LINEAR ALGEBRA AND PROBABILITY FOR COMPUTER SCIENCE APPLICATIONS

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Newsletter - 1982

Applications in School Mathematics - Sidney Sharron 1979

A Second Course in Linear Algebra - Stephan Ramon Garcia 2017-05-11
Linear algebra is a fundamental tool in many fields, including mathematics and statistics, computer science, economics, and the physical and biological sciences. This undergraduate textbook offers a complete second course in linear algebra, tailored to help students transition from basic theory to advanced topics and applications. Concise chapters promote a focused progression through essential ideas, and contain many examples and illustrative graphics. In addition, each chapter contains a bullet list summarising important concepts, and the book includes over 600 exercises to aid the reader's understanding. Topics are derived and discussed in detail, including the singular value decomposition, the Jordan canonical form, the spectral theorem, the QR factorization, normal matrices, Hermitian matrices (of interest to physics students), and positive definite matrices (of interest to statistics students).

Topics in Tropical Linear Algebra and Applied Probability - Ngoc Mai Tran 2013
Tropical linear algebra is the study of classical linear algebra problems with arithmetic done over the tropical semiring, namely with addition replaced by max, and multiplication replaced by addition. It allows one to reformulate nonlinear problems into piecewise-linear ones. This approach has successfully been employed to solve and characterize solutions to many problems in combinatorial optimization, control theory and game theory [5]. Tropical spectral theory, the study of tropical eigenvalues and eigenspaces, often plays a central role in these applications. We derive the basics of this theory in Chapter 1. In Chapter 2 we give a combinatorial description of the cones of linearity of the tropical eigenvector map. In Chapter 3 we extend this work to cones of linearity of the tropical eigenspace and polytrope map. Our results contribute to a better understanding of the polyhedral foundations of tropical linear algebra. Chapter 4 illustrates the above results in the context of pairwise ranking. Here one as- signs to each pair of candidates a comparison score, and the algorithm produces a cardinal (numerically quantified) ranking of candidates. This setup is natural in sport competitions, business and decision making. The difficulty lies in the existence of inconsistencies of the form A> B> C> A, since pairwise comparisons are performed independently. Tropi- calRank is an algorithm pioneered by Elsner and van den Driessche. Solution sets of this ranking method are precisely the polytropes studied in Chapter 3. For generic input pair- wise comparison matrices, this set contains one unique point that is the tropical eigenvector, which is then interpreted as the comparison score. In particular, the results in Chapter 3 provide a complete classification of all possible solution sets to the optimization problem that TropicalRank solves. This answers open questions from several papers [22, 32] in the area. In Chapter 4 we also show that TropicalRank belongs to the same parametrized family of ranking methods as two other commonly used algorithms, PerronRank and HodgeRank. Furthermore, we show that HodgeRank and PerronRank asymptotically give the same score under certain random ranking models. Despite their mathematical connections, we can construct instances in which these three methods produce arbitrarily different rank order. 2 The last two chapters are topics in applied probability. Chapter 5 studies the exact and asymptotic distribution of size-biased permutations of finite sequences with independent and identically distributed (i.i.d) terms. The size-biased permutation of a positive summable sequence (x1, x2, . . .) is the same sequence presented in a random order (x[1], x[2], . . .), where x[1] is defined to be xi with probability proportional to its `size' xi ; given that x[1] is xi, the next term x[2] is defined to be xj for j = i with probability again proportional to its `size' xj, and so on. Size-biased permutations model the successive sampling method in ecology and oil discovery, where species (or oil reserves) are discovered in a random order proportional to their abundances. In the ranking literature it is known as the Plackett-Luce model, a parametrized family modeling ranking distributions. Size-biased permutation is one of the building blocks of combinatorial stochastic processes, an area of probability with applications to computer science [78]. Finite i.i.d sequence setup serves as a simple model for successive sampling, or ranking with increasing number of items. We study the size-biased permutation of such a sequence using two separate methods: Markov chains and induced order statistics. By going back and forth between the two approaches, we arrive at more general results with simplified proofs, and provide a Poisson coupling argument which leads to an explicit formula for the asymptotic distribution of the last few terms in the size-biased permutation. Chapter 6 is about the binary Little-Hopfield network. This is an established computa- tional model of neural memory storage and retrieval which can have exponential capacity relative to the number of neurons. However, known algorithms have produced networks with linear capacity, and it has been a long-standing open problem whether robust exponential storage is possible. For a network with n neurons, the problem involves a linear program in n2 variables and exponentially many constraints. We utilized the action of the symmetric group on the neuron labels and successfully reduced the problem to a linear program in three variables and three constraints. Thus we explicitly constructed simple networks that answer the question affirmatively, with the best possible asymptotic robustness index. This work calls for further research into Little-Hopfield networks and their applications to theoretical neuroscience and computer science.

