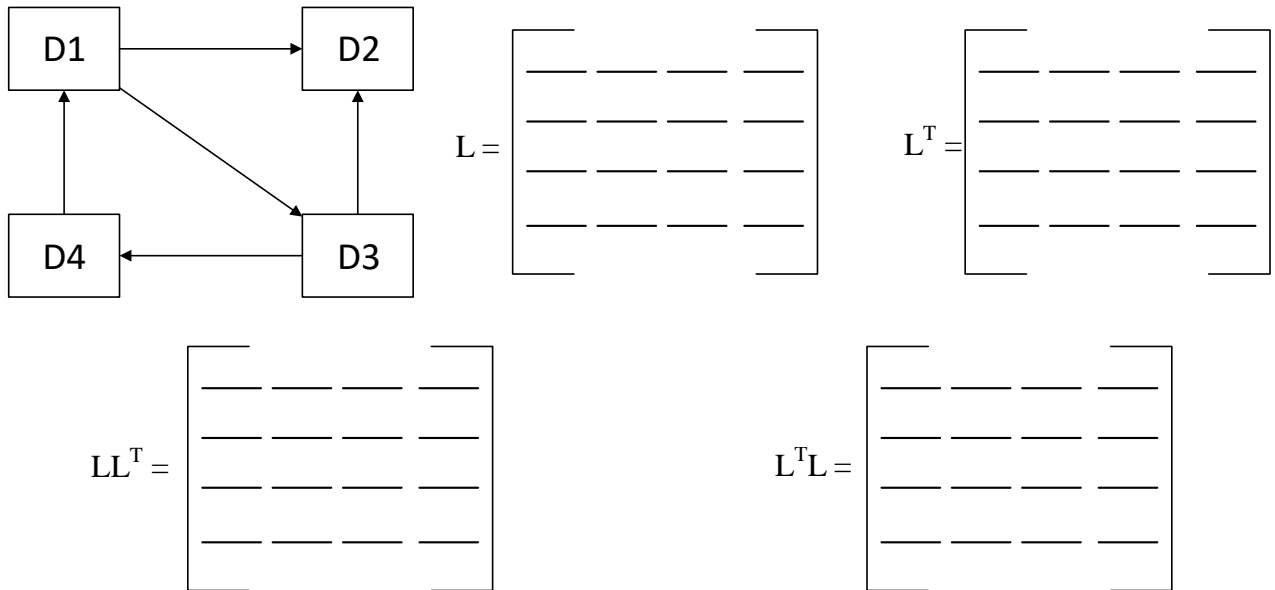


LAB 7: Exercises

1. **HITS:** Given is the network shown in the image below. Find hubs and authorities vectors for this network. Complete the matrix L and L^T for this network and calculate matrix LL^T . Use online eigenvector calculator to find vectors h and a .

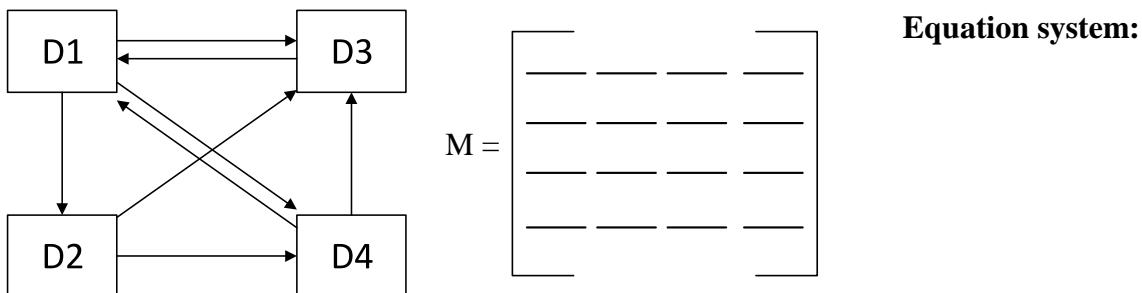


$$h = \begin{bmatrix} _ & _ & _ & _ \end{bmatrix}, \quad a = \begin{bmatrix} _ & _ & _ & _ \end{bmatrix}$$

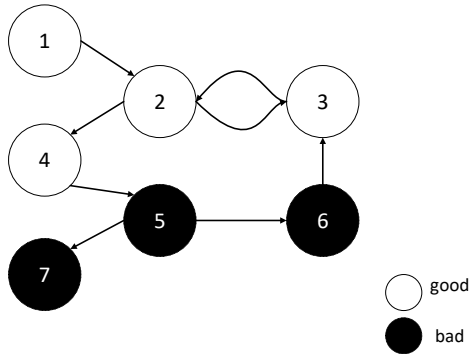
$$h_{\text{norm}} = \begin{bmatrix} _ & _ & _ & _ \end{bmatrix}, \quad a_{\text{norm}} = \begin{bmatrix} _ & _ & _ & _ \end{bmatrix}$$

The best hub is page:, the best authority is page:

2. **PageRank:** Given is the network shown in the picture below. Find stochastic matrix M , write and solve the equation system for finding PageRank values for this network (use basic PageRank model – without a damping factor).



3. **TrustRank:** Find initial TrustRank vector d (seed = {2, 4, 5} and write equations for finding TrustRank for pages 2, 3, and 5, $q = 0.15$.



$$M = \begin{bmatrix} _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \\ _ & _ & _ & _ & _ & _ & _ \end{bmatrix}$$

$d = [\dots, \dots, \dots, \dots, \dots, \dots, \dots]$

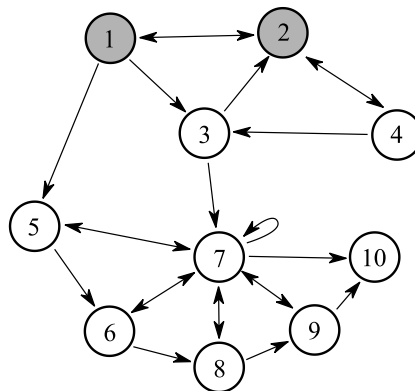
TR(2) =

TR(3) =

TR(5) =

4. **Programming Assignment (deadline +1 week)**

Given is the following web structure:



Download the [pr_tr.py](#) python script from the lab directory. The above structure is kept in L matrix (matrix of indices). Complete the TODOs:

- TODO 1. Compute stochastic matrix M (function getM).
- TODO 2. Compute pagerank vector and return the results (sorted pairs \rightarrow [page id : **pagerank**]). Which pages have the greatest pagerank? Why?
- TODO 3. Which pages do you think belong to the link farm? Compute trustrank vector. Pages 1 and 2 are marked as “good”. Analyze the results. What has changed?
- TODO 4. Repeat TODO3 but remove connections 1 \rightarrow 5 and 3 \rightarrow 7. Analyze the computed trustrank vector.