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Completely bounded p-norms in quantum information theory

Proof of the multiplicativity of maximal p-norms of noisy quantum channels has been conjectured and is known to imply additivity of minimal entropy and several equivalent conjectures. The concept of a completely bounded norm has been defined in the context of operator spaces. A channel is a completely positive, trace-preserving (CPT) map Φ acting on the $d \times d$ matrices, which can be regarded as forming a Banach space associated with the Schatten p-norm. The completely bounded norm of Φ is defined in terms of the action of $I_m \otimes \Phi$ on tensor products of matrices, which generate a non-commutative vector-valued L_p space. The completely bounded norm of a tensor product of CPT maps is multiplicative. This implies that a certain type of minimal conditional entropy is additive.

This talk is based on joint work with I. Devetak, M. Junge and C. King. It is intended to be accessible to both operator algebraists and quantum information theorists.