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Challenges in Multiobjective Optimization using a Quantum Adiabatic Computer

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After proposing the first quantum algorithm for multiobjective combinatorial optimization problems using a convex combination of different objective functions, using the well-known two parabola problem as a simple example, this talk will present open challenges in using adiabatic quantum computers to simultaneously optimize many objective functions to calculate Pareto optimal solutions, a problem known as MaOP (Many-objectives Optimization Problem) that has a recognized importance in science, engineering and economy, among other fields that may need to consider dozens or even hundreds of different objective functions when solving a problem.

Described the constrains of the presented algorithm to solve multiobjective optimization problems, several challenges as the following ones will be analyzed: (1) how to choose the right weight vector to construct the required Halmitonian, (2) how to constraint the domain of a given algorithm in order to minimize the number of solutions when there are too many solutions, (3) what to do with equivalent solutions with the same eigenvalue, (4) how to manage not supported solutions in order to approximate the whole Pareto set and (5) how to use an adiabatic quantum computer for practical applications of multiobjective optimization. Clearly, the promising future of quantum computing still have a long way to go before real commercial applications can benefit from using it in the optimization of problems with many objectives that should be simultaneously considered.

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