Discrete Computational Structures By Robert R Korfhage

Discrete geometry is a relatively new development in pure mathematics, while computational geometry is an emerging area in applications-driven computer science. Their intermingling has yielded exciting advances in recent years, yet what has been lacking until now is an undergraduate textbook that bridges the gap between the two. Discrete and Computational Geometry offers a comprehensive yet accessible introduction to this cutting-edge frontier of mathematics and computer science. This book covers traditional topics such as convex hulls, triangulations, and Voronoi diagrams, as well as more recent subjects like pseudotriangulations, curve reconstruction, and locked chains. It also touches on more advanced material, including Dehn invariants, associahedra, quasigeodesics, Morse theory, and the recent resolution of the Poincaré conjecture. Connections to real-world applications are made throughout, and algorithms are presented independently of any programming language. This richly illustrated textbook also features numerous exercises and unsolved problems. The essential introduction to discrete and computational geometry Covers traditional topics as well as new and advanced material Features numerous full-color illustrations, exercises, and unsolved problems Suitable for sophomores in mathematics, computer science, engineering, or physics Rigorous but accessible An online solutions manual is available (for teachers only). To obtain access, please e-mail: Vickie_Kearn@press.princeton.edu

Numerical Methods of Mathematical Optimization: With ALGOL and FORTRAN Programs reviews the theory and the practical application of the numerical methods of mathematical optimization. An ALGOL and a FORTRAN program was developed for each one of the algorithms described in the theoretical section. This should result in easy access to the application of the different optimization methods. Comprised of four chapters, this volume begins with a discussion on the theory of linear and nonlinear optimization, with the main stress on an easily understood, mathematically precise presentation. In addition to the theoretical considerations, several algorithms of importance to the numerical application of optimization theory are described. The next chapter explains the computer programs used in actual optimization, which have the form of procedures or subroutines. The book concludes with an analysis of ALGOL and FORTRAN, paying particular attention to their use in global optimization procedures as well as for the simplex and duoplex methods and the decomposition, Gomory, Beale, and Wolfe algorithms. This monograph will be helpful to students and practitioners of computer science and applied mathematics.

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. Stein/Drysdale/Bogart's Discrete Mathematics for Computer Scientists is ideal for computer science students taking the discrete math course. Written specifically for computer science students, this unique textbook directly addresses their needs by providing a foundation in discrete math while using motivating, relevant CS applications. This text takes an active-learning approach where activities are presented as exercises and the material is then fleshed out through explanations and extensions of the exercises.

This book contains an introduction to symbolic logic and a thorough discussion of mechanical theorem proving and its applications. The book consists of three major parts. Chapters 2 and 3 constitute an introduction to symbolic logic. Chapters 4-9 introduce several techniques in mechanical theorem proving, and Chapters 10 an 11 show how theorem proving can be applied to various areas such as question answering, problem solving, program analysis, and program synthesis.

Computer Science and Applied Mathematics: Introduction to Numerical Computations, Second Edition introduces numerical algorithms as they are used in practice. This edition covers the usual topics contained in introductory numerical analysis textbooks that include all of the well-known and most frequently used algorithms for interpolation and approximation, numerical differentiation and integration, solution of linear systems and nonlinear equations, and solving ordinary differential equations. A complete discussion of computer arithmetic, problems that arise in the computer evaluation of functions, and cubic spline interpolation are also provided. This text likewise discusses the Newton formulas for interpolation and adaptive methods for integration. The level of this book is suitable for advanced undergraduate students and readers with elementary mathematical background.

Discrete Computational Structures describes discrete mathematical concepts that are important to computing, covering necessary mathematical fundamentals, computer representation of sets, graph theory, storage minimization, and bandwidth. The book also explains conceptual framework (Gorn trees, searching, subroutines) and directed graphs (flowcharts, critical paths, information network). The text discusses algebra particularly as it applies to concentrates on semigroups, groups, lattices, propositional calculus, including a new tabular method of Boolean function minimization. The text emphasizes combinatorics and probability. Examples show different techniques of the general process of enumerating objects. Combinatorics cover permutations, enumerators for combinations, Stirling numbers, cycle classes of permutations, partitions, and compositions. The book cites as example the interplay between discrete mathematics and computing using a system of distinct representatives (SDR) problem. The problem, originating from group theory, graph theory, and set theory can be worked out by the student with a network model involving computers to generate and analyze different scenarios. The book is intended for sophomore or junior level, corresponding to the course B3, "Introduction to Discrete Structures," in the ACM Curriculum 68, as well as for mathematicians or professors of computer engineering and advanced mathematics.

