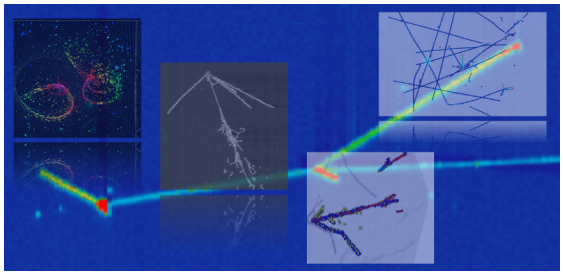

Contribution ID: **8** Type: **Individual Talk**

Faithful Pulse Shape Analysis for Germanium Detectors using Feature Importance Supervision

Friday, 25 August 2023 10:35 (25 minutes)

Experiments using the 76Ge isotope have set leading limits in the search for neutrinoless double beta decay, offering insights into the nature of neutrinos and the universe. The LEGEND experiment employs High Purity Germanium (HPGe) detectors for this purpose and dramatically reduces backgrounds using Pulse Shape Analysis (PSA). To enhance the analysis, we propose the implementation of a Neural Network with Feature Importance Supervision (FIS) for PSA in HPGe detectors. This machine learning model utilizes human knowledge of waveform features to accurately identify relevant elements of the signal and disregard noise. It exhibits promising results in distinguishing between multi-site gamma background events and the single-site signals associated with neutrinoless double beta decay events. By incorporating prior knowledge, the model achieves the aim of being "Right for the Right Reason" and overcomes the energy dependence of the more basic Neural Network classifier, introduced by the limitations of the training dataset available.

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