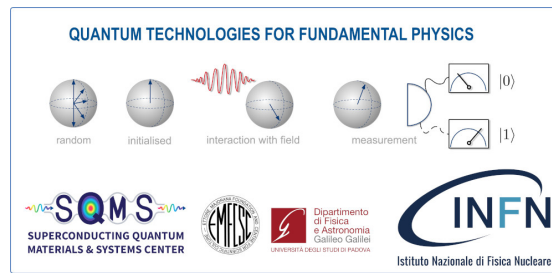


# Quantum Technologies for Fundamental Physics



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## Quantum reservoir computing and Quantum Extreme Learning machines

Wednesday, 6 September 2023 11:55 (25 minutes)

In the past few years we have witnessed a growing interest computational paradigms beyond the gate paradigm. Among these Extreme learning machines and Reservoir computers are two particularly interesting new computational paradigms. Their key feature is the use of a fixed, nonlinear dynamics to efficiently extract information from a given dataset. Such goal, in the classical scenario, is achieved by processing the data as input of some fixed nonlinear dynamics of a suitable (neural) network –the reservoir - which enlarge the dimensionality of the data, making it easier to extract the properties of interest. The difference between Extreme learning machines and Reservoir computers is whether the reservoir being used can deploy an internal memory. More precisely, reservoir computers hold memory of the inputs seen at previous iterations, a feature which plays a crucial role when processing time sequences. Extreme machine learning on the other hand use memoryless reservoirs. Although this makes the training of ELMs easier, it also makes them unsuitable for temporal data processing. We will review some recent theoretical and experimental results on the quantum counterpart of the above.

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