

application of modern algebra

The Unexpectedly Wide World of Modern Algebra Applications

Introduction:

Have you ever wondered about the hidden power behind the seemingly abstract world of modern algebra? Beyond the theorems and proofs, lies a surprisingly diverse landscape of real-world applications that impact our daily lives in profound ways. This comprehensive guide delves into the fascinating realm of modern algebra's applications, exploring its unexpected contributions to fields ranging from cryptography and coding theory to computer graphics and quantum physics. We'll unravel the complexities, revealing how abstract algebraic structures underpin many of the technologies we rely on every day. Get ready to discover the surprising versatility of modern algebra and its vital role in shaping our modern world.

1. Cryptography: Securing Our Digital World

Modern algebra is the bedrock of many modern encryption techniques. The security of online banking, e-commerce, and secure communication relies heavily on concepts like finite fields and group theory. Public-key cryptography, the foundation of secure online transactions, utilizes the difficulty of solving certain algebraic problems, such as factoring large numbers (RSA algorithm) or the discrete logarithm problem (Elliptic Curve Cryptography – ECC). These algorithms leverage the properties of specific algebraic structures to ensure data confidentiality and integrity. Without the sophisticated tools provided by modern algebra, our digital world would be significantly less secure, vulnerable to widespread data breaches and cyberattacks.

1. Coding Theory: Ensuring Accurate Data Transmission

The reliable transmission of data, whether across the internet, through satellite communication, or stored on physical media, is crucial. Coding theory, a branch of mathematics deeply intertwined with modern algebra, plays a pivotal role in error detection and correction. Linear codes, built on vector spaces and finite fields, allow us to add redundancy to data in a structured way. This redundancy enables the detection and correction of errors that might occur during transmission or storage, guaranteeing data integrity. Modern algebra provides the theoretical framework and algorithms for constructing efficient and powerful error-correcting codes, essential for maintaining the reliability of our communication systems.

1. Computer Graphics: Shaping Visual Worlds

The visually stunning graphics we experience in video games, computer-aided design (CAD) software, and 3D modeling are heavily reliant on the underlying mathematics of modern algebra. Transformations such as rotations, scaling, and translations, essential for manipulating three-dimensional objects, are represented using matrices and vector spaces – core concepts within linear algebra, a branch of modern algebra. Understanding these algebraic structures enables efficient computation and manipulation of graphical objects, contributing to the realistic and immersive visual experiences we enjoy today.

1. Quantum Computing: Harnessing the Power of Quantum Mechanics

Quantum computing, a rapidly developing field with the potential to revolutionize computation, also draws heavily on modern algebra. Quantum mechanics, the underlying theory governing quantum computers, is described using complex Hilbert spaces, a concept originating in abstract algebra. Quantum algorithms, designed to solve problems intractable for classical computers, often rely on group theory and other algebraic structures to manipulate quantum states and extract meaningful results. As quantum computing matures, modern algebra's role will only become more critical.

1. Network Theory and Optimization: Connecting the World

Modern algebra provides the mathematical tools needed to analyze and optimize complex networks, such as communication networks, transportation networks, and social networks. Graph theory, a branch of mathematics closely related to modern algebra, provides the framework for representing and analyzing these networks. Algebraic techniques are used to find optimal paths, identify bottlenecks, and ensure efficient flow of information or goods through these networks. The optimization problems arising in these contexts are frequently tackled using techniques rooted in abstract algebra.

1. Polynomial Rings and Applications in Signal Processing:

Signal processing, which underpins many technologies from audio and image processing to telecommunications, relies heavily on the mathematical framework provided by polynomial rings. These algebraic structures are used to represent and manipulate signals, filtering out noise and extracting relevant information. Techniques such as discrete Fourier transforms, crucial for signal analysis and processing, are fundamentally algebraic in nature. This connection between polynomial rings and signal processing underscores the surprising breadth of modern algebra's applications.

1. The Design and Analysis of Algorithms:

The efficiency and correctness of algorithms, the very foundation of computer science, often rely on sophisticated mathematical analyses grounded in modern algebra. The study of algorithm complexity, a crucial aspect of algorithm design, frequently employs algebraic concepts to analyze the time and space requirements of different algorithms. Furthermore, the design of some advanced algorithms leverages specific algebraic structures to achieve optimal performance.

