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# Impurities, infrared catastrophe and renormalization : a principle of holographic quasi-locality

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The multi-scale entanglement renormalization ansatz (MERA), in its scale-invariant version, offers an accurate description of the ground state of a system at a quantum phase transition. On the other hand, the critical ground states for the same system in the abscence/presence of an impurity are known to be orthogonal (infrared catastrophe, or Anderson's orthogonality theorem). And yet, a MERA can be built for the two ground states that only differs in a quasi-local region consisting of a narrow strip of tensors spanning all length scales (namely, the past causal cone of the impurity). In other words, even though the presence of the impurity is felt everywhere in the system, with an intensity that decays as a powerlaw with the distance to the impurity, the tensors in the MERA for the ground state with and without impurity are the same throughout the tensor network, except in a narrow strip. This holographic quasi-locality principle, which states that a local change in the Hamiltonian can be accounted for by a quasi-local change in the holographic geometry represented by the MERA, has practical consequences : I will propose a simple ansatz, depending on a small number of tensors, to extract the critical properties of impurity, boundary, interface and Y-junction systems on an infinite lattice.

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