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Decision tree autoencoder anomaly detection on FPGA at L1 triggers

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We present a decision tree-based implementation of autoencoder anomaly detection. A novel algorithm is presented in which a forest of decision trees is trained only on background and used as an anomaly detector. The fwX platform is used to deploy the trained autoencoder on FPGAs within the latency and resource constraints demanded by level 1 trigger systems. Results are presented with two datasets: a BSM Higgs decay to pseudoscalars with a 4l final state, and the LHC physics dataset for unsupervised New Physics detection. Finally, the effects of signal contamination on the training set are presented, demonstrating the possibility of training on data.

This work is detailed in 2304.03836.

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