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Top tagging with jet constituents and Long Short-Term Memory (LSTM) networks. (15'+5')

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Multivariate techniques based on engineered features have found wide adoption in the identification of jets resulting from hadronic top decays at the Large Hadron Collider (LHC). Recent Deep Learning developments in this area include the treatment of the calorimeter activation as an image or supplying a list of jet constituent momenta to a fully connected network. This latter approach lends itself well to the use of Recurrent Neural Networks. We study the applicability of architectures incorporating Long Short-Term Memory (LSTM) networks. We explore several network architectures, methods of ordering of jet constituents, and input preprocessing. The best performing LSTM-based network achieves a background rejection of 100 for 50\% signal efficiency in the jet transverse momentum range of 600 to 2500 GeV. This represents more than a factor of two improvement over a fully connected Deep Neural Network (DNN) trained on similar types of inputs.

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