

# The Symmetric Eigenvalue Problem

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In Applied Mathematics

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# Symmetric Eigenvalue Problem

**Beresford N. Parlett**



## **Symmetric Eigenvalue Problem:**

**The Symmetric Eigenvalue Problem** Beresford N. Parlett, 1998-01-01 According to Parlett Vibrations are everywhere and so too are the eigenvalues associated with them As mathematical models invade more and more disciplines we can anticipate a demand for eigenvalue calculations in an ever richer variety of contexts Anyone who performs these calculations will welcome the reprinting of Parlett's book originally published in 1980 In this unabridged amended version Parlett covers aspects of the problem that are not easily found elsewhere The chapter titles convey the scope of the material succinctly The aim of the book is to present mathematical knowledge that is needed in order to understand the art of computing eigenvalues of real symmetric matrices either all of them or only a few The author explains why the selected information really matters and he is not shy about making judgments The commentary is lively but the proofs are terse The first nine chapters are based on a matrix on which it is possible to make similarity transformations explicitly The only source of error is inexact arithmetic The last five chapters turn to large sparse matrices and the task of making approximations and judging them The Symmetric Eigenvalue Problem Beresford N. Parlett, 1980 Accelerated solution of the symmetric eigenvalue problem Victor Pan, 1992 The Symmetric Eigenvalue Problem on a Multiprocessor Sy-Shin Lo, Bernard Philippe, 1993

**Accelerated Solution of the Tridiagonal Symmetric Eigenvalue Problem** International Computer Science Institute, Victor Pan, 1993 Eigenvalue Problems: Algorithms, Software and Applications in Petascale Computing Tetsuya Sakurai, Shao-Liang Zhang, Toshiyuki Imamura, Yusaku Yamamoto, Yoshinobu Kuramashi, Takeo Hoshi, 2018-01-03 This book provides state of the art and interdisciplinary topics on solving matrix eigenvalue problems particularly by using recent petascale and upcoming post petascale supercomputers It gathers selected topics presented at the International Workshops on Eigenvalue Problems Algorithms Software and Applications in Petascale Computing EPASA2014 and EPASA2015 which brought together leading researchers working on the numerical solution of matrix eigenvalue problems to discuss and exchange ideas and in so doing helped to create a community for researchers in eigenvalue problems The topics presented in the book including novel numerical algorithms high performance implementation techniques software developments and sample applications will contribute to various fields that involve solving large scale eigenvalue problems **Core-Chasing Algorithms for the Eigenvalue Problem** Jared L. Aurentz, Thomas Mach, Leonardo Robol, Raf Vandebril, David S. Watkins, 2018-07-06 Eigenvalue computations are ubiquitous in science and engineering John Francis's implicitly shifted QR algorithm has been the method of choice for small to medium sized eigenvalue problems since its invention in 1959 This book presents a new view of this classical algorithm While Francis's original procedure chases bulges the new version chases core transformations which allows the development of fast algorithms for eigenvalue problems with a variety of special structures This also leads to a fast and backward stable algorithm for computing the roots of a polynomial by solving the companion matrix eigenvalue problem The authors received a SIAM Outstanding Paper prize for this work This book will be of interest to

researchers in numerical linear algebra and their students

**Lanczos Algorithms for Large Symmetric Eigenvalue Computations** Jane K. Cullum, Ralph A. Willoughby, 2002-09-01 First published in 1985 this book 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

**Modern Algorithms for Large Sparse Eigenvalue Problems** Arnd Meyer, 1987-12-31 No detailed description available for Modern Algorithms for Large Sparse Eigenvalue Problems

