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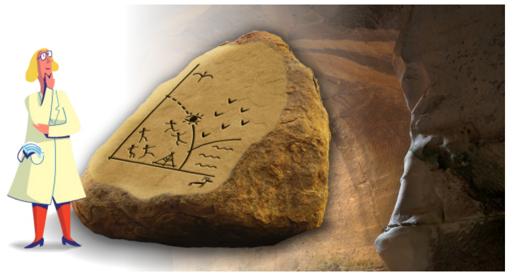

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Machine Learning and Multi-Parton Interactions in pp collisions from RHIC to LHC energies

Monday, January 11, 2021 7:40 PM (1h 30m)

Over the last years, Machine Learning (ML) tools have been successfully applied to a wealth of problems in high-energy physics. Supervised ML methods allow for significant improvements in classification problems by taking into account correlations among observables and by learning the optimal selection from prepared samples. In this talk, we will discuss the application of ML for the extraction of the average number of Multi-Parton Interactions (MPI) from pp data. Boosted Decision Trees (BDT) are trained considering observables calculated with primary charged particles in minimum-bias pp collisions at $\sqrt{s}$ = 13 TeV simulated with Pythia 8.244 tune 4C. Simulations at lower center-of-mass energies ranging from $\sqrt{s} = 0.2$ up to 13 TeV are processed with the trained BDT, the target values are found to be consistent with the expected MPI activity. Consistent results are also obtained in simulations where MPI and color reconnection are not activated. The method is also found to be robust against both the MPI and the hadonization models. Using the existing LHC data on transverse momentum spectra as a function of multiplicity in pp collisions at $\sqrt{s} = 5.02$, 7 and 13 TeV, we extract the average MPI (target variable) for minimum-bias pp collisions as well as the multiplicity dependence of MPI. The multiplicity dependent results are compared with existing ALICE measurements sensitive to MPI. Finally, we discuss the possibility of using ML in order to build an event classifier with strong sensitivity to MPI.

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