One-way Communication in Quantum XOR Games

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Work in progress with Marius Junge, Carlos Palazuelos and Ignacio Villanueva.

The study of two-player games is a central theme in both computational complexity and quantum information theory. Interestingly, deep connections with some branches of functional analysis – as local Banach space and Operator space theories – were uncovered in this context.

Among two-player games, XOR games are arguably the best understood family of them. In this work we study a generalization of this family of games proposed by O. Regev and T. Vidick in 2013, called Quantum XOR games (QXOR). These authors relate the optimal probability of winning such a game with different operator norms (depending on how we restrict the resources that the players are allowed to use) of a linear map from the normed space of bounded operators into the space of trace class operators. In our work, we study new scenarios in which the players are able to communicate, finding new connections with other natural operator norms on the same maps as before. This leads us to study the relation between the bounded, completely bounded norms and two *completely bounded* generalizations of the 1-summing norm of a map, a classical notion in the theory of tensor norms of Banach spaces originated in the celebrated Grothendieck's résumé. We exploit this connection to understand better properties of QXOR games as well as the aforementioned norms.

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