

# Sets are all you need: Ultrafast jet classification on FPGAs for HL-LHC

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The high-luminosity upgrade of the LHC (HL-LHC) will lead to a factor of five increase in instantaneous luminosity, making it possible for experiments as CMS and ATLAS to collect ten times more data. This proton-proton collision rate will result in higher data complexity, making more sophisticated trigger algorithms unavoidable during the HL-LHC phase. The availability of information on the individual jet constituents at the level-1 trigger makes it possible to design more precise jet identification algorithms if they meet the strict latency and resource requirements. In this work, we construct, deploy, and compare fast machine-learning algorithms based on graph and deep sets neural networks on field-programmable gate arrays (FPGAs) to perform jet classification. The latencies and resource consumption of the studied models are reported. Through quantization-aware training and efficient FPGA implementations, we show that O(100) ns inference is feasible at low resource cost.

## Alternate track

1. Operation, Performance and Upgrade (incl. HL-LHC) of Present Detectors

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Yes

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