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Simulation-based inference with non Gaussian statistics in the Dark Energy Survey

Monday, November 27, 2023 4:09 PM (3 minutes)

In recent years, non-Gaussian statistics have been growing in popularity as powerful tools for efficiently extracting cosmological information from current weak lensing data. Their use can improve constraints on cosmological parameters over standard two-point statistics, can additionally help discriminate between general relativity and modified gravity theories, and can help to self-calibrate astrophysical and observational nuisance parameters. During this talk, I will present an end-to-end simulation-based inference (SBI) framework that allows us to use common non-Gaussian statistics (e.g., higher order moments, peaks, scattering transform, phase wavelet harmonics) to constraints cosmological parameters. The pipeline relies on a neural network compression of the summary statistics and estimates the parameter posteriors using a mixture of Neural Density Estimators (NDEs). I will use the pipeline to compare the performance of different summary statistics in terms of cosmological parameters constraining power. I will then show constraints on data using the Dark Energy Survey year 3 weak lensing data. I will also be discussing the impact of observational systematics, and the main challenges ahead in view of stage IV surveys.

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