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Introduction to Finite Fields and Their Applications - Rudolf Lidl 1986

The first part of this book presents an introduction to the theory of finite fields, with emphasis on those aspects that are relevant for applications. The second part is devoted to a discussion of the most important applications of finite fields especially information theory, algebraic coding theory and cryptology (including some very recent material that has never before appeared in book form). There is also a chapter on applications within mathematics, such as finite geometries, combinatorics, and pseudorandom sequences. Worked-out examples and list of exercises found throughout the book make it useful as a textbook.

The Science of Secrecy - Simon Singh 2000

A TV tie-in edition of The Code Book filmed as a prime-time five-part Channel 4 series on the history of codes and code-breaking and presented by the author. This book, which accompanies the major Channel 4 series, brings to life the hidden history of codes and code breaking. Since the birth of writing, there has also been the need for secrecy. The story of codes is the story of the brilliant men and women who used mathematics, linguistics, machines, computers, gut instinct, logic and detective work to encrypt and break these secret messages and the effect their work has had on history.

The Theory of Error-Correcting Codes - F.J. MacWilliams 1988-06-01

Computational Optimization - Jong-Shi Pang 2012-12-06

Computational Optimization: A Tribute to Olvi Mangasarian serves as an excellent reference, providing insight into some of the most challenging research issues in the field. This collection of papers covers a wide spectrum of computational optimization topics, representing a blend of familiar nonlinear programming topics and such novel paradigms as semidefinite programming and complementarity-constrained nonlinear programs. Many new results are presented in these papers which are bound to inspire further research and generate new avenues for applications. An informal categorization of the papers includes: Algorithmic advances for special classes of constrained optimization problems Analysis of linear and nonlinear programs Algorithmic advances B- stationary points of mathematical programs with equilibrium constraints Applications of optimization Some mathematical topics Systems of nonlinear equations.

Lens Design Fundamentals - Rudolf Kingslake 2009-11-20

Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples - ranging from simple lenses to complex zoom lenses and mirror systems - give insight for both the newcomer and specialist in the field Rudolf Kingslake is regarded as the American father of lens design; his book, not revised since its publication in 1978, is viewed as a classic in the field. Naturally, the area has developed considerably since the book was published, the most obvious changes being the availability of powerful lens design software packages, theoretical advances, and new surface fabrication technologies. This book provides the skills and knowledge to move into the exciting world of contemporary lens design and develop practical lenses needed for the great variety of 21st-century applications. Continuing to focus on fundamental methods and procedures of lens design, this revision by R. Barry Johnson of a classic modernizes symbology and nomenclature, improves conceptual clarity, broadens the study of aberrations, enhances discussion of multi-mirror systems, adds tilted and decentered systems with eccentric pupils, explores use of aberrations in the optimization process, enlarges field flattener concepts, expands discussion of image analysis, includes many new exemplary examples to illustrate concepts, and much more. Optical engineers working in lens design will find this book an invaluable guide to lens

design in traditional and emerging areas of application; it is also suited to advanced undergraduate or graduate course in lens design principles and as a self-learning tutorial and reference for the practitioner. Rudolf Kingslake (1903-2003) was a founding faculty member of the Institute of Optics at The University of Rochester (1929) and remained teaching until 1983. Concurrently, in 1937 he became head of the lens design department at Eastman Kodak until his retirement in 1969. Dr. Kingslake published numerous papers, books, and was awarded many patents. He was a Fellow of SPIE and OSA, and an OSA President (1947-48). He was awarded the Progress Medal from SMPTE (1978), the Frederic Ives Medal (1973), and the Gold Medal of SPIE (1980). R. Barry Johnson has been involved for over 40 years in lens design, optical systems design, and electro-optical systems engineering. He has been a faculty member at three academic institutions engaged in optics education and research, co-founder of the Center for Applied Optics at the University of Alabama in Huntsville, employed by a number of companies, and provided consulting services. Dr. Johnson is an SPIE Fellow and Life Member, OSA Fellow, and an SPIE President (1987). He published numerous papers and has been awarded many patents. Dr. Johnson was founder and Chairman of the SPIE Lens Design Working Group (1988-2002), is an active Program Committee member of the International Optical Design Conference, and perennial co-chair of the annual SPIE Current Developments in Lens Design and Optical Engineering Conference. Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples - ranging from simple lenses to complex zoom lenses and mirror systems - give insight for both the newcomer and specialist in the field

