Theory Of Computer Science By S S Sane

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Theory Of Computer Science By S S Sane ***2023-03-16***

BERG DEVAN

Category Theory for Computing Science

Springer

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

Computer Arithmetic in Theory and Practice

Princeton University Press Using basic category theory, this Element describes all the central concepts and proves the main theorems of theoretical computer science. Category theory, which works with functions, processes, and structures, is uniquely qualified to present the fundamental results of theoretical computer science. In this Element, readers will meet some of the deepest ideas and theorems of modern computers and mathematics, such as Turing machines, unsolvable problems, the P=NP question, Kurt Gödel's incompleteness theorem, intractable problems, cryptographic protocols, Alan Turing's Halting problem, and much more. The concepts come alive with many examples and exercises.

Foundations of Computer Science

Princeton University Press

An accessible and rigorous textbook for introducing undergraduates to computer science theory What Can Be Computed? is a uniquely accessible yet rigorous introduction to the most profound ideas at the heart of computer science. Crafted specifically for undergraduates who are studying the subject for the first time, and requiring minimal prerequisites, the book focuses on the essential fundamentals of computer science theory and features a practical approach that uses real computer programs (Python and Java) and encourages active experimentation. It is also ideal for self-study and reference. The book covers the standard topics in the theory of computation, including Turing machines and finite automata, universal computation, nondeterminism, Turing and Karp reductions, undecidability, time-complexity classes such as P and NP, and NP-completeness, including the Cook-Levin Theorem. But the book also provides a broader view of computer science and its historical development, with discussions of Turing's original 1936 computing machines, the connections between undecidability and Gödel's incompleteness theorem, and Karp's famous set of twenty-one NP-complete problems. Throughout, the book recasts traditional computer science concepts by considering how computer programs are used to solve real problems. Standard theorems are stated and proven with full mathematical rigor, but motivation and understanding are enhanced by considering concrete implementations. The book's examples and other content allow readers to view demonstrations of—and to experiment with—a wide selection of the topics it covers. The result is an ideal text for an introduction to the theory of computation. An accessible and rigorous introduction to the essential fundamentals of computer science theory, written specifically for undergraduates taking introduction to the theory of computation Features a practical, interactive approach using real computer programs (Python in the text, with forthcoming Java alternatives online) to enhance motivation and understanding Gives equal emphasis to computability and complexity Includes special topics that demonstrate the profound nature of key ideas in the theory of computation Lecture slides and Python programs are available at whatcanbecomputed.com **44th International Conference on Current Trends in Theory and Practice of Computer Science, Krems, Austria, January 29 -**

February 2, 2018, Proceedings Springer Science & Business Media Basic Category Theory for Computer Scientists provides a straightforward presentation of the basic constructions and terminology of category theory, including limits, functors, natural transformations, adjoints, and cartesian closed categories. Category theory is a branch of pure mathematics that is becoming an increasingly important tool in theoretical computer science, especially in programming language semantics, domain theory, and concurrency, where it is already a standard language of discourse. Assuming a minimum of mathematical preparation, Basic Category Theory for Computer Scientists provides a straightforward presentation of the basic constructions and terminology of category theory, including limits, functors, natural transformations, adjoints, and cartesian closed categories. Four case studies illustrate applications of category theory to programming language design, semantics, and the solution of recursive domain equations. A brief literature survey offers suggestions for further study in more advanced texts. Contents Tutorial • Applications • Further Reading

