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A W^\pm polarization analyzer from Deep Neural Networks

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In this paper we train a Convolutional Neural Network to classify longitudinally and transversely polarized hadronic W^\pm using the images of boosted W^\pm jets as input. The images capture angular and energy information from the jet constituents that is faithful to properties of the original quark/anti-quark W^\pm decay products without the need for invasive substructure cuts. We find that the difference between the polarizations is too subtle for the network to be used as an event-by-event tagger. However, given an ensemble of W^\pm events with unknown polarization, the average network output from that ensemble can be used to extract the longitudinal fraction f_L . We test the network on Standard Model $pp \rightarrow W^\pm Z$ events and on $pp \rightarrow W^\pm Z$ in the presence of dimension-6 operators that perturb the polarization composition.

Summary

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