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Holographic Dynamics from Multiscale Entanglement Renormalization Ansatz[1] VASILIOS PASSIAS, VICTOR CHUA, APOORV TIWARI, SHINSEI RYU, University of Illinois at Urbana-Champaign — The Multiscale Entanglement Renormalization Ansatz (MERA) is a tensor network based variational ansatz that can capture many of the key physical properties of strongly correlated ground states. MERA also shares many deep relationships with the AdS/CFT (gauge-gravity) correspondence by realizing a UV complete holographic duality within the tensor network framework. Motivated by this, we use the MERA tensor network as analysis tool to study the real-time evolution of a periodic 1D paramagnetic phase transverse Ising model in its low energy excited state sector. This network realizes a 'holographic transform' between boundary (spin) and bulk (qubit) degrees of freedom when studying changes in the former and its effects on the latter and vice-versa, despite the boundary theory being in a non-CFT limit. In this limit, we demonstrate a 'dictionary' between the bulk and boundary that realizes many features of the holographic correspondence. We also find a stable holographic quasiparticle, named the 'hologron', and numerically study its bulk 2D Hamiltonian, energy spectrum and dynamics within the MERA network. Holographically, single bulk localized hologrons are dual to extended (non-local) modifications of the ground state in physical (boundary) space.

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