

Boosting the Searches of Gluon Pair Initiated Processes using Deep Learning of ISR Jets

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We introduce new strategy to improve the searches of the signal from gluon-pair-initiated(ggI) processes at the LHC. By the ggI process, we mean the scattering process starting from a pair of gluons which can be associated with initial-state radiation jets(ISR jets) emitted from various incident parton at hadron collision. The ggI processes include gluon-gluon fusion(ggF) into colour singlet state, Higgs associated top-quark pair productions, which are the important windows of proving the sector of electroweak symmetry breaking. Focusing on the flavours of associated to each ISR jets, we show that the ISR jets in the ggI processes have distinctive features from background processes. Provided that features, we classified initial states, and discriminated the ggI processes from its backgrounds by using deep neural networks. As a promising example, we demonstrated this new technique on single Higgs production process in dimuon channel. Higgs to dimuon process is elusive because of huge irreducible backgrounds from Drell-Yan and diboson processes. Finally, we provide an enhanced aspect on the Higgs coupling measurements, and discuss on the universality of this technique for probing ggI processes in various channels.

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