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**Paper**: Peter Harremoes, Flemming Topsoe “The Quantitative Theory of Information”  
1)

1. Information is always information about something. The message selected at one point is accurately or approximately reproduced at another point. This is the characteristic of describing accurate information.

1. Entropy is the minimum average codeword length understood in an ideal sense, measured in natural units rather than bits.
2. There are two protocol for sending messages. First is sending message several time and if the transmitted information is wrong, it will be retransmitted three times. Second is when receiver receives messages, it will give a feedback to the sender.
3. Senmantic content can be expressed by random elements, for example some key notions such as entropy can be extended from only dealing with distribution to incorporate random elements.
4. Arimoto-Blahut’s algorithm
5. Jaynes’ maximum entropy principle
6. Gibbs conditioning principle
7. Law of large numbers and central limit theorem
8. Mutual information measures the information in bits, which has three possible different definition. First is uncertainty removed, second is average redundancy and third is divergence related to a change of joint distributions.
9. Side information is the extra information that I obtain, as the results of data reduction, which can be interpreted as context information used by philosophers.
10. Game theory is the study of how and why people make decisions. It helps people understand parts of science and politics.

After reading the paper above, I am very interested in quantum information and communication so I read a paper and learn the relavant knowledge about the future development of Information Theory.

**Paper**: A. Winter, "Scalable programmable quantum gates and a new aspect of the additivity problem for the classical capacity of quantum channels," Proceedings IEEE International Symposium on Information Theory,, 2002, pp. 70-, doi: 10.1109/ISIT.2002.1023342.

1. In a quantum computer, the program needs to implement a unified mapping, which only allows approximate implementations. The hope of using the continuity of states to represent the continuity of unities is predetermined: in a simple model, Nelson and Chong introduce programmable quantum gates
2. The reduction of the more general scenario to the usual one proved to be a failure due to the non-existence of scalable programmable quantum gates. This leads us to speculate that the question of additivity of quantum channel capacity is not really about "whether entangled inputs help", but rather "whether entangled inputs help".