STABILITY THEOREM FOR THE MINIMAL OUTPUT QUANTUM RÉNYI ENTROPIES

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ABSTRACT

The stability theorem of the depolarizing channel in terms of the maximal output purity provides us with various applications in quantum information science, which bridge seemingly disconnected research areas, quantum information theory and quantum complexity theory. In particular, as an application of the stability theorem, it has been shown by A. W. Harrow and A. Montanaro [1] that the complexity class QMA(k) has the same complexity as QMA(2) for k more than two. In the reference [1], the authors have raised several open questions, one of which is to prove the stability theorem of the depolarizing channel (or more general quantum channels) for the minimal output quantum Rényi entropies. In this work, we show that the stability theorem holds for the depolarizing channel for the minimal output von Neumann entropy by employing several techniques in the reference [2], which shows the local additivity of the minimum output entropy. In addition, we answer the open question by generalizing the above techniques.

REFERENCES

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2. Gour, G. and Friedland, S., "The Minimum Entropy Output of a Quantum Channel Is Locally Additive", *IEEE Transactions on Information Theory*, Vol. 59, No. 1, 2013, pp. 603–614.