

Read Online The Theory Of  
Computation

# *The Theory Of Computation*

*Theory of Computation is  
designed to serve as a  
textbook for*

## Read Online The Theory Of Computation

*undergraduate students of Computer Science & Engineering, Computer Applications, and Information Technology. It seeks to provide a comprehensive coverage*

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*of all the essential concepts of the subject.*

— —

*Computability and Logic has become a classic because of its accessibility to*

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*students without a mathematical background and because it covers not simply the staple topics of an intermediate logic course, such as Godel's*

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*incompleteness theorems, but also a large number of optional topics, from Turing's theory of computability to Ramsey's theorem. This 2007 fifth edition has*

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*been thoroughly revised by John Burgess.*

*Including a selection of exercises, adjusted for this edition, at the end of each chapter, it offers a simpler*

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*treatment of the representability of recursive functions, a traditional stumbling block for students on the way to the Godel incompleteness theorems.*

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*This updated edition is also accompanied by a website as well as an instructor's manual.*

*Algorithms and Theory of Computation Handbook,  
Second Edition: Special*



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*Topics and Techniques provides an up-to-date compendium of fundamental computer science topics and techniques. It also illustrates how the*

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*topics and techniques come together to deliver efficient solutions to important practical problems. Along with updating and revising many of the existing*

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*chapters, this second edition contains more than 15 new chapters. This edition now covers self-stabilizing and pricing algorithms as well as the theories of*

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*privacy and anonymity, databases, computational games, and communication networks. It also discusses computational topology, natural language processing, and*

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*grid computing and explores applications in intensity-modulated radiation therapy, voting, DNA research, systems biology, and financial derivatives.*

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*This best-selling handbook continues to help computer professionals and engineers find significant information on various algorithmic*

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*topics. The expert contributors clearly define the terminology, present basic results and techniques, and offer a number of current references to*

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*the in-depth literature. They also provide a glimpse of the major research issues concerning the relevant topics.*

*Introduction to*

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*Languages and the Theory of Computation* is an introduction to the theory of computation that emphasizes formal languages, automata and abstract models of

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*computation, and computability; it also includes an introduction to computational complexity and NP-completeness. Through the study of these*

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*topics, students encounter profound computational questions and are introduced to topics that will have an ongoing impact in computer science. Once*

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*students have seen some of the many diverse technologies contributing to computer science, they can also begin to appreciate the field as a coherent*

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*discipline. A distinctive feature of this text is its gentle and gradual introduction of the necessary mathematical tools in the context in which*

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*they are used. Martin takes advantage of the clarity and precision of mathematical language but also provides discussion and examples that make the language*

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*intelligible to those just learning to read and speak it. The material is designed to be accessible to students who do not have a strong background in*

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*discrete mathematics, but it is also appropriate for students who have had some exposure to discrete math but whose skills in this area need to be*



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*consolidated and sharpened.*

*Proceedings of the 1983 International FCT-Conference, Borgholm, Sweden, August 21-27, 1983*

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*Limits of Computation  
Theory of Computer  
Science*

*The Nature of  
Computation*

*The Theory of  
Computation*

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**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**

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**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**

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**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**

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**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**

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**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**

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**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.**



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**The aim of this textbook is to present an account of the theory of computation. After introducing the concept of a model of computation and presenting various examples, the author explores the limitations of effective computation via basic recursion theory. Self-reference**

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**and other methods are introduced as fundamental and basic tools for constructing and manipulating algorithms. From there the book considers the complexity of computations and the notion of a complexity measure is introduced. Finally, the book culminates in**

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**considering time and space measures and in classifying computable functions as being either feasible or not. The author assumes only a basic familiarity with discrete mathematics and computing, making this textbook ideal for a graduate-level**

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**introductory course. It is based on many such courses presented by the author and so numerous exercises are included. In addition, the solutions to most of these exercises are provided.**

**Limits of Computation: An Introduction to the Undecidable**

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**and the Intractable offers a gentle introduction to the theory of computational complexity. It explains the difficulties of computation, addressing problems that have no algorithm at all and problems that cannot be solved efficiently. The book enables**

