CS 395T	Large-Scale Data Mining	Fall 2001

Homework 1

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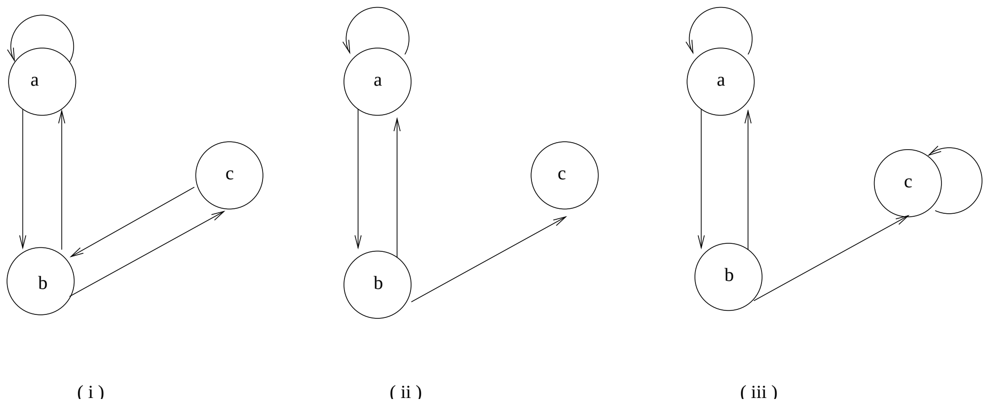
Keywords: *Hubs&Authorities, PageRank*

1. Consider the basic PageRank iteration, $\mathbf{r}^{(k+1)} = \mathbf{A}^T\mathbf{r}^{(k)}$. If $||\mathbf{r}^{(k)}||_1 = 1$, is $||\mathbf{r}^{(k+1)}||_1 = 1$? Is the result true if the 2-norm is used instead of the 1-norm? Give proofs or counterexamples.

2. Consider the 3 possible web graphs :



   What are the PageRanks in each of the above web graphs under the following conditions:

   A. without an extra rank source,

   B. with an extra rank source $\mathbf{s}$ (take each s_i to be equal).

3. Do the above PageRank computations using the algorithm given at the top of page 8 of the paper "What can you do with a Web in your Pocket?", which is available at http://www.research.microsoft.com/research/db/debull/98june/webbase.ps.

4. Using Kleinberg's basic algorithm, calculate hub and authority weight vectors for each of the web graphs above. In all cases, show $\mathbf{A}\mathbf{A}^T$, $\mathbf{A}^T\mathbf{A}$ and the leading left and right singular vectors.