

# Axiom The Scientific Computation System

AXIOM Scientific Computing An Introduction to Parallel and Vector Scientific Computation Scientific Computing and Differential Equations Computer Algebra in Scientific Computing Computer Algebra in Scientific Computing CASC'99 Scientific Computation Design and Implementation of Symbolic Computation Systems A Bibliographic Guide to Resources in Scientific Computing, 1945-1975 A Gentle Introduction to Scientific Computing Federal Register Computer Algebra in Scientific Computing Introduction to Scientific Computing Computing Systems Scientific Computing Computer Algebra in Scientific Computing Data-Driven Modeling & Scientific Computation SIAM Journal on Scientific Computing Boumac Mathematical Principles for Scientific Computing and Visualization Numerical Algorithms Group Gene H. Golub Ronald W. Shonkwiler Gene H. Golub Andreas Weber Victor G. Ganzha Gaston H. Gonnet Alfonso Miola Jeffrey R. Yost Dan Stancescu Vladimir P. Gerdt Gabriel A. Pall Michael T. Heath Andreas Weber J. Nathan Kutz John H. Devenney Gerald Farin AXIOM Scientific Computing An Introduction to Parallel and Vector Scientific Computation Scientific Computing and Differential Equations Computer Algebra in Scientific Computing Computer Algebra in Scientific Computing CASC'99 Scientific Computation Design and Implementation of Symbolic Computation Systems A Bibliographic Guide to Resources in Scientific Computing, 1945-1975 A Gentle Introduction to Scientific Computing Federal Register Computer Algebra in Scientific Computing Introduction to Scientific Computing Computing Systems Scientific Computing Computer Algebra in Scientific Computing Data-Driven Modeling & Scientific Computation SIAM Journal on Scientific Computing Boumac Mathematical Principles for Scientific Computing and Visualization Numerical Algorithms Group Gene H. Golub Ronald W. Shonkwiler Gene H. Golub Andreas Weber Victor G. Ganzha Gaston H. Gonnet Alfonso Miola Jeffrey R. Yost Dan Stancescu Vladimir P. Gerdt Gabriel A. Pall Michael T. Heath Andreas Weber J. Nathan Kutz John H. Devenney Gerald Farin

this book introduces the basic concepts of parallel and vector computing in the context of an introduction to numerical methods it contains chapters on parallel and vector matrix multiplication and solution of linear systems by direct and iterative methods it is suitable for advanced undergraduate and beginning graduate courses in computer science applied mathematics and engineering ideally students will have access to a parallel or vector computer but the material can be studied profitably in any case gives a modern overview of scientific computing including parallel and vector computation introduces numerical methods for both ordinary and partial differential equations has considerable discussion of both direct and iterative methods for linear systems

of equations including parallel and vector algorithms covers most of the main topics for a first course in numerical methods and can serve as a text for this course

in this text students of applied mathematics science and engineering are introduced to fundamental ways of thinking about the broad context of parallelism the authors begin by giving the reader a deeper understanding of the issues through a general examination of timing data dependencies and communication these ideas are implemented with respect to shared memory parallel and vector processing and distributed memory cluster computing threads openmp and mpi are covered along with code examples in fortran c and java the principles of parallel computation are applied throughout as the authors cover traditional topics in a first course in scientific computing building on the fundamentals of floating point representation and numerical error a thorough treatment of numerical linear algebra and eigenvector eigenvalue problems is provided by studying how these algorithms parallelize the reader is able to explore parallelism inherent in other computations such as monte carlo methods

scientific computing and differential equations an introduction to numerical methods is an excellent complement to introduction to numerical methods by ortega and poole the book emphasizes the importance of solving differential equations on a computer which comprises a large part of what has come to be called scientific computing it reviews modern scientific computing outlines its applications and places the subject in a larger context this book is appropriate for upper undergraduate courses in mathematics electrical engineering and computer science it is also well suited to serve as a textbook for numerical differential equations courses at the graduate level an introductory chapter gives an overview of scientific computing indicating its important role in solving differential equations and placing the subject in the larger environment contains an introduction to numerical methods for both ordinary and partial differential equations concentrates on ordinary differential equations especially boundary value problems contains most of the main topics for a first course in numerical methods and can serve as a text for this course uses material for junior senior level undergraduate courses in math and computer science plus material for numerical differential equations courses for engineering science students at the graduate level

although scientific computing is very often associated with numeric computations the use of computer algebra methods in scientific computing has obtained considerable attention in the last two decades computer algebra methods are especially suitable for parametric analysis of the key properties of systems arising in scientific computing the expression based computational answers generally provided by these methods are very appealing as they directly relate properties to parameters and speed up testing and tuning of mathematical models through all their possible behaviors this book contains 8 original research articles dealing with a broad range of topics ranging from algorithms data structures and implementation techniques for high

