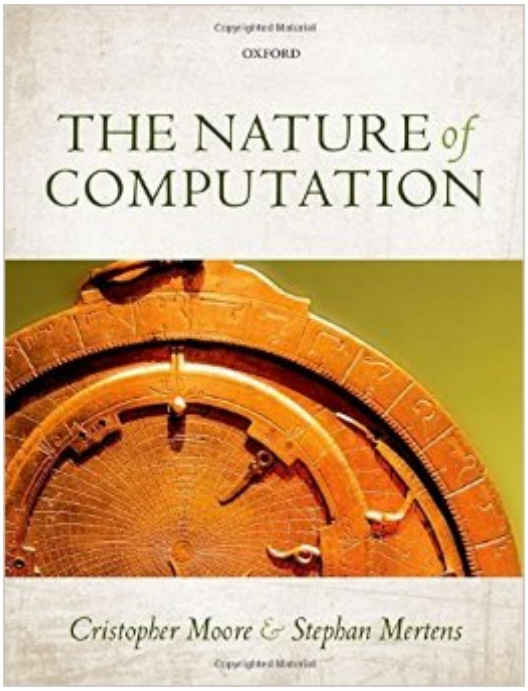
The Nature Of Computation



Synopsis

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 aim of this book is to bridge both 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 understand what their formalisms are actually telling. This book gives a lucid and playful explanation of the field, starting with P and NP-completeness. The authors explain why the P vs. NP problem is so fundamental, and why it is 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 graduates and undergraduates, 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.To request a copy of the Solutions Manual, visit: http://global.oup.com/uk/academic/physics/admin/solutions

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Customer Reviews

"To put it bluntly: this book rocks! It’s 900+ pages of awesome. It somehow manages to combine the fun of a popular book with the intellectual heft of a textbook, so much so that I don’t know what to call it (but whatever the genre is, there needs to be more of it!)." -- Scott Aaronson, Massachusetts Institute of Technology "A creative, insightful, and accessible introduction to the theory of computing, written with a keen eye toward the frontiers of the field and a vivid enthusiasm for the subject matter." -- Jon Kleinberg, Cornell University "If you want to learn about complexity classes, scaling laws in computation, undecidability, randomized algorithms, how to prepare a dinner with Pommard, Quail and Roquefort, or the new ideas that quantum theory brings to computation, this is the right book. It offers a wonderful tour through many facets of computer science. It is precise and gets into details when necessary, but the main thread is always at hand, and entertaining anecdotes help to keep the pace." -- Marc MÃ©zard, UniversitÃ© de Paris Sud, Orsay"A treasure trove of ideas, concepts and information on algorithms and complexity theory. Serious material presented in the most delightful manner!" -- Vijay Vazirani, Georgia Instituute of Technology"A fantastic and unique book - a must-have guide to the theory of computation, for physicists and everyone else." -- Riccardo Zecchina, Politecnico di Torino "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. ... TNoC provides not just a window through which people from other disciplines can get glimpses of the interesting nuggets from computer science, but also provides an entertaining open house session where a visitor can meet various deep ideas and understand the core arguments behind key results." --Haris Aziz, SIGACT News Book Review Column"The book is highly recommended for all interested readers: in or out of courses, students undergraduate, researchers in other fields eager to learn the subject, or scholars already in the field who wish to enrich their current understanding. It makes for a great textbook in a conventional theory of computing course, as I can testify from recent personal experience (I used it once; I’ll use it again!). With its broad and deep wealth of information, it would be a top contender for one of my "desert island" books. [The Nature of Computation] speaks directly, clearly, convincingly, and entertainingly, but also goes much further: it inspires." --Frederic Green, SIGACT News Book Review Column

Cristopher Moore graduated from Northwestern University with honors in 1986, at the age of 18, with a B.A. in Mathematics, Physics, and Integrated Science. He received his Ph.D. in Physics from

Cornell University at the age of 23. After a postdoc at the Santa Fe Institute, he joined the faculty of the University of New Mexico, where he holds joint appointments in Computer Science and Physics and Astronomy. He has written over 90 papers, on topics ranging from undecidability in dynamical systems, to quantum computing, to phase transitions in NP-complete problems, to the analysis of social and biological networks. Stephan Mertens got his Diploma in Physics in 1989, and his Ph.D. in Physics in 1991, both from Georg-August University GÃ¶ttingen. He holds scholarships from the "Studienstiftung des Deutschen Volkes", Germany's most prestigious organisation sponsoring the academically gifted. After his Ph.D. he worked for three years in the software industry before he joined the faculty of Otto-von-Guericke University Magdeburg as a theoretical physicist. His research focuses on disordered systems in statistical mechanics, average case complexity of algorithms, and parallel computing.