Quantum Algorithms

The 1994 discovery of Shor's quantum algorithm for integer factorization—an important practical problem in the area of cryptography—demonstrated quantum computing's potential for real-world impact. Since then, researchers have worked intensively to expand the list of practical problems that quantum algorithms can solve effectively.

This book surveys the fruits of this effort, covering proposed quantum algorithms for concrete problems in many application areas, including quantum chemistry, optimization, finance, and machine learning. For each quantum algorithm considered, the book clearly states the problem being solved and the full computational complexity of the procedure, making sure to account for the contribution from all the underlying primitive ingredients. Separately, the book provides a detailed, independent summary of the most common algorithmic primitives. It has a modular, encyclopedic format to facilitate navigation of the material and to provide a quick reference for designers of quantum algorithms and quantum computing researchers.

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