Proofs from THE BOOK - Martin Aigner 2013-06-29

According to the great mathematician Paul Erdős, God maintains perfect mathematical proofs in The Book. This book presents the authors candidates for such "perfect proofs," those which contain brilliant ideas, clever connections, and wonderful observations, bringing new insight and surprising perspectives to problems from number theory, geometry, analysis, combinatorics, and graph theory. As a result, this book will be fun reading for anyone with an interest in mathematics.

Bounded Arithmetic - Samuel R. Buss 1986

Categorical Logic and Type Theory - B. Jacobs 2001-05-10

This book is an attempt to give a systematic presentation of both logic and type theory from a categorical perspective, using the unifying concept of fibred category. Its intended audience consists of logicians, type theorists, category theorists and (theoretical) computer scientists.

Notes on Diffy Qs - Jiri Lebl 2019-11-13

Version 6.0. An introductory course on differential equations aimed at engineers. The book covers first order ODEs, higher order linear ODEs, systems of ODEs, Fourier series and PDEs, eigenvalue problems, the Laplace transform, and power series methods. It has a detailed appendix on linear algebra. The book was developed and used to teach Math 286/285 at the University of Illinois at Urbana-Champaign, and in the decade since, it has been used in many classrooms, ranging from small community colleges to large public research universities. See <https://www.jirka.org/diffyqs/> for more information, updates, errata, and a list of classroom adoptions.

Applied Iterative Methods - Louis A. Hageman 2012-04-27

This graduate-level text examines the practical use of iterative methods in solving large, sparse systems of linear algebraic equations and in resolving multidimensional boundary-value problems. 1981 edition. Includes 48 figures and 35 tables.

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.

Mining of Massive Datasets - Jure Leskovec 2014-11-13

Now in its second edition, this book focuses on practical algorithms for mining data from even the largest datasets.

Notes on Lie Algebras - Hans Samelson 2012-12-06

(Cartan sub Lie algebra, roots, Weyl group, Dynkin diagram, . . .) and the classification, as found by Killing and Cartan (the list of all semisimple Lie algebras consists of (1) the special- linear ones, i. e. all matrices (of any fixed dimension) with trace 0, (2) the orthogonal ones, i. e. all skewsymmetric matrices (of any fixed dimension), (3) the symplectic ones, i. e. all matrices M (of any fixed even dimension) that satisfy $MJ = -JMT$ with a certain non-degenerate skewsymmetric matrix J , and (4) five special Lie algebras G_2, F_4, E_6, E_7, E_8 , of dimensions 14,52,78,133,248, the "exceptional Lie algebras", that just somehow appear in the process). There is also a discussion of the compact form and other real forms of a (complex) semisimple Lie algebra, and a section on automorphisms. The third chapter brings the theory of the finite dimensional representations of a semisimple Lie algebra, with the highest or extreme weight as central notion. The proof for the existence of representations is an ad hoc version of the present standard proof, but avoids explicit use of the Poincare-Birkhoff-Witt theorem. Complete reducibility is proved, as usual, with J. H. C. Whitehead's proof (the first proof, by H. Weyl, was analytical-topological and used the existence of a compact form of the group in question). Then come H.

