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Einstein-Gauss-Bonnet gravity in four space-time dimensions

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Lovelock's theorem asserts that the most general theory of gravity in D=4 space-time dimensions is given by the action containing the Einstein-Hilbert term and a cosmological constant. Already in D=5 an additional term is possible - the Gauss-Bonnet action - which in D=4 turns into a total derivative not contributing to dynamics. In general, the contribution of the Gauss-Bonnet action to Einstein equation is proportional to (D-4). Here I will present an idea of multiplying the Gauss-Bonnet action by 1/(D-4) and defining the four-dimensional case as a smooth D->4 limit of the Einstein equation. Thus defined the theory propagates only the graviton and it satisfies the criteria of Lovelock's theorem, but bypasses its results. This theory has several novel predictions, including the corrections to the dispersion relation of cosmological tensor and scalar modes and singularity resolution for spherically symmetric solutions.

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