« Atelier sur l'information quantique et mécanique statistique quantique »
15 au 19 octobre 2018

"Workshop on Quantum Information and Quantum Statistical Mechanics"
October 15-19, 2018

Tensor network representations from the geometry of entangled states

Matthias Christandl *

christandl@math.ku.dk

Tensor network states provide successful descriptions of strongly correlated quantum systems with applications ranging from condensed matter physics to cosmology. Any family of tensor network states possesses an underlying entanglement structure given by a graph of maximally entangled states along the edges that identify the indices of the tensors to be contracted. Recently, more general tensor networks have been considered, where the maximally entangled states on edges are replaced by multipartite entangled states on plaquettes. Both the structure of the underlying graph and the dimensionality of the entangled states influence the computational cost of contracting these networks. Using the geometrical properties of entangled states, we provide a method to construct tensor network representations with smaller effective bond dimension. We illustrate our method with the resonating valence bond state on the kagome lattice.

This is joint work with Angelo Lucia, Peter Vrana and Albert Werner.

*Department of Mathematical Sciences, University of Copenhagen, Universitetsparken 5, DK-2100 Copenhagen Ø, DENMARK