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Quadratic Unconstrained Binary Optimization: Exact, Heuristic, and Quantum Methods

The Quadratic Unconstrained Binary Optimization (QUBO) problem is the simplest form of 0-1 optimization with a nonlinear objective function. Despite its apparent simplicity, QUBO is NP-hard, as it's equivalent to Max-Cut. It finds applications in various optimization fields, including mobility, scheduling and logistics, machine learning, and finance.

Due to its widespread relevance, QUBO has been tackled by numerous solution techniques, both exact and heuristic. Recently, interest in QUBO has surged significantly, as it has become the problem of choice for adiabatic quantum computing. This is currently the only quantum technique capable of handling instances with thousands of binary variables. There are claims in the literature that this method vastly outperforms classical digital computers for solving QUBO problems. This talk will review some of these methods.