Deep Learning with TensorFlow - Giancarlo Zaccone 2017-04-24
Delve into neural networks, implement deep learning algorithms, and explore layers of data abstraction with the help of this comprehensive TensorFlow guide About This Book Learn how to implement advanced techniques in deep learning with Google's brainchild, TensorFlow Explore deep neural networks and layers of data abstraction with the help of this comprehensive guide Real-world contextualization through some deep learning problems concerning research and application Who This Book Is For The book is intended for a general audience of people interested in machine learning and machine intelligence. A rudimentary level of programming in one language is

assumed, as is a basic familiarity with computer science techniques and technologies, including a basic awareness of computer hardware and algorithms. Some competence in mathematics is needed to the level of elementary linear algebra and calculus. What You Will Learn Learn about machine learning landscapes along with the historical development and progress of deep learning Learn about deep machine intelligence and GPU computing with the latest TensorFlow 1.x Access public datasets and utilize them using TensorFlow to load, process, and transform data Use TensorFlow on real-world datasets, including images, text, and more Learn how to evaluate the performance of your deep learning models Using deep learning for scalable object detection and mobile computing Train machines quickly to learn from data by exploring reinforcement learning techniques Explore active areas of deep learning research and applications In Detail Deep learning is the step that comes after machine learning, and has more advanced implementations. Machine learning is not just for academics anymore, but is becoming a mainstream practice through wide adoption, and deep learning has taken the front seat. As a data scientist, if you want to explore data abstraction layers, this book will be your guide. This book shows how this can be exploited in the real world with complex raw data using TensorFlow 1.x. Throughout the book, you'll learn how to implement deep learning algorithms for machine learning systems and integrate them into your product offerings, including search, image recognition, and language processing. Additionally, you'll learn how to analyze and improve the performance of deep learning models. This can be done by comparing algorithms against benchmarks, along with machine intelligence, to learn from the information and determine ideal behaviors within a specific context. After finishing the book, you will be familiar with machine learning techniques, in particular the use of TensorFlow for deep learning, and will be ready to apply your knowledge to research or commercial projects. Style and approach This step-by-step guide will explore common, and not so common, deep neural networks and show how these can be exploited in the real world with complex raw data. With the help of practical examples, you will learn how to implement different types of neural nets to build smart applications related to text, speech, and image data processing.

Probability and Statistics for Data Science - Norman Matloff 2019-06-21

Probability and Statistics for Data Science: Math + R + Data covers "math stat"—distributions, expected value, estimation etc.—but takes the phrase "Data Science" in the title quite seriously: * Real datasets are used extensively. * All data analysis is supported by R coding. * Includes many Data Science applications, such as PCA, mixture distributions, random graph models, Hidden Markov models, linear and logistic regression, and neural networks. * Leads the student to think critically about the "how" and "why" of statistics, and to "see the big picture." * Not "theorem/proof"-oriented, but concepts and models are stated in a mathematically precise manner. Prerequisites are calculus, some matrix algebra, and some experience in programming. Norman Matloff is a professor of computer science at the University of California, Davis, and was formerly a statistics professor there. He is on the editorial boards of the Journal of Statistical Software and The R Journal. His book Statistical Regression and Classification: From Linear Models to Machine Learning was the recipient of the Ziegel Award for the best book reviewed in Technometrics in 2017. He is a recipient of his university's Distinguished Teaching Award.

Basics of Linear Algebra for Machine Learning - Jason Brownlee 2018-01-24

Linear algebra is a pillar of machine learning. You cannot develop a deep understanding and application of machine learning without it. In this laser-focused Ebook, you will finally cut through the equations, Greek letters, and confusion, and discover the topics in linear algebra that you need to know. Using clear explanations, standard Python libraries, and step-by-step tutorial lessons, you will discover what linear algebra is, the importance of linear algebra to machine learning, vector, and matrix operations, matrix factorization, principal component analysis, and much more.