Fascinating Mathematical People - Donald J. Albers 2011-09-06

Top mathematicians talk about their work and lives Fascinating Mathematical People is a collection of informal interviews and memoirs of sixteen prominent members of the mathematical community of the twentieth century, many still active. The candid portraits collected here demonstrate that while these men and women vary widely in terms of their backgrounds, life stories, and worldviews, they all share a deep and abiding sense of wonder about mathematics. Featured here—in their own words—are major research mathematicians whose cutting-edge discoveries have advanced the frontiers of the field, such as Lars Ahlfors, Mary Cartwright, Dusa McDuff, and Atle Selberg. Others are leading mathematicians who have also been highly influential as teachers and mentors, like Tom Apostol and Jean Taylor. Fern Hunt describes what it was like to be among the first black women to earn a PhD in mathematics. Harold Bacon made trips to Alcatraz to help a prisoner learn calculus. Thomas Banchoff, who first became interested in the fourth dimension while reading a Captain Marvel comic, relates his fascinating friendship with Salvador Dalí and their shared passion for art, mathematics, and the profound connection between the two. Other mathematical people found here are Leon Bankoff, who was also a Beverly Hills dentist; Arthur Benjamin, a part-time professional magician; and Joseph Gallian, a legendary mentor of future mathematicians, but also a world-renowned expert on the Beatles. This beautifully illustrated collection includes many photographs never before published, concise introductions by the editors to each person, and a foreword by Philip J. Davis.

Topics in the Foundations of General Relativity and Newtonian Gravitation Theory - David B. Malament 2012-04-02

In Topics in the Foundations of General Relativity and Newtonian Gravitation Theory, David B. Malament presents the basic logical-mathematical structure of general relativity and considers a number of special topics concerning the foundations of general relativity and its relation to Newtonian gravitation theory. These special topics include the geometrized formulation of Newtonian theory (also known as Newton-Cartan theory), the concept of rotation in general relativity, and Gödel

spacetime. One of the highlights of the book is a no-go theorem that can be understood to show that there is no criterion of orbital rotation in general relativity that fully answers to our classical intuitions. Topics is intended for both students and researchers in mathematical physics and philosophy of science.

Biotechnology Resources - 1983

Directory of resources that serve the national biomedical community with new technologies and procedures. Arrangement according to category of resource service, i.e., Computer resources, Biomedical engineering resources, Biological structure and function, and Cellular and biochemical materials. Each entry gives title of resource, investigator, descriptions of equipment and personnel, objectives or applications, and current research. Geographical index.

Mathematical Models and Their Analysis - Frederick Y. M. Wan 2018-03-20

A great deal can be learned through modeling and mathematical analysis about real-life phenomena, even before numerical simulations are used to accurately portray the specific configuration of a situation. Scientific computing also becomes more effective and efficient if it is preceded by some preliminary analysis. These important advantages of mathematical modeling are demonstrated by models of historical importance in an easily understandable way. The organization of Mathematical Models and Their Analysis groups models by the issues that need to be addressed about the phenomena. The new approach shows how mathematics effective for one modeled phenomenon can be used to analyze another unrelated problem. For instance, the mathematics of differential equations useful in understanding the classical physics of planetary models, fluid motion, and heat conduction is also applicable to the seemingly unrelated phenomena of traffic flow and congestion, offshore sovereignty, and regulation of overfishing and deforestation. The formulation and in-depth analysis of these and other models on modern social issues, such as the management of exhaustible and renewable resources in response to consumption demands and economic growth, are of increasing concern to students and researchers of our time. The modeling of current social issues typically starts with a simple but meaningful model that may not capture all the important elements of the phenomenon. Predictions extracted from such a model may be informative but not compatible with all known observations; so the model may require improvements. The cycle of model formulation, analysis, interpretation, and assessment is made explicit for the modeler to repeat until a model is validated by consistency with all known facts.

High-Dimensional Probability - Roman Vershynin 2018-09-27

An integrated package of powerful probabilistic tools and key applications in modern mathematical data science.

