Contribution ID: **35** Type: **not specified**

An emergent entanglement wedge from matrix quantum mechanics

Thursday 18 January 2024 15:30 (30 minutes)

The geometrization of entanglement and the formation of an entanglement wedge is a profound feature of quantum gravity: in spite of bulk diffeomorphism invariance, microscopic degrees of freedom are encoded in bulk regions of minimal area. I will explain a simple model of NxN matrix quantum mechanics that displays this feature. The model has a semi-classical solution describing a non-commutative, or fuzzy, sphere upon which a U(N) gauge symmetry acts, at large N, as area-preserving diffeomorphisms. Considering the gauge-invariant question "what is the entanglement entropy of the state reduced to M units of area?"I will give evidence of a transition at strong coupling whereby the answer to this question is dominated by a saddle-point where all the entangled degrees of freedom coalesce into a cap region of minimal perimeter on the fuzzy sphere. The entanglement entropy is given by the perimeter of this emergent entanglement wedge.

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