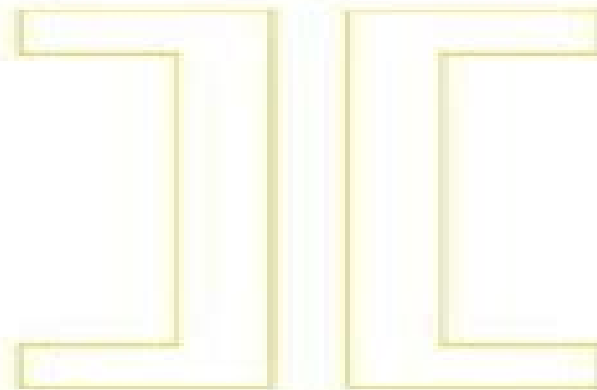


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Parallel Algorithms for Matrix Computations K. Gallivan, M. Heath, E. Ng, B. Peyton, R. Plemmons, C. Romine, A. Sameh, R. Voigt, 1990-01-01 *Mathematics of Computing Parallelism* *Matrix Computations and Mathematical Software* John Rischard Rice, 1981 Linear algebra background types and sources of matrix computational problems type of matrix that arise gauss elimination and LU factorization mathematical software objectives mathematical software performance evaluation how do you know you have right answers conditioning and backward error analysis iterative methods linear least squares and regression projects standard linear algebra software *Parallelism in Matrix Computations* Efstratios Gallopoulos, Bernard Philippe, Ahmed H. Sameh, 2015-07-25 This book is primarily intended as a research monograph that could also be used in graduate courses for the design of parallel algorithms in matrix computations It assumes general but not extensive knowledge of numerical linear algebra parallel architectures and parallel programming paradigms The book consists of four parts I Basics II Dense and Special Matrix Computations III Sparse Matrix Computations and IV Matrix functions and characteristics Part I deals with parallel programming paradigms and fundamental kernels including reordering schemes for sparse matrices Part II is devoted to dense matrix computations such as parallel algorithms for solving linear systems linear least squares the symmetric algebraic eigenvalue problem and the singular value decomposition It also deals with the development of parallel algorithms for special linear systems such as banded Vandermonde Toeplitz and block Toeplitz systems Part III addresses sparse matrix computations a the development of parallel iterative linear system solvers with emphasis on scalable preconditioners b parallel schemes for obtaining a few of the extreme eigenpairs or those contained in a given interval in the spectrum of a standard or generalized symmetric eigenvalue problem and c parallel methods for computing a few of the extreme singular triplets Part IV focuses on the development of parallel algorithms for matrix functions and special characteristics such as the matrix pseudospectrum and the determinant The book also reviews the theoretical and practical background necessary when designing these algorithms and includes an extensive bibliography that will be useful to researchers and students alike The book brings together many existing algorithms for the fundamental matrix computations that have a proven track record of efficient implementation in terms of data locality and data transfer on state of the art systems as well as several algorithms that are presented for the first time focusing on the opportunities for

parallelism and algorithm robustness

Exploiting Hidden Structure in Matrix Computations: Algorithms and Applications Michele Benzi, Dario Bini, Daniel Kressner, Hans Munthe-Kaas, Charles Van Loan, 2017-01-24 Focusing on special matrices and matrices which are in some sense near to structured matrices this volume covers a broad range of topics of current interest in numerical linear algebra Exploitation of these less obvious structural properties can be of great importance in the design of efficient numerical methods for example algorithms for matrices with low rank block structure matrices with decay and structured tensor computations Applications range from quantum chemistry to queuing theory Structured matrices arise frequently in applications Examples include banded and sparse matrices Toeplitz type matrices and matrices with semi separable or quasi separable structure as well as Hamiltonian and symplectic matrices The associated literature is enormous and many efficient algorithms have been developed for solving problems involving such matrices The text arose from a C I M E course held in Cetraro Italy in June 2015 which aimed to present this fast growing field to young researchers exploiting the expertise of five leading lecturers with different theoretical and application perspectives

