

Symmetric SVD Algorithms

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Any complex symmetric matrix has a symmetric singular value decomposition (SSVD) where the right singular vector matrix is the complex conjugate of the left singular vector matrix. In this talk, we discuss the SSVD algorithms for complex symmetric matrices in general and structured matrices such as Toeplitz and Hankel in particular. The computation of SSVD consists of two stages. In the first stage, a complex symmetric matrix is reduced to tridiagonal while maintaining its symmetry. In addition to the standard two-side Householder transformation method, we present Lanczos and block lanczos methods and their orthogonalization schemes. The second stage diagonalizes the complex symmetric and tridiagonal matrix resulted from the first stage. In addition to the standard implicit QR method, we investigate the divide-and-conquer and the twisted methods. We analyze and compare the accuracy and performance of these methods.