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The TICL reconstruction at the CMS Phase-2 High Granularity Calorimeter Endcap

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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 the pile up. In regions characterized by lower radiation levels, small scintillator tiles with individual SiPM on-tile readout are employed. A unique reconstruction framework (TICL: The Iterative CLustering) is being developed within the CMS Software CMSSW to fully exploit the granularity and other significant detector features, such as particle identification and precision timing, with a view to mitigating pile up in the very dense environment of HL-LHC. The TICL framework has been thought of with heterogeneous computing in mind: the algorithms and their data structures are designed to be executed on GPUs. In addition, geometry agnostic data structures have been designed to provide fast navigation and searching capabilities. Seeding capabilities (also exploiting information coming from other detectors), dynamic cluster masking, energy calibration, and particle identification are the main components of the framework. To allow for maximal flexibility, TICL allows the composition of different combinations of modules that can be chained together in an iterative fashion. The presenter will describe the design of TICL pattern recognition algorithms and advanced neural networks under development, as well as future plans.

Experiment context, if any

CMS phase 2 upgrade

References

Significance

TICL is the CMS Phase-2 reconstruction framework for the CMS HGCAL.
In 2022, its version 4 is coming out with new pattern recognition algorithms like CLUE3D, FastJet and new Graph Neural Networks

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