DNP19-2019-000216

Abstract for an Invited Paper
for the DNP19 Meeting of
the American Physical Society

Application of Bayesian methods in effective field theory[1]

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The use of effective field theory (EFT) methods to describe nuclear systems holds the promise of model independence and order-by-order convergence for the calculation of observables. We will describe why Bayesian statistics is an ideal framework to quantify uncertainties from estimating EFT low-energy constants, guided by theoretical expectations about EFT truncation that are explicitly specified through prior probability densities. These uncertainties can then be combined with other sources of error and propagated to observables. Bayesian model selection identifies how many EFT orders can be extracted from given data and offers the possibility of distinguishing between alternative EFT formulations. Bayesian model-checking diagnostics are powerful tools for EFT validation. These statistical methods provide more than just theoretical error bars but can serve as catalysts for physics discovery.

[1]Supported in part by the NSF and the DOE SciDAC program.