Title: Disentangling primordial features and relativistic effects from astrophysical foregrounds in cosmological large-scale structure

A large number of galaxy surveys are being planned to carry out accurate measurements of the evolution of large-scale structure, with the aim of constraining the equation of state of dark energy, revealing possible deviations from a simple cosmological constant, and testing general relativity as a theory of gravity on the largest scales. At such precision level, relativistic effects, like the effect of magnification by lensing in galaxy clustering, will not be negligible; moreover, crucial features from inflation, like primordial non-gaussianities (PNGs), may be detectable. But these measurements will be contaminated by foregrounds, like extinction from Milky Way dust. Systematics in the subtraction of these foregrounds is going to be the limiting factor for the accuracy of these measurements on the largest scales.
The proposed thesis aims at assessing the impact of foreground contamination, and the ability to mitigate it, the accuracy of cosmological parameter measurements, and in the detection of PNGs, in a context that does not neglect the role of relativistic effects.
The student will work with simulated galaxy catalogs, and will test various strategies to quantify and mitigate foreground contamination. This study will be applied to the planned Euclid mission, and will be performed within the Euclid Consortium, that is preparing the collection and scientific exploitation of the data.
The thesis will encompass several aspects of the analysis of a galaxy survey: production of mock galaxy catalogs on the past light cone from numerical simulations including PNGs and relativistic effects, analysis of mock catalogs perturbed by a foreground like Milky-Way extinction, application of (blind or model-dependent) techniques to remove the foreground, measurement of galaxy clustering, cosmological parameter estimation based on this measurement.
The results of this thesis will be of great utility both for the Euclid Consortium and for the wider community of cosmologists working in the many planned surveys for precision measurement of large-scale structure clustering.

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