Probability and Computing - Michael Mitzenmacher 2005-01-31

Randomization and probabilistic techniques play an important role in modern computer science, with applications ranging from combinatorial optimization and machine learning to communication networks and secure protocols. This 2005 textbook is designed to accompany a one- or two-semester course for advanced undergraduates or beginning graduate students in computer science and applied mathematics. It gives an excellent introduction to the probabilistic techniques and paradigms used in the development of probabilistic algorithms and analyses. It assumes only an elementary background in discrete mathematics and gives a rigorous yet accessible treatment of the material, with numerous examples and applications. The first half of the book covers core material, including random sampling, expectations, Markov's inequality, Chevyshev's inequality, Chernoff bounds, the probabilistic method and Markov chains. The second half covers more advanced topics such as continuous probability, applications of limited independence, entropy, Markov chain Monte Carlo methods and balanced allocations. With its comprehensive selection of topics, along with many examples and exercises, this book is an indispensable teaching tool.

Probability, Random Variables, Statistics, and Random Processes - Ali Grami 2019-03-04

Probability, Random Variables, Statistics, and Random Processes: Fundamentals & Applications is a comprehensive undergraduate-level textbook. With its excellent topical coverage, the focus of this book is on the basic principles and practical applications of the fundamental concepts that are extensively used in various Engineering disciplines as well as in a variety of programs in Life and Social Sciences. The text provides students with the requisite building blocks of knowledge they require to understand and progress in their areas of interest. With a simple, clear-cut style of writing, the intuitive explanations, insightful examples, and practical applications are the hallmarks of this book. The text consists of twelve chapters divided into four parts. Part-I, Probability (Chapters 1 – 3), lays a solid groundwork for probability theory, and introduces applications in counting, gambling, reliability, and security. Part-II, Random Variables (Chapters 4 – 7), discusses in detail multiple random variables, along with a multitude of frequently-encountered probability distributions. Part-III, Statistics (Chapters 8 – 10), highlights estimation and hypothesis testing. Part-IV, Random Processes (Chapters 11 – 12), delves into the characterization and processing of random processes. Other notable features include: Most of the text assumes no knowledge of subject matter past first year calculus and linear algebra With its independent chapter structure and rich choice of topics, a variety of syllabi for different courses at the junior, senior, and graduate levels can be supported A supplemental website includes solutions to about 250 practice problems, lecture slides, and figures and tables from the text Given its engaging tone, grounded approach, methodically-paced flow, thorough coverage, and flexible structure, Probability, Random Variables, Statistics, and Random Processes: Fundamentals & Applications clearly serves as a must textbook for courses not only in Electrical Engineering, but also in Computer Engineering, Software Engineering, and Computer Science.

Applied Probability - Kenneth Lange 2010-08-13

Applied Probability presents a unique blend of theory and applications, with special emphasis on mathematical modeling, computational techniques, and examples from the biological sciences. It can serve as a textbook for graduate students in applied mathematics, biostatistics, computational biology, computer science, physics, and statistics. Readers should have a working knowledge of multivariate calculus, linear algebra, ordinary differential equations, and elementary probability theory. Chapter 1 reviews elementary probability and provides a brief survey of relevant results from measure theory. Chapter 2 is an extended essay on calculating expectations. Chapter 3 deals with probabilistic applications of convexity, inequalities, and optimization theory. Chapters 4 and 5 touch on combinatorics and combinatorial optimization. Chapters 6 through 11 present core material on stochastic processes. If supplemented with appropriate sections from Chapters 1 and 2, there is sufficient material for a traditional semester-long course in stochastic processes covering the basics of Poisson processes, Markov chains,

branching processes, martingales, and diffusion processes. The second edition adds two new chapters on asymptotic and numerical methods and an appendix that separates some of the more delicate mathematical theory from the steady flow of examples in the main text. Besides the two new chapters, the second edition includes a more extensive list of exercises, many additions to the exposition of combinatorics, new material on rates of convergence to equilibrium in reversible Markov chains, a discussion of basic reproduction numbers in population modeling, and better coverage of Brownian motion. Because many chapters are nearly self-contained, mathematical scientists from a variety of backgrounds will find Applied Probability useful as a reference

