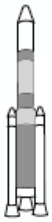

CALOR 2024

第２０回 素粒子・原子核物理学
カロリメータ検出器国際会議
（つくば国際会議場, 2024年5月20日～２４日）

Contribution ID: **72** Type: **Oral**

Vertex Imaging in Hadron Calorimetry using AI/ML Tools

Wednesday 22 May 2024 12:00 (20 minutes)

The fluctuations in energy loss to processes that do not generate measurable signals, such as binding energy losses, set the limit on achievable hadronic energy resolution in traditional energy reconstruction techniques. The correlation between the number of hadronic interaction vertices in a shower and invisible energy is found to be strong and is used to estimate invisible energy fraction in highly granular calorimeters in short time intervals (<5 ns). We simulated images of hadronic showers using GEANT4 and deployed a neural network to analyze the images for energy regression. The neural network-based approach results in significant improvement in energy resolution, from 13% to 4% in the case of a Cherenkov calorimeter and from 7% to 4% for an ionization calorimeter for 100 GeV pion showers. We discuss the significance of the phenomena responsible for this improvement and the plans for experimental verification of these results.

Authors: MERGATE-CACACE, Harold (Texas Tech University); CASH, James (Texas Tech University); DAMGOV, Jordan (Texas Tech University (US)); HARRIS, Miles (Texas Tech University); KELLEY, Mitchell (Texas Tech University); AKCHURIN, Nural (Texas Tech University (US)); SCHNEIDER, Odin (Texas Tech University); KUNORI, Shuichi (Texas Tech University (US)); Dr PELTOLA, Timo Hannu Tapani (Texas Tech University (US)); DELASHAW, Xander (Texas Tech University); KAZHYKARIM, Yelbir (Texas Tech University (US)); SEWELL, Julian (Texas Tech University)

Presenter: KUNORI, Shuichi (Texas Tech University (US))

Session Classification: ML/Geant4