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**readers to understand: What does it mean for a problem to be unsolvable or to be NP-complete? What is meant by a computation and what is a general model of a computer? What does it mean for an algorithm to exist and what kinds of problems have no**

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**algorithm? What problems have algorithms but the algorithm may take centuries to finish? Developed from the authors' course on computational complexity theory, the text is suitable for advanced undergraduate and beginning graduate students without a strong**

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**background in theoretical computer science. Each chapter presents the fundamentals, examples, complete proofs of theorems, and a wide range of exercises.**

**The classical theory of computation has its origins in the work of Goedel, Turing, Church, and Kleene**



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**and has been an extraordinarily successful framework for theoretical computer science. The thesis of this book, however, is that it provides an inadequate foundation for modern scientific computation where most of the algorithms are real number**

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**algorithms. The goal of this book is to develop a formal theory of computation which integrates major themes of the classical theory and which is more directly applicable to problems in mathematics, numerical analysis, and scientific computing. Along the**

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**way, the authors consider such fundamental problems as: \* Is the Mandelbrot set decidable? \* For simple quadratic maps, is the Julia set a halting set? \* What is the real complexity of Newton's method? \* Is there an algorithm for deciding the knapsack problem in a**

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**polynomial number of steps? \* Is the Hilbert Nullstellensatz intractable? \* Is the problem of locating a real zero of a degree four polynomial intractable? \* Is linear programming tractable over the reals? The book is divided into three parts: The first part provides**

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**an extensive introduction and then proves the fundamental NP-completeness theorems of Cook-Karp and their extensions to more general number fields as the real and complex numbers. The later parts of the book develop a formal theory of computation which**

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**integrates major themes of the classical theory and which is more directly applicable to problems in mathematics, numerical analysis, and scientific computing.**

**Computational Complexity  
Formal Languages, Automata, and Complexity**

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**Fundamentals of the Theory of Computation: Principles and Practice**

**Algorithms and Theory of Computation Handbook, Second Edition, Volume 1**

**An Introduction to Computability Theory**

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An Introduction to Formal Languages & Automata provides an excellent presentation of the material that is essential to an introductory theory of computation course. The



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text was designed to familiarize students with the foundations & principles of computer science & to strengthen the students' ability to carry out formal & rigorous mathematical

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argument. Employing a problem-solving approach, the text provides students insight into the course material by stressing intuitive motivation & illustration of ideas through

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straightforward explanations & solid mathematical proofs. By emphasizing learning through problem solving, students learn the material primarily through problem-type illustrative examples

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that show the motivation behind the concepts, as well as their connection to the theorems & definitions.

About the Book: This book is intended for the students who are pursuing courses in

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B.Tech/B.E. (CSE/IT),  
M.Tech/M.E. (CSE/IT), MCA  
and M.Sc (CS/IT). The book  
covers different crucial  
theoretical aspects such as  
of Automata Theory, Formal  
Language Theory,

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Computability Theory and Computational Complexity Theory and their applications. This book can be used as a text or reference book for a one-semester course in theory of

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computation or automata theory. It includes the detailed coverage of □  
Introduction to Theory of Computation □ Essential Mathematical Concepts □ Finite State Automata □

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Formal Language & Formal Grammar □ Regular Expressions & Regular Languages □ Context-Free Grammar □ Pushdown Automata □ Turing Machines □ Recursively Enumerable &



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Recursive Languages □  
Complexity Theory Key  
Features: « Presentation of  
concepts in clear, compact  
and comprehensible manner  
« Chapter-wise supplement  
of theorems and formal

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proofs « Display of chapter-wise appendices with case studies, applications and some pre-requisites « Pictorial two-minute drill to summarize the whole concept « Inclusion of more

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than 200 solved with additional problems « More than 130 numbers of GATE questions with their keys for the aspirants to have the thoroughness, practice and multiplicity « Key terms,