Probability, Statistics, and Queueing Theory Springer In 1936, when he was just twenty-four years old, Alan Turing wrote a remarkable paper in which he outlined the theory of computation, laying out the ideas that underlie all modern computers. This groundbreaking and powerful theory now forms the basis of computer science. In Turing's Vision, Chris Bernhardt explains the theory, Turing's most important contribution, for the general reader. Bernhardt argues that the strength of Turing's theory is its simplicity, and that, explained in a straightforward manner, it is eminently understandable by the nonspecialist. As Marvin Minsky writes, "The sheer simplicity of the theory's foundation and extraordinary short path from this foundation to its logical and surprising conclusions give the theory a mathematical beauty that alone guarantees it a permanent place in computer theory." Bernhardt begins with the foundation and systematically builds to the surprising conclusions. He also views Turing's theory in the context of mathematical history, other views of computation (including those of Alonzo Church), Turing's later work, and the birth of the modern computer. In the paper, "On Computable Numbers, with an Application to the Entscheidungsproblem," Turing thinks carefully about how humans perform computation, breaking it down into a sequence of steps, and then constructs theoretical machines capable of performing each step. Turing wanted to show that there were problems that were beyond any computer's ability to solve; in particular, he wanted to find a decision problem that he could prove was undecidable. To explain Turing's ideas, Bernhardt examines three well-known decision problems to explore the concept of undecidability; investigates theoretical computing machines, including Turing machines; explains universal machines; and proves that certain problems are undecidable, including Turing's problem concerning computable numbers.

Finite Model Theory and Its Applications Elsevier

Based on the ACM model curriculum guidelines, this text covers the fundamentals of computer science required for first year students embarking on a computing degree. Data representation of text, audio, images, and numbers; computer hardware and software, including operating systems and programming languages; data organization topics such as SQL database models - they're all [included]. Progressing from the bits and bytes level to the higher levels of abstraction, this birds-eye view provides the foundation to help you succeed as you continue your studies in programming and other areas in the computer field.-Back cover.

A Theory Revolutionizing Technology and Science Cambridge University Press

Type theory is one of the most important tools in the design of higher-level programming languages, such as ML. This book introduces and teaches its techniques by focusing on one particularly neat system and studying it in detail. By concentrating on the principles that make the theory work in practice, the author covers all the key ideas without getting involved in the complications of more advanced systems. This book takes a type-assignment approach to type theory, and the system considered is the simplest polymorphic one. The author covers all the basic ideas, including the system's relation to propositional logic, and gives a careful treatment of the type-checking algorithm that lies at the heart of every such system. Also featured are two other interesting algorithms that until now have been buried in inaccessible technical literature. The mathematical presentation is rigorous but clear, making it the first book at this level that can be used as an introduction to type theory for computer scientists.

International Seminar, PTCS 2001 Dagstuhl Castle, Germany, October 7-12, 2001. Proceedings Springer Finite model theory,as understoodhere, is an areaof mathematicallogic that has developed in close connection with applications to computer science, in particular the theory of computational complexity and database theory. One of the fundamental insights of mathematical logic is that our understanding of mathematical phenomena is enriched by elevating the languages we use to describe mathematical structures to objects of explicit study. If mathematics is the science of patterns, then the media through which we discern patterns, as well as the structures in which we discern them, command our attention. It isthis aspect oflogicwhichis mostprominentin model theory,“thebranchof mathematical logic which deals with the relation between a formal language and its interpretations”. No wonder, then, that mathematical logic, and ?nite model theory in particular, should ?nd manifold applications in computer science: from specifying programs to querying databases, computer science is rife with phenomena whose understanding requires close attention to the interaction between language and structure. This volume gives a broadoverviewof some central themes of ?nite model theory: expressive power, descriptive complexity, and zero–one laws, together with selected applications to database theory and arti?cial intelligence, es- cially constraint databases and constraint satisfaction problems. The ?nal chapter provides a concise modern introduction to modal logic,which emp- sizes the continuity in spirit and technique with ?nite model theory.

Computer Science W H Freeman & Company Written for professionals learning the field of discrete mathematics, this book provides the necessary foundations of computer science without requiring excessive mathematical prerequisites. Using a balanced approach of theory and examples, software engineers will find it a refreshing treatment of applications in programming.

