Mutual Reinforcement between Neural Networks and Quantum Physics

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Abstract
Quantum machine learning emerges from the symbiosis of quantum mechanics and machine learning. In particular, the latter gets displayed in quantum science as: (i) the use of classical machine learning as a tool applied to quantum physics problems, (ii) or the use of quantum resources such as superposition, entanglement, or quantum optimization protocols to enhance the performance of classification and regression tasks compare to their classical counterparts. This talk reviews examples in these two scenarios. On the one hand, a classical neural network is applied to design a new quantum sensing protocol [1]. On the other hand, the design of a quantum neural network based on the dynamics of a quantum perceptron with the application of shortcuts to adiabaticity gives rise to a short operation time and robust performance [2]. These examples demonstrate the mutual reinforcement of both neural networks and quantum physics.

References

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2. Y. Ban, X. Chen, E. Torrontegui, E. Solano and J. Casanova, Sci. Rep., 11 (2021) 5783.