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Machine Learning for Particle Identification in Real Time at the ATLAS Experiment

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Machine learning algorithms have proven to be powerful tools for identifying and classifying different types of particles. This is especially useful in experiments like the ATLAS experiment at CERN. The large and complex amount of data generated from proton-proton collisions at the Large Hadron Collider (LHC) require advanced techniques to accurately identify various particle signatures for later distribution to different analyses.

In the current data-taking scenario, machine learning techniques are used to identify tau leptons and b quarks. A Recurrent Neural Network (RNN) has replaced the previous Boosted Decision Tree (BDT) for tau lepton identification in the ATLAS High-Level Trigger, significantly improving reconstruction efficiency. More advanced algorithms have also been developed for b-quark identification. The b-tagging algorithms implemented for Run 3 also improved to distinguish these jets from background jets created by single quarks and gluons.

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