Computer Science and Applied Mathematics: A Series of Monographs and Textbooks: Software for Roundoff Analysis of Matrix Algorithms focuses on the presentation of techniques and software tools for analyzing the propagation of rounding error in matrix algorithms. The publication looks into some elements of error analysis, concepts from linear algebra and analysis, and directed graphs. Discussions focus on arithmetic graphs, sums of path products, linear transformations, Minkowski sums and Cartesian products, and elementary concepts from analysis. The text then examines software for roundoff analysis, including rounding and perturbations of the computational problem, comparing rounding errors with problem sensitivity, reverse condition numbers, and comparing two algorithms. The book ponders on case studies, as well as Gaussian elimination with iterative improvement, Cholesky factorization, Gauss-Jordan elimination, variants of the Gram-Schmidt method, and Cholesky factors after rank-one modifications. The text is a valuable reference for researchers interested in the techniques and software tools involved in the analysis of the propagation of rounding error in matrix algorithms.

Elementary Linear Programming with Applications presents a survey of the basic ideas in linear programming and related areas. It also provides students with some of the tools used in solving difficult problems which will prove useful in their professional career. The text is comprised of six chapters. The Prologue gives a brief survey of operations research and discusses the different steps in solving an operations research problem. Chapter 0 gives a quick review of the necessary linear algebra. Chapter 1 deals with the basic necessary geometric ideas in Rn. Chapter 2 introduces linear programming with examples of the problems to be considered, and presents the simplex method as an algorithm for solving linear programming problems. Chapter 3 covers further topics in linear programming, including duality theory and sensitivity analysis. Chapter 4 presents an introduction to integer programming. Chapter 5 covers a few of the more important topics in network flows. Students of business, engineering, computer science, and mathematics will find the book very useful.

A practical guide simplifying discrete math for curious minds and demonstrating its application in solving problems related to software development, computer algorithms, and data science Key Features Apply the math of countable objects to practical problems in computer science Explore modern Python libraries such as scikit-learn, NumPy, and SciPy for performing mathematics Learn complex statistical and mathematical concepts with the help of hands-on examples and expert guidance Book Description Discrete mathematics deals with studying countable, distinct elements, and its principles are widely used in building algorithms for computer science and data science. The knowledge of discrete math concepts will help you understand the algorithms, binary, and general mathematics that sit at the core of data-driven tasks. Practical Discrete Mathematics is a comprehensive introduction for those who are new to the mathematics of countable objects. This book will help you get up to speed with using discrete math principles to take your computer science skills to a more advanced level. As you learn the language of discrete mathematics, you'll also cover methods crucial to studying and describing computer science and machine learning objects and algorithms. The chapters that follow will guide you through how memory and CPUs work. In addition to this, you'll understand how to analyze data for useful patterns, before finally exploring how to apply math concepts in network routing, web searching, and data science. By the end of this book, you'll have a deeper understanding of discrete math and its applications in computer science, and be ready to work on real-world algorithm development and machine learning. What you will learn Understand the terminology and methods in discrete math and their usage in algorithms and data problems Use Boolean algebra in formal logic and elementary control structures Implement combinatorics to measure computational complexity and manage memory allocation Use random variables, calculate descriptive statistics, and find average-case computational complexity Solve graph problems involved in routing, pathfinding, and graph searches, such as depth-first search Perform ML tasks such as data visualization, regression, and dimensionality reduction Who this book is for This book is for computer scientists looking to expand their knowledge of discrete math, the core topic of their field. University students looking to get hands-on with computer science, mathematics, statistics, engineering, or related disciplines will also find this book useful. Basic Python programming skills and knowledge of elementary real-number algebra are required to get started with this book.

In this book, the author examines mathematical aspects of finite element methods for the approximate solution of incompressible flow problems. The principal goal is to present some of the important mathematical results that are relevant to practical computations. In so doing, useful algorithms are also discussed. Although rigorous results are stated, no detailed proofs are supplied; rather, the intention is to present these results so that they can serve as a guide for the selection and, in certain respects, the implementation of algorithms.

In this book the authors try to bridge the gap between the treatments of matrix theory and linear algebra. It is aimed at graduate and advanced undergraduate students seeking a foundation in mathematics, computer science, or engineering. It will also be useful as a reference book for those working on matrices and linear algebra for use in their scientific work.

