

Discrimination between explosions and earthquakes based on informative seismic signal features using machine learning methods

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Abstract. This study proposes an automatic classification approach for seismic events, designed to discriminate between earthquakes and anthropogenic explosions by employing the Random Forest algorithm. The model operates exclusively on features extracted from the signal recorded at a single seismic station without considering the source location or depth. The feature vector included amplitude ratios, along with temporal, spectral, and fractal parameters of the seismogram. A balanced dataset comprising more than 24 000 seismic records from the Pacific Northwest Curated Seismic Dataset was utilized for training and validation. The trained classifier achieved an accuracy of about 94 % on the test dataset. Feature importance analysis indicated that temporal, fractal, and spectral parameters contributed most to the classification, which is consistent with the underlying differences in the generation of natural and anthropogenic signals. The obtained results demonstrate that the proposed method ensures reliable and robust classification performance and can be applied for automatic filtering of anthropogenic events in seismic monitoring.

Keywords:

automatic classification, earthquakes, man-made explosions, machine learning, Random Forest, seismic signal, waveform features

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