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**Neural-Network Quantum States: from Condensed Matter to Quantum Computing**

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Machine-learning-based approaches, routinely adopted in cutting-edge industrial applications, are being increasingly adopted to study fundamental problems in science. Very recently, their effectiveness has been demonstrated also for many-body physics. In this seminar I will present recent applications to the quantum realm. First, I will discuss how a systematic machine learning of the many-body wave-function can be realized. This goal has been achieved in [1], introducing a variational representation of quantum states based on artificial neural networks. This representation can be used to study both ground-state and unitary dynamics, with controlled accuracy. I will then show how a similar representation can be used for applications directly relevant to ultra-cold atoms and quantum computing. In this context, I will discuss both Quantum State Tomography of highly-entangled states [2], and a novel approach for the classical simulation of large quantum circuits [3].

Carleo, and Troyer Science 355, 602 (2017). [2] Torlai, Mazzola, Carrasquilla, Troyer, Melko, and Carleo Nature Physics (2018). doi:10.1038/s41567-018-0048-5 [3] Jonsson, and Carleo In preparation (2018)