

# Enhancing XENONnT's Sensitivity to Neutrinoless Double-beta Decay with TextCNN

*Tuesday, May 14, 2024 3:00 PM (20 minutes)*

XENONnT employs a large target mass and dual-phase TPC to achieve unparalleled sensitivity in rare event searches. The neutrinoless double-beta ( $0\nu\beta\beta$ ) decay searches at XENONnT encounters limitations due to gamma-rays emitted by the detector material. Therefore, a TextCNN (convolutional neural network for text) model with waveform augmentation is designed to extract maximum information from the detector data. It demonstrates remarkable capability, achieving over 60% background rejection while maintaining a 90% signal acceptance. It significantly improved the background rejection for  $0\nu\beta\beta$  searches at XENONnT, which can potentially improve the sensitivity of the  $0\nu\beta\beta$  search for  $^{136}\text{Xe}$  by over 30%. This highlights the potential for utilizing  $^{136}\text{Xe}$  enriched xenon to achieve heightened sensitivity to  $0\nu\beta\beta$  decay in future dark matter experiments such as XLZD.

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