A Computational Introduction To Number Theory And Algebra

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GRAHAM JEFFERSON

Computational Algebraic Geometry Princeton University Press
Interesting, real-world mathematical modeling problems are complex and can usually be studied at different scales. The scale at which the investigation is carried out is one of the factors that determines the type of mathematics most appropriate to describe the problem. The book concentrates on two modeling paradigms: the macroscopic, in which the authors describe phenomena in terms of time evolution via ordinary differential equations, and the microscopic, which requires knowledge of random events and probability. The text emphasizes the development of computational skills to construct predictive models and analyze the results. To elucidate the concepts, a wealth of examples and portions of MATLAB® code used by the authors are included.

Number Fields Springer
Now you can clearly present even the most complex computational theory topics to your students with Sipser's distinct, market-leading INTRODUCTION TO THE THEORY OF COMPUTATION, 3E. The number one choice for today's computational theory course, this highly anticipated revision retains the unmatched clarity and thorough coverage that make it a leading text for upper-level undergraduate and introductory graduate students. This edition continues author Michael Sipser's well-known, approachable style with timely revisions, additional exercises, and more memorable examples in key areas. A new first-of-its-kind theoretical treatment of deterministic context-free languages is ideal for a better understanding of parsing and LR(k) grammars. This edition's refined presentation ensures a trusted accuracy and clarity that make the challenging study of computational theory accessible and intuitive to students while maintaining the subject's rigor and formalism. Readers gain a solid understanding of the fundamental mathematical properties of computer hardware, software, and applications with a blend of practical and philosophical coverage and mathematical treatments, including advanced theorems and proofs. INTRODUCTION TO THE THEORY OF COMPUTATION, 3E's comprehensive coverage makes this an ideal ongoing reference tool for those studying theoretical computing. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Computational Algebraic Number Theory Cambridge University Press
The only book to provide a unified view of the interplay between computational number theory and cryptography Computational number theory and modern cryptography are two of the most important and fundamental research fields in information security. In this book, Song Y. Yang combines knowledge of these two critical fields, providing a unified view of the relationships between computational number theory and cryptography. The author takes an innovative approach, presenting mathematical ideas first, thereupon treating cryptography as an immediate application of the mathematical concepts. The book also presents topics from number theory, which are relevant for applications in public-key cryptography, as well as modern topics, such as coding and lattice based cryptography for post-quantum cryptography. The author further covers the current research and applications for common cryptographic algorithms, describing the mathematical problems behind these applications in a manner accessible to computer scientists and engineers. Makes mathematical problems accessible to computer scientists and engineers by showing their immediate application Presents topics from number theory relevant for public-key cryptography applications Covers modern topics such as coding and lattice based cryptography for post-quantum cryptography Starts with the basics, then goes into applications and areas of active research Geared at a global audience; classroom tested in North America, Europe, and Asia Incudes exercises in every chapter Instructor resources available on the book's Companion Website Computational Number Theory and Modern Cryptography is ideal for graduate and advanced undergraduate students in computer science, communications engineering, cryptography and mathematics. Computer scientists, practicing cryptographers, and other professionals involved in various security schemes will also find this book to be a helpful reference.

A Course in Computational Number Theory CRC Press
This marvellous and highly original book fills a significant gap in the extensive literature on classical modular forms. This is not just yet another introductory text to this theory, though it could certainly be used as such in conjunction with more traditional treatments. Its novelty lies in its computational emphasis throughout: Stein not only defines what modular forms are, but shows in illuminating detail how one can compute everything about them in practice. This is illustrated throughout the book with examples from his own (entirely free) software package SAGE, which really bring the subject to life while not detracting in any way from its theoretical beauty. The author is the leading expert in computations with modular forms, and what he says on this subject is all tried and tested and based on his extensive experience. As well as being an invaluable companion to those learning the theory in a more traditional way, this book will be a great help to those who wish to use modular forms in applications, such as in the explicit solution of Diophantine equations. There is also a useful Appendix by Gunnells on extensions to more general

modular forms, which has enough in it to inspire many PhD theses for years to come. While the book's main readership will be graduate students in number theory, it will also be accessible to advanced undergraduates and useful to both specialists and non-specialists in number theory. --John E. Cremona, University of Nottingham William Stein is an associate professor of mathematics at the University of Washington at Seattle. He earned a PhD in mathematics from UC Berkeley and has held positions at Harvard University and UC San Diego. His current research interests lie in modular forms, elliptic curves, and computational mathematics.

