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Wormholes, random matrices, and (non-)factorization in d>2

Thursday 19 November 2020 21:00 (1 hour)

Abstract:

In the first half of this talk, I will discuss wormholes in pure 3d Euclidean gravity with negative cosmological constant. We compute a wormhole amplitude, the path integral over Euclidean spaces which smoothly connect two hyperbolic regions with torus boundary and topology torus times line. This is a 3d version of the "double trumpet"of JT gravity. From this amplitude we extract the leading two-point fluctuation statistics of highly spinning BTZ microstates near threshold. These statistics precisely match a random matrix ansatz. This is evidence that, if 3d gravity is a consistent theory of gravity, then it is dual to an ensemble rather than a single CFT.

In the second half, I will discuss recent progress in constructing Euclidean wormholes in d>2 dimensional pure Einstein gravity. These configurations are also generalizations of the JT double trumpet, in particular they are not saddle points of the gravity action. They are instead "constrained instantons."For fixed bottleneck size, we have shown that some of these wormholes are completely stable in Einstein gravity. These wormholes can be easily embedded into supergravity, in which they are generically unstable to brane nucleation. However, we find a class of wormholes with AdS-scale bottlenecks in EAdS_5 x Sˆ5 supergravity which are stable against obvious potential brane instabilities. These wormholes may pose a factorization paradox for the duality between N=4 super Yang-Mills and IIB string theory on AdS_5 x Sˆ5.

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