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Rethinking classical optimization in the age of quantum computers

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The development of quantum computers is one of the most intriguing and motivating challenges of the current century. Thanks to their inborn quantum nature, these machines are expected to offer an unprecedented computational advantage over classical machines in solving highly complex
computational problems that span from the simulation of quantum systems to quantum chemistry and material science.
In addition to all this, the future availability of these powerful machines is opening new scenarios in the areas of global optimization and machine learning. Standard computers have been used successfully on a large variety of problems of this kind over the past decades. However, increasing
interest has been spreading throughout the scientific community to understand whether using
quantum resources may provide a computational advantage over classical ones in this context, too.
Since large-scale quantum computers are still under development and their availability is still limited,
different quantum-inspired methodologies able to mimic some aspects concerning the functioning of quantum computers have been developed in the past years to bridge the gap toward the development of algorithms that can exploit this type of resources.
During this brief talk, I will show how to adapt a general optimization problem to quantum hardware by presenting some recent applications of two of the most popular quantum-inspired approaches available, namely Tensor Network Methods and the D-Wave annealers.

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