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Separation of QCD and EWK processes of vector diboson production using machine learning algorithms with third-jet information.

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Rare processes which occur via the electroweak interactions play a very important role among the vector boson production processes. Such processes are of interest both from the perspective of precision tests of the Standard Model, in particular for the investigation of the mechanism of electroweak symmetry breaking, and from the perspective of search for physics beyond the Standard Model via anomalous gauge boson couplings. One of the main difficulties in the study of EWK productions is the separation of signal events from the dominant QCD background processes of vector boson production. A series of studies have shown an additional suppression power for the vector diboson QCD production processes with respect to EWK using the third hadronic jet rapidity. In this study, we present a technique for applying the machine learning algorithms to separate the QCD and EWK processes of vector diboson production using additional information about the third jet in the case of the process of ZZ pair production and subsequent decay to the $\ell\ell\nu\nu$ final state.

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