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Feasibility studies for searches enhanced by machine learning methods of leptoquarks with preferential couplings to third generation fermions at the LHC

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In recent years, the observations reported by LHCb, Babar, and Belle experiments of the apparent anomalies in B-meson decays, together with the possible anomaly on the magnetic angular momentum of muons reported by the Muon $g - 2$ experiment at Fermilab, indicate that, perhaps, lepton flavour universality is violated in the SM, in turn being a window to search new physics.

Of the new models that intent to extend the SM to explain violation of lepton flavour universality, several of them introduce new particles with preferential couplings to third generation fermions. Some of the most popular models include the hypothetical production of heavy mass particles in particular we concéntrate on Leptoquarks (LQ). In this project, we seek to conduct feasibility studies for the LHC associated with the production of these new hypothetical particles through different production mechanism and with preferential couplings to third generation fermions. These studies are conducted using different simulation packages to emulate the LHC conditions and the statistical analysis will use Machine Learning (ML) methods.

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