

Rethinking searches for new physics at the LHC

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Searching for new physics phenomena in the energy frontier is one of the main goals of the Large Hadron Collider (LHC). The Standard Model of Particle Physics (SM) leaves outstanding questions which can be explored by colliders. Hundreds of searches for new physics have been performed since the LHC inception, but there is no definitive evidence for physics beyond the SM so far.

In recent years, Machine Learning (ML) techniques involving deep learning have successfully addressed tasks involving image recognition and text analysis, giving way to automatised complex tasks. Such methods have the potential to revolutionise how high energy physics analyses are made.

This talk reviews recent proposals on how to remodel searches for new physics at the LHC, by switching from hypothesis testing of a specific Beyond the Standard Model (BSM) scenario to the falsification of the SM in specific phase spaces. The deployment of ML techniques, particularly unsupervised algorithms, allows for searches of BSM processes without prior expectations or theory prejudice, potentially extending the scientific reach of the LHC.

Primary author: DE ALMEIDA DIAS, Flavia (University of Copenhagen)

Presenter: DE ALMEIDA DIAS, Flavia (University of Copenhagen)

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