Seminar/Talk

Thermalization of quantum spin chains: an entropic perspective

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TUM

Host: Jan Maas / Haonan Zhang

The strong subadditivity (SSA) of the von Neumann entropy and the data processing inequality (DPI) of Umegaki's relative entropy lie at the heart of quantum information theory. While the former can be interpreted as a statement about the correlations between two quantum systems from the point of view of a third party, the latter expresses the intuitive fact that noise cannot increase the information content of a given signal. In this talk, I will show that generalizations of SSA beyond the setting of tripartite systems lead to refinements of DPI. Then, I will apply these findings to show a generalization to the quantum setting of a seminal result of Holley and Stroock establishing that spin chains weakly coupled to a large heat bath thermalize rapidly at any positive temperature for finite-range, translation-invariant commuting Hamiltonians, reaching equilibrium in a time which scales logarithmically with the system size. In particular, this represents an exponential improvement over bounds based on the non-closure of the spectral gap. From a physical point of view, this result rigorously establishes the absence of dissipative phase transition for Davies evolutions over translation-invariant spin chains.

Thursday, July 7, 2022 04:15pm - 05:15pm
Mondi 2 (I01.01.008), Central Building

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