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# Enhancing Gamma-Ray Spectrometry Through Convolutional Neural Networks and Kolmogorov–Arnold Networks

Gamma-ray spectrometry remains a cornerstone technique in nuclear science and environmental radioactivity assessment, offering precise identification and quantification of radionuclides. Despite its efficacy, conventional analytical methods often rely on manual processing, which can introduce subjectivity, reduce throughput, and hinder real-time analysis. In this study, an automated framework is proposed for gamma-ray spectrometry by employing two advanced deep learning architectures: Convolutional Neural Networks (CNN) and Kolmogorov–Arnold Networks (KAN). The models are trained and evaluated using high-resolution spectral datasets acquired from high-purity germanium (HPGe) detectors. Input features include energy, channel, peak area, and centroid, extracted through digital signal processing techniques. Model performance is assessed based on standard classification metrics such as accuracy, precision, recall, and F1-score, allowing for a comparative evaluation of the CNN and KAN methodologies in terms of classification robustness and generalization capability. This work aims to demonstrate the potential of deep learning for automating gamma-ray spectrum interpretation, thereby enhancing the efficiency, reproducibility, and scalability of nuclear measurement systems. Detailed performance comparisons and implications for real-world deployment will be discussed during the presentation.

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MSc

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Yes, I ACCEPT

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