CENTRE
DE RECHERCHES
MATHÉMATIQUES

Tenseurs : information quantique, complexité et combinatoires quantiques

Tensors: Quantum Information, Complexity and Combinatorics

Dávid Bugár
(Budapest University of Technology and Economics)

Tensors and entanglement II: Interpolating between Rényi entanglement entropies via geometric means

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We introduce a new construction of subadditive and submultiplicative monotone functionals on the semiring of pure states or complex tensors, with the preorder given by local operations and classical communication. The functionals are defined in terms of a regularized Rényi divergence between many copies of the pure state represented by the tensor and a suitable sequence of positive operators. We give explicit families of operators that correspond to the Rényi entanglement entropies for any given bipartition, and show that they can be combined in a nontrivial way using weighted operator geometric means. This leads to a new characterization of all the previously known additive and multiplicative monotones, while for a restricted parameter range lead to new submultiplicative and subadditive monotones that interpolate between the Rényi entropies for all bipartitions. In addition, we find lower bounds on the new functionals that are superadditive and supermultiplicative.