Recent Developments in the Inverse Galois Problem - Michael D. Fried 1995

This book contains the refereed proceedings of the AMS-IMS-SIAM Joint Summer Research Conference on Recent Developments in the Inverse Galois Problem, held in July 1993 at the University of Washington, Seattle. A new review of Serre's Topics in Galois Theory serves as a starting point. The book describes the latest research on explicit presentation of the absolute Galois group of the rationals. Containing the first appearance of generalizations of modular curves, the book presents applications that demonstrate the full scope of the Inverse Galois Problem. In particular, the papers collected here show the ubiquity of the applications of the Inverse Galois Problem and its compelling significance. The book will serve as a guide to progress on the Inverse Galois Problem and as an aid in using this work in other areas of mathematics. This includes coding theory and other finite field applications. Group theory and a first course in algebraic curves are sufficient for understanding many papers in the volume. Graduate students will find this an excellent reference to current research, as it contains a list of problems appropriate for thesis material in arithmetic geometry, algebraic number theory, and group theory.

Mathematical Models in Biology - Leah Edelstein-Keshet 1988-01-01

Mathematical Models in Biology is an introductory book for readers interested in biological applications of mathematics and modeling in biology. A favorite in the mathematical biology community, it shows how relatively simple mathematics can be applied to a variety of models to draw interesting conclusions. Connections are made between diverse biological examples linked by common mathematical themes. A variety of discrete and continuous ordinary and partial differential equation models are explored. Although great advances have taken place in many of the topics covered, the simple lessons contained in this book are still important and informative. Audience: the book does not assume too

much background knowledge--essentially some calculus and high-school algebra. It was originally written with third- and fourth-year undergraduate mathematical-biology majors in mind; however, it was picked up by beginning graduate students as well as researchers in math (and some in biology) who wanted to learn about this field.

Mathematical Reviews - 2003

Interference Alignment - Syed A. Jafar 2011

Interference Alignment: A New Look at Signal Dimensions in a Communication Network provides both a tutorial and a survey of the state-of-art on the topic.

Mathematics of Finance - Donald G. Saari 2019-08-31

This textbook invites the reader to develop a holistic grounding in mathematical finance, where concepts and intuition play as important a role as powerful mathematical tools. Financial interactions are characterized by a vast amount of data and uncertainty; navigating the inherent dangers and hidden opportunities requires a keen understanding of what techniques to apply and when. By exploring the conceptual foundations of options pricing, the author equips readers to choose their tools with a critical eye and adapt to emerging challenges. Introducing the basics of gambles through realistic scenarios, the text goes on to build the core financial techniques of Puts, Calls, hedging, and arbitrage. Chapters on modeling and probability lead into the centerpiece: the Black-Scholes equation. Omitting the mechanics of solving Black-Scholes itself, the presentation instead focuses on an in-depth analysis of its derivation and solutions. Advanced topics that follow include the Greeks, American options, and embellishments. Throughout, the author presents topics in an engaging conversational style. "Intuition breaks" frequently prompt students to set aside mathematical details and think critically about the relevance of tools in context. Mathematics of Finance is ideal for undergraduates from a variety of backgrounds, including mathematics, economics, statistics, data science, and computer science. Students should have experience with the standard calculus sequence, as well as a familiarity with differential equations and probability. No financial expertise is assumed of student or instructor; in fact, the text's deep connection to mathematical ideas makes it suitable for a math capstone course. A complete set of the author's lecture videos is available on YouTube, providing a comprehensive supplementary resource for a course or independent study.

Critical Point Theory and Submanifold Geometry - Richard S. Palais 2006-11-14

An Introduction to Grobner Bases - William W. Adams and Philippe Loustaunau 1994-07-21

A very carefully crafted introduction to the theory and some of the applications of Grobner bases ... contains a wealth of illustrative examples and a wide variety of useful exercises, the discussion is everywhere well-motivated, and further developments and important issues are well sign-posted ... has many solid virtues and is an ideal text for beginners in the subject ... certainly an excellent text. --Bulletin of the London Mathematical Society As the primary tool for doing explicit computations in polynomial rings in many variables, Grobner bases are an important component of all computer algebra systems. They are also important in computational commutative algebra and algebraic geometry. This book provides a leisurely and fairly comprehensive introduction to Grobner bases and their applications. Adams and Loustaunau cover the following topics: the theory and construction of Grobner bases for polynomials with coefficients in a field, applications of Grobner bases to computational problems involving rings of polynomials in many variables, a method for computing syzygy modules and Grobner bases in modules, and the theory of Grobner bases for polynomials with coefficients in rings. With over 120 worked-out examples and 200 exercises, this book is aimed at advanced undergraduate and graduate students. It would be suitable as a supplement to a course in commutative algebra or as a textbook for a course in computer algebra or computational commutative algebra. This book would also be appropriate for students of computer science and engineering who have some acquaintance with modern algebra.

