

p-adic approaches to discretizing holography

Abstract

In its most general incarnation, the AdS/CFT correspondence relates a theory of fields, including gravity, on a hyperbolic spacetime to a conformally invariant field theory on its boundary at infinity. Though the correspondence was first motivated for specific pairs of dual theories by constructions in string theory, much of the dictionary was fleshed out using general considerations about symmetries and equations of motion for fields, and the perspective has emerged that the bulk theory can be thought of as a geometrized picture of the renormalization group flow in the theory on the boundary, with the additional coordinate playing the role of a scale. Recent interest in tensor-network models has been fueled in large part by the proposal that they give a discretized analogue of an AdS/CFT-type correspondence; however, these models are not recognizably field theories, and don't exhibit the symmetry matching that is a key ingredient of the usual dictionary. I'll describe recent work that (following up on numerous clues in the literature, including a suggestion of Manin and Marcolli) begins to develop a holographic dictionary for field theories on non-Archimedean spaces, along with some new results for such field theories that have appeared along the way. Although the bulk spaces in question are automatically discrete, much of the dictionary carries over immediately from ordinary low-dimensional AdS/CFT, almost without alteration.