performance sparse multivariate polynomial arithmetic over the integers and rational numbers over methods for certifying the isolated zeros of polynomial systems to computer algebra problems in quantum computing

the development of powerful computer algebra systems has considerably extended the scope of problems of scientific computing which can now be solved successfully with the aid of computers however as the field of applications of computer algebra in scientific computing becomes broader and more complex there is a danger of separation between theory systems and applications for this reason we felt the need to bring together the researchers who now apply the tools of computer algebra for the solution of problems in scientific computing in order to foster new and closer interactions casc 99 is the second conference devoted to applications of computer algebra in scientific computing the first conference in this sequence casc 98 was held 20 24 april 1998 in st petersburg russia this volume contains revised versions of the papers submitted by the participants and accepted by the program committee after a thorough reviewing process the collection of papers included in the proceedings covers various topics of computer algebra methods algorithms and software applied to scientific computing symbolic numeric analysis and solving differential equations efficient computations with polynomials groups matrices and other related objects special purpose programming environments application to physics mechanics optics and to other areas in particular a significant group of papers deals with applications of computer algebra methods for the solution of current problems in group theory which mostly arise in mathematical physics

using real life applications this graduate level textbook introduces different mathematical methods of scientific computation to solve minimization problems using examples ranging from locating an aircraft finding the best time to replace a computer analyzing developments on the stock market and constructing phylogenetic trees the textbook focuses on several methods including nonlinear least squares with confidence analysis singular value decomposition best basis dynamic programming linear programming and various optimization procedures each chapter solves several realistic problems introducing the modeling optimization techniques and simulation as required this allows readers to see how the methods are put to use making it easier to grasp the basic ideas there are also worked examples practical notes and background materials to help the reader understand the topics covered interactive exercises are available at cambridge org 9780521849890

this volume constitutes the proceedings of the international symposium on design and implementation of symbolic computation systems disco 93 held in gmunden austria in september 1993 the growing importance of systems for symbolic computation has greatly influenced the decision of organizing this third conference in the series disco 93 focuses mainly on the most innovative methodological and technological aspects of the design and implementation

of hardware and software systems for symbolic and algebraic computation automated reasoning geometric modeling and computation and automatic programming the general objective of disco 93 is to present an up to date view of the field and to serve as a forum in symbolic computation for the scientific exchange among academic industrial and user communities besides invited talks by buchberger monagan omodeo and hong the volume contains 28 contributions carefully selected by a highly competent international program committee from a total of 56 submissions

an essential contribution to the study of the history of computers this work identifies the computer's impact on the physical biological cognitive and medical sciences references fundamental to the understudied area of the history of scientific computing also document the significant role of the sciences in helping to shape the development of computer technology more broadly the many resources on scientific computing help demonstrate how the computer was the most significant scientific instrument of the 20th century the only guide of its kind covering the use and impact of computers on the physical biological medical and cognitive sciences it contains more than 1 000 annotated citations to carefully selected secondary and primary resources historians of technology and science will find this a very useful resource computer scientists physicians biologists chemists and geologists will also benefit from this extensive bibliography on the history of computer applications and the sciences

scientific computation has established itself as a stand alone area of knowledge at the borderline between computer science and applied mathematics nonetheless its interdisciplinary character cannot be denied its methodologies are increasingly used in a wide variety of branches of science and engineering a gentle introduction to scientific computing intends to serve a very broad audience of college students across a variety of disciplines it aims to expose its readers to some of the basic tools and techniques used in computational science with a view to helping them understand what happens behind the scenes when simple tools such as solving equations plotting and interpolation are used to make the book as practical as possible the authors explore their subject both from a theoretical mathematical perspective and from an implementation driven programming perspective features middle ground approach between theory and implementation suitable reading for a broad range of students in stem disciplines could be used as the primary text for a first course in scientific computing introduces mathematics majors without any prior computer science exposure to numerical methods all mathematical knowledge needed beyond calculus together with the most widely used calculus notation and concepts is introduced in the text to make it self contained the erratum document for a gentle introduction to scientific computing can be accessed here

this book constitutes the proceedings of the 16th international workshop on computer algebra in scientific computing casc 2014 held in warsaw poland in september 2014 the 33 full papers presented were carefully reviewed and selected for inclusion in this book the papers address issues such as studies in

