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Mapping modified gravity signatures with cosmic volumes

The new generation of galaxy surveys will provide unprecedented data allowing us to test gravity at cosmological scales. A robust cosmological analysis of the large-scale structure demands exploiting the nonlinear information encoded in the cosmic web. This study delves into the meticulous task of mapping modified gravity (MG) signatures within cosmic volumes by employing a large state-of-the-art particle mesh N-body simulations including modified gravity models. On the one hand, we model the effective nonlinear and nonlocal bias between a tracer distribution of MG with respect to a dark matter field obtained by assuming the Lambda Cold Matter (LCDM) scenario. This technique provides fast calculation of MG mock catalogs using a small number of reference simulations. On the other hand, we implement Bayesian neural networks with enriched approximate posterior distributions for estimating cosmological parameters with uncertainty estimations. This approach contributes to setting the path to extracting cosmological parameters from complete small cosmic volumes towards the highly nonlinear regime.

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