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Self-Organizing Map in ATLAS Higgs Searches

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Artificial Neural Networks (ANN) are widely used in High Energy Physics, in particular as software for data analysis. In the ATLAS experiment that collects proton-proton and heavy ion collision data at the Large Hadron Collider, ANN are mostly applied to make a quantitative judgment on the class membership of an event, using a number of variables that are supposed to discriminate between different classes. The discrimination between quark-initiated and gluon-initiated jets is an example of the possible applications in the ATLAS experiment and it potentially has a great chance to improve many physics analyses.

In this work the application of the unsupervised Self-Organizing Map (SOM) is proposed as quark-gluon tagging for events with two jets in the ATLAS experiment. The performance of the SOM application for quark-gluon discrimination are shown in different ranges of jet p_T , confirming the feasibility of the quark-gluon tagging down to very low p_T values. The application of the SOM technique to the Higgs searches is described and the results are shown and discussed.

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