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Linear Algebra SIAM

This book introduces numerical issues that arise in linear algebra and its applications. It touches on a wide range of techniques, including direct and iterative methods, orthogonal factorizations, least squares, eigenproblems, and nonlinear equations. Detailed explanations on a wide range of topics from condition numbers to singular value decomposition are provided, as well as material on nonlinear and linear systems. Numerical examples, often based on discretizations of boundary-value problems, are used to illustrate concepts. Exercises with detailed solutions are provided at the end of the book, and supplementary material and updates are available online. This Classics edition is appropriate for junior and senior undergraduate students and beginning graduate students in courses such as advanced numerical analysis, special topics on numerical analysis, topics on data science, topics on numerical optimization, and topics on approximation theory.

Linear Algebra with Applications CRC Press

This book distinguishes itself from the many other textbooks on the topic of linear algebra by including mathematical and computational chapters along with examples and exercises with Matlab. In recent years, the use of computers in many areas of engineering and science has made it essential for students to get training in numerical methods and computer programming. Here, the authors use both Matlab and SciLab software as well as covering core standard material. It is intended for libraries; scientists and researchers; pharmaceutical industry.

Numerical Linear Algebra for High-performance Computers Springer Science & Business Media

This is a book on linear algebra and matrix theory. While it is self contained, it will work best for those who have already had some exposure to linear algebra. It is also assumed that the reader has had calculus. Some optional topics require more analysis than this, however. I think that the subject of linear algebra is likely the most significant topic discussed in undergraduate mathematics courses. Part of the reason for this is its usefulness in unifying so many different topics. Linear algebra is essential in analysis, applied math, and even in theoretical mathematics. This is the point of view of this book, more than a presentation of linear algebra for its own sake. This is why there are numerous applications, some fairly unusual.

Introduction to Computational Linear Algebra SIAM

Matrix analysis presented in the context of numerical computation at a basic level.

Numerical Linear Algebra and Matrix Factorizations Springer

With a substantial amount of new material, the Handbook of Linear Algebra, Second Edition provides comprehensive coverage of linear algebra concepts, applications, and computational software packages in an easy-to-use format. It guides you from the very elementary aspects of the subject to the frontiers of current research. Along with revisions and updates throughout, the second edition of this bestseller includes 20 new chapters. New to the Second Edition Separate chapters on Schur complements, additional types of canonical forms, tensors, matrix polynomials, matrix equations, special types of matrices, generalized inverses, matrices over finite fields, invariant subspaces, representations of quivers, and spectral sets New chapters on combinatorial matrix theory topics, such as tournaments, the minimum rank problem, and spectral graph theory, as well as numerical linear algebra topics, including algorithms for structured matrix computations, stability of structured matrix computations, and nonlinear eigenvalue problems More chapters on applications of linear algebra, including epidemiology and quantum error correction New chapter on using the free and open source software system Sage for linear algebra Additional sections in the chapters on sign pattern matrices and applications to geometry Conjectures and open problems in most chapters on advanced topics Highly praised as a valuable resource for anyone who uses linear algebra, the first edition covered virtually all aspects of linear algebra and its applications. This edition continues to encompass the fundamentals of linear algebra, combinatorial and numerical linear algebra, and applications of linear algebra to various disciplines while also covering up-to-date software packages for linear algebra computations.

Exercises in Numerical Linear Algebra and Matrix Factorizations Springer Science & Business Media

Numerical Linear Algebra is a concise, insightful, and elegant introduction to the field of numerical linear algebra.

Numerical Linear Algebra: Theory and Applications Academic Press

Numerical linear algebra, digital signal processing, and parallel algorithms are three disciplines with a great deal of activity in the last few years. The interaction between them has been growing to a level that merits an Advanced Study Institute dedicated to the three areas together. This volume gives an account of the main results in this interdisciplinary field. The following topics emerged as major themes of the meeting: - Singular value and eigenvalue decompositions, including applications, - Toeplitz matrices, including special algorithms and architectures, - Recursive least squares in linear algebra, digital signal processing and control, - Updating and downdating techniques in linear algebra and signal processing, - Stability and sensitivity

analysis of special recursive least squares problems, - Special architectures for linear algebra and signal processing. This book contains tutorials on these topics given by leading scientists in each of the three areas. A considerable number of new research results are presented in contributed papers. The tutorials and papers will be of value to anyone interested in the three disciplines.

