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Speeding up Krylov subspace methods for matrix functions via randomization

Alice Cortinovis
Stanford University

Abstract: In this talk we consider the computation of the action of a matrix function f(A), such as the matrix exponential or the matrix square root, on a vector b. For a general matrix A, this can be done by computing the compression of A onto a suitable Krylov subspace. Such compression is usually computed by forming an orthonormal basis of the Krylov subspace using the Arnoldi method. In this talk, we propose to compute (non-orthonormal) bases in a faster way and to use a fast randomized algorithm for least-squares problems to compute the compression of A onto the Krylov subspace. We present some numerical examples which show that our algorithms can be faster than the standard Arnoldi method while achieving comparable accuracy.

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