An Introduction to Computational Combinatorics CUP Archive
Collecting scattered knowledge into one coherent account, this book provides a compendium of both classical and recently developed results on reversible computing. It offers an expanded view of the field that includes the traditional energy-motivated hardware viewpoint as well as the emerging application-motivated software approach. It explores up-and-coming theories, techniques, and tools for the application of reversible computing. The topics covered span several areas of computer science, including high-performance computing, parallel/distributed systems, computational theory, compilers, power-aware computing, and supercomputing.

Elementary Number Theory: Primes, Congruences, and Secrets Wiley
Written at a level appropriate to undergraduates, this book covers such topics as the Hilbert Basis Theorem, the Nullstellensatz, invariant theory, projective geometry, and dimension theory. Contains a new section on Axiom and an update about MAPLE, Mathematica and REDUCE.

Introduction to Computational Fluid Dynamics Springer Science & Business Media
Emphasizing issues of computational efficiency, Michael Kearns and Umesh Vazirani introduce a number of central topics in computational learning theory for researchers and students in artificial intelligence, neural networks, theoretical computer science, and statistics. Emphasizing issues of computational efficiency, Michael Kearns and Umesh Vazirani introduce a number of central topics in computational learning theory for researchers and students in artificial intelligence, neural networks, theoretical computer science, and statistics. Computational learning theory is a new and rapidly expanding area of research that examines formal models of induction with the goals of discovering the common methods underlying efficient learning algorithms and identifying the computational impediments to learning. Each topic in the book has been chosen to elucidate a general principle, which is explored in a precise formal setting. Intuition has been emphasized in the presentation to make the material accessible to the nontheoretician while still providing precise arguments for the specialist. This balance is the result of new proofs of established theorems, and new presentations of the standard proofs. The topics covered include the motivation, definitions, and fundamental results, both positive and negative, for the widely studied L. G. Valiant model of Probably Approximately Correct Learning; Occam's Razor, which formalizes a relationship between learning and data compression; the Vapnik-Chervonenkis dimension; the equivalence of weak and strong learning; efficient learning in the presence of noise by the method of statistical queries; relationships between learning and cryptography, and the resulting computational limitations on efficient learning; reducibility between learning problems; and algorithms for learning finite automata from active experimentation.

Abelian l-Adic Representations and Elliptic Curves CRC Press
A description of 148 algorithms fundamental to number-theoretic computations, in particular for computations related to algebraic number theory, elliptic curves, primality testing and factoring. The first seven chapters guide readers to the heart of current research in computational algebraic number theory, including recent algorithms for computing class groups and units, as well as elliptic curve computations, while the last three chapters survey factoring and primality testing methods, including a detailed description of the number field sieve algorithm. The whole is rounded off with a description of available computer packages and some useful tables, backed by numerous exercises. Written by an authority in the field, and one with great practical and teaching experience, this is certain to become the standard and indispensable reference on the subject.

Computational Mathematical Modeling Birkhäuser
This book describes algorithms of mathematical methods and illustrates their application with examples. The mathematical background needed is elementary algebra and calculus.

A Computational Introduction to Number Theory and Algebra Cambridge University Press
Modular Forms is a graduate student-level introduction to the classical theory of modular forms and computations involving modular forms, including modular functions and the theory of Hecke operators. It also includes applications of modular forms to various subjects, such as the theory of quadratic forms, the proof of Fermat's Last Theorem and the approximation of π. The text gives a balanced overview of both the theoretical and computational sides of its subject, allowing a variety of courses to be taught from it.This second edition has been revised and updated. New material on the future of modular forms as well as a chapter about longer-form projects for students has also been added.

Computational Excursions in Analysis and Number Theory Princeton University Press
This unique book provides a comprehensive introduction to computational mathematics, which forms an essential part of modern numerical algorithms and scientific computing. It uses a theorem-free approach with just the right balance between mathematics and numerical algorithms. It covers all major topics in computational mathematics with a wide range of carefully selected numerical algorithms, ranging from the root-finding algorithms, numerical integration, numerical methods of partial differential equations, finite element methods, optimization algorithms, stochastic models, to nonlinear curve-fitting and swarm optimization. Especially suitable for undergraduates and graduates in computational mathematics, numerical algorithms, and scientific computing, it can be used as a textbook and/or reference book.