Linear Algebra and Group Theory for Physicists and Engineers - Yair Shapira 2019-05-11

This textbook demonstrates the strong interconnections between linear algebra and group theory by presenting them simultaneously, a pedagogical strategy ideal for an interdisciplinary audience. Being approached together at the same time, these two topics complete one another, allowing students to attain a deeper understanding of both subjects. The opening chapters introduce linear algebra with applications to mechanics and statistics, followed by group theory with applications to projective geometry. Then, high-order finite elements are presented to design a regular mesh and assemble the stiffness and mass matrices in advanced applications in quantum chemistry and general relativity. This text is ideal for undergraduates majoring in engineering, physics, chemistry, computer science, or applied mathematics. It is mostly self-contained—readers should only be familiar with elementary calculus. There are numerous exercises, with hints or full solutions provided. A series of roadmaps are also provided to help instructors choose the optimal teaching approach for their discipline.

Coding the Matrix - Philip N. Klein 2013-07

An engaging introduction to vectors and matrices and the algorithms that operate on them, intended for the student who knows how to program. Mathematical concepts and computational problems are motivated by applications in computer science. The reader learns by "doing," writing programs to implement the mathematical concepts and using them to carry out tasks and explore the applications. Examples include: error-correcting codes, transformations in graphics, face detection, encryption and secret-sharing, integer factoring, removing perspective from an image, PageRank (Google's ranking algorithm), and cancer detection from cell features. A companion web site, codingthematrix.com provides data and support code. Most of the assignments can be auto-graded online. Over two hundred illustrations, including a selection of relevant "xkcd" comics. Chapters: "The Function," "The Field," "The Vector," "The Vector Space," "The Matrix," "The Basis," "Dimension," "Gaussian Elimination," "The Inner Product," "Special Bases," "The Singular Value Decomposition," "The Eigenvector," "The Linear Program" A new edition of this text, incorporating corrections and an expanded index, has been issued as of September 4, 2013, and will soon be available on Amazon.

Bulletin of Information - United States Coast Guard Academy

Extremal Combinatorics - Stasys Jukna 2013-03-09

This is a concise, up-to-date introduction to extremal combinatorics for non-specialists. Strong emphasis is made on theorems with particularly elegant and informative proofs which may be called the gems of the theory. A wide spectrum of the most powerful combinatorial tools is presented, including methods of extremal set theory, the linear algebra method, the probabilistic method and fragments of Ramsey theory. A thorough discussion of recent applications to computer science illustrates the inherent usefulness of these methods.

Linear Algebra and Its Applications with R - Ruriko Yoshida 2021-06-23

The book developed from the need to teach a linear algebra course to students focused on data science and bioinformatics programs. These students tend not to realize the importance of linear algebra in applied sciences since traditional linear algebra courses tend to cover mathematical contexts but not the computational aspect of linear algebra or its applications to data science and bioinformatics. The author presents the topics in a traditional course yet offers lectures as well as lab exercises on simulated and empirical data sets. This textbook provides students a theoretical basis which can then be applied to the practical R and Python problems, providing the tools needed for real-world applications. Each section starts with working examples to demonstrate how tools from linear algebra can help solve problems in applied science. These exercises start from easy computations, such as computing determinants of matrices, to practical applications on simulated and empirical data sets with R so that students learn how to get started with R along with computational examples in each section and then they learn how to apply what they learn to problems in applied sciences. This book is designed from first principles to demonstrate the importance of linear algebra through working computational examples with R and python including tutorials on how to install R in the Appendix. If a student has never seen R, they can get started without any additional help. Since Python is one of the most popular languages in data science, optimization, and computer science, code supplements are available for students who feel more comfortable with Python. R is used primarily for computational examples to develop student's practical computational skills. Table of Contents Preface List of Figures List of Tables 1. Systems of Linear Equations and Matrices 2. Matrix Arithmetic 3. Deteminants 4. Vector Spaces 5. Inner Product Space 6. Eigen values and Eigen vectors 7. Linear Regression 8. Linear Programming Network Analysis Appendices A) Introduction to RStudio via Amazon Web Service (AWS) B) Introduction to R Bibliography Index Biography Dr. Ruriko Yoshida is an Associate Professor of Operations Research at the Naval Postgraduate School. She received her Ph.D. in Mathematics from the University of California, Davis. Her research topics cover a wide variety of areas: applications of algebraic combinatorics to statistical problems such as statistical learning on non-Euclidean spaces, sensor networks, phylogenetics, and phylogenomics. She teaches courses in statistics, stochastic models, probability, and data science.

