



Contribution ID : 48

Type : Oral

Quantifying the difference between many-body quantum states

venerdì 15 ottobre 2021 16:30 (25)

The quantum state fidelity is the textbook measure of the difference between two quantum states. Yet, it is inadequate to compare the complex configurations of many-body systems. We introduce the weighted distances, a new class of information-theoretic measures that overcome these limitations. They quantify how hard it is to discriminate between two quantum states of many particles, factoring in the structure of the required measurement apparatus. We also show that the newly defined “weighted Bures length” between the input and output states of a quantum process is a lower bound to the experimental cost of the transformation. The result uncovers an exact quantum limit to our ability to convert physical resources into computational ones. Ref.: PRL 126, 170502 (2021)

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Session Classification : Session 14