polynomial algebra are represented by contributions devoted to factoring sparse bivariate polynomials using the priority queue the construction of irreducible polynomials by using the newton index real polynomial root finding by means of matrix and polynomial iterations application of the eigenvalue method with symmetry for solving polynomial systems arising in the vibration analysis of mechanical structures with symmetry properties application of gröbner systems for computing the absolute reduction number of polynomial ideals the application of cylindrical algebraic decomposition for solving the quantifier elimination problems certification of approximate roots of overdetermined and singular polynomial systems via the recovery of an exact rational univariate representation from approximate numerical data new parallel algorithms for operations on univariate polynomials multi point evaluation interpolation based on subproduct tree techniques

part i describes the digital computer in terms of technology and systems design concepts chapters 1 and 2 provide certain background information necessary to understand and recognize the characteristics of a computing system designed to solve scientific computing problems and they also define the role of the digital computer as a modern problem solving tool chapter 3 comprises material helpful for a clear understanding of the remaining chapters especially those in part iii and it is presented principally for the sake of definitions and uniform terminology the material on operating systems has been included since students who have had an introduction to programming may not necessarily have an understanding of operating systems monitor programs and such related concepts as input output control throughout turnaround time and operating efficiency this chapter also deals with properties and characteristics of high level programming languages suitable for scientific problem solving it is assumed that the reader already knows one of these languages and is familiar with its syntax and external specifications the intent is to enhance and complement this basic information rather than to teach how to design an artificial language or construct a compiler an abridged version of part 1 was taught to students ranging in level from second year undergraduates in engineering and science and third and fourth year undergraduates in applied mathematics to graduate students in engineering

this book differs from traditional numerical analysis texts in that it focuses on the motivation and ideas behind the algorithms presented rather than on detailed analyses of them it presents a broad overview of methods and software for solving mathematical problems arising in computational modeling and data analysis including proper problem formulation selection of effective solution algorithms and interpretation of results in the 20 years since its original publication the modern fundamental perspective of this book has aged well and it continues to be used in the classroom this classics edition has been updated to include pointers to python software and the chebfun package expansions on barycentric formulation for lagrange polynomial interpretation and stochastic methods and the availability of about 100 interactive educational modules that dynamically illustrate the concepts and algorithms in the book scientific computing an introductory survey second edition is intended as both a textbook and a reference for computationally

oriented disciplines that need to solve mathematical problems

although scientific computing is very often associated with numeric computations the use of computer algebra methods in scientific computing has obtained considerable attention in the last two decades computer algebra methods are especially suitable for parametric analysis of the key properties of systems arising in scientific computing the expression based computational answers generally provided by these methods are very appealing as they directly relate properties to parameters and speed up testing and tuning of mathematical models through all their possible behaviors this book contains 8 original research articles dealing with a broad range of topics ranging from algorithms data structures and implementation techniques for high performance sparse multivariate polynomial arithmetic over the integers and rational numbers over methods for certifying the isolated zeros of polynomial systems to computer algebra problems in quantum computing

the burgeoning field of data analysis is expanding at an incredible pace due to the proliferation of data collection in almost every area of science the enormous data sets now routinely encountered in the sciences provide an incentive to develop mathematical techniques and computational algorithms that help synthesize interpret and give meaning to the data in the context of its scientific setting a specific aim of this book is to integrate standard scientific computing methods with data analysis by doing so it brings together in a self consistent fashion the key ideas from statistics time frequency analysis and low dimensional reductions the blend of these ideas provides meaningful insight into the data sets one is faced with in every scientific subject today including those generated from complex dynamical systems this is a particularly exciting field and much of the final part of the book is driven by intuitive examples from it showing how the three areas can be used in combination to give critical insight into the fundamental workings of various problems data driven modeling and scientific computation is a survey of practical numerical solution techniques for ordinary and partial differential equations as well as algorithms for data manipulation and analysis emphasis is on the implementation of numerical schemes to practical problems in the engineering biological and physical sciences an accessible introductory to advanced text this book fully integrates matlab and its versatile and high level programming functionality while bringing together computational and data skills for both undergraduate and graduate students in scientific computing

excerpt from boumac a macro programming system for scientific computation the purpose of this system is to allow a scientist having no programming knowledge to perform one or a sequence of standard mathematical operations on sets of data using a high speed electronic computer this system is designed to eliminate the task of programming the computer and hence eliminate the necessity of the scientist to learn computer programming about the publisher forgotten books publishes hundreds of thousands of rare and classic books find more at [forgottenbooks.com](http://forgottenbooks.com) this book is a reproduction of

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this non traditional introduction to the mathematics of scientific computation describes the principles behind the major methods from statistics applied mathematics scientific visualization and elsewhere in a way that is accessible to a large part of the scientific community introductory material includes computational basics a review of coo

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