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On the quantification of resourcefulness in quantum information[1]

YUVAL SANDERS, University of Waterloo, BEN FORTESCUE, Southern Illinois University, GILAD GOUR, University of Calgary — Quantum information processing tasks cannot be performed for free; several types of informational resource must be consumed. Such resources are often expensive: entanglement, for example, is quite difficult to distribute between distant parties. Efficient consumption of informational resources is therefore desirable for practical quantum information processing. Determination of the efficiency of a given protocol requires some method of quantifying the resources present before and after the implementation of a protocol. In the prototypical case of entanglement, one or several entanglement monotones are often used to determine the entanglement cost of a protocol. The mathematical definition of an entanglement monotone has undergone multiple revisions since its formal introduction by Vidal. Currently, a real-valued function of quantum states is considered an entanglement monotone if the function is monotonically decreasing under application of channels that can be enacted using only local operations with classical communication. In this lecture, I argue that even this simple definition is unnecessarily restrictive for fully characterising the entanglement of a state and propose a more general scheme of relative quantifiers of entanglement.

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