Contribution ID: **1400** Type: **not specified**

A $W^{\pm}$ polarization analyzer from Deep Neural Networks

Monday 24 May 2021 17:30 (15 minutes)

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 $pp \to W^{\pm}Z$ events and on $pp \to W^{\pm}Z$ in the presence of dimension-6 operators that perturb the polarization composition.

Summary

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Session Classification: Tools II