Tight Modified Log-Sobolev inequality for quantum Markov semigroups

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Functional inequalities are potent tools in analyzing the convergence time of quantum Markov semigroups. Specifically, the modified log-Sobolev inequality (MLSI) concerns the (exponential) convergence of the time evolution in terms of relative entropy as a quantitative measure. In this talk, I will present an estimate of modified log-Sobolev constant using completely positive mixing time. Our proof uses only entropic inequalities, which gives a unified information-theoretic approach that applies in both classical and quantum setting, even the Type III von Neumann algebras. For a quantum analog of birth-and-death process, our estimate is tight up to a factor of absolute constant. As an application, I will talk about the use of (complete) modified log-Sobolev constant in estimating the decay of relative entropy of entanglement. This is based on an joint work with Marius Junge, Nicholas LaRacuente, and Haojian Li.