

Identification of repeating seismic events using diffusion maps

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In this work, an advanced machine learning technique named diffusion maps is applied for automatic identification of repeating seismic event clusters such as an aftershock sequence. Identification of such a sequence will help to lighten the analysts' burden and to allow for timely production of reviewed bulletins. The proposed methods begin with a pre-processing stage in which a time–frequency representation is extracted from each seismogram while capturing common properties of seismic events and overcoming magnitude differences. Then diffusion maps are used in order to construct a low-dimensional model of the original data. In this new low-dimensional space, classification analysis is carried out. The algorithm's performance is demonstrated on several seismic data sets that were recorded at the IMS stations, as the identification process can be carried out with no need of master templates for detecting new aftershocks. Moreover, the proposed method can be used together with the waveform cross-correlation detector as a verification tool for reducing the number of false alarms.

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