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-nuclear-explosion Discrimination using Discrete Wavelet Transform Machine Learning (DWTML) supervised techniques

Accurately distinguishing between nuclear explosions and earthquakes by manual discrimination or automatic discrimination is crucial in the field of seismic signal analysis. The technique of manual discriminating takes a lot of time, and it can occasionally become inaccurate. Thus, a high-accuracy automatic discrimination method is required. An inaccurate assessment of a region's inherent seismicity can result from falsely differentiating between nuclear explosions and earthquakes. Multi resolution analysis (MRA) of Discrete Wavelet Transform (DWT) has emerged as an innovative approach to differentiate between seismic activities caused by earthquakes and those triggered by nuclear explosions. This multiscale analysis provides rich feature sets that enhance the performance of various machine learning (ML) techniques, such as Support Vector Machines (SVM), and Random Forests. These algorithms have been trained on the distinct spectral signatures and temporal characteristics discerned from the wavelet-transformed data, allowing for precise classification. Utilizing waveforms from 295 nuclear explosions and 369 earthquakes, the proposed algorithm attains an 83% discrimination accuracy.

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