21st International Conference on Computing in High Energy and Nuclear Physics **CHEP2015** Okinawa Japan: April 13 - 17, 2015

Contribution ID: **12** Type: **oral presentation**

LHCb topological trigger reoptimization

Thursday, April 16, 2015 9:45 AM (15 minutes)

The main b-physics trigger algorithm used by the LHCb experiment is the so-called topological trigger. The topological trigger selects vertices which are a) detached from the primary proton-proton collision and b) compatible with coming from the decay of a b-hadron. In the LHC Run 1, this trigger utilized a custom boosted decision tree algorithm, selected an almost 100% pure sample of b-hadrons with a typical efficiency of 60-70%, and its output was used in about 60% of LHCb papers. This talk presents studies carried out to optimize the topological trigger for LHC Run 2. In particular, we have carried out a detailed comparison of various machine learning classifier algorithms, e.g., AdaBoost, MatrixNet and neural networks. The topological trigger algorithm is designed to select all "interesting" decays of b-hadrons, but cannot be trained on every such decay. Studies have therefore been performed to determine how to optimize the performance of the classification algorithm on decays not used in the training. These include cascading, ensembling and blending techniques. Furthermore, novel boosting techniques have been implemented that will help reduce systematic uncertainties in Run 2 measurements. We demonstrate that the reoptimized topological trigger is expected to significantly improve on the Run 1 performance for a wide range of b-hadron decays.

Primary author: LIKHOMANENKO, Tatiana (National Research Centre Kurchatov Institute (RU))

Co-authors: USTYUZHANIN, Andrey (ITEP Institute for Theoretical and Experimental Physics (RU)); WILLIAMS, J Michael (Massachusetts Inst. of Technology (US)); ILTEN, Philip (Massachusetts Inst. of Technology (US))

Presenter: LIKHOMANENKO, Tatiana (National Research Centre Kurchatov Institute (RU))

Session Classification: Track 1 Session

Track Classification: Track1: Online computing