Introduction to Probability - David F. Anderson 2017-11-02

This classroom-tested textbook is an introduction to probability theory, with the right balance between mathematical precision, probabilistic intuition, and concrete applications. Introduction to Probability covers the material precisely, while avoiding excessive technical details. After introducing the basic vocabulary of randomness, including events, probabilities, and random variables, the text offers the reader a first

glimpse of the major theorems of the subject: the law of large numbers and the central limit theorem. The important probability distributions are introduced organically as they arise from applications. The discrete and continuous sides of probability are treated together to emphasize their similarities. Intended for students with a calculus background, the text teaches not only the nuts and bolts of probability theory and how to solve specific problems, but also why the methods of solution work.

Lectures on Finite Fields and Galois Rings - Zhe-Xian Wan 2003

This is a textbook for graduate and upper level undergraduate students in mathematics, computer science, communication engineering and other fields. The explicit construction of finite fields and the computation in finite fields are emphasised. In particular, the construction of irreducible polynomials and the normal basis of finite fields are included. The essentials of Galois rings are also presented. This invaluable book has been written in a friendly style, so that lecturers can easily use it as a text and students can use it for self-study. A great number of exercises have been incorporated.

The Code Book: The Secrets Behind Codebreaking - Simon Singh 2002-05-14

"As gripping as a good thriller." --The Washington Post Unpack the science of secrecy and discover the methods behind cryptography--the encoding and decoding of information--in this clear and easy-to-understand young adult adaptation of the national bestseller that's perfect for this age of WikiLeaks, the Sony hack, and other events that reveal the extent to which our technology is never quite as secure as we want to believe. Coders and codebreakers alike will be fascinated by history's most mesmerizing stories of intrigue and cunning--from Julius Caesar and his Caesar cipher to the Allies' use of the Enigma machine to decode German messages during World War II. Accessible, compelling, and timely, The Code Book is sure to make readers see the past--and the future--in a whole new way. "Singh's power of explaining complex ideas is as dazzling as ever." --The Guardian

Introduction to Coding Theory - J.H. van Lint 1998-12-15

It is gratifying that this textbook is still sufficiently popular to warrant a third edition. I have used the opportunity to improve and enlarge the book. When the second edition was prepared, only two pages on algebraic geometry codes were added. These have now been removed and replaced by a relatively long chapter on this subject. Although it is still only an introduction, the chapter requires more mathematical background of the reader than the remainder of this book. One of the very interesting recent developments concerns binary codes defined by using codes over the alphabet \mathbb{F}_4 . There is so much interest in this area that a chapter on the essentials was added. Knowledge of this chapter will allow the reader to study recent literature on \mathbb{F}_4 -codes. 4

Furthermore, some material has been added that appeared in my Springer Lecture Notes 201, but was not included in earlier editions of this book, e. g. Generalized Reed-Solomon Codes and Generalized Reed-Muller Codes. In Chapter 2, a section on "Coding Gain" (the engineer's justification for using error-correcting codes) was added. For the author, preparing this third edition was a most welcome return to mathematics after seven years of administration. For valuable discussions on the new material, I thank C.P.I.M.Baggen, I. M.Duursma, H.D.L.Hollmann, H. C. A. van Tilborg, and R. M. Wilson. A special word of thanks to R. A. Pellikaan for his assistance with Chapter 10.

