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Earthquakes are natural hazards that occur suddenly and without much notice. The most established method of detecting earthquakes is to use a network of seismometers. Nowadays, station positions of the global navigation satellite system (GNSS) can be determined with a high accuracy of a few centimetres or even millimetres. This high accuracy, together with the dense global coverage, makes it possible to also use GNSS station networks to investigate geophysical phenomena such as earthquakes. Absolute ground movements caused by earthquakes are reflected in the GNSS station coordinate time series and can be characterised using statistical methods or machine learning techniques.

In this work, we have used thousands of time series of GNSS station positions distributed all over the world to detect and classify earthquakes. We apply a variety of machine learning algorithms that enable large-scale processing of the time series in order to identify spatio-temporal patterns. Several machine learning algorithms, including Random Forest, Nearest Neighbours, and Multi-Layer Perceptron, are compared against each other, as well as against classical statistical methods, based on their performance on detecting earthquakes from the station coordinate time series.