SFB/TRR 21 - Colloquium

22. November 2013, Ulm

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(MPQ, Garching)

The role of entanglement in quantum computation

In this talk I will present an overview of results addressing the basic question: 'What is the role of entanglement for quantum speed-ups?' While colloquially the increased power of quantum computers over classical ones is sometimes straightforwardly attributed to entanglement, in reality its role in this matter is currently rather unclear. Part of the difficultly is that entanglement is a multi-faceted concept which cannot be quantified in a single unique way. The talk will cover several questions, such as: 'How much, or how little, entanglement is necessary for quantum speed-ups?', 'Can entanglement be dispensed with completely?' and 'Is entanglement a sufficient condition for quantum speed-ups?' Finally I will highlight the different behavior of pure and mixed quantum states and the importance of choosing appropriate measures of entanglement.

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