CEA – Saclay, 91191 Gif-sur-Yvette Cedex
Service de Physique de l'Etat Condensé - UMR 3680

SÉMINAIRE

Mercredi 15 mai 2019 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

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Can a machine infer quantum mechanics from direct observations?

Quantum mechanics provides us with an accurate set of rules to optimally predict the outcome of experiments, however, it is also infamous for being abstract and highly counter-intuitive. Neural networks are powerful tools to extract non-trivial correlation in vast datasets, they recently outperformed state-of-the-art techniques in language translation, medical diagnosis or image recognition. It remains to be seen if they can be of aid in learning non-intuitive dynamics such as ones found in quantum systems without any prior.
Here, we demonstrate that a recurrent neural network can be trained in real time to infer the quantum evolution of a superconducting qubit under non-trivial unitary evolution and continuous measurement from raw experimental observations only. These predictions are exploited to extract the system Hamiltonian, measurement operators and parameters such as quantum efficiency with greater accuracy than usual calibration methods. Also, the quantum tomography of an unknown initial state is performed without prior calibration. This work shows that quantum mechanics can be inferred from observation based on deep learning methods and can be readily extended to larger quantum systems in a model-independent fashion to enhance quantum sensing or quantum characterization, verification, and validation.

A coffee break will be served at 11h00.

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