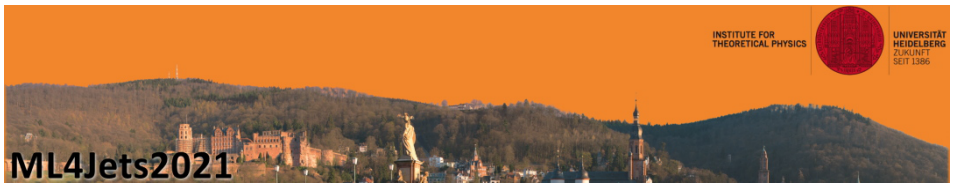

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Measurement of Muon Energy From Radiative Losses in a Granular Calorimeter

Wednesday, 7 July 2021 16:00 (20 minutes)

The performance demands of future particle-physics experiments investigating the high-energy frontier pose a number of new challenges, forcing us to find new solutions for the detection, identification, and measurement of final-state particles in subnuclear collisions. One such challenge is the precise measurement of muon momenta at very high energy, where the curvature provided by conceivable magnetic fields in realistic detectors proves insufficient to achieve the desired resolution. In this work we show the feasibility of an entirely new avenue for the measurement of the energy of muons based on their radiative losses in a dense, finely segmented calorimeter.

Using a task-specific 3D convolutional neural network, the raw energy deposits in the calorimeter cells may be used as inputs to regress to the energy of the originating muon. We demonstrate that this approach provides superior resolution for high energy muons. Additionally, due to the differing energy dependence, we show that the regression is entirely complementary to traditional tracker-based measurements, which degrades with energy, together allowing one to achieve good resolution across the energy spectrum.

Affiliation

CERN, CMS, Padova

Academic Rank

1 PhD student, 1 Postdoctoral researcher (speaker), 1 Professor, 1 research staff, 1 masters student

Primary authors: CHIANDOTTO, Filippo; STRONG, Giles Chatham (Universita e INFN, Padova (IT)); KIESELER, Jan (CERN); LAYER, Lukas (Universita e INFN, Padova (IT)); DORIGO, Tommaso (Universita e INFN, Padova (IT))

Presenter: STRONG, Giles Chatham (Universita e INFN, Padova (IT))

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