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Review questions and Problems at chapter-wise termination What is New in the 2nd Edition?? «  
Introduction to Myhill-Nerode theorem in Chapter-3 «  
Updated GATE questions and

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keys starting from the year 2000 to the year 2018

«Practical Implementations through JFLAP Simulator

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Computing Science and Engineering at Galgotias University, Greater Noida, U.P., India. Previously he has worked at GITA, Bhubaneswar, Odisha, K L Deemed to be University, A.P

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and AKS University, M.P, India. He has more than 5 years of teaching experience. He has been awarded M.Tech in IT, B.Tech in CSE and CCNA. He is the author of Design and

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Analysis of Algorithms book published by University Science Press, Laxmi Publications Pvt. Ltd, New Delhi. Santosh Kumar Swain, Ph.D, is an Professor in School of Computer



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Engineering at KIIT Deemed to be University, Bhubaneswar, Odisha. He has over 23 years of experience in teaching to graduate and post-graduate students of computer

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engineering, information technology and computer applications. He has published more than 40 research papers in International Journals and Conferences and one patent

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on health monitoring system. "Intended as an upper-level undergraduate or introductory graduate text in computer science theory," this book lucidly covers the key concepts and theorems

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of the theory of computation. The presentation is remarkably clear; for example, the "proof idea," which offers the reader an intuitive feel for how the proof was constructed,

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accompanies many of the theorems and a proof.

Introduction to the Theory of Computation covers the usual topics for this type of text plus it features a solid section on complexity

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theory--including an entire chapter on space complexity. The final chapter introduces more advanced topics, such as the discussion of complexity classes associated with

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probabilistic algorithms. 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

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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



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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

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of computation. Topics and features include more than 40 lectures for first year graduate students, and a dozen homework sets and exercises.

Introduction to the Theory of

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Computation  
Complexity and Real  
Computation  
Pearson New International  
Edition  
General Concepts and  
Techniques

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An Introduction

***Theory of computation is seen as a branch of both theoretical computer science and modern mathematics (however, it also contains some concepts from pure mathematics). Theory of***

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***computation shows how one can effectively solve a problem using a computational model. A number of computational models are described in theory of computation.***

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***Algorithm is most common format of computational model. Algorithm is a logical, systematic presentation of the process of problem solution. It theoretically represents the procedure of solving a***

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***particular problem. Flowchart is another form of such model of computation. Simply, flowchart is a graphical representation of any algorithm, using various symbols. Each symbol of***

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***flowchart represents a particular action. Algorithms and flowcharts possess a strong relation among each other. Yet, theory of computation talks more deeply and descriptively about***



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***algorithms and less about flowcharts.***

***This classic book on formal languages, automata theory, and computational complexity has been updated to present theoretical concepts in a***

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***concise and straightforward manner with the increase of hands-on, practical applications. This new edition comes with Gradiance, an online assessment tool developed for computer***

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***science. Please note, Gradiance is no longer available with this book, as we no longer support this product.***

***With the objective of making into a science the art of***

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***verifying computer programs (debugging), the author addresses both practical and theoretical aspects. Subjects include computability (with discussions of finite automata and Turing machines);***

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***predicate calculus; verification of programs (both flowchart and algol-like programs); flowchart schemas; and the fixpoint theory of programs. 1974 edition. Includes 77 figures.***

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***Algorithms and Theory of Computation Handbook, Second Edition: General Concepts and Techniques provides an up-to-date compendium of fundamental computer science topics and***

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***techniques. It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems. Along with updating and revising many of the existing chapters, this***

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***second edition contains four new chapters that cover external memory and parameterized algorithms as well as computational number theory and algorithmic coding theory. This best-selling***



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***handbook continues to help computer professionals and engineers find significant information on various algorithmic topics. The expert contributors clearly define the terminology, present basic***

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***results and techniques, and offer a number of current references to the in-depth literature. They also provide a glimpse of the major research issues concerning the relevant topics.***

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***Foundations of Computation  
Theory***

***Theory of Computation and  
Application (2nd Revised  
Edition)***

***A Modern Approach***

***Introduction to Automata***

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## ***Theory, Languages, and Computation***

