QUANTUM NON-MARKOVIANITY

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Abstract: In the study of open quantum systems, memory effects are usually ignored, and this leads to dynamical semi-groups and Markovian dynamics. However, in practice, non-Markovian dynamics is the rule rather than exception. With the recent emergence of quantum information theory, there is a flurry of investigations of non-Markovian dynamics. In this talk, we first review several significant measures for non-Markovianity, such as deviation from divisibility, information exchange between a system and its environment, or entanglement with the environment. Then by exploiting the correlations flow between a system and an arbitrary ancillary, we study a considerably intuitive measure for non-Markovianity by use of correlations as quantified by the quantum mutual information rather than entanglement. The measure captures quite directly and deeply the characteristics of non-Markovianity from the perspective of information. A simplified version based on Jamiolkowski-Choi isomorphism which encodes operations via bipartite states and does not involve any optimization is also proposed.