Twin Artificial Neural Networks for Gamma Ray Spectra Comparison

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Abstract:

Many general-purpose algorithms have attempted to identify radiological sources from gamma ray spectra. In this project, a twin neural network architecture is trained to identify radiological sources from gamma ray spectra by comparing each input spectra to other spectra from a known library. The known library used for network training consists of simulated spectra from 53 different radiological sources. During spectra simulation, many factors such as background radiation, detector distance, detector measurement time, source height, and source shielding were taken into account to generate training data to closely match that of gamma ray spectra found in real world measurements. The preliminary accuracy of the twin network architecture in combination with the large number of radiological sources contained in the simulated training set supports the generality of this approach.

Future Work:

In addition, other machine learning techniques are explored to solve similar spectral problems. In these problems, multiple sources lie within each spectrum. Proposed approaches involve using autoencoders for spectral unmixing and convolutional neural networks for classification.