

Cosmic Cartography 2022: Exploring the Cosmic Web and Large-Scale Structure



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Better cosmological predictions with less effort

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Next-generation data sets promise 1% cosmology, but 1% predictions from simulations are expensive to build likelihood approximations and inference frameworks. Instead of intensive simulations, we can use approximate solvers, or surrogates, which introduce model error with respect to the simulations, which translates into biased and underestimated confidence bounds on cosmological parameters. To circumvent the dilemma, I proposed the “CARPool” principle that uses both simulations and surrogates to build minimal variance estimators. A Bayesian extension of this method allows to incorporate a priori knowledge. To illustrate the potential of the method, I used Dark Matter N-body simulations from the Quijote suite and surrogates from the Comoving Lagrangian Acceleration (COLA) solver to estimate the covariance matrix of summary statistics. I will also show how to use CARPool to speed up CMB polarization likelihood construction for the South Pole Telescope (SPT-3G) survey by a factor 100.

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