THE UNIVERSITY OF CHICAGO

Departments of Computer Science, Mathematics, and Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

ILSE IPSEN

Department of Mathematics

North Carolina State University

Randomly Sampling Rows from Orthonormal Matrices, with Application to Least Squares Problems

Thursday, December 6, 2012, at at 3:00 PM

206 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

The Blendenpik algorithm is a fast method for solving least squares problems for matrices A of full column rank. Blendenpik consists of the preconditioned iterative solver LSQR, where the preconditioner is obtained by randomly sampling rows of A.

We show that the condition number of the preconditioned matrix can be determined by randomly sampling rows from a specific matrix Q with orthonormal columns. We consider three different sampling strategies, and present different probabilistic bounds for the condition numbers of the sampled matrices. Our bounds depend on the coherence of Q, or on its leverage scores. Numerical experiments confirm the accuracy of the bounds, even for small matrix dimensions.

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