### ***A Recursive Introduction to the Theory of Computation***

*Theory of Computation offers comprehensive coverage of one of the most important subjects in the study of*

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*engineering and MCA. This book gives a detailed analysis of the working of different sets of models developed by computer scientists regarding computers and programs. It uses simple language and a systematic approach to explain the concepts, which are often considered*

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*rather difficult by students. A number of solved programs will further help the students in assimilating understanding of this important subject. A thorough perusal of this book will ensure success for students in the semester examinations. Key Features • In-depth*

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*analysis of different computational methods • Large number of solved programs for hands-on practice • Thorough coverage of additional and latest computational methods*  
*This Third Edition, in response to the enthusiastic reception given by academia*

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*and students to the previous edition, offers a cohesive presentation of all aspects of theoretical computer science, namely automata, formal languages, computability, and complexity. Besides, it includes coverage of mathematical preliminaries. NEW TO THIS EDITION*



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*• Expanded sections on pigeonhole principle and the principle of induction (both in Chapter 2) • A rigorous proof of Kleene's theorem (Chapter 5) • Major changes in the chapter on Turing machines (TMs) – A new section on high-level description of TMs – Techniques*

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*for the construction of TMs – Multitape TM and nondeterministic TM • A new chapter (Chapter 10) on decidability and recursively enumerable languages • A new chapter (Chapter 12) on complexity theory and NP-complete problems • A section on quantum computation in*

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*Chapter 12. • KEY FEATURES • Objective-type questions in each chapter—with answers provided at the end of the book. • Eighty-three additional solved examples—added as Supplementary Examples in each chapter. • Detailed solutions at the end*

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*of the book to chapter-end exercises. The book is designed to meet the needs of the undergraduate and postgraduate students of computer science and engineering as well as those of the students offering courses in computer applications.*

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*Appropriate for senior and graduate level courses in Computer Science Theory, Automata, and Theory of Computation. This is the long awaited Second Edition of Lewis and Papadimitriou's best-selling theory of computation text. In this substantially*

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*modified edition, the authors have enhanced the clarity of their presentation by making the material more accessible to a broader undergraduate audience with no special mathematical experience. This book constitutes the proceedings of the 22nd International Symposium on*

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*Fundamentals of Computation Theory, FCT 2019, held in Copenhagen, Denmark, in August 2019. The 21 full papers included in this volume were carefully reviewed and selected from 45 submissions. In addition, the book contains 3 invited talks in full-paper*

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*length. The papers were organized in topical sections named: formal methods, complexity, and algorithms.*

*Topics in the Theory of Computation*

*Principles and Practice*

*Fundamentals of Computation Theory*



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*Algorithms and Theory of Computation Handbook, Second Edition, Volume 2*

An introduction to computational complexity theory, its connections and interactions with mathematics, and its central role in the

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natural and social sciences, technology, and philosophy  
Mathematics and Computation provides a broad, conceptual overview of computational complexity theory—the mathematical study of efficient

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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

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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

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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

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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

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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

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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



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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

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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

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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,

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technology, and society

Extensive bibliography

An accessible and rigorous textbook for introducing undergraduates to computer science theory What Can Be Computed? is a uniquely

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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

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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

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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,

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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



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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

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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

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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

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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

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computation. An accessible and rigorous introduction to the essential fundamentals of computer science theory, written specifically for undergraduates taking introduction to the theory of

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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

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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

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[whatcanbecomputed.com](http://whatcanbecomputed.com)

This textbook presents a thorough foundation to the theory of computation.

Combining intuitive descriptions and illustrations with rigorous arguments and



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detailed proofs for key topics, the logically structured discussion guides the reader through the core concepts of automata and languages, computability, and complexity of computation. Topics and

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features: presents a detailed introduction to the theory of computation, complete with concise explanations of the mathematical prerequisites; provides end-of-chapter problems with solutions, in

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addition to chapter-opening summaries and numerous examples and definitions throughout the text; draws upon the author's extensive teaching experience and broad research interests; discusses

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finite automata, context-free languages, and pushdown automata; examines the concept, universality and limitations of the Turing machine; investigates computational complexity based

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on Turing machines and Boolean circuits, as well as the notion of NP-completeness. The foundation of computer science is built upon the following questions: What is an algorithm? What can be

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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

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considered feasible? For more than 70 years, computer scientists are searching for answers to such questions. Their ingenious techniques used in answering these questions form the theory of computation.

