

South African Gravity Society Conference 2025 (SAGS2025)



Contribution ID: 42

Type: **not specified**

A model independent approach to the cosmology of $f(R)$ dark energy

Wednesday 19 November 2025 14:00 (40 minutes)

Over the last decade, much attention has been given to the study of modified gravity theories to find a more natural explanation for the late-time acceleration of the Universe. Particular attention has focused on the so-called $f(R)$ dark energy models. Instead of focusing on a particular $f(R)$ model, we present a completely model-independent approach to study the background dynamics and the growth of matter density perturbations for those $f(R)$ models that mimic the Lambda cold dark matter (Λ CDM) evolution at the background level. We do this by characterizing the dynamics of the gravitational field using a set of dimensionless variables and using cosmography to determine the expansion history. We then illustrate the integrity of this method by fixing the cosmography to be the same as an exact Λ CDM model, allowing us to test the solution. We compare the exact evolution of the density contrast and growth index with what one obtains from various levels of the quasi-static approximation, without explicitly choosing the form of $f(R)$. We find that on quasi-linear scales, the difference between what one obtains from the exact equations and the quasi-static approximation can be as much as 15%.

Author: DUNSBY, Peter (University of Cape Town)

Presenter: DUNSBY, Peter (University of Cape Town)