SFB/TRR 21 - Colloquium

8. Mai 2015, Ulm

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Entanglement, complementarity and correlations

We provide an interpretation of entanglement based on classical correlations between measurement outcomes of complementary properties for bipartite quantum systems. We discuss in particular what classical correlations in the measurements of these complementary properties tell us about the quantum correlations of the state of the system under consideration. We show that states that have correlations for complementary observables beyond a certain threshold value are entangled. The reverse is not true, however. We also show that, surprisingly, separable states with quantum correlations exhibit smaller correlations for complementary observables with respect to classical states. We use mutual information as a measure of classical correlations, but we conjecture that the first result holds also for other measures (e.g. the Pearson correlation coefficient or the sum of conditional probabilities).

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