Quantum Perceptrons and Evolution

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Abstract

In this paper, the authors propose a role for quantum learning in evolution.

Consider ions in some environment. We can define a quantum perceptron with N inputs as N single-particle Schrodinger equations starting off with entangled motional states of the particles. The environment voltage applied to each equation changes in three steps. The first step performs the dot product or projection onto a weight array, the second step performs a summation and the final step performs the activation step. The input data is the present motional state of each particle (within the constraint of entanglement), or the joint such state. As the data enters the pipeline, it is processed by the external voltage steps and results in a final state. Read-off can be in the form of measurement. The ions are refreshed into (or reprepared in) the initial state once again, weight update is performed as per the general rules, and the process repeats. The ions of the quantum perceptron are quantum-learning the features of the motional nature of their (thermodynamic say) environment and succinctly transcribing it in the electric field they generate. Their goal is a given electric field profile.

Once the quantum perceptron is so trained, it is lifted and placed in a new environment and functions as per the finalized weights from the training phase. In this environment the thermodynamic motional data is new. The quantum perceptron, because it is previously trained, produces an output electric field corresponding to the motional (new) data. A well trained quantum perceptron will quickly generate the given or desired electric field profile from any new motional data.

Suppose the electric field to be generated is an action potential field or a local field potential. Evolution might have trained the initial quantum perceptrons and later when they got detached from their initial hosts and entered a new environment, different in some respects, they kept on pulling its motional state into the same field pattern as their training phase. Thus electric field patterns which are found to be common in so many organisms might have come to be replicated widely.