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Cosmology of the de Sitter Horndeski models

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The discovery, in 1998, that the Universe is currently undergoing an accelerated expansion is one of the greatest milestones in all physics. Naturally, over the last 17 years, many proposals to explain this evolution have been brought forward. Most ideas involve scalar field dark energy or extensions of Einstein's gravity. These proposals are essentially phenomenological without any relation to each other. One major step forward was the realization in 2011 that all these proposals are subclasses of the most general scalar-tensor theory that leads to second order equations of motion, the Horndeski Lagrangian.

Seeking viable cosmological solutions, one can focus on the Friedmann-Lemaitre-Robertson-Walker spacetime and search for cosmological models that have a late time flat de Sitter critical point for any kind of material content or value of the vacuum energy. Such models were attained and in this proceedings we address their phenomenology following recent work.

The class of non-linear models with shift symmetry are in a better footing when they are compared with current observational constraints of the effective equation of state parameter and limits on early dark energy contribution. In order to further scrutinise these models, we are now required to face them against observables that depend on the evolution of the field and matter fluid fluctuations.

Summary

I will describe how one can construct a subclass of the Horndeski Lagrangian with a de Sitter critical point for any kind of material content. These models might alleviate the cosmological constant problem. I will present the cosmological evolution of two classes of families - the linear models and the non-linear models with shift symmetry. We conclude that the latter models can deliver a background dynamics compatible with the latest observational data.

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