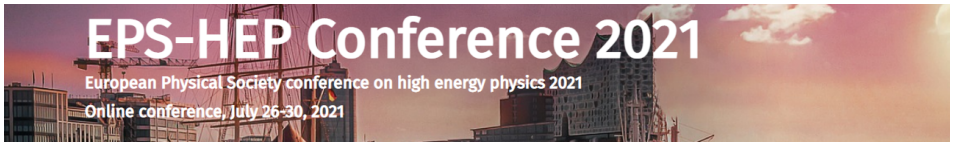

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Data-Driven Background Modelling using Conditional Probabilities

Constructing a robust background model is one of the main challenges in particle physics data analysis. A common strategy is to simulate the background process, though this is not always possible, and the uncertainties arising from simulation-based background modelling or from limited simulation statistics often limit the physics sensitivity. Two novel data-driven background modelling techniques are presented, which address these issues for a broad class of searches and measurements by providing an almost fully generic background modelling strategy. The first method uses data from a relaxed version of the event selection to estimate a graph of conditional probability density functions of the variables used in the analysis, accounting for all significant correlations. A background model is then generated by sampling events from this graph, before the full event selection is applied. In the second method, a generative adversarial network is trained to estimate the joint probability density function of the variables used in the analysis, conditioned on the variable used to blind the signal region. This training proceeds in the sidebands, and the conditional probability density function is interpolated into the signal region to estimate the background. Results are presented which demonstrate the performance of both methods, and their impacts on two benchmark analyses are discussed.

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Collaboration / Activity

ExclusiveHiggs

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