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Boosting Neutral Particles Identification by Boosting Trees: LHCb case

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Reconstruction and identification in calorimeters of modern High Energy Physics experiments is a complicated task. Solutions are usually driven by a priori knowledge about expected properties of reconstructed objects. Such an approach is also used to distinguish single photons in the electromagnetic calorimeter of the LHCb detector on LHC from overlapping photons produced from high momentum pi0 decays. We studied an alternative solution based on applying machine learning techniques to primary calorimeter information, that are energies collected in individual cells around the energy cluster. ML based model employs extreme gradient boosting trees approach which is widely used nowadays, and separates pi0 and photon responses from "first principles"i.e. plain energies deposited in calorimeter cells. This approach allowed to improve separation performance score from 80% to 93% on simulated data, that means reducing primary photons fake rate by factor of four. This presentation will describe the approach used for this identification problem, and compare performances obtained on simulated and real data. Possible extension and generalisation of the approach also will be discussed.

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