The rapid rate at which the field of digital picture processing has grown in the past five years had necessitated extensive revisions and the introduction of topics not found in the original edition.

Probability, Statistics, and Queueing Theory: With Computer Science Applications focuses on the use of statistics and queueing theory for the design and analysis of data communication systems, emphasizing how the theorems and theory can be used to solve practical computer science problems. This book is divided into three parts. The first part discusses the basic concept of probability, probability distributions commonly used in applied probability, and important concept of a stochastic process. Part II covers the discipline of queueing theory, while Part III deals with statistical inference. This publication is designed as a junior-senior level textbook on applied probability and statistics with computer science applications, but is also a self-study book for practicing computer science (data processing) professionals.

Computer Science and Applied Mathematics: Picture Languages: Formal Models for Picture Recognition treats pictorial pattern recognition from the formal standpoint of automata theory. This book emphasizes the capabilities and relative efficiencies of two types of automata—array automata and cellular array automata, with respect to various array recognition tasks. The array automata are simple processors that perform sequences of operations on arrays, while the cellular array automata are arrays of processors that operate on pictures in a highly parallel fashion, one processor per picture element. This compilation also reviews a collection of results on two-dimensional sequential and parallel array acceptors. Some of the analogous one-dimensional results and array grammars and their relation to acceptors are likewise covered in this text. This publication is suitable for researchers, professionals, and specialists interested in pattern recognition and automata theory.

Computability, Complexity, and Languages: Fundamentals of Theoretical Computer Science provides an introduction to the various aspects of theoretical computer science. Theoretical computer science is the mathematical study of models of computation. This text is composed of five parts encompassing 17 chapters, and begins with an introduction to the use of proofs in mathematics and the development of computability theory in the context of an extremely simple abstract programming language. The succeeding parts demonstrate the performance of abstract programming language using a macro expansion technique, along with presentations of the regular and context-free languages. Other parts deal with the aspects of logic that are important for computer science and the important theory of computational complexity, as well as the theory of NP-completeness. The closing part introduces the advanced recursion and polynomial-time computability theories, including the priority constructions for recursively enumerable Turing degrees. This book is intended primarily for undergraduate and graduate mathematics students.

Every 3rd issue is a quarterly cumulation.

Numerical Solution of Differential Equations is a 10-chapter text that provides the numerical solution and practical aspects of differential equations. After a brief overview of the fundamentals of differential equations, this book goes on presenting the principal useful discretization techniques and their theoretical aspects, along with geometrical and physical examples, mainly from continuum mechanics. Considerable chapters are devoted to the development of the techniques of the numerical solution of differential equations and their analysis. The remaining chapters explore the influential invention in computational mechanics-finite elements. Each chapter emphasizes the relationship among the analytic formulation of the physical event, the discretization techniques applied to it, the algebraic properties of the discrete systems created, and the properties of the digital computer. This book will be of great value to undergraduate and graduate mathematics and physics students.

This volume contains selected papers from the DIMACS Workshop on Logic and Random Structures held in November 1995. The workshop was a major event of the DIMACS Special Year on Logic and Algorithms. The central theme was the relationship between logic and probabilistic techniques in the study of finite structures. In the last several years, this subject has developed into a very active area of mathematical logic with important connections to computer science. The DIMACS workshop was the first of its kind devoted to logic and random structures. Recent work of leaders in the field is contained in the volume, as well as new theoretical developments and applications to computer science.

Computer Science and Applied Mathematics: Mathematical Methods for Wave Phenomena focuses on the methods of applied mathematics, including equations, wave fronts, boundary value problems, and scattering problems. The publication initially ponders on first-order partial differential equations, Dirac delta function, Fourier transforms, asymptotics, and second-order partial differential equations. Discussions focus on prototype second-order equations, asymptotic expansions, asymptotic expansions of Fourier integrals with monotonic phase, method of stationary phase, propagation of wave fronts, and variable index of refraction. The text then examines wave equation in one space dimension, as well as initial boundary value problems, characteristics for the wave equation in one space dimension, and asymptotic solution of the Klein-Gordon equation. The manuscript offers information on wave equation in two and three dimensions and Helmholtz equation and other elliptic equations. Topics include energy integral, domain of dependence, and uniqueness, scattering problems, Green's functions, and problems in unbounded domains and the Sommerfeld radiation condition. The asymptotic techniques for direct scattering problems and the inverse methods for reflector imaging are also elaborated. The text is a dependable reference for computer science experts and mathematicians pursuing studies on the mathematical methods of wave phenomena.

