

# Accurate eigenvalue decomposition of arrowhead matrices and applications

(Poster)

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(joint work with Ivan Slapničar and Jesse Barlow)

We present a new, improved, algorithm for solving an eigenvalue problem of real symmetric arrowhead matrix. Under certain conditions the algorithm computes all eigenvalues and all components of the corresponding eigenvectors with high relative accuracy in  $O(n^2)$  operations. The algorithm is based on shift-and-invert technique and limited use of double precision arithmetic when necessary. Each eigenvalue and the corresponding eigenvector can be computed separately, which makes the algorithm suitable for cases when only part of the spectrum is required and for parallel computing.

We also present perturbation theory, applications to Hermitian arrowhead matrices and symmetric tridiagonal matrices, diagonal-plus-rank-one matrices, and numerical examples.

MSC2010: 65F15.

Keywords: eigenvalue decomposition, arrowhead matrices.

Section: Numerical Analysis and Scientific Computing.