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Fast and Precise Amplitude Surrogates with Bayesian and Symmetry Preserving Networks

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One of the biggest obstacles for machine learning algorithms that predict amplitudes from phase space points is the scaling with the number of interacting particles. The more particles there are in a given process, the more challenging it is for the model to provide accurate predictions for the matrix elements. We present a deep learning framework that is built to reduce the impact of this issue, based on the implementation of permutation invariance and Lorentz equivariance within the network architecture. We demonstrate how the use of both of these symmetries grants the model the necessary structure to reproduce LO and NLO amplitude distributions in a competent way for processes with multiple QCD jets in the final state. Additionally, we use Bayesian networks as a main ingredient for all studied amplitude surrogates. That way, we can perform a Bayesian analysis to understand and optimize the uncertainty on model predictions.

Significance

References

Experiment context, if any

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