Contribution ID: **41** Type: **Contributed Talk**

Enhancing the Accuracy of Gamma-Ray Spectrometry Using CNN and KAN Architectures

Tuesday, 25 November 2025 17:05 (15 minutes)

Accurate analysis in gamma-ray spectrometry is critical for a wide range of applications, from environmental monitoring to nuclear safeguards. In this study, we present a machine learning-driven approach to improve spectrometric accuracy using two powerful neural architectures: Convolutional Neural Networks (CNNs) and Kolmogorov-Arnold Networks (KANs). By training these models on a curated dataset of gamma spectra, we demonstrate enhanced energy resolution and peak identification compared to traditional analytical methods. The performance of each model is assessed using standard evaluation metrics including accuracy, precision, recall, F1-score, and mean absolute error (MAE). Additionally, we will showcase a custom-built interactive dashboard that visualizes training progress, model predictions, and spectrum classification results in real-time. This work highlights the potential of deep learning techniques, especially hybrid and non-linear approximators like KAN, in advancing the state-of-the-art in nuclear spectrometric analysis.

Primary authors: MALULEKE, Vuako (Univen, iTHemba LABS); Dr NKADIMENG, Edward (iThemba LABS); Dr NEMANGWELE, Fhulufhelo (Univen); Dr NDABENI, Ntombizikhona (iThemba LABS)

Presenter: MALULEKE, Vuako (Univen, iTHemba LABS)

Session Classification: Session 7

Track Classification: Applied Nuclear Physics