Contribution ID: **110** Type: **Parallel talk**

Anomaly Detection techniques for New Physics searches at the ATLAS experiment

Tuesday 8 April 2025 14:30 (15 minutes)

Despite extensive efforts by many High Energy Physics experiments, no significant evidence for New Physics (NP) has been found. Novel analysis techniques, such as unsupervised Machine Learning (ML), have been proposed to try and extend the reach of these searches. This analysis uses unsupervised ML algorithms to perform event-based Anomaly Detection (AD) to search for BSM physics using Run 2 and early Run 3 data collected by the ATLAS experiment. The final states under consideration are those containing at least two leptons, where the leptons considered are electrons and muons. A wide range of theorised BSM particles could produce such final states within the ATLAS detector. For example, the heavy Higgs boson decaying to pairs of SM Z-bosons and SUSY stop pairs decaying to top quark, W-boson and neutralino pairs. By exploiting data-driven analysis methods to produce results that are independent of a specific signal model, the analysis can probe for BSM physics in a fully model independent way. This talk would present an overview of these novel anomaly detection techniques as well as an update on the status of this ATLAS analysis.

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Session Classification: Beyond the Standard Model

Track Classification: Beyond the Standard Model