

A short summary of “A strong converse for classical channel coding using entangled inputs”

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1 Motivation

This paper targets the following questions :

- In classical channels, C (capacity) is an important factor due to the strong converse by Wolfowitz. Is there a strong converse for quantum channels (for classical communication)?
- Does entanglement provide any operational advantage?

2 Prior Art

- Strong converse exists for classical channels as well as quantum identity channels.
- Strong converse does exist if inputs are assumed to be in a tensor product form.
- A weak converse holds for entangled inputs.

3 Results

- For channels whose Holevo quantity is additive, strong converse holds; $\exists \gamma > 0$ such that

$$p_{\text{succ}}^{\phi}(n, R) \leq 2^{-\gamma n(R-C)}$$

where R is the code rate, ϕ is the channel and C is the classical capacity, for sufficiently large n .

- Entanglement does not provide any operational advantage.

4 Remarks

- Whether there are non-additive channels for which only a weak converse holds.
- Do we need better mathematics to evaluate the capacity for channels with non-additive Holevo quantity?
- Is there a strong converse for channels whose Holevo quantity is non-additive?