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The trailer for a new documentary short titled "Quantum Technology | Our Sustainable Future" was released today.

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Scheduled for a world premiere July 29, the documentary features insights by ...

The multidisciplinary field of quantum computing strives to exploit some of the uncanny aspects of quantum mechanics to expand our computational horizons. Quantum Computing for Computer Scientists takes readers on a tour of this fascinating area of cutting-edge research. Written in an accessible yet rigorous fashion, this book employs ideas and techniques familiar to every student of computer science. The reader is not expected to have any advanced mathematics or physics background. After presenting the necessary prerequisites, the material is organized to look at different aspects of

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quantum computing from the specific standpoint of computer science. There are chapters on computer architecture, algorithms, programming languages, theoretical computer science, cryptography, information theory, and hardware. The text has step-by-step examples, more than two hundred exercises with solutions, and programming drills that bring the ideas of quantum computing alive for today's computer science students and researchers.

The multidisciplinary field of quantum computing strives to exploit some of the uncanny aspects of quantum mechanics to expand our computational horizons. Quantum Computing for Computer Scientists takes readers on a tour of this fascinating area of cutting-edge research. Written in an accessible yet rigorous fashion, this book employs ideas and techniques familiar to every student of

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computer science. The reader is not expected to have any advanced mathematics or physics background. After presenting the necessary prerequisites, the material is organized to look at different aspects of quantum computing from the specific standpoint of computer science. There are chapters on computer architecture, algorithms, programming languages, theoretical computer science, cryptography, information theory, and hardware. The text has step-by-step examples, more than two hundred exercises with solutions, and programming drills that bring the ideas of quantum computing alive for today's computer science students and researchers. --from publisher description.

"Quantum computation, one of the latest joint ventures between physics and the theory of computation, is a scientific field whose

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main goals include the development of hardware and algorithms based on the quantum mechanical properties of those physical systems used to implement such algorithms." "Solving difficult tasks (for example, the Satisfiability Problem and other NP-complete problems) requires the development of sophisticated algorithms, many of which employ stochastic processes as their mathematical basis. Discrete random walks are a popular choice among those stochastic processes." "Inspired on the success of discrete random walks in algorithm development, quantum walks, an emerging field of quantum computation, is a generalization of random walks into the quantum mechanical world." "The purpose of this lecture is to provide a concise yet comprehensive introduction to quantum walks."--BOOK JACKET.

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In the 1990's it was realized that quantum physics has some spectacular applications in computer science. This book is a concise introduction to quantum computation, developing the basic elements of this new branch of computational theory without assuming any background in physics. It begins with an introduction to the quantum theory from a computer-science perspective. It illustrates the quantum-computational approach with several elementary examples of quantum speed-up, before moving to the major applications: Shor's factoring algorithm, Grover's search algorithm, and quantum error correction. The book is intended primarily for computer scientists who know nothing about quantum theory, but will also be of interest to physicists who want to learn the theory of quantum computation, and philosophers of science interested in quantum foundational issues. It evolved during six

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years of teaching the subject to undergraduates and graduate students in computer science, mathematics, engineering, and physics, at Cornell University.

Is the universe actually a giant quantum computer? According to Seth Lloyd, the answer is yes. All interactions between particles in the universe, Lloyd explains, convey not only energy but also information – in other words, particles not only collide, they compute. What is the entire universe computing, ultimately? “ Its own dynamical evolution, ” he says. “ As the computation proceeds, reality unfolds. ” Programming the Universe, a wonderfully accessible book, presents an original and compelling vision of reality, revealing our world in an entirely new light.

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An accessible introduction to an exciting new area in computation, explaining such topics as qubits, entanglement, and quantum teleportation for the general reader. Quantum computing is a beautiful fusion of quantum physics and computer science, incorporating some of the most stunning ideas from twentieth-century physics into an entirely new way of thinking about computation. In this book, Chris Bernhardt offers an introduction to quantum computing that is accessible to anyone who is comfortable with high school mathematics. He explains qubits, entanglement, quantum teleportation, quantum algorithms, and other quantum-related topics as clearly as possible for the general reader. Bernhardt, a mathematician himself, simplifies the mathematics as much as he can and provides elementary examples that illustrate both how the math works and what it means. Bernhardt introduces

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the basic unit of quantum computing, the qubit, and explains how the qubit can be measured; discusses entanglement—which, he says, is easier to describe mathematically than verbally—and what it means when two qubits are entangled (citing Einstein's characterization of what happens when the measurement of one entangled qubit affects the second as “spooky action at a distance”); and introduces quantum cryptography. He recaps standard topics in classical computing—bits, gates, and logic—and describes Edward Fredkin's ingenious billiard ball computer. He defines quantum gates, considers the speed of quantum algorithms, and describes the building of quantum computers. By the end of the book, readers understand that quantum computing and classical computing are not two distinct disciplines, and that quantum computing is the fundamental form of computing. The basic unit of

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computation is the qubit, not the bit.

A thorough exposition of quantum computing and the underlying concepts of quantum physics, with explanations of the relevant mathematics and numerous examples. The combination of two of the twentieth century's most influential and revolutionary scientific theories, information theory and quantum mechanics, gave rise to a radically new view of computing and information. Quantum information processing explores the implications of using quantum mechanics instead of classical mechanics to model information and its processing. Quantum computing is not about changing the physical substrate on which computation is done from classical to quantum but about changing the notion of computation itself, at the most basic level. The fundamental unit of computation is no longer

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the bit but the quantum bit or qubit. This comprehensive introduction to the field offers a thorough exposition of quantum computing and the underlying concepts of quantum physics, explaining all the relevant mathematics and offering numerous examples. With its careful development of concepts and thorough explanations, the book makes quantum computing accessible to students and professionals in mathematics, computer science, and engineering. A reader with no prior knowledge of quantum physics (but with sufficient knowledge of linear algebra) will be able to gain a fluent understanding by working through the book.

This book targets computer scientists and engineers who are familiar with concepts in classical computer systems but are curious to learn the general architecture of quantum computing systems. It

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gives a concise presentation of this new paradigm of computing from a computer systems' point of view without assuming any background in quantum mechanics. As such, it is divided into two parts. The first part of the book provides a gentle overview on the fundamental principles of the quantum theory and their implications for computing. The second part is devoted to state-of-the-art research in designing practical quantum programs, building a scalable software systems stack, and controlling quantum hardware components. Most chapters end with a summary and an outlook for future directions. This book celebrates the remarkable progress that scientists across disciplines have made in the past decades and reveals what roles computer scientists and engineers can play to enable practical-scale quantum computing.

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Takes students and researchers on a tour through some of the deepest ideas of maths, computer science and physics.

A quantum computer is a computer based on a computational model which uses quantum mechanics, which is a subfield of physics to study phenomena at the micro level. There has been a growing interest on quantum computing in the 1990's and some quantum computers at the experimental level were recently implemented. Quantum computers enable super-speed computation and can solve some important problems whose solutions were regarded impossible or intractable with traditional computers. This book provides a quick introduction to quantum computing for readers who have no backgrounds of both theory of computation and quantum mechanics. “ Elements of Quantum Computing ” presents the

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history, theories and engineering applications of quantum computing. The book is suitable to computer scientists, physicists and software engineers.

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