Contribution ID: **122** Type: **Poster**

Transformer for Energy Calibration in the ATLAS Electromagnetic Calorimeter

Monday 7 April 2025 19:40 (20 minutes)

In the ATLAS experiment, electrons and photons are reconstructed from energy clusters detected in the electromagnetic calorimeter. To accurately determine their energy, corrections must be applied to the measured energy from these clusters. These adjustments account for energy losses occurring within the passive material of the calorimeter itself. Traditional Multi-variant Analysis methods like Boosted decision tree use high-level cluster variables to correct the raw deposited energy to match the true particle energy.

To fully explore the potential of this task, we decided to delve deeper into lower-level data. Transformer models are well-suited for this, as they can process graphs of arbitrary sizes and excel at capturing long-range dependencies between cells. We rebuilt the processing pipeline with a transformer model implemented in the SALT framework. New loss and architecture designs are introduced for energy calibration tasks. These techniques lead to an improvement of up to 40% in energy resolution of unconverted photons. Adversarial training modules mitigate Data-MC differences, and an additional uncertainty-aware network is implemented to quantify prediction confidence and improve model robustness.

Author: JIANG, Cheng (University of Edinburgh)

Presenter: JIANG, Cheng (University of Edinburgh)

Session Classification: Poster session

Track Classification: Analysis and Reconstruction Methods