Contribution ID: **49** Type: **Parallel talk**

Optimizing the Machine Learning techniques used in the CMS Higgs$\rightarrow \tau\tau$ analysis

Thursday 5 November 2020 16:00 (20 minutes)

One of the main goals of LHC experiments is the precise measurement of the Higgs boson's production properties in order to clarify its coupling structure. In Standard Model physics the coupling of the Higgs boson to fermions are introduced as Yukawa couplings. Due to the high branching ratio of the Higgs boson decay into tau leptons and the lower background contribution compared to $H \rightarrow b\bar{b}$, the $H \rightarrow \tau\tau$ channel is an interesting channel to probe the Higgs coupling to fermions.

The presented measurement is performed using data collected by the CMS experiment at a center-of-mass energy of 13 TeV in 2018 corresponding to an integrated luminosity of 59.7 fb^{-1}.

The analysis is based on a multi-class neural network, which classifies the events into two signal classes (gluon-gluon and vector boson fusion production) and several background classes.The eμ final state of the tau lepton pair is studied.
The main challenge in the analysis is the differentiation between the signal events produced via gluon-gluon fusion and the irreducible background process where a Z boson decays into tau lepton pair.

In this talk, studies aiming to improve the separation power of the neural network between these processes will be presented.

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Session Classification: Talks from participants: Particle Physics (de/engl)