**Error Analysis of Update Methods for the Symmetric Eigenvalue Problem** Jesse L. Barlow, 1991 Abstract Cuppens divide and conquer method for solving the symmetric tridiagonal eigenvalue problem has been shown to be very efficient on shared memory multiprocessor architectures In this paper we resolve some error analysis issues concerning this method We show that the method is stable and suggest a slightly different stopping criterion for finding the zeroes of the spectral function These error analysis results extend to general update methods for the symmetric eigenvalue problem That is we have good backward error bounds for methods to find the eigenvalues and eigenvectors of  $A \rho w w^T$  given those of  $A$  These results can also be used to analyze a new fast method for finding the eigenvalues of banded symmetric Toeplitz matrices

**Numerical Methods for the Symmetric Eigenvalue Problem** Stephen W. Hancock, 1995 *An Error Analysis of Householder's Method for the Symmetric Eigenvalue Problem* James M. Ortega, 1962 *Eigenvalue Problems in Power Systems* Federico Milano, Ioannis Dassios, Muyang Liu, Georgios Tzounas, 2020-12-22 The book provides a comprehensive taxonomy of non symmetrical eigenvalues problems as applied to power systems The book bases all formulations on mathematical concept of matrix pencils MPs and considers both regular and singular MPs for the eigenvalue problems Each eigenvalue problem is illustrated with a variety of examples based on electrical circuits and or power system models and controllers and related data are provided in the appendices of the book Numerical methods for the solution of all considered eigenvalue problems are discussed The focus is on large scale problems and hence attention is dedicated to the performance and scalability of the methods The target of the book are researchers and graduated students in Electrical Computer Science Engineering both taught and research Master programmes as well as PhD programmes and it explains eigenvalue problems applied into electrical power systems explains numerical examples on applying the mathematical

methods into studying small signal stability problems of realistic and large electrical power systems includes detailed and in depth analysis including non linear and other advanced aspects provides theoretical understanding and advanced numerical techniques essential for secure operation of power systems provides a comprehensive set of illustrative examples that support theoretical discussions

**The Matrix Eigenvalue Problem** David S. Watkins, 2007-01-01 An in depth theoretical discussion of the two most important classes of algorithms for solving matrix eigenvalue problems

*The Givens-Householder Method for the Symmetric Eigenvalue Problem* James M. Ortega, 1964

Templates for the Solution of Algebraic Eigenvalue Problems Zhaojun Bai, James Demmel, Jack Dongarra, Axel Ruhe, Henk van der Vorst, 2000-01-01

Mathematics of Computing Numerical Analysis

**The Symmetric Eigenvalue Problem** Tiba Porta, 1987

**High Performance Algorithms for Structured Matrix Problems** Peter Arbenz, 1998 Comprises 10 contributions that summarize the state of the art in the areas of high performance solutions of structured linear systems and structured eigenvalue and singular value problems Topics covered range from parallel solvers for sparse or banded linear systems to parallel computation of eigenvalues and singular values of tridiagonal and bidiagonal matrices Specific paper topics include the stable parallel solution of general narrow banded linear systems efficient algorithms for reducing banded matrices to bidiagonal and tridiagonal form a numerical comparison of look ahead Levinson and Schur algorithms for non Hermitian Toeplitz systems and parallel CG methods automatically optimized for PC and workstation clusters Annotation copyrighted by Book News Inc Portland OR

A Fully Parallel Algorithm for the Symmetric Eigenvalue Problem University of Illinois at Urbana-Champaign. Center for Supercomputing Research and Development, J. J. Dongarra, D. C. Sorensen, 1986 Presents a parallel algorithm for the symmetric eigenvalue problem

*Large Scale Eigenvalue Problems* J. Cullum, R.A. Willoughby, 1986-01-01 Results of research into large scale eigenvalue problems are presented in this volume The papers fall into four principal categories novel algorithms for solving large eigenvalue problems novel computer architectures computationally relevant theoretical analyses and problems where large scale eigenelement computations have provided new insight

## Reviewing **Symmetric Eigenvalue Problem**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Symmetric Eigenvalue Problem**," an enthralling opus penned by a highly acclaimed wordsmith, readers attempt an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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