

Quadratic Unconstrained Binary Optimization: Solution Techniques and Challenging Instances

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Abstract: *Binary Unconstrained Quadratic Optimization* (QUBO) is the area of optimization concerning the maximization or the minimization of an arbitrary quadratic form on binary variables, without any additional requirements. Each problem falling into this area is equivalent to the one of finding a cut of maximal weight in a weighted graph. Solution algorithms (exact or with *ex-post* certified solutions) based on polyhedral and semidefinite relaxations will be revised. Polyhedral based algorithms are typically successful for very large, but very sparse instances. Those based on the semi-definite relaxations seem to be the algorithms of choice for small dense instances. Recently, a class of instances that are derived from the architecture of state-of-the-art computers based on quantum annealing, became quite popular among people interested in QUBO. Even instances of moderate sizes seem to be quite challenging for both the approaches mentioned above.

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