

# Discrimination between Nuclear Explosions and Natural Earthquakes Using Multi-Machine Learning Approaches

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In seismic signal analysis it's crucial to be able to distinguish between earthquakes and underground nuclear explosions, which is an important component of the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO). Many methods have been used, such as the complexity, the spectral ratio, body wave and surface wave magnitudes (mb-Ms), and P and S corner frequencies. The data set of nuclear explosions and earthquakes with body wave magnitudes MB ranging between 4.5 and 6.5 in different regions around the world, such as China, India, Pakistan, North Korea, and the USA, have been collected using broadband seismic stations from different networks, including the International Monitoring System network and the International Research Institute for Seismology. The purpose of this study is to apply various approaches of machine learning based on the output features from the previous methods. These approaches, including logistic regression, the K-neighbors classifier, the decision tree classifier, the random forest classifier, the voting classifier, the XGB classifier, and Naive Bayes, had been widely used to automatically discriminate between underground nuclear explosions and large earthquakes. The performance of our proposed discrimination algorithms was proven by the receiver operating characteristics (ROC) and area under the ROC curve results.

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## Promotional text

This study focus about automatic discrimination between nuclear explosions and natural earthquakes using different techniques of machine learning based on output features of our previous discrimination methods applying on different zones around the world.

## Oral preference format

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