Geophysical Research Abstracts
Vol. 21, EGU2019-18732, 2019
EGU General Assembly 2019

Performance of a Real-Time Machine Learning Based Seismic Catalog Generator Over a One Year Period in Production

Sepideh Karimi, Andrew Reynen, and Dario Baturan
Nanometrics Inc., Canada (sepidehkarimi@nanometrics.ca)

Accurate and complete seismic event catalogs generated in real-time provide valuable insight into, among other things, induced seismic risk management and public safety strategies. However, due to the vast amount of seismic data being collected, the construction of such catalogs is traditionally labor intensive. Hence automated processes have been developed to reduce the manual workload involved in catalog production. Many machine learning oriented approaches have been proposed, however, their performance is commonly reviewed with relation to a static seismic catalog. As machine learning algorithms can be prone to overfitting, the ability to generalize for use in a real-time system is critical.

In this study, we focus on the temporal stability of the Feature Weighted Beamforming (FWB) which has been applied on over 15 networks over a one year period in a production environment. The performance is measured with regards to the comparison of the automatically generated catalog with the corresponding analyst reviewed catalog. We present detailed results from an induced seismic monitoring array over the Duvernay Formation in Western Canada (Duvernay Subscriber Array, DSA), as well as some higher level statistics on other seismic networks. The initial results from DSA in comparison to standard STA/LTA picking with subsequent associations shows that FWB reduced the number of false positives by 75% without loss of sensitivity, it also reduced the average difference in the event location between automatic and manually picked solutions by 82%. Similar to DSA, for all networks which included a large variety of training data FWB demonstrated consistent detection of all real seismic events compared to a sensitive STA/LTA pick associator regarding system sensitivity and location accuracy. Our investigation confirmed that the average difference in automated event locations output by FWB with respect to the analyst reviewed solutions are consistent over time. New clusters of seismic activity not seen during training are also correctly detected and located. We also discuss cautions for use of FWB when provided a limited training data set.