



UNIVERSITY
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Department of Physics

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The non-Gaussian Universe: a challenge in cosmological data analysis

Abstract

One of the main goals of observational cosmology is the measurement of cosmological parameters, using the Cosmic Microwave Background (CMB) or the galaxy distribution *2-point function* (power spectrum). This procedure would optimally extract all cosmological information if the CMB and galaxy density fields were perfectly Gaussian. Non-Gaussian features are however imprinted in these fields, both through gravitational evolution of cosmic structures and through possible non-linear interactions during the primordial inflationary process. Cosmological non-Gaussianity is therefore a powerful tool to test inflation, improve our constraints on cosmological parameters and get a better understanding of the structure formation process. Its observational and statistical study is a complex data analysis task, which I will discuss in this talk. After a general introduction, I will show how non-Gaussianity from inflation was constrained via fast, optimal estimation of the CMB bispectrum (3-point function) in *Planck* data. I will then discuss different approaches for studying non-Gaussianity in forthcoming big galaxy surveys, either via optimal compression of relevant summary statistics of the galaxy density field, or through field level, machine learning based analysis. Finally, I will briefly show how Gravitational Wave observations from third generation detectors could also be used to place constraints on inflationary non-Gaussian features.

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