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Top tagging with Lorentz Boost Networks and simulation of electromagnetic showers with a Wasserstein GAN (20'+5')

Thursday 15 November 2018 13:30 (25 minutes)

In this talk, we present two applications of deep learning in the areas of top quark identification and electromagnetic shower generation.
As deep learning methods are adopted for high energy physics, increasing attention is given to the development of dedicated architectures incorporating physical knowledge. We introduce a model that utilizes our knowledge of particle combinations and directly integrates Lorentz boosting, and apply this model to separate hadronic top-quark decays from light quark and gluon jets. We also investigate the trained combinations and boosts to gain insights into what the network is learning.
Generative models have recently been applied to physics simulations, in particular for calorimeter showers. They promise a speed-up of several orders of magnitude compared to full simulations. We present results on the generation of electromagnetic showers in a multi-layer calorimeter using a Wasserstein Generative Adversarial Network (WGAN), emphasizing on the comparison to a traditional simulation using GEANT4. Initial conditions of the simulation are incorporated through a dedicated architecture based on constrainer networks.

[M. Rieger, D. Schmidt, Winners presentation at the IML Machine Learning
Working Group: sequential models, CERN, Geneva, Jun. 2018, https://indico.cern.ch/event/722319/contributions/
]
[M. Erdmann, J. Glombitza, T. Quast, arXiv:1807.01954]

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