1. Error-Correcting Codes in Data Storage:

Beyond data transmission, modern algebra plays a critical role in ensuring data integrity in storage media. From hard drives to flash memory and cloud storage, error-correcting codes derived from algebraic structures protect data from corruption due to physical defects or noise. The ability to reliably retrieve data even in the presence of errors is essential for the functioning of modern information technology.

1. Finite State Machines and Automata Theory:

Finite state machines, used extensively in computer science and engineering, can be effectively analyzed using algebraic techniques. The states and transitions within a finite state machine can be represented using algebraic structures, enabling formal analysis of their behavior and properties. This algebraic approach helps verify the correctness and efficiency of complex systems modeled using finite state machines.

A Textbook Outline: "Applications of Modern Algebra in the Digital Age"

Introduction: Brief overview of modern algebra and its relevance to the modern world.

Chapter 1: Linear Algebra and its Applications: Matrix algebra, vector spaces, linear transformations, applications in computer graphics, cryptography (RSA), and signal processing.

Chapter 2: Group Theory and its Applications: Groups, subgroups, group homomorphisms, applications in cryptography (ECC), coding theory, and quantum computing.

Chapter 3: Ring Theory and its Applications: Rings, ideals, polynomial rings, applications in coding theory, signal processing, and cryptography.

Chapter 4: Field Theory and its Applications: Fields, finite fields, Galois theory, applications in cryptography and coding theory.

Chapter 5: Advanced Topics and Emerging Applications: A discussion of more advanced topics like lattice-based cryptography, graph theory, and applications in network optimization and machine learning.

Conclusion: Summary of key applications and future directions for the field.

FAQs:

1. What is the difference between classical algebra and modern algebra? Classical algebra focuses primarily on solving equations, while modern algebra emphasizes the study of algebraic structures (groups, rings, fields) and their properties.
1. Is modern algebra difficult to learn? Like any advanced mathematical subject, modern algebra requires dedication and effort, but with persistent study and clear explanations, it's achievable.
1. What are the prerequisites for studying modern algebra? A strong foundation in linear algebra and some exposure to abstract mathematical reasoning are beneficial.
1. Are there any online resources to learn modern algebra? Yes, many online courses, tutorials, and textbooks are available.
1. Why is modern algebra important for computer scientists? Because many fundamental computer science concepts rely on algebraic structures and algorithms.
1. How is modern algebra used in cryptography? It provides the mathematical framework for creating secure encryption and decryption algorithms.
1. What are the applications of modern algebra in engineering? It's used in various engineering disciplines, particularly in signal processing, control systems, and network design.
1. What are some future directions for research in modern algebra? Areas like quantum algebra, algebraic topology, and algebraic geometry are active research areas.

1. Is modern algebra only theoretical, or does it have practical applications? Modern algebra is both theoretical and practical, with widespread real-world applications across many fields.

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application of modern algebra: Introduction to Modern Algebra and Its Applications

Nadiya Gubareni, 2021-06-23 The book provides an introduction to modern abstract algebra and its applications. It covers all major topics of classical theory of numbers, groups, rings, fields and finite dimensional algebras. The book also provides interesting and important modern applications in such subjects as Cryptography, Coding Theory, Computer Science and Physics. In particular, it considers algorithm RSA, secret sharing algorithms, Diffie-Hellman Scheme and ElGamal cryptosystem based on discrete logarithm problem. It also presents Buchberger's algorithm which is one of the important algorithms for constructing Gröbner basis. Key Features: Covers all major topics of classical theory of modern abstract algebra such as groups, rings and fields and their applications. In addition it provides the introduction to the number theory, theory of finite fields, finite dimensional algebras and their applications. Provides interesting and important modern applications in such subjects as Cryptography, Coding Theory, Computer Science and Physics. Presents numerous examples illustrating the theory and applications. It is also filled with a number of exercises of various difficulty. Describes in detail the construction of the Cayley-Dickson construction for finite dimensional algebras, in particular, algebras of quaternions and octonions and gives their applications in the number theory and computer graphics.

