Nonlocally interacting metrics and cosmic acceleration

Valeri Vardanyan
Lorentz Institute, University of Leiden
The Netherlands

In this talk we present a simple, nonlocal modification to general relativity (GR) on large scales with the same number of free parameters as in standard cosmology, which provides late-time cosmic acceleration in the absence of a cosmological constant. The model is constructed by adding to the gravity sector an extra spin-2 field, which interacts nonlocally with the physical metric coupled to matter. The model is inspired by the simplest form of the Deser-Woodard (DW) model, $\alpha R\frac{1}{\Box}R$, with one of the Ricci scalars replaced by the one associated with the extra metric-like field. We study the cosmic expansion histories, and demonstrate that this new model can provide background expansions consistent with observations, contrary to the simple DW model. We also compare the cosmology of the model to that of the Maggiore-Mancarella (MM) model, $m^2R\frac{1}{\Box^2}R$, and demonstrate that the viable cosmic histories follow the standard-model evolution more closely compared to the MM model. In addition, we show that the consistency conditions on the proposed model of nonlocally interacting metrics render it effectively equivalent to a single-metric model where gravity is modified in the infrared by adding a simple term of the form $m^2\frac{1}{\Box}R$, with m a constant of the order of the Hubble expansion rate today. We further demonstrate that the model possesses the same number of physical degrees of freedom as in GR. Finally, we discuss the appearance of ghosts in the local formulation of the model, and argue that they are unphysical and harmless to the theory, keeping the physical degrees of freedom healthy.