Computational Number Theory MIT Press
From the reviews: "This book offers a coherent treatment, at the graduate textbook level, of the field that has come to be known in the last decade or so as computational geometry. ... ... The book is well organized and lucidly written; a timely contribution by two founders of the field. It clearly demonstrates that computational geometry in the plane is now a fairly well-understood branch of computer science and mathematics. It also points the way to the solution of the more challenging problems in dimensions higher than two." #Mathematical Reviews#1 "... This remarkable book is a comprehensive and systematic study on research results obtained especially in the last ten years. The very clear presentation concentrates on basic ideas, fundamental combinatorial structures, and crucial algorithmic

techniques. The plenty of results is clever organized following these guidelines and within the framework of some detailed case studies. A large number of figures and examples also aid the understanding of the material. Therefore, it can be highly recommended as an early graduate text but it should prove also to be essential to researchers and professionals in applied fields of computer-aided design, computer graphics, and robotics." #Biometrical Journal#2

Introduction To Computational Mathematics Cambridge University Press
The interplay between algebra and geometry is a beautiful (and fun!) area of mathematical investigation. Advances in computing and algorithms make it possible to tackle many classical problems in a down-to-earth and concrete fashion. This opens wonderful new vistas and allows us to pose, study and solve problems that were previously out of reach. Suitable for graduate students, the objective of this 2003 book is to bring advanced algebra to life with lots of examples. The first chapters provide an introduction to commutative algebra and connections to geometry. The rest of the book focuses on three active areas of contemporary algebra: Homological Algebra (the snake lemma, long exact sequence inhomology, functors and derived functors (Tor and Ext), and double complexes); Algebraic Combinatorics and Algebraic Topology (simplicial complexes and simplicial homology, Stanley-Reisner rings, upper bound theorem and polytopes); and Algebraic Geometry (points and curves in projective space, Riemann-Roch, Cech cohomology, regularity).

Introduction to Computational Science World Scientific Publishing Company
Undergraduate text uses combinatorial approach to accommodate both math majors and liberal arts students. Covers the basics of number theory, offers an outstanding introduction to partitions, plus chapters on multiplicativity-divisibility, quadratic congruences, additivity, and more.

An Introduction to Online Computation Springer
A Course in Computational Number Theory uses the computer as a tool for motivation and explanation. The book is designed for the reader to quickly access a computer and begin doing personal experiments with the patterns of the integers. It presents and explains many of the fastest algorithms for working with integers. Traditional topics are covered, but the text also explores factoring algorithms, primality testing, the RSA public-key cryptosystem, and unusual applications such as check digit schemes and a computation of the energy that holds a salt crystal together. Advanced topics include continued fractions, Pell’s equation, and the Gaussian primes.

A Computational Introduction to Number Theory and Algebra Cambridge University Press
This book provides a comprehensive introduction to advanced topics in the computational and algorithmic aspects of number theory, focusing on applications in cryptography. Readers will learn to develop fast algorithms, including quantum algorithms, to solve various classic and modern number theoretic problems. Key problems include prime number generation, primality testing, integer factorization, discrete logarithms, elliptic curve arithmetic, conjecture and numerical verification. The author discusses quantum algorithms for solving the Integer Factorization Problem (IFP), the Discrete Logarithm Problem (DLP), and the Elliptic Curve Discrete Logarithm Problem (ECDLP) and for attacking IFP, DLP and ECDLP based cryptographic systems. Chapters also cover various other quantum algorithms for Pell's equation, principal ideal, unit group, class group, Gauss sums, prime counting function, Riemann's hypothesis and the BSD conjecture. Quantum Computational Number Theory is self-contained and intended to be used either as a graduate text in computing, communications and mathematics, or as a basic reference in the related fields. Number theorists, cryptographers and professionals working in quantum computing, cryptography and network security will find this book a valuable asset.