application of modern algebra: MODERN ALGEBRA WITH APPLICATIONS

William J Gilbert, 2008-09 Market_Desc: Upper undergraduate and graduate level modern algebra courses Special Features: · Includes applications so students can see right away how to use the theory· This classic text has sold almost 12,000 units· Contains numerous examples· Includes chapters on Boolean Algebras, groups, quotient groups, symmetry groups in three dimensions, Polya-Burnside method of enumeration, monoids and machines, rings and fields, polynomial and Euclidean rings, quotient rings, field extensions, Latin squares, geometrical constructions, and error-correcting codes· Answers to odd-numbered exercises so students can check their work About The Book: The book covers all the group, ring, and field theory that is usually contained in a standard modern algebra course; the exact sections containing this material are indicated in the Table of Contents. It stops short of the Sylow theorems and Galois theory. These topics could only be touched on in a first course, and the author feels that more time should be spent on them if they are to be appreciated.

application of modern algebra: Basic Modern Algebra with Applications

Mahima Ranjan Adhikari, Avishek Adhikari, 2013-12-08 The book is primarily intended as a textbook on modern algebra for undergraduate mathematics students. It is also useful for those who are interested in supplementary reading at a higher level. The text is designed in such a way that it encourages independent thinking and motivates students towards further study. The book covers all major topics in group, ring, vector space and module theory that are usually contained in a standard modern algebra text. In addition, it studies semigroup, group action, Hopf's group, topological groups and Lie groups with their actions, applications of ring theory to algebraic geometry, and defines Zariski topology, as well as applications of module theory to structure theory of rings and homological algebra. Algebraic aspects of classical number theory and algebraic number theory are also discussed with an eye to developing modern cryptography. Topics on applications to algebraic

topology, category theory, algebraic geometry, algebraic number theory, cryptography and theoretical computer science interlink the subject with different areas. Each chapter discusses individual topics, starting from the basics, with the help of illustrative examples. This comprehensive text with a broad variety of concepts, applications, examples, exercises and historical notes represents a valuable and unique resource.

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application of modern algebra: A Book of Abstract Algebra Charles C Pinter, 2010-01-14 Accessible but rigorous, this outstanding text encompasses all of the topics covered by a typical course in elementary abstract algebra. Its easy-to-read treatment offers an intuitive approach, featuring informal discussions followed by thematically arranged exercises. This second edition features additional exercises to improve student familiarity with applications. 1990 edition.

application of modern algebra: Modern Algebra with Applications William J. Gilbert, W. Keith Nicholson, 2004-01-30 Praise for the first edition This book is clearly written and presents a large number of examples illustrating the theory . . . there is no other book of comparable content available. Because of its detailed coverage of applications generally neglected in the literature, it is a desirable if not essential addition to undergraduate mathematics and computer science libraries. -CHOICE As a cornerstone of mathematical science, the importance of modern algebra and discrete structures to many areas of science and technology is apparent and growing—with extensive use in computing science, physics, chemistry, and data communications as well as in areas of mathematics such as combinatorics. Blending the theoretical with the practical in the instruction of modern algebra, *Modern Algebra with Applications, Second Edition* provides interesting and important applications of this subject—effectively holding your interest and creating a more seamless method of instruction.

Incorporating the applications of modern algebra throughout its authoritative treatment of the subject, this book covers the full complement of group, ring, and field theory typically contained in a standard modern algebra course. Numerous examples are included in each chapter, and answers to odd-numbered exercises are appended in the back of the text. Chapter topics include: Boolean Algebras Polynomial and Euclidean Rings Groups Quotient Rings Quotient Groups Field Extensions Symmetry Groups in Three Dimensions Latin Squares Pólya—Burnside Method of Enumeration Geometrical Constructions Monoids and Machines Error-Correcting Codes Rings and Fields In addition to improvements in exposition, this fully updated Second Edition also contains new material on order of an element and cyclic groups, more details about the lattice of divisors of an integer, and new historical notes. Filled with in-depth insights and over 600 exercises of varying difficulty, *Modern Algebra with Applications, Second Edition* can help anyone appreciate and understand this subject.

application of modern algebra: Abstract Algebra David R. Finston, Patrick J. Morandi, 2014-08-29 This text seeks to generate interest in abstract algebra by introducing each new structure and topic via a real-world application. The down-to-earth presentation is accessible to a readership with no prior knowledge of abstract algebra. Students are led to algebraic concepts and questions in a natural way through their everyday experiences. Applications include: Identification numbers and modular arithmetic (linear) error-correcting codes, including cyclic codes ruler and compass constructions cryptography symmetry of patterns in the real plane *Abstract Algebra: Structure and Application* is suitable as a text for a first course on abstract algebra whose main purpose is to generate interest in the subject or as a supplementary text for more advanced courses. The material paves the way to subsequent courses that further develop the theory of abstract algebra and will appeal to students of mathematics, mathematics education, computer science, and engineering interested in applications of algebraic concepts.

