

# SEMINAR: Experimental quantum machine learning on photonic architectures

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15:00 to 16:00

Elements Room

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In the last decades, quantum machine learning has attracted a flurry of interest, with significant experimental developments, especially on photonic platforms. The hope is that the combination of quantum features and optical computing paves the way for more resource-efficient protocols, e.g. in terms of energy consumption, with respect to standard ones.

In this context, the main challenge is how to implement nonlinear behaviors, that are crucial for any learning process. In fact, quantum evolutions are intrinsically linear and optical nonlinearities are extremely weak.

However, especially when working with classical input data, we can resort to several strategies to implement nonlinear input/output functions. For instance, this can be achieved through nonlinear

encoding, or by re-uploading the input several times in the model. Also resorting to feedback loops can introduce nonlinear input/output correlations, with the option of equipping the model with short term memory.

In this talk, we will provide an overview over several experimental works resorting to the aforementioned strategies and show how, even on small-sized photonic processors, we can effectively tackle real-world problems, such as image recognition. Moreover, for given tasks, our quantum models can achieve higher accuracy with respect to widely used classical ones. We also illustrate the implementation of a quantum reservoir computing based on a photonic quantum, benchmarked on time-series predictions.

**Hosted by:** Prof. Dr. Antonio Acin