Introduction to Quasi-Monte Carlo Integration and Applications - Gunther Leobacher 2014-09-12

This textbook introduces readers to the basic concepts of quasi-Monte Carlo methods for numerical integration and to the theory behind them. The comprehensive treatment of the subject with detailed explanations comprises, for example, lattice rules, digital nets and sequences and discrepancy theory. It also presents methods currently used in research and discusses practical applications with an emphasis on finance-related problems. Each chapter closes with suggestions for further reading and with exercises which help students to arrive at a deeper understanding of the material presented. The book is based on a one-semester, two-hour undergraduate course and is well-suited for readers with a basic grasp of algebra, calculus, linear algebra and basic probability theory. It provides an accessible introduction for undergraduate students in mathematics or computer science.

Computational Methods for Macromolecules: Challenges and Applications - Tamar Schlick 2012-12-06

This special volume collects invited articles by participants of the Third International Workshop on Methods for Macromolecular Modeling, Courant Institute of Mathematical Sciences, Oct. 12-14, 2000. Leading developers of methods for biomolecular simulations review advances in Monte Carlo and molecular dynamics methods, free energy computational methods, fast electrostatics (particle-mesh Ewald and fast multipole methods), mathematics, and molecular neurobiology, nucleic acid simulations, enzyme reactions, and other essential applications in biomolecular simulations. A Perspectives article by the editors assesses the directions and impact of macromolecular modeling research, including genomics and proteomics. These reviews and original papers by applied mathematicians, theoretical chemists, biomedical researchers, and physicists are of interest to interdisciplinary research students, developers and users of biomolecular methods in academia and industry.

The Probability Companion for Engineering and Computer Science - Adam Prügel-Bennett 2020-01-23

Using examples and building intuition, this friendly guide helps readers understand and use probabilistic tools from basic to sophisticated.

High-Dimensional Probability - Roman Vershynin 2018-09-30

High-dimensional probability offers insight into the behavior of random vectors, random matrices, random subspaces, and objects used to quantify uncertainty in high dimensions. Drawing on ideas from probability, analysis, and geometry, it lends itself to applications in mathematics, statistics, theoretical computer science, signal processing, optimization, and more. It is the first to integrate theory, key tools, and modern applications of high-dimensional probability. Concentration inequalities form the core, and it covers both classical results such as Hoeffding's and Chernoff's inequalities and modern developments such as the matrix Bernstein's inequality. It then introduces the powerful methods based on stochastic processes, including such tools as Slepian's, Sudakov's, and Dudley's inequalities, as well as generic chaining and bounds based on VC dimension. A broad range of illustrations is embedded throughout, including classical and modern results for covariance estimation, clustering, networks, semidefinite programming, coding, dimension reduction, matrix completion, machine learning, compressed sensing, and sparse regression.

Introduction to Inverse Problems in Imaging - M. Bertero 2021-12-20

Fully updated throughout and with several new chapters, this second edition of Introduction to Inverse Problems in Imaging guides advanced undergraduate and graduate students in physics, computer science, mathematics and engineering through the principles of linear inverse problems, in addition to methods of their approximate solution and their practical applications in imaging. This second edition contains new chapters on edge-preserving and sparsity-enforcing regularization in addition to maximum likelihood methods and Bayesian regularization for Poisson data. The level of mathematical treatment is kept as low as possible to make the book suitable for a wide range of students from different backgrounds, with readers needing just a rudimentary understanding of analysis, geometry, linear algebra, probability theory, and Fourier analysis. The authors concentrate on presenting easily implementable and fast solution algorithms, and this second edition is accompanied by numerical examples throughout. It will provide readers with the appropriate background needed for a clear understanding of the essence of inverse problems (ill-posedness and its cure) and, consequently, for an intelligent assessment of the rapidly growing literature on these problems. Key features: Provides an accessible introduction to the topic while keeping mathematics to a minimum Interdisciplinary topic with growing relevance and wide-ranging applications Accompanied by numerical examples throughout

