

Matrix Computations & Scientific Computing Seminar

Organizer: James Demmel & Ming Gu

Wednesday, 12:10–1:00pm, 380 Soda

March 14 **Kensuke Aishima**, University of Tokyo

dqds algorithm with aggressive deflation for computing singular values

Computing singular values of a bidiagonal matrix is the final phase of the standard algorithm for computing the singular values of a general matrix. The dqds algorithm was introduced in 1994 by Fernando-Parlett for computing all the singular values of a bidiagonal matrix with high relative accuracy. The dqds is currently implemented in LAPACK as DLASQ, which is the standard routine to compute the singular values of bidiagonal matrices. Our objective in this talk is to reduce the dqds runtime with maintaining high relative accuracy. Specifically, we incorporate into the dqds a technique called aggressive deflation, which has been applied successfully to the Hessenberg QR. In addition, a shift-free version of our algorithm has a potential to be parallelized in a pipelined fashion. Our mixed forward-backward stability analysis proves that with our proposed deflation strategy, dqds computes all the singular values to high relative accuracy. Numerical experiments show that our aggressive deflation strategy often reduces the dqds runtime significantly and the new algorithm is comparable in accuracy to the standard dqds algorithm.