Quantum Computational Number Theory SIAM
News about this title: — Author Marty Weissman has been awarded a Guggenheim Fellowship for 2020. (Learn more here.) — Selected as a 2018 CHOICE Outstanding Academic Title — 2018 PROSE Awards Honorable Mention An Illustrated Theory of Numbers gives a comprehensive introduction to number theory, with complete proofs, worked examples, and exercises. Its exposition reflects the most recent scholarship in mathematics and its history. Almost 500 sharp illustrations accompany elegant proofs, from prime decomposition through quadratic reciprocity. Geometric and dynamical arguments provide new insights, and allow for a rigorous approach with less algebraic manipulation. The final chapters contain an extended treatment of binary quadratic forms, using Conway's topograph to solve quadratic Diophantine equations (e.g., Pell's equation) and to study reduction and the finiteness of class numbers. Data visualizations introduce the reader to open questions and cutting-edge results in analytic number theory such as the Riemann hypothesis, boundedness of prime gaps, and the class number 1 problem. Accompanying each chapter, historical notes curate primary sources and secondary scholarship to trace the development of number theory within and outside the Western tradition. Requiring only high school algebra and geometry, this text is recommended for a first course in elementary number theory. It is also suitable for mathematicians seeking a fresh perspective on an ancient subject.

Representations of Groups MIT Press
Introduction to Computational Fluid Dynamics is a textbook for advanced undergraduate and first year graduate students in mechanical, aerospace and chemical engineering. The book emphasizes understanding CFD through physical principles and examples. The author follows a consistent philosophy of control volume formulation of the fundamental laws of fluid motion and energy transfer, and introduces a novel notion of 'smoothing pressure correction' for solution of flow equations on collocated grids within the framework of the well-known SIMPLE algorithm. The subject matter is developed by considering pure conduction/diffusion, convective transport in 2-dimensional boundary layers and in fully elliptic flow situations and phase-change problems in succession. The book includes chapters on discretization of equations for transport of mass, momentum and energy on Cartesian, structured curvilinear and unstructured meshes, solution of discretised equations, numerical grid generation and convergence enhancement. Practising engineers will find this particularly useful for reference and for continuing education.

Advanced Topics in Computational Number Theory Springer
The representation theory of finite groups has seen rapid growth in recent years with the development of efficient algorithms and computer algebra systems. This is the first book to provide an introduction to the ordinary and modular representation theory of finite groups with special emphasis on the computational aspects of the subject. Evolving from courses taught at Aachen University, this well-paced text is ideal for graduate-level study. The authors provide over 200 exercises, both theoretical and computational, and include worked examples using the computer

algebra system GAP. These make the abstract theory tangible and engage students in real hands-on work. GAP is freely available from www.gap-system.org and readers can download source code and solutions to selected exercises from the book's web page.

Computational Number Theory and Modern Cryptography American Mathematical Soc.

From the winner of the Turing Award and the Abel Prize, an introduction to computational complexity theory, its connections and interactions with mathematics, and its central role in the natural and social sciences, technology, and philosophy Mathematics and Computation provides a broad, conceptual overview of computational complexity theory—the mathematical study of efficient computation. With important practical applications to computer science and industry, computational complexity theory has evolved into a highly interdisciplinary field, with strong links to most mathematical areas and to a growing number of scientific endeavors. Avi Wigderson takes a sweeping survey of complexity theory, emphasizing the field’s insights and challenges. He explains the ideas and motivations leading to key models, notions, and results. In particular, he looks at algorithms and complexity, computations and proofs, randomness and interaction, quantum and arithmetic computation, and cryptography and learning, all as parts of a cohesive whole with numerous cross-influences. Wigderson illustrates the immense breadth of the field, its beauty and richness, and its diverse and growing interactions with other areas of mathematics. He ends with a comprehensive look at the theory of computation, its methodology and aspirations, and the unique and fundamental ways in which it has shaped and will further shape science, technology, and society. For further reading, an extensive bibliography is provided for all topics covered. Mathematics and Computation is useful for undergraduate and graduate students in mathematics, computer science, and related fields, as well as researchers and teachers in these fields. Many parts require little background, and serve as an invitation to newcomers seeking an introduction to the theory of computation. Comprehensive coverage of computational complexity theory, and beyond High-level, intuitive exposition, which brings conceptual clarity to this central and dynamic scientific discipline Historical accounts of the evolution and motivations of central concepts and models A broad view of the theory of computation's influence on science, technology, and society Extensive bibliography