An Introduction Jones & Bartlett Pub

This textbook is uniquely written with dual purpose. It cover cores material in the foundations of computing for graduate students in computer science and also provides an introduction to some more advanced topics for those intending further study in the area. This innovative text focuses primarily on computational complexity theory: the classification of computational problems in terms of their inherent complexity. The book contains an invaluable collection of lectures for first-year graduates on the theory of computation. Topics and features include more than 40 lectures for first year graduate students, and a dozen homework sets and exercises.

Bits of Theory, Bytes of Practice PHI Learning Pvt. Ltd.

Named a Notable Book in the 21st Annual Best of Computing list by the ACM! Robert Sedgewick and Kevin Wayne's Computer Science: An Interdisciplinary Approach is the ideal modern introduction to computer science with Java programming for both students and professionals. Taking a broad, applications-based approach, Sedgewick and

Wayne teach through important examples from science, mathematics, engineering, finance, and commercial computing. The book demystifies computation, explains its intellectual underpinnings, and covers the essential elements of programming and computational problem solving in today’s environments. The authors begin by introducing basic programming elements such as variables, conditionals, loops, arrays, and I/O. Next, they turn to functions, introducing key modular programming concepts, including components and reuse. They present a modern introduction to object-oriented programming, covering current programming paradigms and approaches to data abstraction. Building on this foundation, Sedgewick and Wayne widen their focus to the broader discipline of computer science. They introduce classical sorting and searching algorithms, fundamental data structures and their application, and scientific techniques for assessing an implementation’s performance. Using abstract models, readers learn to answer basic questions about computation, gaining insight for practical application. Finally, the authors show how machine architecture links the theory of computing to real computers, and to the field’s history and evolution. For each concept, the authors present all the information readers need to build confidence, together with examples that solve intriguing problems. Each chapter contains question-and-answer sections, self-study drills, and challenging problems that demand creative solutions. Companion web site (introcs.cs.princeton.edu/java) contains Extensive supplementary information, including suggested approaches to programming assignments, checklists, and FAQs Graphics and sound libraries Links to program code and test data Solutions to selected exercises Chapter summaries Detailed instructions for installing a Java programming environment Detailed problem sets and projects Companion 20-part series of video lectures is available at informit.com/title/9780134493831

Introduction to Lattice Theory with Computer Science Applications MIT Press

This book explains the development of theoretical computer science in its early stages, specifically from 1965 to 1990. The author is among the pioneers of theoretical computer science, and he guides the reader through the early stages of development of this new discipline. He explains the origins of the field, arising from disciplines such as logic, mathematics, and electronics, and he describes the evolution of the key principles of computing in strands such as computability, algorithms, and programming. But mainly it's a story about people – pioneers with diverse backgrounds and characters came together to overcome philosophical and institutional challenges and build a community. They collaborated on research efforts, they established schools and conferences, they developed the first related university courses, they taught generations of future researchers and practitioners, and they set up the key publications to communicate and archive their knowledge. The book is a fascinating insight into the field as it existed and evolved, it will be valuable reading for anyone interested in the history of computing.

Universal Algebra and Applications in Theoretical Computer Science

Academic Press

This introductory text provides both a foundation in a popular programming language (Turbo PASCAL) and an introduction to the principles and applications of the field. It stresses applications that demonstrate computers' many roles in our lives

Graph Theory with Applications to Engineering and Computer Science

Theory of Computer ScienceAutomata, Languages and Computation

The Handbook of Theoretical Computer Scienceprovides professionals and students with a comprehensive overview of the main results and developments in this rapidly evolving field. Volume A covers models of computation, complexity theory, data

