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The Nature Of Computation. Order @ amazon: The Nature of Computation by Cristopher Moore and Stephan Mertens, Oxford University Press (2011) 985 pages, 900 problems and exercises, 370 figures. Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology.

### The Nature Of Computation

The Nature of Computation is one of those books you can open to a random page and find something amazing, surprising and, often, very funny. ( American Scientist ) a comprehensive, accessible, and highly enjoyable book that conveys the key intellectual contributions of the theory of computing ... a valuable resource for any educator ( Haris Aziz, SIGACT )

The Nature of Computation: Amazon.co.uk: Moore, Cristopher ...

Abstract. Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. However, this beauty is often buried underneath layers of unnecessary formalism, and exciting recent results such as interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student.

Nature of Computation - Oxford Scholarship

Christopher Moore + Stephan Mertens. Unlike many texts on the theory of computation, The Nature of Computation doesn't start with a mass of formal definitions and the erection of a lot

of scaffolding. Moore and Mertens assume we basically know what computation is, following the Church-Turing thesis, and "use whatever model of computation makes it easiest to convey the key ideas".

The Nature of Computation (Christopher Moore, Stephan Mertens)

The Nature of Computation Continue When it comes down to it, the most obvious applications of quantum computers seem trivial—naturally, a computer built of photons will be effective at simulating photons.

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Computational complexity is 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 unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student.

The Nature of Computation | Oxford University Press

In theoretical computer science and mathematics, the theory of computation is the branch that deals with what problems can be solved on a model of computation, using an algorithm, how efficiently they can be solved or to what degree (e.g., approximate solutions versus precise ones). The field is divided into three major branches: automata theory and formal languages, computability theory, and ...

Theory of computation - Wikipedia

Natural computing, also called natural computation, is a terminology introduced to encompass three classes of methods: 1 those that take inspiration from nature for the development of novel problem-solving techniques; 2 those that are based on the use of computers to synthesize natural phenomena; and 3 those that employ natural materials to compute. The main fields of research that compose these three branches are artificial neural networks, evolutionary algorithms, swarm intelligence, artificia

Natural computing - Wikipedia

"The Nature of Computation (TNoC) is a comprehensive, accessible, and highly enjoyable book that conveys the key intellectual contributions of the theory of computing. The project took off as an effort to present theoretical computer science to physicists, but it is equally suitable for any science graduate who is curious to explore beautiful and deep ideas related to the mathematical structure of problems. ...

Amazon.com: The Nature of Computation (9780199233212 ...

The Nature of Computation. by. Cristopher Moore, Stephan Mertens. 4.60 · Rating details · 84 ratings · 3 reviews. Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology.

The Nature of Computation by Cristopher Moore

The Nature of Computation. Logic, Algorithms, Applications 9th Conference on Computability in Europe, CiE 2013, Milan, Italy, July 1-5, 2013. Proceedings

The Nature of Computation. Logic, Algorithms, Applications ...

Cristopher Moore and Stephan Mertens. Description. Computational complexity is 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 unnecessary formalism, and exciting recent results like interactive proofs, cryptography, and quantum computing are usually considered too "advanced" to show to the typical student.

The Nature of Computation - Cristopher Moore; Stephan ...

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The Nature of Computation - Cristopher Moore, Stephan ...

The Nature of Computation is meant to emphasize the special focus of CiE13 on the unexpected and strong changes that studies on Nature have brought in several areas of mathematics, physics, and computer science.

The boundary between physics and computer science has become a hotbed of interdisciplinary collaboration. In this book the authors introduce the reader to the fundamental concepts of computational complexity and give in-depth explorations of the major interfaces between computer science and physics.

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

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This book constitutes the refereed proceedings of the 9th Conference on Computability in Europe, CiE 2013, held in Milan, Italy, in July 2013. The 48 revised papers presented together with 1 invited lecture and 2 tutorials were carefully reviewed and selected with an acceptance rate of under 31,7%. Both the conference series and the association promote the development of computability-related science, ranging over mathematics, computer science and applications in various natural and engineering sciences such as physics and biology, and also including the promotion of related non-scientific fields such as philosophy and history of computing.

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

Neural network research often builds on the fiction that neurons are simple linear threshold units, completely neglecting the highly dynamic and complex nature of synapses, dendrites, and voltage-dependent ionic currents. *Biophysics of Computation: Information Processing in Single Neurons* challenges this notion, using richly detailed experimental and theoretical findings from cellular biophysics to explain the repertoire of computational functions available to single neurons. The author shows how individual nerve cells can multiply, integrate, or delay synaptic inputs and how information can be encoded in the voltage across the membrane, in the intracellular calcium concentration, or in the timing of individual spikes. Key topics covered include the linear cable equation; cable theory as applied to passive dendritic trees and dendritic spines; chemical and electrical synapses and how to treat them from a computational point of view; nonlinear interactions of synaptic input in passive and active dendritic trees; the Hodgkin-Huxley model of action potential generation and propagation; phase space analysis; linking stochastic ionic channels to membrane-dependent currents; calcium and potassium currents and their role in information processing; the role of diffusion, buffering and binding of calcium, and other messenger systems in information processing and storage; short- and long-term models of synaptic plasticity; simplified models of single cells; stochastic aspects of neuronal firing; the nature of the neuronal code; and unconventional models of sub-cellular computation. *Biophysics of Computation: Information Processing in Single Neurons* serves as an ideal text for advanced undergraduate and graduate courses in cellular biophysics, computational neuroscience, and neural networks, and will appeal to students and professionals in neuroscience, electrical and computer engineering, and physics.

With the objective of making into a science the art of verifying computer programs (debugging), the author addresses both practical and theoretical aspects. Subjects include computability (with discussions of finite automata and Turing machines); predicate calculus; verification of programs (both flowchart and algol-like programs); flowchart schemas; and the fixpoint theory of programs. 1974 edition. Includes 77 figures.

Although we are entirely unaware of it, computation is central to all aspects of our existences. Every day we solve, or try to solve, a myriad of problems, from the utterly trivial to the bafflingly complex. This book explains why it is possible to do computation and what the ultimate limits of it are, as understood by modern science.

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](http://whatcanbecomputed.com)

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