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Combinatorial Algorithms for Computers and Calculators, Second Edition deals with combinatorial algorithms for computers and calculators. Topics covered range from combinatorial families such as the random subset and k-subset of an n-set and Young tableaux, to combinatorial structures including the cycle structure of a permutation and the spanning forest of a graph. Newton forms of a polynomial and the composition of power series are also discussed. Comprised of 30 chapters, this volume begins with an introduction to combinatorial algorithms by considering the generation of all of the 2n subsets of the set {1, 2,...,n}. The discussion then turns to the random subset and k-subset of an n-set; next composition of n into k parts; and random composition of n into k parts. Subsequent chapters focus on sequencing, ranking, and selection algorithms in general combinatorial families; renumbering rows and columns of an array; the cycle structure of a permutation; and the permanent function. Sorting and network flows are also examined, along with the backtrack method and triangular numbering in partially ordered sets. This book will be of value to both students and specialists in the fields of applied mathematics and computer science.

Computer Systems Organization -- general.

Finite Element Solution of Boundary Value Problems: Theory and Computation provides an introduction to both the theoretical and computational aspects of the finite element method for solving boundary value problems for partial differential equations. This book is composed of seven chapters and begins with surveys of the two kinds of preconditioning techniques, one based on the symmetric successive overrelaxation iterative method for solving a system of equations and a form of incomplete factorization. The subsequent chapters deal with the concepts from functional analysis of boundary value problems. These topics are followed by discussions of the Ritz method, which minimizes the quadratic functional associated with a given boundary value problem over some finite-dimensional subspace of the original space of functions. Other chapters are devoted to direct methods, including Gaussian elimination and related methods, for solving a system of linear algebraic equations. The final chapter continues the analysis of preconditioned conjugate gradient methods, concentrating on applications to finite element problems. This chapter also looks into the techniques for reducing rounding errors in the iterative solution of finite element equations. This book will be of value to advanced undergraduates and graduates in the areas of numerical analysis, mathematics, and computer science, as well as for theoretically inclined workers in engineering and the physical sciences.

Iterative Solution of Large Linear Systems describes the systematic development of a substantial portion of the theory of iterative methods for solving large linear systems, with emphasis on practical techniques. The focal point of the book is an analysis of the convergence properties of the successive overrelaxation (SOR) method as applied to a linear system where the matrix is "consistently ordered". Comprised of 18 chapters, this volume begins by showing how the solution of a certain partial differential equation by finite difference methods leads to a large linear system with a sparse matrix. The next chapter reviews matrix theory and the properties of matrices, as well as several theorems of matrix theory without proof. A number of iterative methods, including the SOR method, are then considered. Convergence theorems are also given for various iterative methods under certain assumptions on the matrix A of the system. Subsequent chapters deal with the eigenvalues of the SOR method for consistently ordered matrices; the optimum relaxation factor; nonstationary linear iterative methods; and semi-iterative methods. This book will be of interest to students and practitioners in the fields of computer science and applied mathematics.

Numerical linear algebra is far too broad a subject to treat in a single introductory volume. Stewart has chosen to treat algorithms for solving linear systems, linear least squares problems, and eigenvalue problems involving matrices whose elements can all be contained in the high-speed storage of a computer. By way of theory, the author has chosen to discuss the theory of norms and perturbation theory for linear systems and for the algebraic eigenvalue problem. These choices exclude, among other things, the solution of large sparse linear systems by direct and iterative methods, linear

