## Rencontres des Jeunes Physicien ne s 2019



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## **Neural networks for Quantum Physics**

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The state of a quantum system is completely determined by its wave-function or density-matrix, which evolve according to an equation of motion. When the system is composed of many interacting particles, the manybody problem increases exponentially the size of those objects, which eventually cannot be stored in the memory of a computer. For decades researchers approached the issue by constructing approximations based on our physical understanding that could reduce the complexity. This approach, while successful, requires a through study of every system. In the field of machine learning a different technique has been developed: Neural-Networks are a general class of functions which are able to represent the solutions to very disparate problems. By combining a quantum variational principle with an iterative procedure, we show that it is possible to optimize neural-networks in order to encode the ground- (or steady-)state of a quantum system. Such procedure, similar in spirit to supervised learning, can be performed efficiently by means of a Montecarlo sampling, which sidesteps the problem of exponential complexity. In this talk we will also showcase several other applications of machine learning to quantum physics.

## Field

Machine learning/Quantum physics

## Language

English

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