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Field-level inference of primordial non-Gaussianity in upcoming galaxy redshift surveys

One of the most outstanding questions in modern cosmology concerns the physical processes governing the primordial universe and the origin of cosmic structure. The detection and measurement of (local) primordial non-Gaussianity would provide insights into the shape of the potential of the inflaton field, the hypothetical particle driving cosmic inflation. In the coming years, the next generation of galaxy surveys, e.g., Euclid, will observe the Universe, with the scientific goal of constraining the nonlinearity parameter, fnl, to the precision required to identify viable inflationary models. In my talk, I will describe my approach to constraining primordial non-Gaussianity using a field-level inference algorithm and demonstrate a proof of concept. The method is based on forward-modelling the initial conditions and exploring the joint posterior in a Bayesian hierarchical framework. By utilizing the full field, the method naturally and fully self-consistently accounts for all stochastic uncertainties and systematic effects associated with selection effects, galaxy biasing, and survey geometries. The current and preliminary results, which I will showcase, demonstrate that we are able to achieve competitive constraints on f_{NL} in existing and upcoming galaxy redshift surveys

AI keywords

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