Elementary Numerical Analysis An Algorithmic Approach

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Methods in Algorithmic Analysis John Wiley & Sons Incorporated

Offering a clear, precise, and accessible presentation, complete with MATLAB programs, this new Third Edition of Elementary Numerical Analysis gives students the support they need to master basic numerical analysis and scientific computing. Now updated and revised, this significant revision features reorganized and rewritten content, as well as some new additional examples and problems. The text introduces core areas of numerical analysis and scientific computing along with basic themes of numerical analysis such as the approximation of problems by simpler methods, the construction of algorithms, iteration methods, error analysis, stability, asymptotic error formulas, and the effects of machine arithmetic.

Numerical Analysis Springer Science & Business Media

Elementary yet rigorous, this concise treatment is directed toward students with a knowledge of advanced calculus, basic numerical analysis, and some background in ordinary differential equations and linear algebra. 1968 edition.

Elementary Numerical Analysis John Wiley & Sons Incorporated

Numerical Algorithms: Methods for Computer Vision, Machine Learning, and Graphics presents a new approach to numerical analysis for modern computer scientists. Using examples from a broad base of computational tasks, including data processing, computational photography, and animation, the textbook introduces numerical modeling and algorithmic desig

Elementary Numerical Analysis John Wiley & Sons

On the occasion of this new edition, the text was enlarged by several new sections. Two sections on B-splines and their computation were added to the chapter on spline functions: Due to their special properties, their flexibility, and the availability of well-tested programs for their computation, B-splines play an important role in many applications. Also, the authors followed suggestions by many readers to supplement the chapter on elimination methods with a section

dealing with the solution of large sparse systems of linear equations. Even though such systems are usually solved by iterative methods, the realm of elimination methods has been widely extended due to powerful techniques for handling sparse matrices. We will explain some of these techniques in connection with the Cholesky algorithm for solving positive definite linear systems. The chapter on eigenvalue problems was enlarged by a section on the Lanczos algorithm; the sections on the LR and QR algorithm were rewritten and now contain a description of implicit shift techniques. In order to some extent take into account the progress in the area of ordinary differential equations, a new section on implicit differential equa tions and differential-algebraic systems was added, and the section on stiff differential equations was updated by describing further methods to solve such equations.

Fundamentals of Numerical Computation (Computer-Oriented Numerical Analysis) Courier Corporation

Numerical analysis is the study of computation and its accuracy, stability and often its implementation on a computer. This book focuses on the principles of numerical analysis and is intended to equip those readers who use statistics to craft their own software and to understand the advantages and disadvantages of different numerical methods.

An Introduction to Numerical Methods and Analysis Cengage Learning

Algorithms play an increasingly important role in nearly all fields of mathematics. This book allows readers to develop basic mathematical abilities, in particular those concerning the design and analysis of algorithms as well as their implementation. It presents not only fundamental algorithms like the sieve of Eratosthenes, the Euclidean algorithm, sorting algorithms, algorithms on graphs, and Gaussian elimination, but also discusses elementary data structures, basic graph theory, and numerical questions. In addition, it provides an introduction to programming and demonstrates in detail how to implement algorithms in C++. This textbook is suitable for students who are new to the subject and covers a basic mathematical lecture course, complementing traditional courses on analysis and linear algebra. Both authors have given this "Algorithmic Mathematics" course at the University of Bonn several times in recent years.

Elementary Functions

Birkh ä user

Number systems and errors; The solution of nonlinear equations; Interpolation and approximation; Differentiation and integration; Matrices and systems of linear equations; The solution of differential equations; Boundary-value problems in ordinary differential equations.

Elementary Theory & Application of Numerical Analysis Springer

This book presents the central ideas of modern numerical analysis in a vivid and straightforward fashion with a minimum of fuss and formality. Stewart designed this volume while teaching an upper-division course in introductory numerical analysis. To clarify what he was teaching, he wrote down each lecture immediately after it was given. The result reflects the wit, insight, and verbal craftmanship which are hallmarks of the author. Simple examples are used to introduce each topic, then the author quickly moves on to the discussion of important methods and techniques. With its rich mixture of graphs and code segments, the book provides insights and advice that help the reader avoid the many pitfalls in numerical computation that can easily trap an unwary beginner. Written by a leading expert in numerical analysis, this book is certain to be the one you need to guide

you through your favorite textbook.

