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The Interpretable Machine Learning Analysis for MAJORANA Demonstrator[1] AOBO LI, University of North Carolina at Chapel Hill, MAJORANA DEMONSTRATOR COLLABORATION — Neutrinoless Double Beta Decay($0\nu\beta\beta$) is one of the major research interests in neutrino physics. The discovery of $0\nu\beta\beta$ would answer persistent puzzles in the standard model. In the search of $0\nu\beta\beta$, The Majorana Demonstrator experiment retains the best energy resolution and one of the lowest backgrounds at the region of interest. Data is collected from 44kg of enriched and natural Germanium-76 crystals operating as a p-type point-contact detector array. Several pulse shape parameters have been developed to reject backgrounds. To collectively analyze those pulse shape parameters, we developed a fully interpretable boosted decision tree (BDT) model that has the potential to outperform the traditional selection criteria. By interpreting the BDT, we find that it uses parameter correlation to identify known background event categories that have required supplementary cuts in the traditional analysis. We demonstrated that the BDT analysis and traditional analysis benefit each other in a reciprocal way.

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