

Pagerank

The pagerank v_i of page i in a web satisfies by definition

$$v_i = \sum_j \frac{v_j}{n_j} \Leftrightarrow v = Qv$$

where the sum is taken over all pages linking to page i and n_j is the number of outgoing links from page j .

- Write a function pagerank.m that uses the power method on $A=0.85I+0.15Q$ to compute the pagerank of all pages given a matrix Q .
- Show that all eigenvalues of Q have modulus less than or equal to one. Hint: $\rho(Q) \leq \|Q\|$.
- Give an example of a matrix Q that corresponds to a web and has an eigenvalue $\lambda = 1$ (so that $v = Qv$ is solvable).
- Give an example of a matrix Q that corresponds to a web but has no eigenvalue $\lambda = 1$ (so that $v = Qv$ has no solution).
- Assume that Q has an eigenvalue $\lambda = 1$. Show that the eigenvalue of A with largest modulus is $\mu = 1$.

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