Truth in Mathematics - Harold G. Dales 1998

The nature of truth in mathematics has exercised the minds of thinkers from at least the time of the ancient Greeks. The great advances in mathematics and philosophy in the twentieth century and in particular the work by Gödel and the development of the notion of independence in mathematics have led to new and complex views on this question. Collecting the work of a number of outstanding mathematicians and philosophers, including Yuri Manin, Vaughan Jones, and Per Martin-Löf, this volume provides an overview of the forefront of current thinking and a valuable introduction for researchers in the area.

Game Theory through Examples - Erich Prisner 2014-12-31

Game Theory through Examples is a thorough introduction to elementary game theory, covering finite games with complete information. The core philosophy underlying this volume is that abstract concepts are best learned when encountered first (and repeatedly) in concrete settings. Thus, the essential ideas of game theory are here presented in the context of actual games, real games much more complex and rich than the typical toy examples. All the fundamental ideas are here: Nash equilibria, backward induction, elementary probability, imperfect information, extensive and normal form, mixed and behavioral strategies. The active-learning, example-driven approach makes the text suitable for

a course taught through problem solving. Students will be thoroughly engaged by the extensive classroom exercises, compelling homework problems, and nearly sixty projects in the text. Also available are approximately eighty Java applets and three dozen Excel spreadsheets in which students can play games and organize information in order to acquire a gut feeling to help in the analysis of the games. Mathematical exploration is a deep form of play; that maxim is embodied in this book. *Game Theory through Examples* is a lively introduction to this appealing theory. Assuming only high school prerequisites makes the volume especially suitable for a liberal arts or general education spirit-of-mathematics course. It could also serve as the active-learning supplement to a more abstract text in an upper-division game theory course.

Finite Element Methods for Maxwell's Equations - Peter Monk
2003-04-17

The emphasis is on finite element methods for scattering problems that involve the solution of Maxwell's equations on infinite domains. Suitable variational formulations are developed and justified mathematically. An error analysis of edge finite element methods that are particularly well suited to Maxwell's equations is the main focus of the book.

Database Modeling and Design - Toby J. Teorey 1999

This work has been revised and updated to provide a comprehensive treatment of database design for commercial database products and their applications. The book covers the basic foundation of design as well as more advanced techniques, and also incorporates coverage of data warehousing and OLAP (On-Line Analytical Processing), data mining, object-relational, multimedia, and temporal/spatial design.

Ant Colony Optimization - Marco Dorigo 2004-06-04

An overview of the rapidly growing field of ant colony optimization that describes theoretical findings, the major algorithms, and current applications. The complex social behaviors of ants have been much studied by science, and computer scientists are now finding that these behavior patterns can provide models for solving difficult combinatorial optimization problems. The attempt to develop algorithms inspired by one aspect of ant behavior, the ability to find what computer scientists would call shortest paths, has become the field of ant colony optimization (ACO), the most successful and widely recognized algorithmic technique based on ant behavior. This book presents an overview of this rapidly growing field, from its theoretical inception to practical applications, including descriptions of many available ACO algorithms and their uses. The book first describes the translation of observed ant behavior into working optimization algorithms. The ant colony metaheuristic is then introduced and viewed in the general context of combinatorial optimization. This is followed by a detailed description and guide to all major ACO algorithms and a report on current theoretical findings. The book surveys ACO applications now in use, including routing, assignment, scheduling, subset, machine learning, and bioinformatics problems. AntNet, an ACO algorithm designed for the network routing problem, is described in detail. The authors conclude by summarizing the progress in the field and outlining future research directions. Each chapter ends with bibliographic material, bullet points setting out important ideas covered in the chapter, and exercises. *Ant Colony Optimization* will be of interest to academic and industry researchers, graduate students, and practitioners who wish to learn how to implement ACO algorithms.

Spectral Methods in MATLAB - Lloyd N. Trefethen 2000-07-01
Mathematics of Computing -- Numerical Analysis.

