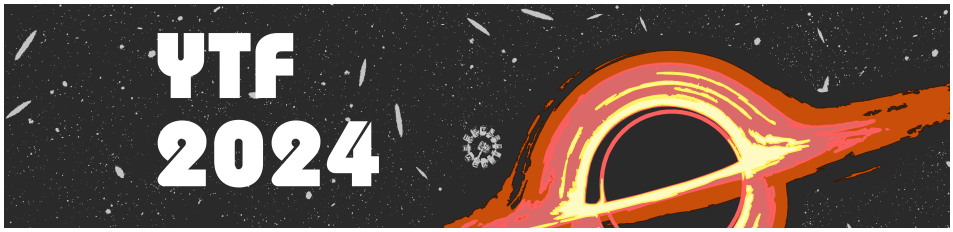

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Scalar Field Effective Potentials in de Sitter Space

Wednesday, 18 December 2024 17:10 (30 minutes)

In this work, we present a detailed computation of the standard and constraint effective potentials in 4-dimensional de Sitter spacetime. Second to the pathologies arising in the perturbation theory of "lighter-than-Hubble" scalars, the stochastic approach is commonly used in the literature to describe the dynamics of scalar degrees of freedom. However, some ambiguities appear in the set-up of this theory. Chiefly, the potential term in the stochastic equation of motion does not have a straightforward generalisation from the Minkowski case, as in curved geometries its definition becomes thermodynamic ensemble-dependent.

Starting from Euclidean path integral methods, we obtain novel, closed-form, analytical expressions for both potentials and examine whether either one is infrared (IR) and ultraviolet (UV) safe at one-loop in the asymptotically light limit, $\frac{m^2}{H^2} \to 0$. This work warrants the study of the dynamics, vacuum structure and stability of light cosmological spectators in a well-defined mathematical set-up.

Primary author: Mr VICENTE GARCIA-CONSUEGRA, Lucas (King's College London)

Presenter: Mr VICENTE GARCIA-CONSUEGRA, Lucas (King's College London)

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