

Operational interpretation of weight-based resource quantifiers in convex quantum resource theories

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Extended Abstract

The framework of *Quantum Resource Theories (QRTs)* [1] has proven to be a powerful framework within quantum information [2–20]. Within the the language of QRTs, properties of different objects deemed as *resources* can be addressed under the same umbrella and this has consequently led to the cross fertilisation of ideas amongst different quantum phenomena; results in a particular QRT with a particular resource has led to insights into different resources and QRTs of different objects. One of the main goals of QRTs is to define *resource quantifiers* in order to properly quantify the amount of a resource present in an object, as well as to devise *operational tasks* explicitly harnessing these resources.

In this work, we introduce the resource quantifier of weight of resource for convex quantum resource theories of states and measurements with arbitrary resources. We show that it captures the advantage that a resourceful state (measurement) offers over all possible free states (measurements), in the operational task of exclusion of subchannels (states). Furthermore, we introduce information-theoretic quantities related to exclusion for quantum channels, and find a connection between the weight of resource of a measurement, and the exclusion-type information of quantum-to-classical channels. The results found in this article apply to the resource theory of entanglement, in which the weight of resource is known as the best-separable approximation or Lewenstein-Sanpera decomposition, introduced in 1998. Consequently, the results found here provide an operational interpretation to this 21 year-old entanglement quantifier.

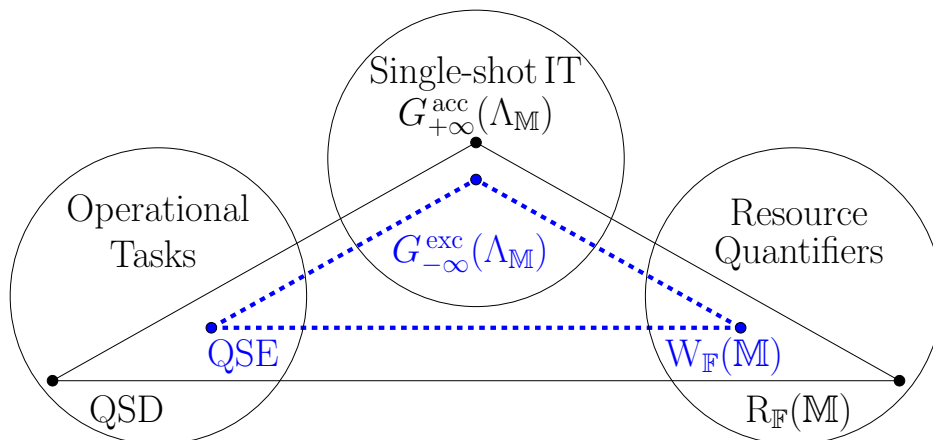


Figure 1: Three-way correspondence between: resource quantifiers, operational tasks, and single-shot information-theoretic quantities, for QRTs of measurements with arbitrary convex resources.

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