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Theory of computation deals with the most fundamental ideas of computer science in an abstract but easily understood form. The notions and techniques employed are widely spread across various topics



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and are found in almost every branch of computer science. It has thus become more than a necessity to revisit the foundation, learn the techniques, and apply them with confidence. Overview and

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Goals This book is about this solid, beautiful, and pervasive foundation of computer science. It introduces the fundamental notions, models, techniques, and results that form the basic paradigms of computing. It

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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

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shown remarkable persistence over the years and are very much in current use.

Special Topics and Techniques  
Introduction to Languages and  
the Theory of Computation  
22nd International Symposium,

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FCT 2019, Copenhagen,  
Denmark, August 12-14, 2019,  
Proceedings  
Mathematics and Computation  
A Practical Guide to the Theory  
of Computation

*Computational complexity is*

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*one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. But this beauty is often buried underneath layers of*

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*unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student. This book bridges these gaps by*

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*explaining the deep ideas of theoretical computer science in a clear and enjoyable fashion, making them accessible to non-computer scientists and to computer scientists who finally want to appreciate their field*



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*from a new point of view. The authors start with a lucid and playful explanation of the P vs. NP problem, explaining why it is so fundamental, and so hard to resolve. They then lead the reader through the*

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*complexity of mazes and games; optimization in theory and practice; randomized algorithms, interactive proofs, and pseudorandomness; Markov chains and phase transitions; and the outer*

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*reaches of quantum computing. At every turn, they use a minimum of formalism, providing explanations that are both deep and accessible. The book is intended for graduate and undergraduate*

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*students, scientists from other areas who have long wanted to understand this subject, and experts who want to fall in love with this field all over again. Preliminaries; Finite automata and regular*

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*languages; Pushdown automata and context-free languages; Turing machines and phrase-structure languages; Computability; Complexity; Appendices.*

*Learn the skills and acquire the intuition to assess the*

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*theoretical limitations of computer programming  
Offering an accessible approach to the topic,  
Theory of Computation focuses on the metatheory of computing and the theoretical boundaries*

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*between what various computational models can do and not do—from the most general model, the URM (Unbounded Register Machines), to the finite automaton. A wealth of programming-like examples*

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*and easy-to-follow explanations build the general theory gradually, which guides readers through the modeling and mathematical analysis of computational phenomena and provides insights on what*



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*makes things tick and also what restrains the ability of computational processes. Recognizing the importance of acquired practical experience, the book begins with the metatheory of general purpose computer*

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*programs, using URMs as a straightforward, technology-independent model of modern high-level programming languages while also exploring the restrictions of the URM language. Once readers gain an*

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*understanding of  
computability  
theory—including the  
primitive recursive  
functions—the author  
presents automata and  
languages, covering the  
regular and context-free*

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*languages as well as the machines that recognize these languages. Several advanced topics such as reducibilities, the recursion theorem, complexity theory, and Cook's theorem are also*

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*discussed. Features of the book include: A review of basic discrete mathematics, covering logic and induction while omitting specialized combinatorial topics A thorough development of the modeling and mathematical*

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*analysis of computational phenomena, providing a solid foundation of un-computability The connection between un-computability and un-provability: Gödel's first incompleteness theorem The book provides numerous*

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*examples of specific URMs as well as other programming languages including Loop Programs, FA (Deterministic Finite Automata), NFA (Nondeterministic Finite Automata), and PDA (Pushdown Automata). Exercises at the*

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*end of each chapter allow readers to test their comprehension of the presented material, and an extensive bibliography suggests resources for further study. Assuming only a basic understanding of*



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