Mathematics for Computer Science - Eric Lehman 2017-03-08

This book covers elementary discrete mathematics for computer science and engineering. It emphasizes mathematical definitions and proofs as well as applicable methods. Topics include formal logic notation, proof methods; induction, well-ordering; sets, relations; elementary graph theory; integer congruences; asymptotic notation and growth of functions; permutations and combinations, counting principles; discrete probability. Further selected topics may also be covered, such as recursive definition and structural induction; state machines and invariants; recurrences; generating functions.

Introduction to Applied Linear Algebra - Stephen Boyd 2018-06-07

A groundbreaking introduction to vectors, matrices, and least squares for engineering applications, offering a wealth of practical examples.

Measures and Probabilities - Michel Simonnet 2012-12-06

Integration theory holds a prime position, whether in pure mathematics or in various fields of applied mathematics. It plays a central role in analysis; it is the basis of probability theory and provides an indispensable tool in mathe matical physics, in particular in quantum mechanics and statistical mechanics. Therefore, many textbooks devoted to integration theory are already avail able. The present book by Michel Simonnet differs from the previous texts in many respects, and, for that reason, it is to be particularly recommended. When dealing with integration theory, some authors choose, as a starting point, the notion of a measure on a family of subsets of a set; this approach is especially well suited to applications in probability theory. Other authors prefer to start with the notion of Radon measure (a continuous linear func tional on the space of continuous functions with compact support on a locally compact space) because it plays an important role in analysis and prepares for the study of distribution theory. Starting off with the notion of Daniell measure, Mr. Simonnet provides a unified treatment of these two approaches.

Probability and Statistics for Computer Science - James L. Johnson 2011-09-09

Comprehensive and thorough development of both probability andstatistics for serious computer scientists; goal-oriented: "topresent the mathematical analysis underlying probabilityresults" Special emphases on simulation and discrete decision theory Mathematically-rich, but self-contained text, at a gentlepace Review of calculus and linear algebra in an appendix Mathematical interludes (in each chapter) which examinemathematical techniques in the context of probabilistic orstatistical importance Numerous section exercises, summaries, historical notes, andFurther Readings for reinforcement of content

Topics in Graph Theory - Mark Anderson 2023-05-31

The interplay between graph theory and a wide variety of models and applications in mathematics, computer science, operations research, and the natural and social sciences continues to grow. This book is geared toward the more mathematically mature student. The first two chapters provide the basic definitions and theorems of graph theory and the remaining chapters introduce a variety of topics and directions for research. These topics draw on numerous areas of theoretical and applied mathematics, including combinatorics, probability, linear algebra, group theory, topology, operations research, and computer science. This makes the book appropriate for a first course at the graduate level or as a second course at the undergraduate level. The authors build upon material previously published in Graph Theory and Its Applications, third edition, by the same authors. That text covers material for both an undergraduate and graduate course, while this book builds on and expands the graduate-level material. List of Features Extensive exercises and applications. Flexibility: appropriate for either a first course at the graduate level; or an advanced course at the undergraduate level. Opens avenues to a variety of research areas in graph theory. Emphasis on topological and algebraic graph theory

Linear Algebra and Probability for Computer Science Applications - Ernest Davis 2012-05-02

Based on the author's course at NYU, Linear Algebra and Probability for Computer Science Applications gives an introduction to two mathematical fields that are fundamental in many areas of computer science. The course and the text are addressed to students with a very weak mathematical background. Most of the chapters discuss relevant MATLAB functi

Elementary Linear Algebra - Stephen Andrilli 2010-02-04

Elementary Linear Algebra develops and explains in careful detail the computational techniques and fundamental theoretical results central to a first course in linear algebra. This highly acclaimed text focuses on developing the abstract thinking essential for further mathematical study The authors give early, intensive attention to the skills necessary to make students comfortable with mathematical proofs. The text builds a gradual and smooth transition from computational results to general theory of abstract vector spaces. It also provides flexbile coverage of practical applications, exploring a comprehensive range of topics. Ancillary list: * Maple Algorithmic testing- Maple TA- www.maplesoft.com Includes a wide variety of applications, technology tips and exercises, organized in chart format for easy reference More than 310 numbered examples in the text at least one for each new concept or application Exercise sets ordered by increasing difficulty, many with multiple parts for a total of more than 2135 questions Provides an early introduction to eigenvalues/eigenvectors A Student solutions manual, containing fully worked out solutions and instructors manual available

