Dr. Valentin Stauber

Tensor Networks in Strongly Correlated Matter: From Local Tensors to Global Properties

Supervisor: Prof. Frank Verstraete

Abstract:

This thesis is concerned with the question whether it is possible to learn global properties of a complex many body system in the thermodynamic limit from a local description of its current state. More specifically, tensor network representations of classical or quantum states are used to study one or two dimensional strongly correlated many body systems in and out of equilibrium, where the focus lies on matrix product state (MPS) descriptions, a variant of tensor networks designed for one dimensional quantum lattices. The local tensors, which are the constituents of such a description are used to form local objects or quantities, from which statements about general global properties of the system can be made, such as e.g. dispersions of elementary excitations, the geometry of all possible reduced density matrices or phase transitions in dynamical state overlaps.