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Towards the use of quantum computers in radiotherapy

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Radiotherapy aims at treating patients with cancer using ionising radiation. However, a key step is the optimization of the treatment. This is done using an inverse-planning approach where the treatment goals are encoded into a cost-function to minimize. The latter can be either non-convex or non-smooth with several local minima.

Quantum computers may efficiently solve this problem thanks to their inborn parallelisation ability. Therefore, in the last two years, our group focused on the development of new optimization strategies based mainly on Tensor Network Methods where

the classical optimization problem is mapped into an ising-type Hamiltonian whose ground state corresponds to the best solution to the initial problem and the optimization variables are represented in terms of qubits. Our preliminary results show that this approach is compatible with any type of function and can perform at least comparably as classical optimization algorithms on the test functions considered.

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