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Simulate holographic entanglement entropy and correlation function in hyperbolic lattices

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This talk will report an experimental simulation of bulk entanglement entropy (BEE) and boundary-boundary correlation function (BBCF) of scalar fields in two types of hyperbolic lattices, serving as the discretized regularizations of spatial geometries of pure AdS2+1 spacetime and AdS2+1 black hole, respectively. We experimentally confirm that BEE exhibits universal logarithmic scaling with the subsystem size, following the well-known Ryu-Takayanagi (RT) formula, while BBCF displays an exponential law dependence on the boundary separation, the scaling dimension of which conforms to the Klebanov-Witten (KW) relation. This heuristic experimental effort opens a new avenue for in-depth investigations on the gravity/gauge duality and the extensive exploration of quantum-gravity-inspired phenomena in classical systems.

Presenter(s) : YANG, Run-Qiu (Tianjin University)

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