

Combinatorial Optimization Using Quantum Computing

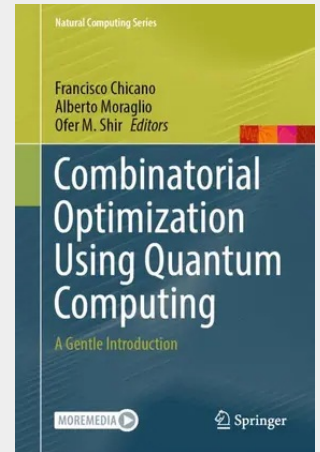
A Gentle Introduction

This book provides a comprehensive introduction to quantum optimization, bridging quantum computing and combinatorial optimization for readers without prior background in quantum mechanics. It covers both the theoretical foundations and practical implementation of optimization problems on current quantum hardware.

The book is organized in three parts: Part I (Foundations) introduces essential concepts in quantum computing and combinatorial optimization, establishing the mathematical and computational framework needed for subsequent chapters. Part II (Methodologies) covers the two main quantum computing paradigms: quantum annealing (as implemented on D-Wave systems) and gate-based quantum computing (including variational algorithms such as QAOA and VQE). Part III (Applications and Tools) presents practical case studies and implementation details, including executable code that readers can study, modify, and apply to their own problems. Each chapter emphasizes clear explanations and worked examples. Where appropriate, chapters include code implementations using standard quantum computing frameworks, enabling readers to experiment with algorithms on simulators and actual quantum hardware.

The book is intended for researchers, graduate students, and practitioners in Optimization, Operations Research, Computer Science, and related fields who seek to understand and apply quantum computing methods to combinatorial optimization problems.

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