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End-to-end multi-particle reconstruction in high occupancy imaging calorimeters with graph neural networks

Monday 24 October 2022 15:50 (20 minutes)

We present an end-to-end reconstruction algorithm to build particle candidates from detector hits in next-generation granular calorimeters similar to that foreseen for the high-luminosity upgrade of the CMS detector. The algorithm exploits a distance-weighted graph neural network, trained with object condensation, a graph segmentation technique. Through a single-shot approach, the reconstruction task is paired with energy regression. We describe the reconstruction performance in terms of efficiency as well as in terms of energy resolution. In addition, we show the jet reconstruction performance of our method and discuss its inference computational cost. To our knowledge, this work is the first-ever example of single-shot calorimetric reconstruction of 𝒪(1000) particles in high-luminosity conditions with 200 pileup.

Significance

To our knowledge, this work is the first-ever example of single-shot calorimetric reconstruction with machine learning of O(1000) particles in high-luminosity conditions with up to 200 pileup.

References

arXiv:2204.01681
arXiv:1902.07987
arXiv:2002.03605

Experiment context, if any

Loosely related to CMS HGCAL

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