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A hybrid classical-quantum approach to improve Q-learning

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A classical-quantum hybrid approach to computation is presented, allogwing for a (quadratic) performance improvement in the learning stage of a neural network. In particular, a quantum computing routine is described, which helps to prepare/update the probability distributions that drive the agent operations. This algorithm can be used not only in a reinforcement learning scenario, but also in several other contexts. After intrudicing the algorithm and presenting a formal evaluation of its performance (in terms of required qubits, number of required operations, and maximum approximation error), the way it can be exploited in a reinforcement learning set-up is discussed in details.

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