Elements of Causal Inference - Jonas Peters 2017-11-29

A concise and self-contained introduction to causal inference, increasingly important in data science and machine learning. The mathematization of causality is a relatively recent development, and has become increasingly important in data science and machine learning. This book offers a self-contained and concise introduction to causal models and how to learn them from data. After explaining the need for causal models and discussing some of the principles underlying causal inference, the book teaches readers how to use causal models: how to compute intervention distributions, how to infer causal models from

observational and interventional data, and how causal ideas could be exploited for classical machine learning problems. All of these topics are discussed first in terms of two variables and then in the more general multivariate case. The bivariate case turns out to be a particularly hard problem for causal learning because there are no conditional independences as used by classical methods for solving multivariate cases. The authors consider analyzing statistical asymmetries between cause and effect to be highly instructive, and they report on their decade of intensive research into this problem. The book is accessible to readers with a background in machine learning or statistics, and can be used in graduate courses or as a reference for researchers. The text includes code snippets that can be copied and pasted, exercises, and an appendix with a summary of the most important technical concepts.

Handbook of Set Theory - Matthew Foreman 2009-12-10

Numbers imitate space, which is of such a different nature —Blaise Pascal It is fair to date the study of the foundation of mathematics back to the ancient Greeks. The urge to understand and systematize the mathematics of the time led Euclid to postulate axioms in an early attempt to put geometry on a firm footing. With roots in the *Elements*, the distinctive methodology of mathematics has become proof. Inevitably two questions arise: What are proofs? and What assumptions are proofs based on? The first question, traditionally an internal question of the field of logic, was also wrestled with in antiquity. Aristotle gave his famous syllogistic systems, and the Stoics had a nascent propositional logic. This study continued with tests and starts, through Boethius, the Arabs and the medieval logicians in Paris and London. The early germs of logic emerged in the context of philosophy and theology. The development of analytic geometry, as exemplified by Descartes, illustrated one of the difficulties inherent in founding mathematics. It is classically phrased as the question of how one reconciles the arithmetic with the geometric. Are numbers one type of thing and geometric objects another? What are the relationships between these two types of objects? How can they interact? Discovery of new types of mathematical objects, such as imaginary numbers and, much later, formal objects such as free groups and formal power series make the problem of finding a common playing field for all of mathematics importunate. Several pressures made foundational issues urgent in the 19th century.

Algebraic Coding Theory (Revised Edition) - Elwyn R Berlekamp
2015-03-26

This is the revised edition of Berlekamp's famous book, 'Algebraic Coding Theory', originally published in 1968, wherein he introduced several algorithms which have subsequently dominated engineering practice in this field. One of these is an algorithm for decoding Reed-Solomon and Bose-Chaudhuri-Hocquenghem codes that subsequently became known as the Berlekamp-Massey Algorithm. Another is the Berlekamp algorithm for factoring polynomials over finite fields, whose later extensions and embellishments became widely used in symbolic manipulation systems. Other novel algorithms improved the basic methods for doing various arithmetic operations in finite fields of characteristic two. Other major research contributions in this book included a new class of Lee metric codes, and precise asymptotic results on the number of information symbols in long binary BCH codes. Selected chapters of the book became a standard graduate textbook. Both practicing engineers and scholars will find this book to be of great value.

Information Theoretic Learning - Jose C. Principe 2010-04-06

This book is the first cohesive treatment of ITL algorithms to adapt linear or nonlinear learning machines both in supervised and unsupervised paradigms. It compares the performance of ITL algorithms with the second order counterparts in many applications.

Algorithmic Learning Theory - Osamu Watanabe 2007-03-05

This book constitutes the refereed proceedings of the 10th International Conference on Algorithmic Learning Theory, ALT'99, held in Tokyo, Japan, in December 1999. The 26 full papers presented were carefully reviewed and selected from a total of 51 submissions. Also included are three invited papers. The papers are organized in sections on Learning Dimension, Inductive Inference, Inductive Logic Programming, PAC Learning, Mathematical Tools for Learning, Learning Recursive Functions, Query Learning and On-Line Learning.