

Book Description

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 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.

The text covers the basic building blocks of quantum information processing, quantum bits and quantum gates, showing their relationship to the key quantum concepts of quantum measurement, quantum state transformation, and entanglement between quantum subsystems; it treats quantum algorithms, discussing notions of complexity and describing a number of simple algorithms as well as the most significant algorithms to date; and it explores entanglement and robust quantum computation, investigating such topics as quantifying entanglement, decoherence, quantum error correction, and fault tolerance.

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