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Analysis of Bayesian estimates for missing higher orders in perturbative calculations

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With current high precision collider data and high-order calculations, the reliable estimation of theoretical uncertainty due to missing higher orders (MHO) terms has become a pressing issue for perturbative QFT predictions. The traditionally used simple but ad hoc scale variation has no probabilistic interpretation. Bayesian approach to MHO introduced by Cacciari and Houdeau and recently extended by Bonvini offers a promising alternative. In this paper, we thoroughly scrutinize the Bayesian approach and systematically study the performance of different models on an extensive set of high-order calculations.We extend the framework in two significant ways. First, we define three-parameter *abc*-model to allow for asymmetric probability distributions. Secondly, we calculate MHO uncertainty for scale-dependent quantities, treating different choices of the factorization and regularization scales democratically, without the hidden parameter interpretation à la Bonvini. We clarify how these two choices bias the result towards specific scale values. Finally, we provide a practical prescription of how existing perturbative results at the standard scale variation points can be converted to 68 %/95 % confidence intervals in the Bayesian approach.

Ref.: Claude Duhr, Alexander Huss, Aleksas Mazeliauskas, and Robert Szafron, to appear soon.

Summary

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