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BDTs in the Level 1 Muon Endcap Trigger at CMS

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The first implementation of Machine Learning inside a Level 1 trigger system at the LHC is presented. The Endcap Muon Track Finder at CMS uses Boosted Decision Trees to infer the momentum of muons based on 25 variables. All combinations of variables represented by 2^30 distinct patterns are evaluated using regression BDTs, whose output is stored in 2 GB look-up tables. These BDTs take advantage of complex correlations between variables, the inhomogeneous magnetic field, and non-linear effects to distinguish high momentum signal muons from the overwhelming low-momentum background. The new algorithm reduced the background rate by a factor of two compared to the previous analytic algorithm, with further improvements foreseen.

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