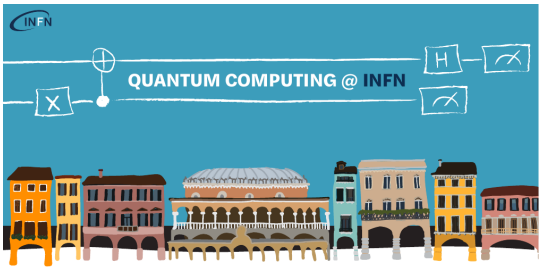

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Approximate inverse measurement channel for shallow shadows

Wednesday, 30 October 2024 17:25 (20 minutes)

Classical shadows are a versatile tool to probe many-qubit quantum systems, consisting of a combination of randomised measurements and classical post-processing computations. In a recently introduced version of the protocol, the randomization step is performed via unitary circuits of variable depth t, defining the so-called shallow shadows. For sufficiently large t, this approach allows one to get around the use of non-local unitaries to probe global properties such as the fidelity with respect to a target state or the purity. Still, shallow shadows involve the inversion of a many-qubit map, the measurement channel, which requires non-trivial computations in the post-processing step, thus limiting its applicability when the number of qubits N is large. In this talk, I will explain a recent proposal to use a simple approximate post-processing scheme where the infinite-depth inverse channel is applied to the finite-depth classical shadows and discuss its performance for fidelity and purity estimation. The scheme is efficient and allows for different circuit connectivity, as I will illustrate for geometrically local circuits in one
and two spatial dimensions and geometrically non-local circuits made of two-qubit gates. I will argue that this approach extends the
applicability of shallow shadows to large number of qubits and general circuit connectivity, with potential application to quantum simulation.

Talk based on arXiv:2407.11813

Sessione

Simulazione

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