Numerical Linear Algebra and Applications PHI Learning Pvt. Ltd.

This book combines a solid theoretical background in linear algebra with practical algorithms for numerical solution of linear algebra problems. Developed from a number of courses taught repeatedly by the authors, the material covers topics like matrix algebra, theory for linear systems of equations, spectral theory, vector and matrix norms combined with main direct and iterative numerical methods, least squares problems, and eigenproblems. Numerical algorithms illustrated by computer programs written in MATLAB® are also provided as supplementary material on SpringerLink to give the reader a better understanding of professional numerical software for the solution of real-life problems. Perfect for a one- or two-semester course on numerical linear algebra, matrix computation, and large sparse matrices, this text will interest students at the advanced undergraduate or graduate level.

Numerical Linear Algebra Springer Science & Business Media

Matrix algebra is one of the most important areas of mathematics for data analysis and for statistical theory. This much-needed work presents the relevant aspects of the theory of matrix algebra for applications in statistics. It moves on to consider the various types of matrices encountered in statistics, such as projection matrices and positive definite matrices, and describes the special properties of those matrices. Finally, it covers numerical linear algebra, beginning with a discussion of the basics of numerical computations, and following up with accurate and efficient algorithms for factoring matrices, solving linear systems of equations, and extracting eigenvalues and eigenvectors.

Numerical Linear Algebra Arcler Press

Accurate and efficient computer algorithms for factoring matrices, solving linear systems of equations, and extracting eigenvalues and eigenvectors. Regardless of the software system used, the book describes and gives examples of the use of modern computer software for numerical linear algebra. It begins with a discussion of the basics of numerical computations, and then describes the relevant properties of matrix inverses, factorisations, matrix and vector norms, and other topics in linear algebra. The book is essentially self-contained, with the topics addressed constituting the essential material for an introductory course in statistical computing. Numerous exercises allow the text to be used for a first course in statistical computing or as supplementary text for various courses that emphasise computations.

Linear Algebra and Its Applications Springer

Sketching as a Tool for Numerical Linear Algebra highlights the recent advances in algorithms for numerical linear algebra that have come from the technique of linear sketching, whereby given a matrix, one first compressed it to a much smaller matrix by multiplying it by a (usually) random matrix with certain properties. Much of the expensive computation can then be performed on the smaller matrix, thereby accelerating the solution for the original problem. It is an ideal primer for researchers and students of theoretical computer science interested in how sketching techniques can be used to speed up numerical linear algebra applications.

Handbook of Linear Algebra, Second Edition Jones & Bartlett Learning

There exists a vast literature on numerical methods of linear algebra. In our bibliography list, which is by far not complete, we included some monographs on the subject [46], [15], [32], [39], [11], [21]. The present book is devoted to the theory of algorithms for a single problem of linear algebra, namely, for the problem of solving systems of linear equations with non-full-rank matrix of coefficients. The solution of this problem splits into many steps, the detailed discussion of which are interesting problems on their own (bidiagonalization of matrices, computation of singular values and eigenvalues, procedures of deflation of singular values, etc.). Moreover, the theory of algorithms for solutions of the symmetric eigenvalues problem is closely related to the theory of solving linear systems (Householder's algorithms of bidiagonalization and tridiagonalization, eigenvalues and singular values, etc.). It should be stressed that in this book we discuss algorithms which to computer programs having the virtue that the accuracy of computations is guaranteed. As far as the final program product is concerned, this means that the user always finds an unambiguous solution of his problem. This solution might be of two kinds: 1. Solution of the problem with an estimate of errors, where also lutely all errors of input data and machine round-offs are taken into account. 2. *Sketching as a Tool for Numerical Linear Algebra* World Scientific

