

بيان بالبحث رقم (7)

عنوان البحث:

**Modeling of charged-particle multiplicity and transverse-momentum distributions
in pp collisions using a DNN**

منشور في:

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المُلخص العربي للبحث:

A machine learning technique is used to fit multiplicity distributions in high energy proton-proton collisions and applied to make predictions for collisions at higher energies. The method is tested with Monte Carlo event generators. Charged-particle multiplicity and transverse-momentum distributions within different pseudorapidity intervals in proton-proton collisions were simulated using the PYTHIA event generator for center of mass energies $\sqrt{s}= 0.9, 2.36, 2.76, 5, 7, 8, 13$ TeV for model training and validation and at 10, 20, 27, 50, 100 and 150 TeV for model predictions. Comparisons are made in order to ensure the model reproduces the relation between input variables and output distributions for the charged particle multiplicity and transverse-momentum. The multiplicity and transverse-momentum distributions are described and predicted very well, not only in the case of the trained but also in the case of untrained energy values. The study proposes a way to predict multiplicity distributions at a new energy by extrapolating the information inherent in the lower energy data. Using real data instead of Monte Carlo, as measured at the LHC, the technique has the potential to project the multiplicity distributions for different intervals at very high collision energies, e.g. 27 TeV or 100 TeV for the upgraded HE-LHC and FCC-hh respectively, using only data collected at the LHC, i.e. at center of mass energies from 0.9 up to 13 TeV.