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Bidirectional holographic codes and sub-AdS locality[1] ZHAO YANG, PATRICK HAYDEN, XIAOLIANG QI, Stanford Univ — Tensor networks implementing quantum error correcting codes have recently been used as toy models of the holographic duality which explicitly realize some of the more puzzling features of the AdS/CFT correspondence. These models reproduce the Ryu-Takayanagi entropy formula for boundary intervals, and allow bulk operators to be mapped to the boundary in a redundant fashion. These exactly solvable, explicit models have provided valuable insight but nonetheless suffer from many deficiencies, some of which we attempt to address in this talk. We propose a new class of tensor network models that subsume the earlier advances and, in addition, incorporate additional features of holographic duality, including: (1) a holographic interpretation of all boundary states, not just those in a "code" subspace, (2) a set of bulk states playing the role of "classical geometries" which reproduce the Ryu-Takayanagi formula for boundary intervals, (3) a bulk gauge symmetry analogous to diffeomorphism invariance in gravitational theories, (4) emergent bulk locality for sufficiently sparse excitations, and the ability to describe geometry at sub-AdS resolutions or even flat space.

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