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From gravitational symmetries to the area law

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The complete structure of quantum gravity remains unknown to this day. A recent line of research proposes using the symmetries of gravity as a guiding principle in the search for its quantum formulation. In this talk, I will present our approach, which employs these symmetries to classify the possible quantum gravitational states associated with a subregion of spacetime. I will further show that our formalism naturally leads to a computation of the entanglement entropy of such subregions. Finally, I will argue that, in the classical limit, the leading term of this entanglement entropy scales with the area of the subregion's boundary, thus recovering the famous Bekenstein–Hawking area law and strengthening the case for a symmetry-based approach to quantum gravity.

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