

Top quark pair reconstruction using an attention-based neural network

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For many top quark measurements, it is essential to reconstruct the top quark from its decay products. For example, the top quark pair production process in the all-jets final state has six jets initiated from daughter partons and additional jets from initial or final state radiation. Due to the many possible permutations, it is very hard to assign jets to partons. We use a deep neural network with an attention-based architecture together with a new objective function for the jet-parton assignment problem. Our novel deep learning model and the physics-inspired objective function enable jet-parton assignment using jet-wise input variables while the attention mechanism bypasses the combinatorial explosion that usually leads to intractable computational requirements. The model can also be applied as a classifier to reject the overwhelming QCD background, showing increased performance over standard classification methods.

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