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Non-perturbative quantum gravity denounces singular Black Holes

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Although General Relativity predicts the presence of a singularity inside of a Black Hole, it is not a complete theory of gravity. A real structure of a Black Hole interior near an expected singularity depends on the UV completion of gravity. In this paper, we establish that the question whether singular spherically symmetric solutions are absent is governed by the functional form of a non-perturbative graviton propagator. We explicitly show in a framework of a ghost-free infinite derivative gravity that for the graviton propagator of an exponential form favored by the unitarity a singularity is not possible unless an unphysical situation when the total mass of the Black Hole is infinite is considered.

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