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Machine learning approaches for parameter reweighting in MC samples of top quark production — ●VALENTINA GUGLIELMI, KATERINA LIPKA, and SIMONE AMOROSO — DESY, Hamuburg, Germany

In particle physics, complex Monte Carlo (MC) simulations are needed to compare theoretical predictions to observables. Further MC samples have to be generated to account for all the systematic uncertainties. Therefore, the MC statistic becomes a limiting factor for most measurements. Moreover, the significant computational cost of these programs is a bottleneck in most physics analyses. Therefore, finding a way to reduce the MC samples is important to decrease the MC statistical uncertainties and lower the computational cost. In this contribution, an approach called Deep neural network using Classification for Tuning and Reweighting (DCTR) is evaluated. DCTR is a method, based on a Deep Neural Network (DNN) technique, to reweight simulations to different models by using the full kinematic information in the event. This methodology avoids the need for simulating the detector response multiple times by incorporating the relevant variations in a single sample. This way, the MC statistical uncertainties and the computational cost are reduced. Unlike the standard reweighting, in which the ratio in bins of two histograms at truth level is performed, multidimensional and unbinned information can be used as inputs to the DNN. This method is tested on MC simulations of top quark pair production within the CMS experiment.

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