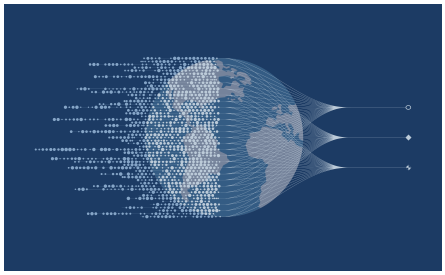

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Analyst: AI/ML assisted analyses of radionuclides from high resolution gamma-ray spectra

Pacific Northwest National Laboratory (PNNL) is developing a comprehensive database of over 100,000 analyzed gamma-ray spectra from an archive from decades of radiometric analysis of a diverse range of radionuclide samples by trained gamma spectroscopists. This dataset will be leveraged to embed domain expert interpretation and analysis of gamma-ray spectra into trained semi-supervised Machine Learning (ML) tools for raw spectral data analysis and to supplement and enhance targeted deep learning techniques. ML-based algorithms have demonstrated value as a powerful tool for enhancing the precision and robustness of gamma spectroscopic analysis. However, these successes have primarily been limited to low energy resolution detectors with far less information density than high resolution detectors like HPGe employed within the International Monitoring System (IMS) network. This effort is targeted at addressing the challenges of ML overfitting and under-generalization which have resulted in poor performance in real world applications where spectral signatures vary due to detector calibration and resolution drift, varied detector/source media resulting in spectral shifts, and a resulting lack of transparency and trust in the black box approach of the decision making process when ingesting raw spectral data.

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