Numerical Analysis for Statisticians John Wiley & Sons

This well-respected text gives an introduction to the theory and application of modern numerical approximation techniques for students taking a one- or two-semester course in numerical analysis. With an accessible treatment that only requires a calculus prerequisite, Burden and Faires explain how, why, and when approximation techniques can be expected to work, and why, in some situations, they fail. A wealth of examples and exercises develop students' intuition, and demonstrate the subject's practical applications to important everyday problems in math, computing, engineering, and physical science disciplines. The first book of its kind built from the ground up to serve a diverse undergraduate audience, three decades later Burden and Faires remains the definitive introduction to a vital and practical subject. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Condition SIAM

This revised edition discusses numerical methods for computing eigenvalues and eigenvectors of large sparse matrices. It provides an in-depth view of the numerical methods that are applicable for solving matrix eigenvalue problems that arise in various engineering and scientific applications. Each chapter was updated by shortening or deleting outdated topics, adding topics of more recent interest, and adapting the Notes and References section. Significant changes have been made to Chapters 6 through 8, which describe algorithms and their implementations and now include topics such as the implicit restart techniques, the Jacobi-Davidson method, and automatic multilevel substructuring.

Algorithmic Mathematics Springer Science & Business Media

Compactly supported smooth piecewise polynomial functions provide an efficient tool for the approximation of curves and surfaces and other smooth functions of one and several arguments. Since they are locally polynomial, they are easy to evaluate. Since they are smooth, they can be used when smoothness is required, as in the numerical solution of partial differential equations (in the Finite Element method) or the modeling of smooth sur faces (in Computer Aided Geometric Design). Since they are compactly supported, their linear span has the needed flexibility to approximate at all, and the systems to be solved in the construction of approximations are 'banded'. The construction of compactly supported smooth piecewise polynomials becomes ever more difficult as the dimension, s, of their domain G ~ IRs, i. e. , the number of arguments, increases. In the univariate case, there is only one kind of cell in any useful partition, namely, an interval, and its boundary consists of two separated points, across which polynomial pieces would have to be matched as one constructs a smooth piecewise polynomial function. This can be done easily, with the only limitation that the num ber of smoothness conditions across such a breakpoint should not exceed the polynomial degree (since that would force the two joining polynomial pieces to coincide). In particular, on any partition, there are (nontrivial) compactly supported piecewise polynomials of degree ~ k and in C(k-l), of which the univariate B-spline is the most useful example.

Elementary Numerical Analysis Academic Press

This book provides a thorough and careful introduction to the theory and practice of scientific computing at an elementary, yet rigorous, level, from theory via examples and algorithms to computer programs. The original FORTRAN programs have been rewritten in MATLAB and now

appear in a new appendix and online, offering a modernized version of this classic reference for basic numerical algorithms.

Elementary Numerical Analysis. An Algorithmic Approach ... Second Edition Springer Science & Business Media

Focusing on grid computing and asynchronism, Parallel Iterative Algorithms explores the theoretical and practical aspects of parallel numerical algorithms. Each chapter contains a theoretical discussion of the topic, an algorithmic section that fully details implementation examples and specific algorithms, and an evaluation of the advantages and drawbacks of the algorithms. Several exercises also appear at the end of most chapters. The first two chapters introduce the general features of sequential iterative algorithms and their applications to numerical problems. The book then describes different kinds of parallel systems and parallel iterative algorithms. It goes on to address both linear and nonlinear parallel synchronous and asynchronous iterative algorithms for numerical computation, with an emphasis on the multisplitting approach. The final chapter discusses the features required for efficient implementation of asynchronous iterative algorithms. Providing the theoretical and practical knowledge needed to design and implement efficient parallel iterative algorithms, this book illustrates how to apply these algorithms to solve linear and nonlinear numerical problems in parallel environments, including local, distant, homogeneous, and heterogeneous clusters.

Numerical Algorithms SIAM

Covers basic topics as well as approximation methods, construction of algorithms, iteration methods, error analysis, stability, asymptotic error formulas and the effect of machine arithmetic. Computer programming applications are given in Fortran-77. Features numerous graphs, problems and exercises at the end of each section.

Computational Methods for Numerical Analysis with R Thomas Telford

This book examines the solution of some of the most common problems of numerical computation. By concentrating on one effective algorithm for each basic task, it develops the fundamental theory in a brief, elementary way. There are ample exercises, and codes are provided to reduce the time otherwise required for programming and debugging. Exposes readers to art of numerical computing as well as the science. Readers need only a familiarity with either FORTRAN or C. Applications are taken from a variety of disciplines including engineering, physics, and chemistry.

