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Accelerating Hadronic Calorimetry with Sparse Point-Voxel Convolutional Neural Networks

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In this study, we demonstrate the potential of sparse point-voxel convolutional neural networks (SPVCNN) for hadronic calorimetry tasks using HCAL and HGCAL datasets. By employing a modified object condensation loss, we train the network to group cell deposits into clusters while filtering out noise. We show that SPVCNN performs comparably to generic topological cluster-based methods in both pileup and no pileup scenarios, with the added advantage of acceleration using GPUs. This type of acceleration, as part of heterogeneous computing frameworks, will be crucial for the High-Luminosity Large Hadron Collider (HL-LHC). Our findings indicate that SPVCNN can provide efficient and accurate calorimetry solutions, particularly for high level trigger (HLT) applications with latency on the order of milliseconds.

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