

Neural Network Development for the ATLAS Run 2 $t\bar{t}H(H \rightarrow b\bar{b})$ Legacy Analysis at 13 TeV

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The bottom anti-bottom Higgs boson decay channel of Higgs-associated top quark pair production offers direct access to measurements of the top Yukawa coupling and Higgs- p_T differential cross-section, which are sensitive to potential new physics. To incorporate improvements such as developments in b-tagging and Monte Carlo simulation of the dominant $t\bar{t} + b\bar{b}$ background, a legacy analysis of the $t\bar{t}H(H \rightarrow b\bar{b})$ process with the full ATLAS Run 2 dataset of $\mathcal{L} = 140 \text{ fb}^{-1}$ is currently ongoing.

This talk will provide insight into the analysis strategy with a special focus on recent improvements and validation of the transformers –an advanced deep learning architecture –developed in the analysis for event classification and Higgs- p_T reconstruction. The developments herein consist especially of the inclusion of missing transverse energy in the model inputs, performance comparisons of competing reconstruction methods, and the optimisation of the region definitions obtained from the event classification networks.

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