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Use Artificial Intelligence to pinpoint Dark Matter at the LHC

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Høgskulen på Vestlandet (HVL) has over the last couple of years built up a strong group working on machine learning (ML) for data analysis in collider experiments.

With the project "Use Artificial Intelligence to pinpoint Dark Matter at the LHC", financed by the Research Council of Norway, we focus on dark matter searches in the tau lepton sector of the LHC phase space in ATLAS data analyses. This talk will present the overall aim of the project, methods, approaches and challenges we face when applying machine learning in BSM searches and event classification.

The lack of new discoveries over the past decade motivates the use of ML methods to increase search sensitivity, which can be done in different ways. We aim to approach the task from two different angles –one following a traditional ML-based analysis, and one that reformulates the data into a computer vision task. The details will be covered in separate presentations, but we take a look at the benefits and disadvantages and discuss open problems in both approaches. Although ML-based analysis is by now well established, there is still a troublesome lack of consensus on certain points in strategy and implementation, which we wish to both highlight and offer solutions to.

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