This well-organized text provides a clear analysis of the fundamental concepts of numerical linear algebra. It presents various numerical methods for the basic topics of linear algebra with a detailed discussion on theory, algorithms, and MATLAB implementation. The book provides a review of matrix algebra and its important results in the opening chapter and examines these results in the subsequent chapters. With clear explanations, the book analyzes different kinds of numerical algorithms for solving linear algebra such as the elimination and iterative methods for linear systems, the condition number of a matrix, singular value decomposition (SVD) of a matrix, and linear least-squares problem. In addition, it describes the Householder and Givens matrices and their applications, and the basic numerical methods for solving the matrix eigenvalue problem. Finally, the text reviews the numerical methods for systems and control. Key Features Includes numerous worked-out examples to help students grasp the concepts easily. ? Provides chapter-end exercises to enable students to check their comprehension of the topics discussed. ? Gives answers to exercises with hints at the end of the book. ? Uses MATLAB software for problem-solving. Primarily designed as a textbook for postgraduate students of Mathematics, this book would also serve as a handbook on matrix computations for scientists and engineers.

An Introduction to Applied Numerical Linear Algebra Using MATLAB Now Publishers

After reading this book, students should be able to analyze computational problems in linear algebra such as linear systems, least squares- and eigenvalue problems, and to develop their own algorithms for solving them. Since these problems can be large and difficult to handle, much can be gained by understanding and taking advantage of special structures. This in turn requires a good grasp of basic numerical linear algebra and matrix factorizations. Factoring a matrix into a product of simpler matrices is a crucial tool in numerical linear algebra, because it allows us to tackle complex problems by solving a sequence of easier ones. The main characteristics of this book are as follows: It is self-contained, only assuming that readers have completed first-year calculus and an introductory course on linear algebra, and that they have some experience with solving mathematical problems on a computer. The book provides detailed proofs of virtually all results. Further, its respective parts can be used independently, making it suitable for self-study. The book consists of 15 chapters, divided into five thematically oriented parts. The chapters are designed for a one-week-per-chapter, one-semester course. To facilitate self-study, an introductory chapter includes a brief review of linear algebra.

Numerical Matrix Analysis Springer Nature

This book is intended for a first linear algebra course. The text includes all essential topics in a concise manner and can therefore be fully covered in a one term course. After this course, the student is fully equipped to specialize further in their direction(s) of choice (advanced pure linear algebra, numerical linear algebra, optimization, multivariate statistics, or one of the many other areas of linear algebra applications). Linear Algebra is an exciting area of mathematics that is gaining more and more importance as the world is becoming increasingly digital. It has the following very appealing features: It is a solid axiomatic based mathematical theory that is accessible to a large variety of students. It has a multitude of applications from many different fields, ranging from traditional science and engineering applications to more 'daily life' applications (internet searches, guessing consumer preferences, etc.). It easily allows for numerical experimentation through the use of a variety of readily available software (both commercial and open source). This book incorporates all these aspects throughout the whole text with the intended effect that each student can find their own niche in the field. Several suggestions of different software are made. While MATLAB is certainly still a favorite choice, open source programs such as Sage (especially among algebraists) and the Python libraries are increasingly popular. This text guides the student through different programs by providing specific commands.

Linear Algebra: Theory and Applications Cambridge University Press
The purpose of this book is to give a thorough introduction to the most commonly used methods of numerical linear algebra and optimisation. The prerequisites are some familiarity with the basic properties of matrices, finite-dimensional vector spaces, advanced calculus, and some elementary notations from functional analysis. The book is in two parts. The first deals with numerical linear algebra (review of matrix theory, direct and iterative methods for solving linear systems, calculation of eigenvalues and eigenvectors) and the second, optimisation (general algorithms, linear and nonlinear programming). The author has based the book on courses taught for advanced undergraduate and beginning graduate students and the result is a well-organised and lucid exposition. Summaries of basic mathematics are provided, proofs of theorems are complete yet kept as simple as possible, and applications from physics and mechanics are discussed. Professor Ciarlet has also helpfully provided over 40 line diagrams, a great many applications, and a useful guide to further reading. This excellent textbook, which is translated and revised from the very successful French edition, will be of great value to students of numerical analysis, applied mathematics and engineering.

