Joint CQSE and CASTS Seminar

Weekly Seminar
Sep. 22, 2017 (Friday)

TIME Sep. 22, 2017, 14:30 ~ 15:30
TITLE Quantifying resource in catalytic resource theory
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Abstract

We consider a general resource theory that allows the use of free resource as a catalyst. We show that the amount of `resource' contained in a given state, in the asymptotic scenario, is equal to the regularized relative entropy of resource of that state, which then yields a straightforward operational meaning to this quantity.

Such an answer has been long sought for in any resource theory since the usefulness of a state in information-processing tasks is directly related to the amount of resource the state possesses in the beginning. While we need to place a few assumptions in our resource theoretical framework, it is still general enough and includes quantum resource theory of entanglement, coherence, asymmetry, non-uniformity, purity, contextuality, stabilizer computation and the classical resource theory of randomness extraction as special cases.

Since our resource theoretic framework includes entanglement theory, our result also implies that the amount of noise one has to inject locally in order to erase all entanglement contained in an entangled state is equal to the regularized relative entropy of entanglement, resolving an open question posted in [Groisman et al., Phys. Rev. A. 72: 032317, 2005]. On the way to prove the main result, we also quantify the amount of resource contained in a state in the one-shot setting (where one only has a single copy of the state), in terms of the smooth max-relative entropy. Our one-shot result employs a recently developed technique of convex-split lemma.