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3.3-P27. Rapid Search of Large Seismic Signal Archives

The exploitation of similar waveform signals from historic seismic events to detect, locate, and study new events is widely accepted as a key capability for modern nuclear explosion monitoring systems. The basic underlying calculation – time series cross correlation – is simple to implement and the ever-increasing online archives of signals suggests that the technique will become increasingly important. Yet there is an inherent limitation in how widely the technique can be applied due to the computational demands of searching large signal archives. In this study, we investigate the applicability of Kernelized Locality-Sensitive Hashing (KLSH) to significantly decrease the search time for large signal archives. KLSH probabilistically interrogates the database such that much of the database is ignored when searching for closest matches. We evaluate KLSH using data from the IMS primary station PS23 (MKAR). First we built a KLSH indexed archive using all associated signals from the IDC Late Event Bulletin (LEB) for 2000-2012. We then tested the signal matching capability using new IDC-detected signals from 2013, including a variety of regional and teleseismic phases. We used the LEB phase assignments as ground-truth to score the results. Metrics for the evaluation include precision, recall, and speed of search.

Primary author: YOUNG, Christopher (Sandia National Laboratories)

Presenter: YOUNG, Christopher (Sandia National Laboratories)

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