

Abstract Submitted  
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**Graph Neural Network to Measure Four-top Production with the ATLAS Detector** RYAN ROBERTS, University of California, Berkeley, ATLAS EXPERIMENT COLLABORATION — The ATLAS collaboration recently published evidence for the production of four top quarks at the  $4.3\sigma$  level in  $pp$  collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector. This rare high energy process is sensitive to a number of scenarios for physics beyond the Standard Model, including modifications to the coupling of the Higgs boson to the top quark. A major challenge to improving the sensitivity of this analysis is that the signal and main backgrounds both involve the production of multiple top quarks and therefore have very similar event topology. We present a novel application of a Graph Neural Network (GNN) for the measurement of four top quark production. The GNN-based event classification leverages deep learning and graph representation of collision data to provide significant performance improvement over other classifiers, including Boosted Decision Trees. The use of this GNN in the ATLAS four-top measurement will significantly improve the experimental sensitivity to both the Standard Model signal and possible effects from beyond the Standard Model.

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