Functional Analysis and Operator Theory
Webinar

Entropy inequalities – beyond strong subadditivity(?)

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What are the constraints that the von Neumann entropies of the 2^n possible marginals of an n-party quantum state have to obey? Similarly for the Shannon entropy of n random variables? Pippenger called these "the laws of (quantum) information theory", among them subadditivity and strong subadditivity, and while we know a few of them, we seem to me missing many.

In fact, it is known that both classically and quantumly, the set of entropy vectors is essentially a convex cone, so the laws in question naturally take the form of homogeneous convex inequalities. More specifically, we can describe the classical and quantum entropy cones for n parties by linear information inequalities.

Starting with Zhang and Yeung, Dougherty et al. and finally Matus have shown that 4-partite Shannon entropies satisfy infinitely many inequalities beyond the standard ones, the "Shannon inequalities", which define a polyhedral cone. Matus' result implies that the entropy cone of 4 random variables is not polyhedral.

In the talk I will review progress towards finding non-von-Neumann inequalities in the quantum case, commenting briefly on the case of Rényi entropies as well.

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