Contribution ID: **391** Type: **not specified**

A Matrix-Based Approach for Jet-Parton Assignment Leveraging Mass and Momentum Using CMS Open Data

Monday 13 May 2024 16:15 (15 minutes)

The Large Hadron Collider was developed, in part, to produce and study heavy particles such as the top quark. The lifetime of the top quark is on the order of less than 10^{-24} seconds. Due to its short lifetime, the top quark is observed indirectly by particle detectors through the particles it decays into. A key part of reconstructing heavy particles for observation is to properly assign the decay products to their respective top quarks or other parent particles. One common approach in this process involves summing the momenta and energy of various particle combinations in different permutations to compute the masses of the expected parent particles in a specific decay process. Those masses are then compared to expected masses in order to select the best set of particle assignments for the full collision event. Here we demonstrate that a matrix-based approach, which incorporates additional terms related to the expected transverse momenta associated with both correct and incorrect particle pairings, leads to improvements in reconstruction. For the benchmark task, where two top quarks decay to six quarks (fully-hadronic decay), this method leads to an improvement in reconstruction efficiency of approximately $10 - 13\%$ in events, containing six to fourteen jets, compared to a mass-only approach.

Mini Symposia (Invited Talks Only)

Author: REINHARDT, Eric (University of Alabama (US))

Presenter: REINHARDT, Eric (University of Alabama (US))

Session Classification: Computing, Analysis Tool and Data Handling

Track Classification: Computing, Analysis Tools and Data Handling