Numerical Linear Algebra Cambridge University Press

This edited book, "Numerical Methods and their applications to Linear Algebra", is a collection of contemporary open access articles that highlight new numerical methods and computational techniques for solving of linear algebra problems. Comprised of 11 chapters, this book consists of five major sections: Section 1, Chapters 1 to 3, focuses on the matrix and eigenvalue decompositions. It begins by presenting an algorithm for QR decomposition based on the Gram-Schmidt orthogonalization followed by several iterative methods for computing the singular-value decomposition of a large sparse matrix and eigenvalue decomposition of para-Hermitian matrices. Section 2, Chapters 4 and 5, focuses on the matrix perturbation analysis, the nonlinear matrix differences, the inverse eigenvalue problem and the

construction of a tridiagonal matrix with specified multiple eigenvalues. Section 3, Chapters 6 to 7, focus on the stability analysis and numerical methods for solving differential algebraic equations. Section 4, Chapters 8 to 9, presents several examples of numerical algebra techniques applied to engineering, scientific and real-world problems. Several iterative methods based on Newton iteration, Poisson integration model, an iterative Krylov subspace solver are also featured in this section. Section 5, Chapters 10 to 11, introduces the reader to the development of a variable-metric adaptive projected subgradient method, new techniques for linear arithmetic based on the linear cube transformation. The intended audience of this edited book will mainly consist of graduate or advanced undergraduate students in engineering, science, and mathematics. The contents of this volume will also be of particular interest to researching academics in engineering and science whom to update their knowledge of modern numerical linear algebra methodologies. Book jacket.

Guaranteed Accuracy in Numerical Linear Algebra Springer Science & Business Media

This book presents a unified treatment of recently developed techniques and current understanding about solving systems of linear equations and large scale eigenvalue problems on high-performance computers. It provides a rapid introduction to the world of vector and parallel processing for these linear algebra applications. Topics include major elements of advanced-architecture computers and their performance, recent algorithmic development, and software for direct solution of dense matrix problems, direct solution of sparse systems of equations, iterative solution of sparse systems of equations, and solution of large sparse eigenvalue problems.

Linear Algebra Springer Nature

Building upon the sequence of topics of the popular 5th Edition, **Linear Algebra with Applications**, Alternate Seventh Edition provides instructors with an alternative presentation of course material. In this edition earlier chapters cover systems of linear equations, matrices, and determinates. The vector space R^n is introduced in chapter 4, leading directly into general vector spaces and linear transformations. This order of topics is ideal for those preparing to use linear equations and matrices in their own fields. New exercises and modern, real-world applications allow students to test themselves on relevant key material and a MATLAB manual, included as an appendix, provides 29 sections of computational problems.

Numerical Linear Algebra and Its Applications CRC Press

Numerical Linear Algebra with Applications is designed for those who want to gain a practical knowledge of modern computational techniques for the numerical solution of linear algebra problems, using MATLAB as the vehicle for computation. The book contains all the material necessary for a first year graduate or advanced undergraduate course on numerical linear algebra with numerous applications to engineering and science. With a unified presentation of computation, basic algorithm analysis, and numerical methods to compute solutions, this book is ideal for solving real-world problems. The text consists of six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra. It explains in great detail the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra. In addition to examples from engineering and science applications, proofs of required results are provided without leaving out critical details. The Preface suggests ways in which the book can be used with or without an intensive study of proofs. This book will be a useful reference for graduate or advanced undergraduate students in engineering, science, and mathematics. It will also appeal to professionals in engineering and science, such as practicing engineers who want to see how numerical linear algebra problems can be solved using a programming language such as MATLAB, MAPLE, or Mathematica. Six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra Detailed explanations and examples A through discussion of the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra Examples from engineering and science applications