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Jet Single Shot Detection

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In this paper, we apply object detection techniques based on convolutional neural networks to jet images, where the input data corresponds to the calorimeter energy deposits. In particular, we focus on the CaloJet reconstruction and tagging as a detection task with a Single Shot Detection network, called Jet-SSD. The model performs simultaneous localization and classification and additional mass regression task. The algorithm will operate in a hardware restricted environment and we report on necessary changes to VGG-16 network architecture, which is the base for the detection model. Finally, as aggressive quantization of weights in the network can be a handle for speeding up inference to match latency constraints of the trigger selection system, we further investigate Ternary Weight Networks with weights constrained to {-1, 0, 1} with per-layer and per-channel scaling factors. We show that the quantized version of the network closely matches the performance of the full precision equivalent.

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