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Implicit likelihood inference in cosmology while checking for survey systematics.

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We present methodological advances to perform implicit likelihood inference of cosmology from any forward model of galaxy surveys, while efficiently checking for systematics. The approach is based on a two-steps framework, and does not require any inner knowledge of the forward data model. First, we use SELFI (Simulator expansion for likelihood-free inference) to infer the initial matter power spectrum from any probe, and we use it to check whether all systematics are correctly accounted for based on qualitative and quantitative criteria. Second, cosmological parameters are inferred using implicit likelihood inference. Simulations used in the first step are recycled for optimal data compression, which is required for the second step. We show that mis-modelled systematic effects that would result in a biased posterior are unambiguously detected before performing the inference of cosmological parameters. The method is currently being used for Additional Galaxy Clustering probes in preparation for the first Euclid data release.

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