

Searching for new physics at the LHC using machine learning: multiclass jet -tagging

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ATLAS experiment

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Subject

The ATLAS collaboration uses a generic detector collecting proton collisions produced by the LHC, at CERN (Geneva). With the aim of testing the Standard Model as far as possible, the collaboration is constantly improving the algorithms reconstructing the physics objects (electron, muon, jets, ...) from the detector outputs.

This internship in the ATLAS-LPC team will focus on the identification of large mass jets (collection of particles nearby in the detector) with Machine Learning methods. These large mass jets can originate from heavy particles such as Higgs, W, Z bosons, or top quarks, with very high momentum, which are particularly interesting in the context of searches for new physics (new physics is phenomena that would deviate from Standard Model predictions and would give hints for the theory needed to fix the Standard Model defaults).

The student will work on a multiclass tagging method, that is under-development in ATLAS. The goal of this method is to identify the origin (W, Z, H or top) of a given jet with the highest possible accuracy. For that purpose, different ML architectures can be studied using frameworks such as pytorch or Tensorflow. For this reason, a good level in python is required.

The possibility of a thesis topic in the continuity of this internship will be discussed with the student.

