CENTRE
DE RECHERCHES
MATHÉMATIQUES

Tenseurs : information quantique, complexité et combinatoires quantiques

Tensors: Quantum Information, Complexity and Combinatorics

Tobias Fritz
(University of Innsbruck)

Vergleichsstellensätze for ordered semirings

The semiring structure of tensors, and more generally that of many resource theories in quantum information, has recently received significant attention thanks to a strong separation theorem due to Strassen. Here, I will present two theorems of the same flavour which strengthen Strassen's result and broaden its range of applicability substantially by weakening its Archimedeanicity assumption. By analogy with the Nullstellensatz and Positivstellensätze, such theorems should be called "Vergleichsstellensätze". They provide criteria for asymptotic and catalytic resource convertibility that are almost necessary and sufficient in a sense that I will explain. I will also sketch three existing applications of these results to which Strassen's theorem does not apply, namely to random walks, representation theory of SU(n) and to matrix majorization: in each of these cases, our Vergleichsstellensätze make the asymptotic and catalytic orderings essentially computable and provide simple formulas for asymptotic rates of conversion.