

Application of a novel Machine Learning approach for the search of heavy resonances with topological features at the LHC

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We propose a new approach to search for new resonances beyond the Standard Model (SM) of particle physics in topological configurations using Machine Learning techniques. This involves a novel classification procedure based on a combination of weak-supervision and full-supervision in conjunction with Deep Neural Network algorithms. The performance of this strategy is evaluated on the production of SM Higgs boson decaying to a pair of photons inclusively and exclusive regions of phase space, for specific production modes at the Large Hadron Collider (LHC), namely through the gluon-gluon fusion, the fusion of weak vector bosons, in associated production with a weak vector boson, or in association with a pair of top quarks. After verifying the ability of the methodology to extract different Higgs signal mechanisms, a search for new phenomena in high-mass diphoton final states is setup for the LHC.

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