MP 7: Quantum Field Theory II

Zeit: Mittwoch 16:30–17:55 Raum: Z6 - SR 1.012

Hauptvortrag MP 7.1 Mi 16:30 Z6 - SR 1.012

Complexity of states in quantum field theory — •Michal P. Heller — MPI for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany

One of the most interesting developments in holography is an apparent link between the notion of complexity of states, the measure of how hard it is to obtain a given state from a chosen reference state using a restricted set of allowed operations, and emergent spacetime geometry. In this talk I will present recent attempts to define complexity of states in quantum field theory and discuss their connection with holographic results, as well as with the field of tensor networks.

MP 7.2 Mi 17:15 Z6 - SR 1.012

Fermionic tensor networks: A functorial approach — •Pascal Fries — Fakultät für Physik und Astronomie, Julius-Maximilians-Universität Würzburg, Am Hubland, 97074 Würzburg, Germany

I give an overview on how fermionic tensor networks can be understood in terms of symmetric monoidal categories. In this setting, the meaning of second quantization as a *functor of diagrams* is made precise.

The results can be used to derive quantum circuits from arbitrary spectral decompositions and thus provide a systematic Ansatz for obtaining new analytic classes of tensor networks.

MP 7.3 Mi 17:35 Z6 - SR 1.012

Holography and criticality in matchgate tensor networks — •Alexander Jahn, Marek Gluza, Fernando Pastawski, and Jens Eisert — Dahlem Center for Complex Quantum Systems, Freie Universität Berlin, 14195 Berlin, Germany

The AdS/CFT correspondence conjectures a holographic duality between gravity in a bulk space and a critical quantum field theory on its boundary. Tensor networks have come to provide toy models to understand such bulk-boundary correspondences, shedding light on connections between geometry and entanglement. We introduce a versatile and efficient framework for studying tensor networks, extending previous tools for Gaussian matchgate tensors in 1+1 dimensions. Using regular bulk tilings, we show that the critical Ising theory can be realized on the boundary of both flat and hyperbolic bulk lattices. Within our framework, we also produce translation-invariant critical states by an efficiently contractible network dual to the multi-scale entanglement renormalization ansatz. Furthermore, we explore the correlation structure of states emerging in holographic quantum error correction. We hope that our work will stimulate a comprehensive study of tensor-network models capturing bulk-boundary correspondences.