



McGill Computational Science and Engineering Seminar



Friday, November 19, 2004 at 10:45 a.m.
McConnell Engineering Bldg. Room 603

Arnoldi-type Algorithms for Computing Stationary Distribution Vectors with Application to PageRank

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The iterative computation of the stationary distribution vector of large finite Markov chains has been receiving a lot of attention recently, mainly due to the success of Google, whose PageRank algorithm plays a major role in its search engine technology. The large size of the matrices involved precludes any possibility of using traditional decompositional techniques, and methods based on matrix-vectors products must be used.

In this talk we look at computing the stationary vector using Arnoldi-type algorithms. We focus on a refined restarted Arnoldi algorithm that relies on the fact that the largest eigenvalue of the matrix is known. Instead of computing Ritz vectors directly, a singular value decomposition approach is incorporated.

We start the talk by providing a general overview of the problem; we will then move to discuss the method we propose and some of its numerical properties. Numerical examples for a few test Markov matrices and Web matrices illustrate the performance and convergence behavior of the algorithm.

$$X = P^T X$$

The diagram illustrates the equation $X = P^T X$. Three red arrows point from the terms in the equation to their respective visual representations below:

- The left X is represented by a vertical blue column vector with values: .1, .3, .2, .3, .1, .1.
- The P^T is represented by a square matrix with a green background and a red horizontal band in the second row. The values in the red band are: 0.2, 0.3, 0, 0.1, .4, 0.1.
- The right X is represented by a vertical blue column vector with values: .1, .3, .2, .3, .1, .1.

Coffee and snacks will be served at 10:30 a.m. in Room 603 before the seminar.