structures, and efficient computation in many recognized subdisciplines of theoretical computer science. Volume B takes up the theory of automata and rewriting systems, the foundations of modern programming languages, and logics for program specification and verification, and presents several studies on the theoretic modeling of advanced information processing. The two volumes contain thirty-seven chapters, with extensive chapter references and individual tables of contents for each chapter. There are 5,387 entry subject indexes that include notational symbols, and a list of contributors and affiliations in each volume.
Springer Science & Business Media
The foundation of computer science is built upon the following questions: What is an algorithm? What can be computed and what cannot be computed? What does it mean for a function to be computable? How does computational power depend upon programming constructs? Which algorithms can be considered feasible? For more than 70 years, computer scientists are searching for answers to such qu- tions. Their ingenious techniques used in answering these questions form the theory of computation. Theory of computation deals with the most fundamental ideas of computer s- ence in an abstract but easily understood form. The notions and techniques employed are widely

spread across various topics and are found in almost every branch of c- puter science. It has thus become more than a necessity to revisit the foundation, learn the techniques, and apply them with con?dence. Overview and Goals This book is about this solid, beautiful, and pervasive foundation of computer s- ence. It introduces the fundamental notions, models, techniques, and results that form the basic paradigms of computing. It gives an introduction to the concepts and mathematics that computer scientists of our day use to model, to argue about, and to predict the behavior of algorithms and computation. The topics chosen here have shown remarkable persistence over the years and are very much in current use.

A Type Theory for Computer Science

Chapman & Hall

A computational perspective on partial order and lattice theory, focusing on algorithms and their applications This book provides a uniform treatment of the theory and applications of lattice theory. The applications covered include tracking dependency in distributed systems, combinatorics, detecting global predicates in distributed systems, set families, and integer partitions. The book presents algorithmic proofs of theorems whenever possible. These proofs are written in the calculational style advocated by Dijkstra, with arguments explicitly spelled out step by step. The author’s intent is for readers to learn not only the proofs, but the heuristics that guide said proofs. Introduction to Lattice Theory with Computer Science Applications: Examines; posets, Dilworth’s theorem, merging algorithms, lattices, lattice completion, morphisms, modular and distributive lattices, slicing, interval orders, tractable posets, lattice enumeration algorithms, and dimension theory Provides end of chapter exercises to help readers retain newfound knowledge on each subject Includes supplementary material at www.ece.utexas.edu/~garg Introduction to Lattice Theory with Computer Science Applications is written for students of computer science, as well as practicing mathematicians.

System Development with Set Theory and Logic

Springer Science & Business Media

This book constitutes the refereed proceedings of the 44th International Conference on Current Trends in Theory and Practice of Computer Science, SOFSEM 2018, held in Krems, Austria, in January/February 2018. The 48 papers presented in this volume were carefully reviewed and selected from 97 submissions. They were organized in topical sections named: foundations of computer science; software engineering: advances methods, applications, and tools; data, information and knowledge engineering; network science and parameterized complexity; model-based software engineering; computational models and complexity; software quality assurance and transformation; graph structure and computation; business processes, protocols, and mobile networks; mobile robots and server systems; automata, complexity, completeness; recognition and generation; optimization, probabilistic analysis, and sorting; filters, configurations, and picture encoding; machine learning; text searching algorithms; and data model engineering.

Introductory Computer Science Springer Science & Business Media

A wide coverage of topics in category theory and computer science is developed in this text, including introductory treatments of cartesian closed categories, sketches and elementary categorical model theory, and triples. Over 300 exercises are included.

Mathematics and Computation

International Monographs on Company

This book presents the proceedings of the Sixth International Conference on Category Theory and Computer Science, CTCS '95, held in Cambridge, UK in August 1995. The 15 revised full papers included in the volume document the exploitation of links between logic and category theory leading to a solid basis for much of the understanding of the semantics of computation. Notable amongst other advances is the introduction of linear logic and other substructural logics, providing a new approach to proof theory.

Further aspects covered are semantics of lambda calculi and type theories, program specification and development, and domain theory.

Handbook of Theoretical Computer Science

Addison-Wesley Longman

The second part of this Handbook presents a choice of material on the theory of automata and rewriting systems, the foundations of modern programming languages, logics for program specification and verification, and some chapters on the theoretic modelling of advanced information processing.