Finite Mathematics - Carla C. Morris 2015-09-15

Features step-by-step examples based on actual data and connects fundamental mathematical modeling skills and decision making concepts to everyday applicability Featuring key linear programming, matrix, and probability concepts, Finite Mathematics: Models and Applications emphasizes cross-disciplinary applications that relate mathematics to everyday life. The book provides a unique combination of practical mathematical applications to illustrate the wide use of mathematics in fields ranging from business, economics, finance, management, operations research, and the life and social sciences. In order to emphasize the main concepts of each chapter, Finite Mathematics: Models and Applications features plentiful pedagogical elements throughout such as special exercises, end notes, hints, select solutions, biographies of key mathematicians, boxed key principles, a glossary of important terms and topics, and an overview of use of technology. The book encourages the modeling of linear programs and their solutions and uses common computer software programs such as LINDO. In addition to extensive chapters on probability and statistics, principles and applications of matrices are included as well as topics for enrichment such as the Monte Carlo method, game theory, kinship matrices, and dynamic programming. Supplemented with online instructional support materials, the book features coverage including: Algebra Skills Mathematics of Finance Matrix Algebra Geometric Solutions Simplex Methods Application Models Set and Probability Relationships Random Variables and Probability Distributions Markov Chains Mathematical Statistics Enrichment in Finite Mathematics An ideal textbook, Finite Mathematics: Models and Applications is intended for students in fields from entrepreneurial and economic to environmental and social science, including many in the arts and humanities.

Introduction to Probability Theory With Engineering Applications - Aly Farag 2021-08-05

Introduction to Probability Theory with Engineering Applications provides students with a solid foundation in probability theory, which deals with the modeling of uncertainty, and illuminates several modern applications of probability in engineering, physics and data analysis. The text is organized into five chapters and three appendices. The opening chapter introduces the notion of probability as a model or representation for the uncertainty associated with statistical experiments. In additional chapters, students learn about random variables through explanations of discrete and continuous variables, conditional distribution, and statistical distribution. Students examine functions of one random variable, two random variables, and extensions to multivariable distributions. The final chapter covers random processes. Helpful appendices include six computer laboratories that correspond with the content in Chapters 2-5, assessment and review questions for each chapter, and basic results from linear algebra. The book is an ideal resource for courses in engineering, computer science, biomedicine, physics, and mathematics. It is also an excellent text for researchers seeking an overview in applied probability theory. It is assumed readers have a background in introductory calculus and computer programming.

Encyclopedia of Mathematics Education - Louise Grinstein 2001-03-15

First published in 2001. Routledge is an imprint of Taylor & Francis, an informa company.

A Concise Text on Advanced Linear Algebra - Yisong Yang 2015

This engaging, well-motivated textbook helps advanced undergraduate students to grasp core concepts and reveals applications in mathematics and beyond.

Introduction to Probability with Statistical Applications - Géza Schay 2007-08-23

Introduction to Probability with Statistical Applications targets non-mathematics students, undergraduates and graduates, who do not need an exhaustive treatment of the subject. The presentation is rigorous and contains theorems and proofs, and linear algebra is largely avoided so only a minimal amount of multivariable calculus is needed. The book contains clear definitions, simplified notation and techniques of statistical analysis, which combined with well-chosen examples and exercises, motivate the exposition. Theory and applications are carefully balanced. Throughout the book there are references to more advanced concepts if required.

Applied Linear Algebra in Action - Vasilios Katsikis 2016-07-06

The present text book contains a collection of six high-quality articles. In particular, this book is devoted to Linear Mathematics by presenting problems in Applied Linear Algebra of general or special interest.

