

Level 1 trigger track quality machine learning models on FPGAs for the Phase 2 upgrade of the CMS experiment

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In 2026, the LHC will be upgraded to the HL-LHC which will provide up to 10 times as many proton-proton collisions per bunch crossing. In order to keep up with the increase in data rates, the CMS collaboration is updating the Level 1 Trigger system to run particle selection and reconstruction algorithms on FPGAs in real-time with the data collection system. One such particle algorithm measures the quality of the reconstructed tracks to classify them as “real” or “fake” reconstructed tracks. In this work, we develop supervised machine learning algorithms for track quality classification and test these models on simulated FPGAs using the HLS4ML and Conifer open-source packages.

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