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# Monitoring System 3-Component Seismic Signal Detection Using the PhaseNet Deep Learning Model

*Thursday 22 June 2023 09:19 (1 minute)*

We train deep learning models for seismic detection on 3-component stations from the International Monitoring System (IMS) based on PhaseNet architecture and evaluate the results using the Unconstrained Global Event Bulletin (UGEB). Using 14 years of associated signals from the Late Event Bulletin (LEB), we auto-curate a training data set consisting of signal windows containing associated arrivals, and noise windows that contain no LEB associated signals. We construct five training data sets by varying the ratio of noise windows to signal windows and found that increasing the number of noise windows increases the precision from .15 to .4 while reducing the recall from .6 to .5. Using the SeisBench Toolbox, we compare eight PhaseNet models trained on non IMS data on the UGEB and show the best SeisBench model achieved a .24 F1 score versus .49 F1 score for our best IMS models. We qualitatively compare the PhaseNet response curves to the STA/LTA response for true positive detection, false positive detections generated from windows with associated signals, and false positive detections generated from windows with no associated signals. Finally, we find that the primary benefit of training with LEB data is not in detecting more signals, but rather the suppression of noise detections.

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## Promotional text

Our results suggest that primary consideration for improving the PhaseNet model for nuclear-test-ban monitoring is developing training data sets that adequately characterize the station network noise.

## Oral preference format

in-person

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