

Deep Learning applied to VBF Higgs Boson in the $b\bar{b}$ channel: a study of Neural Networks impact on High Energy Physics analysis

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The influence of exploiting Deep Neural Networks (DNNs) for signal-over-background classification in High Energy Physics (HEP) analysis is often underrated. In this research, we investigated the effect of a DNN classifier on the Vector Boson Fusion (VBF) production mode of the Higgs boson that decays into b-quark pairs. The DNN improves the identification of the signal events overwhelmed by the QCD background. However, the selection of the signal efficiency Working Point has a sculpting effect on the background Higgs boson's invariant mass distribution due to algorithm correlation with the latter. We studied the correlation impact, tested different decorrelation methods, and compared the relative sensitivities to the signal on Monte Carlo simulated datasets self-produced. The analysis of the Higgs boson in the VBF production mode decaying in the hadronic channels is ongoing at the major HEP experiments. Hence, this work will have a strong impact on future measurements of this channel.

Alternate track

1. Higgs Physics

I read the instructions above

Yes

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