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Emergent Gravity, hidden sectors and TT Deformations

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We investigate emergent gravity extending the paradigm of the AdS/CFT correspondence. The emergent graviton is associated to the (dynamical) expectation value of the energy-momentum tensor. We derive the general effective description of such dynamics, and apply it to the case where a hidden theory generates gravity that is coupled to the Standard Model. In the linearized description, generically, such gravity is (effectively) massive with the presence of an extra scalar degree of freedom. The propagators of both the spin-two and spin-zero modes are positive and well defined. The associated emergent gravitational theory is a bi-gravity theory, as is (secretly) the case in holography. The background metric on which the QFTs are defined, plays the role of dark energy and the emergent theory has always as a solution the original background (flat) metric. In the case where the hidden theory is holographic, the overall description yields a higher-dimensional bulk theory coupled to a brane. The effective graviton on the brane has four-dimensional characteristics both in the UV and IR and is always massive. The setup realizes the self-tuning mechanism of the cosmological constant.

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