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Advancements in the Reconstruction and Identification of Hadronically Decaying Tau Leptons at the CMS Experiment

Tau leptons play a crucial role in studies of the Higgs boson and searches for Beyond the Standard Model physics at the LHC. This talk presents the latest advancements in the reconstruction and identification of hadronic decays of tau leptons at the CMS experiment. The tau identification algorithm deployed for the early Run 3 data-taking period, based on a deep convolutional neural network with domain adaptation, showcases significantly improved discrimination of genuine hadronic tau decays against mis-identified quark and gluon jets, electrons, and muons. The performance and calibration of the algorithm using early Run 3 data is presented. Many CMS physics analyses involving tau leptons are expected to benefit from these improvements. Alternative approaches to identify hadronic taus combined with jet flavour, based on graph neural networks and particle transformers, are also covered. Additionally, the dedicated techniques used to reconstruct and identify displaced tau leptons originating from long-lived particle decays using graph neural networks are discussed.

Secondary track

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