

## Nanosecond machine learning with BDT for high energy physics

We present a novel implementation of classification using boosted decision trees (BDT) on field programmable gate arrays (FPGA). Two example problems are presented, in the binary classification of electrons vs. photons and in the selection of vector boson fusion-produced Higgs bosons vs. the rejection of the multijet processes. The firmware implementation of binary classification requiring 100 training trees with a maximum depth of 4 using four input variables gives a latency value of about 10ns. Implementations of machine learning algorithms such as BDT will enable the level-1 trigger systems of the Run 4 LHC to be more sensitive to new physics. The work is described in [2104.03408].

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