Contribution ID: **179** Type: **Short Talk**

# End-to-End Jet Classification of Boosted Top Quarks with CMS Open Data

*Thursday, 20 May 2021 15:52 (13 minutes)*

We describe a novel application of the end-to-end deep learning technique to the task of discriminating top quark-initiated jets from those originating from the hadronization of a light quark or a gluon. The end-to-end deep learning technique combines deep learning algorithms and low-level detector representation of the high-energy collision event. In this study, we use low-level detector information from the simulated CMS Open Data samples to construct the top jet classifiers.

To optimize classifier performance we progressively add low-level information from the CMS tracking detector, including pixel detector reconstructed hits and impact parameters, and demonstrate the value of additional tracking information even when no new spatial structures are added.

Relying only on calorimeter energy deposits and reconstructed pixel detector hits, the end-to-end classifier achieves an AUC score of $0.975 \pm 0.002$ for the task of classifying boosted top quark jets.

After adding derived track quantities, the classifier AUC score increases to $0.9824 \pm 0.0013$, serving as the first performance benchmark for these CMS Open Data samples.

**Primary authors:** BURKLE, Bjorn (Brown University (US)); ANDREWS, Michael (Carnegie-Mellon University (US)); SUNIL CHAUDHARI, Shravan; Dr DI CROCE, Davide (University of Alabama); Prof. GLEYZER, Sergei (University of Alabama); HEINTZ, Ulrich (Brown University (US)); NARAIN, Meenakshi (Brown University (US)); PAULINI, Manfred (Carnegie-Mellon University (US)); Dr USAI, Emanuele (Brown University)

**Presenter:** BURKLE, Bjorn (Brown University (US))

**Session Classification:** Artificial Intelligence

**Track Classification:** Online Computing