programming, and the useful Perron-Frobenious theory and its extensions. However, a person who has fully mastered the material in this book should be well prepared for independent study in other areas of numerical linear algebra.
Computer Science and Applied Mathematics: Algorithm-Structured Computer Arrays and Networks: Architectures and Processes for Images, Percepts, Models, Information examines the parallel-array, pipeline, and other network multi-computers. This book describes and explores arrays and networks, those built, being designed, or proposed. The problems of developing higher-level languages for systems and designing algorithm, program, data flow, and computer structure are also discussed. This text likewise describes several sequences of successively more general attempts to combine the power of arrays with the flexibility of networks into structures that reflect and embody the flow of information through their processors. This publication is useful as a textbook or auxiliary textbook for students taking courses on computer architecture, parallel computers, arrays and networks, and image processing and pattern recognition.
The Measure of Mind provides a sustained critique of a widely held representationalist view of propositional attitudes and their role in the production of thought and behaviour. On this view, having a propositional attitude is a matter of having an explicit representation that plays a particular causal/computational role in the production of thought and behaviour. Robert J. Matthews argues that this view does not enjoy the theoretical or the empirical support that proponents claim for it; moreover, the view misconstrues the role of propositional attitude attributions in cognitive scientific theorizing. The Measure of Mind goes on to develop an alternative measurement-theoretic account of propositional attitudes and the sentences by which we attribute them. On this account, the sentences by which we attribute propositional attitudes function semantically like the sentences by which we attribute a quantity of some physical magnitude (e.g., having a mass of 80 kilos). That is, in much the same way that we specify a quantity of some physical magnitude by means of its numerical representative on a measurement scale, we specify propositional attitude of a given type by means of its representative in a linguistically-defined measurement space. Propositional attitudes turn out to be causally efficacious aptitudes for thought and behaviour, not semantically evaluable mental particulars of some sort. Matthews' measurement-theoretic account provides a more plausible view of the explanatorily relevant properties of propositional attitudes, the semantics of propositional attitude attributions, and the role of such attributions in computational cognitive scientific theorizing.
Computer Arithmetic in Theory and Practice deals with computer arithmetic and the various implementations of the entire arithmetic package on diverse processors, including microprocessors. It illustrates the importance of theoretical development in the sound implementation of arithmetic on computers, and argues that such an implementation requires the establishment of various isomorphisms between different definitions of arithmetic operations. Comprised of seven chapters, this volume begins with an introduction to the theory of computer arithmetic by giving an axiomatic characterization of the essential properties of sets and subsets; complete lattices and complete subnets; screens and roundings; and arithmetic operations. The discussion then turns to the concepts of a ringoid and a vectoid as well as those of ordered or weakly ordered ringoids and vectoids; interval arithmetic; and floating-point arithmetic. The operations in interval spaces are defined by means of semimorphisms. The final chapter shows how to embed the five basic data types (integer, real, complex, real interval, and complex interval) together with the arithmetic operations that are defined for all of these types into existing higher programming languages. This book will be helpful to students and practitioners in the fields of computer science and applied mathematics.
Computer Science and Applied Mathematics: Constrained Optimization and Lagrange Multiplier Methods focuses on the advancements in the applications of the Lagrange multiplier methods for constrained minimization. The publication first offers information on the method of multipliers for equality constrained problems and the method of multipliers for inequality constrained and nondifferentiable optimization problems. Discussions focus on approximation procedures for nondifferentiable and ill-conditioned optimization problems; asymptotically exact minimization in the methods of multipliers; duality framework for the method of multipliers; and the quadratic penalty function method. The text then examines exact penalty methods, including nondifferentiable exact penalty functions; linearization algorithms based on nondifferentiable exact penalty functions; differentiable exact penalty functions; and local and global convergence of Lagrangian methods. The book ponders on the nonquadratic penalty functions of convex programming. Topics include large scale separable integer programming problems and the exponential method of multipliers; classes of penalty functions and corresponding methods of multipliers; and convergence analysis of multiplier methods. The text is a valuable reference for mathematicians and researchers interested in the Lagrange multiplier methods.
Note: This is the 3rd edition. If you need the 2nd edition for a course you are taking, it can be found as a "other format" on amazon, or by searching its isbn: 1534970746 This gentle introduction to discrete mathematics is written for first and second year math majors, especially those who intend to teach. The text began as a set of lecture notes for the discrete mathematics course at the University of Northern Colorado. This course serves both as an introduction to topics in discrete math and as the "introduction to proof" course for math majors. The course is usually taught with a large amount of student inquiry, and this text is written to help facilitate this. Four main topics are covered: counting, sequences, logic, and graph theory. Along the way proofs are introduced, including proofs by contradiction, proofs by induction, and combinatorial proofs. The book contains over 470 exercises, including 275 with solutions and over 100 with hints. There are also Investigate! activities throughout the text to support active, inquiry based learning. While there are many fine discrete math textbooks available, this text has the following advantages: It is written to be used in an inquiry rich course. It is written to be used in a course for future math teachers. It is open source, with low cost print editions and free electronic editions. This third edition brings improved exposition, a new section on trees, and a bunch of new and improved exercises. For a complete list of changes, and to view the free electronic version of the text, visit the book's website at discrete.openmathbooks.org