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by Banach [Ba]. It asks whether the Lebesgue measure is the only σ -additive measure of total measure one, defined on the Lebesgue subsets of the n -dimensional sphere and invariant under all rotations. The two problems seem, at first glance, totally unrelated. It is therefore so- what surprising that both problems were solved using similar methods: initially, Kazhdan's property (T) from representation theory of semi-simple Lie groups was applied in both cases to achieve partial results, and later on, both problems were solved using the (proved) Ramanujan conjecture from the theory of automorphic forms. The fact that representation theory and automorphic forms have anything to do with these problems is a surprise and a hint as well that the two questions are strongly related.

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application of modern algebra: The Modern Algebra of Information Retrieval Sándor Dominich, 2008-04-03 This book takes a unique approach to information retrieval by laying down the foundations for a modern algebra of information retrieval based on lattice theory. All major retrieval methods developed so far are described in detail, along with Web retrieval algorithms, and the author shows that they all can be treated elegantly in a unified formal way, using lattice theory as the one basic concept. The book's presentation is characterized by an engineering-like approach.

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abstraction and in particular, the concept of proofs in the setting of linear algebra. Typically such a student would have taken calculus, though the only prerequisite is suitable mathematical grounding. The purpose of this book is to bridge the gap between the more conceptual and computational oriented undergraduate classes to the more abstract oriented classes. The book begins with systems of linear equations and complex numbers, then relates these to the abstract notion of linear maps on finite-dimensional vector spaces, and covers diagonalization, eigenspaces, determinants, and the Spectral Theorem. Each chapter concludes with both proof-writing and computational exercises.

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application of modern algebra: *Applied Linear Algebra* Peter J. Olver, Chehrzad Shakiban, 2018-05-30 This textbook develops the essential tools of linear algebra, with the goal of imparting technique alongside contextual understanding. Applications go hand-in-hand with theory, each reinforcing and explaining the other. This approach encourages students to develop not only the technical proficiency needed to go on to further study, but an appreciation for when, why, and how the tools of linear algebra can be used across modern applied mathematics. Providing an extensive treatment of essential topics such as Gaussian elimination, inner products and norms, and eigenvalues and singular values, this text can be used for an in-depth first course, or an application-driven second course in linear algebra. In this second edition, applications have been updated and expanded to include numerical methods, dynamical systems, data analysis, and signal processing, while the pedagogical flow of the core material has been improved. Throughout, the text emphasizes the conceptual connections between each application and the underlying linear algebraic techniques, thereby enabling students not only to learn how to apply the mathematical tools in routine contexts, but also to understand what is required to adapt to unusual or emerging problems. No previous knowledge of linear algebra is needed to approach this text, with single-variable calculus as the only formal prerequisite. However, the reader will need to draw upon some mathematical maturity to engage in the increasing abstraction inherent to the subject. Once equipped with the main tools and concepts from this book, students will be prepared for further study in differential equations, numerical analysis, data science and statistics, and a broad range of

applications. The first author's text, Introduction to Partial Differential Equations, is an ideal companion volume, forming a natural extension of the linear mathematical methods developed here.

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Ford, 2014-09-14 *Numerical Linear Algebra with Applications* is designed for those who want to gain a practical knowledge of modern computational techniques for the numerical solution of linear algebra problems, using MATLAB as the vehicle for computation. The book contains all the material necessary for a first year graduate or advanced undergraduate course on numerical linear algebra with numerous applications to engineering and science. With a unified presentation of computation, basic algorithm analysis, and numerical methods to compute solutions, this book is ideal for solving real-world problems. The text consists of six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra. It explains in great detail the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra. In addition to examples from engineering and science applications, proofs of required results are provided without leaving out critical details. The Preface suggests ways in which the book can be used with or without an intensive study of proofs. This book will be a useful reference for graduate or advanced undergraduate students in engineering, science, and mathematics. It will also appeal to professionals in engineering and science, such as practicing engineers who want to see how numerical linear algebra problems can be solved using a programming language such as MATLAB, MAPLE, or Mathematica. - Six introductory chapters that thoroughly provide the required background for those who have not taken a course in applied or theoretical linear algebra - Detailed explanations and examples - A through discussion of the algorithms necessary for the accurate computation of the solution to the most frequently occurring problems in numerical linear algebra - Examples from engineering and science applications

