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METNetSig: a ML-approach to estimate the MET Significance

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The Missing Transverse Energy (MET) is a variable that is used to quantify the energy (or transverse momentum) that is not reconstructed by the ATLAS detector. In recent years, an ML-approach to estimate the MET has been developed in ATLAS, called METNet, which uses a Neural Network to combine the Working Points used to reconstruct the MET into a new WP.
In this contribution, we present an ML-based definition of the MET Significance (MET/σ_{MET}), which is a key variable in many BSM searches due to its discrimination between events with real MET (i.e., neutrinos or potential BSM) from events with fake MET (i.e., missing energy caused by a mis-reconstruction of the objects). Currently, the state-of-the-art MET significance is an object-based significance, which uses the resolutions of the objects entering the MET calculation. METNetSig extends METNet by performing a constrained regression on a gaussian negative-log-likelihood loss function to predict a confidence interval as well as providing a central value for the MET.
This model currently holds a greater separation power with respect to the Object-based MET Significance, and we are working on finalizing the validation in order to include this in the consolidated recommendations, as a new single WP for both MET and MET Significance to be used for all ATLAS analyses.

Author: PLEBANI, Alberto (University of Cambridge (GB))

Co-author: HODKINSON, Ben (University of Oxford (GB))

Presenter: PLEBANI, Alberto (University of Cambridge (GB))

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