Abstract Submitted
for the APR18 Meeting of
The American Physical Society

Machine learning approaches to measure the hadronic recoil for a W mass precision measurement with the CMS experiment at LHC[1]
OLMO CERRI, Caltech — Given the large amount of data collected at LHC, an effective way of searching for new physics and test the SM consistency is comparing high precision theoretical prediction with observables measured in experiments. At the state of art, a better measurement of the W boson mass is of great importance in this procedure since the theoretical prediction uncertainty is much smaller than the world average measured one. In order to achieve the required relative precision of 10^{-4}, it is crucial to master the detector, the analysis, and the theoretical predictions at an unprecedented level. An innovative study of the hadronic recoil produced in association with the W boson at LHC, which represent one of the main systematic uncertainty to the W mass measurement, is described in this work. Using a semi-parametric regression based on neural networks, a new and better experimental definition of this quantity is achieved. The power of the new definition is tested in terms of systematic uncertainties, which are evaluated in a new and original way. Thanks to the event-by-event prediction of the recoil pdf, the new definition results in a significative reduction of the related systematic uncertainty, estimated to be up to a factor 3 smaller. Full work link: http://cds.cern.ch/record/2285935

[1]The author acknowledge prof. L. Rolandi and Nicolo Foppiani for the collaboration and the CMS collaboration, Scuola Normale Superiore and INFN of Pisa for the crucial support.

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Date submitted: 08 Jan 2018 Electronic form version 1.4