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TITULO: Entanglement renormalization, holography and correlations between disjoint regions in quantum critical systems

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ABSTRACT

Recently, it has been proposed that in (d+1) dimensional Multiscale Entanglement Renormalization Ansatz (MERA) networks, tensors are connected so as to reproduce the discrete, (d + 2) holographic geometry of Anti de Sitter space (AdS) with the original system lying at the boundary. In thistalk we will provide additional support for this proposal by showing the explicit formal equivalence between the real space renormalization group (RG) flow of the two point correlators in different types of MERA states and the holographic RG flow of these correlators in asymptotically Anti de Sitter (AdS) spacetimes. Additionally, we analyze the MERA renormalization flow that arises when computing the correlations between two disjoint blocks of a quantum critical system, to show that the structure of the causal cones characteristic of MERA, requires a transition between two different regimes attainable by changing the ratio between the size and the separation of the two disjoint blocks. We argue that this transition in the MERA causal developments of the blocks may be easily accounted by an AdS black hole geometry when the mutual information (MI) between the blocks is computed using the Ryu-Takayanagi formula. As an explicit example, we use the BTZ AdS black hole to compute the MI between two disjoint intervals of a one dimensional boundary critical system. Our results for this low dimensional system show the existence of a phase transition emerging when the conformal four point ratio reaches a critical value and discuss the robustness of this transition when finite size effects are taken into account.