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Constraining CP-violation in the Higgs-top-quark interaction using machine-learning-based inference

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While CP violation in the Higgs interactions with massive vector boson is already tightly constrained, the CP nature of the Higgs interactions with fermions is far less constrained. In this talk, we assess the potential of machine-learning-based inference methods to constrain CP violation in the Higgs top-Yukawa coupling. This approach enables the use of the full available kinematic information. Concentrating on top-associated Higgs production with the Higgs decaying to two photons, we derive expected exclusion bounds for the LHC and the high-luminosity phase of the LHC. We also study the dependence of these bounds on the Higgs interaction with massive vector bosons and their robustness against theoretical uncertainties. In addition to deriving expected exclusion bounds, we discuss at which level a non-zero CP-violating top-Yukawa coupling can be distinguished from the SM. Moreover, we analyze which kinematic distributions are most sensitive to a CP-violating top-Yukawa coupling.

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