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A novel reconstruction framework for an imaging calorimeter for HL-LHC

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To sustain the harsher conditions of the high-luminosity LHC, the CMS collaboration is designing a novel endcap calorimeter system. The new calorimeter will predominantly use silicon sensors to achieve sufficient radiation tolerance and will maintain highly-granular information in the readout to help mitigate the effects of pileup. In regions characterised by lower radiation levels, small scintillator tiles with individual on-tile SiPM readout are employed.
A unique reconstruction framework (TICL: The Iterative CLustering) is being developed to fully exploit the granularity and other significant detector features, such as particle identification and precision timing, with a view to mitigate pileup in the very dense environment of HL-LHC. The inputs to the framework are clusters of energy deposited in individual calorimeter layers. Clusters are formed by a density-based algorithm. Recent developments and tunes of the clustering algorithm will be presented. To help reduce the expected pressure on the computing resources in the HL-LHC era, the algorithms and their data structures are designed to be executed on GPUs. Preliminary results will be presented on decreases in clustering time when using GPUs versus CPUs.
Ideas for machine-learning techniques to further improve the speed and accuracy of reconstruction algorithms will be presented.

Primary author: Dr CRISTELLA, Leonardo (CERN)

Presenter: Dr CRISTELLA, Leonardo (CERN)

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