

Machine Learning and Physics Seminar Series

Thursday, 12 November 2020 at 3.00pm
To receive the Zoom room link, send an empty email to
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Many-body quantum wave functions in the era of machine learning

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Machine-learning-based approaches, routinely adopted in cutting-edge industrial applications, are being increasingly embraced to study fundamental problems in science. Many-body quantum physics is very much at the forefront of these exciting developments, given its intrinsic “big-data” nature. In this seminar I will review machine learning approaches tailored to find compact representations of many-body wave-functions. This goal is achieved by a variational representation of quantum states based on artificial neural networks. I will mainly discuss two applications with direct ties to quantum information and computing. First, I will show how techniques borrowed from quantum computing can be used to simulate fermionic matter using spin-based neural network wave functions. Then, I will show that there are relevant cases in which machine learning techniques can be already used to classically simulate useful quantum algorithms.

Giuseppe Carleo is a computational quantum physicist, best known for the introduction and development of novel machine learning techniques to study complex quantum phenomena. He earned a PhD in 2011 at the International School for Advanced Studies (SISSA) in Italy. He has held several research and academic positions, including lecturer at ETH Zurich, and staff research scientist at Flatiron Institute in New York City. Since 2020, he is an assistant professor at the Institute of Physics of EPFL, in Switzerland, and serves as head of the Computational Quantum Science Lab.