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Deep Learning and Vector Boson Scattering

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The unitarization of the longitudinal Vector Boson Scattering (VBS) cross section by the Higgs boson is a fundamental prediction of the Standard Model which has not been experimentally verified. In the first LHC run, ATLAS and CMS presented the first studies of VBS in events with two leptonically decaying same sign W bosons produced in association with two jets. This channel has the advantage of having very small backgrounds compared to other VBS channels. However, the two neutrinos in the final state make full kinematic event reconstruction and hence evaluation the longitudinal scattering fraction difficult. The angular distributions of the leptons in the W boson rest frame, which are commonly used to fit polarization fractions, are not readily available due to the missing information resulting from the unmeasured neutrinos. In this talk we circumvent this problem by using deep machine learning to recover the angular distributions from measurable event kinematics, and show sensitivities to longitudinal vector boson scattering in future LHC runs. This method can also easily be applied to opposite-sign WW studies, or more generally in any situation where desired quantities are not directly calculable and must be inferred.

Oral or Poster Presentation

Oral

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