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A Deep Learning approach to the search for $\gamma\gamma$ in association with missing energy at the ATLAS detector

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The Large Hadron Collider (LHC) generates petabytes of data during each data taking period and machine learning (ML) techniques are required to analyse this data. In particular, Boosted Decision Trees (BDTs) have been the de-facto standard ML tool for this task. However, in the recent past, more modern techniques such as Deep Learning have emerged and there has been growing justification for their use in High Energy Physics (HEP). Deep Neural Networks (DNNs) are known for handling high dimensionality well, which often characterises ATLAS data and thus making them a suitable tool for analysing it. We conduct a comparative study between BDTs and DNNs in classifying signal and background events in the $H \rightarrow \gamma\gamma + \chi$ decay channel. We also consider an unsupervised approach called Weakly Supervised Classification. Preliminary results indicate that DNNs perform better than BDTs, however, more rigorous testing is still required.

Apply to be
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Yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

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