Studying the Higgs Boson production in association with top-quarks and decaying into a b-quark pair with CMS Run 3 data

The measurement of the top-Higgs coupling is a crucial probe for testing the validity of the Standard Model. One direct way to explore this coupling is through the top-associated Higgs boson production process (ttH). On the other hand, the Higgs decay into a pair of bottom quarks (Hbb) features the largest branching fraction among all possible channels and thus offers a great incentive to scrutinize this process. This project contributes to the ongoing analysis of the ttHbb process with CMS Run 3 data, with an emphasis on several key improvements:

• The transition towards more data-driven methods for improved background description.

• The application of advanced Machine Learning (ML) techniques for more accurate jet-parton assignment and event categorization.

The student will gain an in-depth understanding of the analysis workflows at CMS and will contribute to the development of the ttHbb analysis. They will explore the potential kinematic reconstruction of the signal events when both W bosons emerging from the top quark pair decay to a (anti-)lepton and a (anti-)neutrino.

Group

FH-CMS

Project Category

B1. Physics data analysis and performance (software-oriented)

Special Qualifications

Python

DESY Site

Hamburg

Primary authors: LEYVA PERNIA, Daina (CMS (CMS Fachgruppe TOP)); PEREZ ADAN, Danyer (RWTH Aachen); ALDAYA MARTIN, Maria (CMS (CMS Fachgruppe TOP)); TORKIAN, Matin (CMS (CMS Fachgruppe TOP))

Presenter: LEYVA PERNIA, Daina (CMS (CMS Fachgruppe TOP))