Afternotes on Numerical Analysis SIAM

This book provides an elementary yet comprehensive introduction to the numerical solution of partial differential equations (PDEs). Used to model important phenomena, such as the heating of apartments and the behavior of electromagnetic waves, these equations have applications in engineering and the life sciences, and most can only be solved approximately using computers.? Numerical Analysis of Partial Differential Equations Using Maple and MATLAB provides detailed descriptions of the four major classes of discretization methods for PDEs (finite difference method, finite volume method, spectral method, and finite element method) and runnable MATLAB? code for each of the discretization methods and exercises. It also gives self-contained convergence proofs

for each method using the tools and techniques required for the general convergence analysis but adapted to the simplest setting to keep the presentation clear and complete. This book is intended for advanced undergraduate and early graduate students in numerical analysis and scientific computing and researchers in related fields. It is appropriate for a course on numerical methods for partial differential equations.

Academic Press

Market_Desc: · Mathematics Students · Instructors About The Book: This Second Edition of a standard numerical analysis text retains organization of the original edition, but all sections have been revised, some extensively, and bibliographies have been updated. New topics covered include optimization, trigonometric interpolation and the fast Fourier transform, numerical differentiation, the method of lines, boundary value problems, the conjugate gradient method, and the least squares solutions of systems of linear equations.

Numerical Analysis of Partial Differential Equations Using Maple and MATLAB Springer Science & Business Media

This textbook presents the concepts and tools necessary to understand, build, and implement algorithms for computing elementary functions (e.g., logarithms, exponentials, and the trigonometric functions). Both hardware- and software-oriented algorithms are included, along with issues related to accurate floating-point implementation. This third edition has been updated and expanded to incorporate the most recent advances in the field, new elementary function algorithms, and function software. After a preliminary chapter that briefly introduces some fundamental concepts of computer arithmetic, such as floating-point arithmetic and redundant number systems, the text is divided into three main parts. Part I considers the computation of elementary functions using algorithms based on polynomial or rational approximations and using table-based methods; the final chapter in this section deals with basic principles of multiple-precision arithmetic. Part II is devoted to a presentation of " shift-and-add " algorithms (hardware-oriented algorithms that use additions and shifts only). Issues related to accuracy, including range reduction, preservation of monotonicity, and correct rounding, as well as some examples of implementation are explored in Part III. Numerous examples of command lines and full programs are provided throughout for various software packages, including Maple, Sollya, and Gappa. New to this edition are an in-depth overview of the IEEE-754-2008 standard for floating-point arithmetic; a section on using double- and triple-word numbers; a presentation of new tools for designing accurate function software; and a section on the Toom-Cook family of multiplication algorithms. The techniques presented in this book will be of interest to implementers of elementary function libraries or circuits and programmers of numerical applications. Additionally, graduate and advanced undergraduate students, professionals, and researchers in scientific computing, numerical analysis, software engineering, and computer engineering will find this a useful reference and resource. PRAISE FOR PREVIOUS EDITIONS " [T]his book seems like an essential reference for the experts (which I'm not). More importantly, this is an interesting book for the curious (which I am). In this case, you'll probably learn many interesting things from this book. If you teach numerical analysis or approximation theory, then this book will give you some good examples to discuss in class." — MAA Reviews (Review of Second Edition) "The rich content of ideas sketched or presented in some detail in this book is supplemented by a list of over three hundred references, most of them of 1980 or more recent. The book also contains some relevant typical programs." — Zentralblatt MATH (Review of Second Edition) " I think that the book will be very valuable to

students both in numerical analysis and in computer science. I found [it to be] well written and containing much interesting material, most of the time disseminated in specialized papers published in specialized journals difficult to find." — Numerical Algorithms (Review of First Edition)

Precise Numerical Methods Using C++ CRC Press

Elementary Numerical Analysis *Numerical Algorithms with C* Cengage Learning

Offering a clear, precise, and accessible presentation, complete with MATLAB programs, this new Third Edition of Elementary Numerical Analysis gives students the support they need to master basic numerical analysis and scientific computing. Now updated and revised, this significant revision features reorganized and rewritten content, as well as some new additional examples and problems. The text introduces core areas of numerical analysis and scientific computing along with basic themes of numerical analysis such as the approximation of problems by simpler methods, the construction of algorithms, iteration methods, error analysis, stability, asymptotic error formulas, and the effects of machine arithmetic.