Matrix Computations and Semiseparable Matrices Raf Vandebril, Marc Van Barel, Nicola Mastronardi, 2008-01-14 In recent years several new classes of matrices have been discovered and their structure exploited to design fast and accurate algorithms In this new reference work Raf Vandebril Marc Van Barel and Nicola Mastronardi present the first comprehensive overview of the mathematical and numerical properties of the family's newest member semiseparable matrices The text is divided into three parts The first provides some historical background and introduces concepts and definitions concerning structured rank matrices The second offers some traditional methods for solving systems of equations involving the basic subclasses of these matrices The third section discusses structured rank matrices in a broader context presents algorithms for solving higher order structured rank matrices and examines hybrid variants such as block quasiseparable matrices An accessible case study clearly demonstrates the general topic of each new concept discussed Many of the routines featured are implemented in Matlab and can be downloaded from the Web for further exploration *Matrix Computations and Semiseparable Matrices* Raf Vandebril, Marc Van Barel, Nicola Mastronardi, 2008-11-12 The general properties and mathematical structures of semiseparable matrices were presented in volume 1 of *Matrix Computations and Semiseparable Matrices* In volume 2 Raf Vandebril Marc Van Barel and Nicola Mastronardi discuss the theory of structured eigenvalue and singular value computations for semiseparable matrices These matrices have hidden properties that allow the development of efficient methods and algorithms to accurately compute the matrix eigenvalues This thorough analysis of semiseparable matrices explains their theoretical underpinnings and contains a wealth of information on implementing them in practice Many of the routines featured are coded in Matlab and can be downloaded from the Web for further exploration

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Liu,2012-12-06 When reality is modeled by computation matrices are often the connection between the continuous physical world and the finite algorithmic one Usually the more detailed the model the bigger the matrix the better the answer however efficiency demands that every possible advantage be exploited The articles in this volume are based on recent research on sparse matrix computations This volume looks at graph theory as it connects to linear algebra parallel computing data structures geometry and both numerical and discrete algorithms The articles are grouped into three general categories graph models of symmetric matrices and factorizations graph models of algorithms on nonsymmetric matrices and parallel sparse matrix algorithms This book will be a resource for the researcher or advanced student of either graphs or sparse matrices it will be useful to mathematicians numerical analysts and theoretical computer scientists alike [Encyclopedia of Parallel Computing](#) David Padua,2011-09-08 Containing over 300 entries in an A Z format the Encyclopedia of Parallel Computing provides easy intuitive access to relevant information for professionals and researchers seeking access to any aspect within the broad field of parallel computing Topics for this comprehensive reference were selected written and peer reviewed by an international pool of distinguished researchers in the field The Encyclopedia is broad in scope covering machine organization programming languages algorithms and applications Within each area concepts designs and specific implementations are presented The highly structured essays in this work comprise synonyms a definition and discussion of the topic bibliographies and links to related literature Extensive cross references to other entries within the Encyclopedia support efficient user friendly searchers for immediate access to useful information Key concepts presented in the Encyclopedia of Parallel Computing include laws and metrics specific numerical and non numerical algorithms asynchronous algorithms libraries of subroutines benchmark suites applications sequential consistency and cache coherency machine classes such as clusters shared memory multiprocessors special purpose machines and dataflow machines specific machines such as Cray supercomputers IBM s cell processor and Intel s multicore machines race detection and auto parallelization parallel programming languages synchronization primitives collective operations message passing libraries checkpointing and operating systems Topics covered Speedup Efficiency Isoefficiency Redundancy Amdahls law Computer Architecture Concepts Parallel Machine Designs Benmarks Parallel Programming concepts design Algorithms Parallel applications This authoritative reference will be published in two formats print and online The online edition features hyperlinks to cross references and to additional significant research Related Subjects supercomputing high performance computing distributed computing [Polynomial and Matrix Computations: Fundamental algorithms](#) Dario Bini,1994

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