ID de Contribution: **44** Type: **Non spécifié**

Uncertainty modeling in particle physics

lundi 27 novembre 2023 14:15 (35 minutes)

I will present a pedagogical introduction to uncertainty modeling in particle physics. I will mostly focus on the methods used at the Large Hadron Collider experiments, where systematic effects are explicitly parameterized in the likelihood function in terms of nuisance parameters. Accurate modeling of systematic effects is of increasing importance at the LHC as the abundant data has decreased statistical uncertainties in many measurements to be on par with systematic uncertainties. I will discuss the reasoning behind the modeling approaches commonly chosen, common challenges in the parametric modeling and in the interpretation of the corresponding uncertainties. I will conclude with the special considerations in the modeling of theoretical uncertainties, which are often incompletely defined.

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Classification de Session: Opening session, Uncertainty Quantification

Classification de thématique: Uncertainty Quantification, Uncertainty Prediction