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Analysis of a deep neural network for missing transverse momentum reconstruction with the ATLAS detector

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The missing transverse momentum (E_T^{miss}) of a pp collision is an important observable as it serves as a proxy for the transverse momentum carried away by undetectable particles. In addition to Standard Model neutrinos, there exist many theorised particles which would not leave any signals in a detector. Therefore, measuring E_T^{miss} with high degrees of accuracy is critical for the understanding many physical processes which take place at the LHC, in the Standard Model and beyond. ATLAS currently utilises several working points to reconstruct the E_T^{miss} of the hard-scatter interaction using only the observed objects. The optimal choice of working point depends strongly on the event topology. The aim of this project is to investigate the use of a deep neural network, trained using Monte-Carlo samples, to develop a more accurate E_T^{miss} reconstruction, which is independent of topology and more resilient to pile-up effects. We demonstrate how the network improves E_T^{miss} accuracy in both simulated and real data, and how this new method might assist in searches for physics beyond the Standard Model.

Apply to be
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Yes

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

MSc

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