

Towards scale invariant theory of gravity

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I will construct an effective theory of gravity which contains infinitely many covariant derivatives and can ameliorate the problem of ghost instability at the perturbative level. I will discuss how to constrain the gravitational form factors and such an action from the perturbative unitarity. I will demonstrate non-singular solutions in the context of a static and a rotating blackhole, and in cosmology. If time permits, I will discuss some quantum aspects of the infinite derivative theory of gravity and show how an infrared scale emerges from the ultraviolet in the presence of N -gravitons interacting in a scattering process. This will bring a potential analogy between fuzz-ball states in string theory and non-locality, where one can compute the metric solutions in a time dependent background. I will also discuss how to construct infinite derivative action for an Abelian Higgs, which can potentially yield a scale invariant theory of the Standard Model of particle physics.