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Constraining Modified Gravity with the Marked Power Spectrum

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The nature of cosmic acceleration remains an open question, with Modified Gravity (MG) providing an alternative to dark energy models within General Relativity. Cosmic voids are particularly sensitive tracers of MG and their two-point clustering captures higher order density field statistics. Since conventional two-point statistics are primarily dominated by overdensities, we use the marked power spectrum, which reweights the matter overdensity field to enhance information from voids. We first verify that the MG boost from COLA (COmoving Lagrangian Acceleration) simulations is comparable to that from corresponding full N-body simulations for the marked power spectrum and cross-spectrum within $\sim 1\%$. We further show that this agreement holds across a range of mark definitions. Since the marked field contains non-Gaussian information, we develop a simulation-based inference (SBI) pipeline using a Neural Posterior Estimator (NPE) to constrain phenomenological MG (μ , η) and cosmological parameters (Ω_m , A_s). We test this pipeline by performing parameter inference on 500 Lognormal Mock and 150 MGCOLA simulations. Our results demonstrate the feasibility of using the marked power spectrum within the SBI framework to constrain MG and cosmological parameters. This framework has the potential to extract additional information from underdense regions and improve MG constraints by combining CMB lensing maps with marked void statistics.

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No

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Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Cosmology

Primary author(s) : HUSSIEN, Amani (University of Toronto)

Co-author(s) : KARIM, Tanveer (University of Toronto); SRINIVASAN, Sankarshana (Central European Institute for Cosmology and Fundamental Physics (CEICO)); Prof. HLOŽEK, Renée (Dunlap Institute for Astronomy and Astrophysics, Université Laval)

Presenter(s) : HUSSEIN, Amani (University of Toronto)

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