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Machine learning Higgs tagger

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Based on the jet image approach, which treats the energy deposition in each calorimeter cell as the pixel intensity, the Convolutional neural network (CNN) method has been found to achieve a sizable improvement in jet tagging compared to the traditional jet substructure analysis.

In this work, the Mask R-CNN framework is adopted to reconstruct Higgs jets in collider-like events, with the effects of pileup contamination taken into account. This automatic jet reconstruction method achieves higher efficiency of Higgs jet detection and higher accuracy of Higgs boson four-momentum reconstruction than traditional jet clustering and jet substructure tagging methods.

Moreover, the Mask R-CNN trained on events containing a single Higgs jet is capable of detecting one or more Higgs jets in events of several different processes, without apparent degradation in reconstruction efficiency and accuracy.

The outputs of the network also serve as new handles for the $t\bar{t}$ background suppression, complementing to traditional jet substructure variables.

Primary author: LI, Jinmian (Sichuan University)

Presenter: LI, Jinmian (Sichuan University)

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