Lanczos algorithms for large symmetric eigenvalue computations, vol. I: theory

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Abstrak

First published in 1985, Lanczos Algorithms for Large Symmetric Eigenvalue Computations; Vol. I: Theory presents background material, descriptions, and supporting theory relating to practical numerical algorithms for the solution of huge eigenvalue problems. This book deals with "symmetric" problems. However, in this book, "symmetric" also encompasses numerical procedures for computing singular values and vectors of real rectangular matrices and numerical procedures for computing eigenelements of nondefective complex symmetric matrices.

Although preserving orthogonality has been the golden rule in linear algebra, most of the algorithms in this book conform to that rule only locally, resulting in markedly reduced memory requirements. Additionally, most of the algorithms discussed separate the eigenvalue (singular value) computations from the corresponding eigenvector (singular vector) computations. This separation prevents losses in accuracy that can occur in methods which, in order to be able to compute further into the spectrum, use successive implicit deflation by computed eigenvector or singular vector approximations.

This book continues to be useful to the mathematical, scientific, and engineering communities as a reservoir of information detailing the nonclassical side of Lanczos algorithms and as a presentation of what continues to be the most efficient methods for certain types of large-scale eigenvalue computations.