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application of modern algebra: *An Invitation to Abstract Mathematics* Béla Bajnok, 2020-10-27 This undergraduate textbook promotes an active transition to higher mathematics. Problem solving is the heart and soul of this book: each problem is carefully chosen to demonstrate, elucidate, or extend a concept. More than 300 exercises engage the reader in extensive arguments and creative approaches, while exploring connections between fundamental mathematical topics. Divided into four parts, this book begins with a playful exploration of the building blocks of mathematics, such as definitions, axioms, and proofs. A study of the fundamental concepts of logic, sets, and functions follows, before focus turns to methods of proof. Having covered the core of a transition course, the author goes on to present a selection of advanced topics that offer

opportunities for extension or further study. Throughout, appendices touch on historical perspectives, current trends, and open questions, showing mathematics as a vibrant and dynamic human enterprise. This second edition has been reorganized to better reflect the layout and curriculum of standard transition courses. It also features recent developments and improved appendices. An Invitation to Abstract Mathematics is ideal for those seeking a challenging and engaging transition to advanced mathematics, and will appeal to both undergraduates majoring in mathematics, as well as non-math majors interested in exploring higher-level concepts. From reviews of the first edition: Bajnok's new book truly invites students to enjoy the beauty, power, and challenge of abstract mathematics. ... The book can be used as a text for traditional transition or structure courses ... but since Bajnok invites all students, not just mathematics majors, to enjoy the subject, he assumes very little background knowledge. Jill Dietz, MAA Reviews The style of writing is careful, but joyously enthusiastic.... The author's clear attitude is that mathematics consists of problem solving, and that writing a proof falls into this category. Students of mathematics are, therefore, engaged in problem solving, and should be given problems to solve, rather than problems to imitate. The author attributes this approach to his Hungarian background ... and encourages students to embrace the challenge in the same way an athlete engages in vigorous practice. John Perry, zbMATH

application of modern algebra: *Algebraic and Discrete Mathematical Methods for Modern Biology* Raina Robeva, 2015-05-09 Written by experts in both mathematics and biology, Algebraic and Discrete Mathematical Methods for Modern Biology offers a bridge between math and biology, providing a framework for simulating, analyzing, predicting, and modulating the behavior of complex biological systems. Each chapter begins with a question from modern biology, followed by the description of certain mathematical methods and theory appropriate in the search of answers. Every topic provides a fast-track pathway through the problem by presenting the biological foundation, covering the relevant mathematical theory, and highlighting connections between them. Many of the projects and exercises embedded in each chapter utilize specialized software, providing students with much-needed familiarity and experience with computing applications, critical components of the modern biology skill set. This book is appropriate for mathematics courses such as finite mathematics, discrete structures, linear algebra, abstract/modern algebra, graph theory, probability, bioinformatics, statistics, biostatistics, and modeling, as well as for biology courses such as genetics, cell and molecular biology, biochemistry, ecology, and evolution. - Examines significant questions in modern biology and their mathematical treatments - Presents important mathematical concepts and tools in the context of essential biology - Features material of interest to students in both mathematics and biology - Presents chapters in modular format so coverage need not follow the Table of Contents - Introduces projects appropriate for undergraduate research - Utilizes freely accessible software for visualization, simulation, and analysis in modern biology - Requires no calculus as a prerequisite - Provides a complete Solutions Manual - Features a companion website with supplementary resources