Introduction to Probability with Statistical Applications - Géza Schay 2016-06-17

Now in its second edition, this textbook serves as an introduction to probability and statistics for non-mathematics majors who do not need the exhaustive detail and mathematical depth provided in more comprehensive treatments of the subject. The presentation covers the mathematical laws of random phenomena, including discrete and continuous random variables, expectation and variance, and common probability distributions such as the binomial, Poisson, and normal distributions. More classical examples such as Montmort's problem, the ballot problem, and Bertrand's paradox are now included, along with applications such as the Maxwell-Boltzmann and Bose-Einstein distributions in physics. Key features in new edition: * 35 new exercises * Expanded section on the algebra of sets * Expanded chapters on probabilities to include more classical examples * New section on regression * Online instructors' manual containing solutions to all exercises“/p> Advanced undergraduate and graduate students in computer science, engineering, and other natural and social sciences with only a basic background in calculus will benefit from this introductory text balancing theory with applications. Review of the first edition: This textbook is a classical and well-written introduction to probability theory and statistics. ... the book is written 'for an audience such as computer science students, whose mathematical background is not very strong and who do not need the detail and mathematical depth of similar books written for mathematics or statistics majors.' ... Each new concept is clearly explained and is followed by many detailed examples. ... numerous examples of calculations are given and proofs are well-detailed." (Sophie Lemaire, Mathematical Reviews, Issue 2008 m)

Deep Learning for Coders with fastai and PyTorch - Jeremy Howard 2020-06-29

Deep learning is often viewed as the exclusive domain of math PhDs and big tech companies. But as this hands-on guide demonstrates, programmers comfortable with Python can achieve impressive results in deep learning with little math background, small amounts of data, and minimal code. How? With fastai, the first library to provide a consistent interface to the most frequently used deep learning applications. Authors Jeremy Howard and Sylvain Gugger, the creators of fastai, show you how to train a model on a wide range of tasks using fastai and PyTorch. You'll also dive progressively further into deep learning theory to gain a complete understanding of the algorithms behind the scenes. Train models in computer vision, natural language processing, tabular data, and collaborative filtering Learn the latest deep learning techniques that matter most in practice Improve accuracy, speed, and reliability by understanding how deep learning models work Discover how to turn your models into web applications Implement deep learning algorithms from scratch Consider the ethical implications of your work Gain insight from the foreword by PyTorch cofounder, Soumith Chintala

Linear Algebra, Markov Chains, and Queueing Models - Carl D. Meyer 2012-12-06

This IMA Volume in Mathematics and its Applications LINEAR ALGEBRA, MARKOV CHAINS, AND QUEUEING MODELS is based on the proceedings of a workshop which was an integral part of the 1991-92 IMA program on "Applied Linear Algebra". We thank Carl Meyer and R.J. Plemmons for editing the proceedings. We also take this opportunity to thank the National Science Founda tion, whose financial support made the workshop possible. A vner Friedman Willard Miller, Jr. xi PREFACE This volume contains some of the lectures given at the workshop Lin ear Algebra, Markov Chains, and Queueing Models held January 13-17, 1992, as part of the Year of Applied Linear Algebra at the Institute for Mathematics and its Applications. Markov chains and queueing models play an increasingly important role in the understanding of complex systems such as computer, communi cation, and transportation systems. Linear algebra is an indispensable tool in such research, and this volume collects a selection of important papers in this area. The articles contained herein are representative of the underlying

purpose of the workshop, which was to bring together practitioners and re searchers from the areas of linear algebra, numerical analysis, and queueing theory who share a common interest of analyzing and solving finite state Markov chains. The papers in this volume are grouped into three major categories-perturbation theory and error analysis, iterative methods, and applications regarding queueing models.

Thirty-three Miniatures - Jiří Matoušek 2010-01-01

Contains a collection of clever mathematical applications of linear algebra, mainly in combinatorics, geometry, and algorithms. Each chapter covers a single main result with motivation and full proof in at most ten pages and can be read independently of all other chapters (with minor exceptions), assuming only a modest background in linear algebra. --from publisher description

Boolean Algebra and Its Applications - J. Eldon Whitesitt 2012-05-24

Introductory treatment begins with set theory and fundamentals of Boolean algebra, proceeding to concise accounts of applications to symbolic logic, switching circuits, relay circuits, binary arithmetic, and probability theory. 1961 edition.

Mathematics for Machine Learning

- Marc Peter Deisenroth 2020-04-23

The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.

Resources in Education - 1982