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Beyond-Gaussian statistics for cosmological clustering - k-Nearest Neighbor Distributions

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Statistical measurements of the clustering of galaxies is one of the main observables from cosmological surveys, containing information both about the initial conditions of the Universe - such as the physics of inflation - as well as about those components that drive the expansion of the Universe today - Dark Energy, the nature of Dark Matter, and massive neutrinos. While most cosmology analyses in the past have focused on two-point functions of the galaxy distribution to probe these questions, there has been growing recognition that there is significant information in higher order N-point functions of the highly nonlinear galaxy distributions. In this talk, I will introduce the formalism for a new measure of cosmological clustering - the k-Nearest Neighbor distributions. These distributions are formally sensitive to all N-point functions, while being computationally inexpensive to measure. I will discuss how these statistics can also be easily extended to describing cross-correlations of different cosmological datasets. Finally I will discuss the potential improvements in constraints on various cosmological parameters when using these statistics over two-point functions, as well as current efforts in measuring these on actual data.

Author: BANERJEE, Arka (Indian Institute of Science Education and Research)

Presenter: BANERJEE, Arka (Indian Institute of Science Education and Research)