

Use of Machine Learning in Seismic Monitoring at the IDC: Classification of Events Built with Waveform Cross Correlation

Seismic monitoring with waveform cross correlation has demonstrated a significant reduction in detection threshold, which may reach 0.5 magnitude units in the areas where master events with high quality templates are available. With the increasing completeness of the Reviewed Event Bulletin, a larger number of event hypotheses are also built in automatic processing. We have applied supervised machine learning (naïve Bayes classifier, Support Vector Machine, and bootstrap aggregating applied to decision tree methods) to the automatic cross correlation bulletin (XSEL) built for the 2012 Sumatera 2012 (Ms(IDC)=8.6) aftershock sequence. The XSEL includes 4924 events with 19027 arrivals at 7 IMS stations. Training dataset includes 461 arrivals from 119 newly built REB (valid) events and 451 arrivals from 144 rejected XSEL (bogus) events as obtained in interactive processing by experienced IDC analysts. The success rate of phase classification is near 75%, with false positive rate exceeding the false negative rate by a factor of 3.

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Track Classification: Theme 2: Events and Their Characterization