The University of Chicago
Departments of Computer Science,
Mathematics, and Statistics

Scientific and Statistical Computing Seminar

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Fast Pair-wise and Column-wise Matrix Computations for Katz Scores and Commute Times

FRIDAY, October 7, 2011, at 3:30 PM
133 Eckhart Hall, 5734 S. University Avenue (unless announced otherwise).

ABSTRACT

We first explore methods for approximating the commute time and Katz score between a pair of nodes. These methods are based on the approach of matrices, moments, and quadrature developed in the numerical linear algebra community. They rely on the Lanczos process and provide upper and lower bounds on an estimate of the pair-wise scores. We also explore methods to approximate the commute times and Katz scores from a node to all other nodes in the graph. Here, our approach for the commute times is based on a variation of the conjugate gradient algorithm, and it provides an estimate of all the diagonals of the inverse of a matrix. Our technique for the Katz scores is based on exploiting an empirical localization property of the Katz matrix. We adopt algorithms used for personalized PageRank computing to these Katz scores and theoretically show that this approach is convergent. We evaluate these methods on 17 real world graphs ranging in size from 1000 to 1,000,000 nodes. Our results show that our pair-wise commute time method and column-wise Katz algorithm both have attractive theoretical properties and empirical performance.

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