1. Record Nr. UNINA9910741147803321

Autore	Chang Weng-Long
Titolo	Fundamentals of quantum programming in IBM's quantum computers / / Weng-Long Chang, Athanasios V. Vasilakos
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] Â©2021
ISBN	3-030-63583-X
Edizione	[1st ed. 2021.]
Descrizione fisica	1 online resource (XIV, 340 p. 155 illus., 115 illus. in color.)
Collana	Studies in big data ; ; Volume 81
Disciplina	006.3843
Soggetti	Quantum computing Quantum computers
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Introduction to Quantum Bits and Quantum Gates on IBM’s Quantum Computer -- Boolean Algebra and its Applications -- Quantum Search Algorithm and its Applications -- Quantum Fourier Transform and its Applications -- Order-Finding and Factoring -- Phase Estimationand its Applications. .
Sommario/riassunto	This textbook introduces major topics that include quantum bits, superposition, entanglement, logic gates, quantum search algorithm, quantum Fourier transform, inverse quantum Fourier transform, Shor’s order-finding algorithm and phase estimation. Everyone can write algorithms and programs in the cloud making using IBM’s quantum computers that support IBM Q Experience which contains the composer, open quantum assembly language, simulators and real quantum devices. Furthermore, this book teaches you how to use open quantum assembly language to write quantum programs for dealing with complex problems. Through numerous examples and exercises, readers will learn how to write a quantum program with open quantum assembly language for solving any problem from start to complete. This book includes six main chapters: ·Quantum Bits and Quantum Gates—learn what quantum bits are, how to declare and measure them, what quantum gates are and how they work on a simulator or a real device in the cloud. ·Boolean Algebra and its Applications—learn how to decompose CCNOT gate into six CNOT gates and nine gates of one bit

and how to use NOT gates, CNOT gates and CCNOT gates to implement logic operations including NOT, OR, AND, NOR, NAND, Exclusive-OR (XOR) and Exclusive-NOR (XNOR). ·Quantum Search Algorithm and its Applications—learn core concepts of quantum search algorithm and how to write quantum programs to implement core concepts of quantum search algorithm for solving two famous NP-complete problems that are the satisfiability problem in n Boolean variables and m clauses and the clique problem in a graph with n vertices and q edges. ·Quantum Fourier Transform and its Applications—learn core concepts of quantum Fourier transform and inverse quantum Fourier transform and how to write quantum programs to implement them for solving two real applications that are to compute the period and the frequency of two given oracular functions. ·Order-Finding and Factoring—learn core concepts of Shor's order-finding algorithm and how to write quantum programs to implement Shor's order-finding algorithm for completing the prime factorization to 15. Phase Estimation and its Applications—learn core concepts of phase estimation and quantum counting and how to write quantum programs to implement them to compute the number of solution(s) in the independent set problem in a graph with two vertices and one edge. .