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Pattern recognition of Xe-136 double beta decay signal in a High Pressure Xe gaseous TPC

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Neutrinoless double beta decay could give essential information about neutrino mass and nature. One of the nowadays experimental approaches to look for the double beta decay is to use a high pressure gaseous TPC due to the good energy resolution and the topological information of each event that can be obtained with a pixelized gaseous detector. Pattern recognition may help to discriminate background, a key point for these experiments. In this work the topology of the Xe-136 double beta decay events simulated in a high pressure Xe TPC has been studied, as well as that of the typical competing backgrounds. Different discrimination algorithms based on graph theory have been developed to perform an automated analysis which is able to reduce the background in three orders of magnitude in the region of interest of the Xe-136 Qββ while keeping a high efficiency of 40% for the signal when applied to Monte Carlo simulated data. The effect of the diffusion in the topological capabilities is also studied as well as are discussed possible ideas for further improvement in the discrimination algorithms.

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