application of modern algebra: Applications of Automata Theory and Algebra John L. Rhodes, Chrystopher L. Nehaniv, 2010 This book was originally written in 1969 by Berkeley mathematician John Rhodes. It is the founding work in what is now called algebraic engineering, an emerging field created by using the unifying scheme of finite state machine models and their complexity to tie together many fields: finite group theory, semigroup theory, automata and sequential machine theory, finite phase space physics, metabolic and evolutionary biology, epistemology, mathematical theory of psychoanalysis, philosophy, and game theory. The author thus introduced a completely original algebraic approach to complexity and the understanding of finite systems. The unpublished manuscript, often referred to as The Wild Book, became an underground classic, continually requested in manuscript form, and read by many leading researchers in mathematics, complex systems, artificial intelligence, and systems biology. Yet it has never been available in print until now. This first published edition has been edited and updated by Chrystopher Nehaniv for the 21st century. Its novel and rigorous development of the mathematical theory of

complexity via algebraic automata theory reveals deep and unexpected connections between algebra (semigroups) and areas of science and engineering. Co-founded by John Rhodes and Kenneth Krohn in 1962, algebraic automata theory has grown into a vibrant area of research, including the complexity of automata, and semigroups and machines from an algebraic viewpoint, and which also touches on infinite groups, and other areas of algebra. This book sets the stage for the application of algebraic automata theory to areas outside mathematics. The material and references have been brought up to date by the editor as much as possible, yet the book retains its distinct character and the bold yet rigorous style of the author. Included are treatments of topics such as models of time as algebra via semigroup theory; evolution-complexity relations applicable to both ontogeny and evolution; an approach to classification of biological reactions and pathways; the relationships among coordinate systems, symmetry, and conservation principles in physics; discussion of punctuated equilibrium (prior to Stephen Jay Gould); games; and applications to psychology, psychoanalysis, epistemology, and the purpose of life. The approach and contents will be of interest to a variety of researchers and students in algebra as well as to the diverse, growing areas of applications of algebra in science and engineering. Moreover, many parts of the book will be intelligible to non-mathematicians, including students and experts from diverse backgrounds.

application of modern algebra: Geometric Algebra Applications Vol. I Eduardo Bayro-Corrochano, 2018-06-20 The goal of the Volume I Geometric Algebra for Computer Vision, Graphics and Neural Computing is to present a unified mathematical treatment of diverse problems in the general domain of artificial intelligence and associated fields using Clifford, or geometric, algebra. Geometric algebra provides a rich and general mathematical framework for Geometric Cybernetics in order to develop solutions, concepts and computer algorithms without losing geometric insight of the problem in question. Current mathematical subjects can be treated in a unified manner without abandoning the mathematical system of geometric algebra for instance: multilinear algebra, projective and affine geometry, calculus on manifolds, Riemann geometry, the representation of Lie algebras and Lie groups using bivector algebras and conformal geometry. By treating a wide spectrum of problems in a common language, this Volume I offers both new insights and new solutions that should be useful to scientists, and engineers working in different areas related with the development and building of intelligent machines. Each chapter is written in accessible terms accompanied by numerous examples, figures and a complementary appendix on Clifford algebras, all to clarify the theory and the crucial aspects of the application of geometric algebra to problems in graphics engineering, image processing, pattern recognition, computer vision, machine learning, neural computing and cognitive systems.

application of modern algebra: Episodes in the History of Modern Algebra (1800-1950) Jeremy J. Gray, Karen Hunger Parshall, 2011-08-31 Algebra, as a subdiscipline of mathematics, arguably has a history going back some 4000 years to ancient Mesopotamia. The history, however, of what is recognized today as high school algebra is much shorter, extending back to the sixteenth century, while the history of what practicing mathematicians call modern algebra is even shorter still. The present volume provides a glimpse into the complicated and often convoluted history of this latter conception of algebra by juxtaposing twelve episodes in the evolution of modern algebra from the early nineteenth-century work of Charles Babbage on functional equations to Alexandre Grothendieck's mid-twentieth-century metaphor of a "rising sea" in his categorical approach to algebraic geometry. In addition to considering the technical development of various aspects of algebraic thought, the historians of modern algebra whose work is united in this volume explore such themes as the changing aims and organization of the subject as well as the often complex lines of mathematical communication within and across national boundaries. Among the specific algebraic ideas considered are the concept of divisibility and the introduction of non-commutative algebras into the study of number theory and the emergence of algebraic geometry in the twentieth century. The resulting volume is essential reading for anyone interested in the history of modern mathematics in general and modern algebra in particular. It will be of particular interest to mathematicians and historians of mathematics.

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Jeremy Howard, Sylvain Gugger, 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

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