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Physics Inspired Deep Neural Networks for Top Quark Reconstruction

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Deep neural networks (DNNs) have been applied to the fields of computer vision and natural language processing with great success in recent years. The success of these applications has hinged on the development of specialized DNN architectures that take advantage of specific characteristics of the problem to be solved, namely convolutional neural networks for computer vision and recurrent neural networks for natural language processing. This research explores whether a neural network architecture specific to the task of identifying t⟶Wb decays in particle collision data yields better performance than a generic, fully-connected DNN. This approach is inspired by an DNN technique for tagging boosted top quarks, which consists of defining custom neural network layers known as the combination and Lorentz layers. These layers encode knowledge of relativistic kinematics applied to combinations of particles, and the output of these specialized layers can then be fed into a fully connected neural network to learn tasks such as classification. This research compares the performance of these physics inspired networks to that of a generic, fully-connected DNN, to see if there is any advantage in terms of classification performance, size of the network, or ease of training.

Consider for promotion

No

Authors: Mr GREIF, Kevin (University of Notre Dame); LANNON, Kevin Patrick (University of Notre Dame (US))

Presenter: Mr GREIF, Kevin (University of Notre Dame)

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