Supplementary material for paper: Monitoring urban construction and quarry blasts with low-cost seismic sensors and deep learning tools in the city of Oslo, Norway

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1 Model performance evaluation

Recall and precision metrics are computed to evaluate performance of the outlier detector and the blast classifier with respect to our reference blast data set. This is done for different decision thresholds: correlation coefficient in the case of the outlier detector and classification probability in the case of the blast classifier. This results in recall-precision curves for different models shown in Figure S1, S2, and S3.



Figure S1: Performance of three different outlier detectors deployed at OSLN2 using different latent dimension for the auto-encoder. The performance metrics are precision and recall using the reference data set as true events for different correlation thresholds given as text labels along the curves.

2 Outlier detection thresholds

Figure S4 shows correlation values and construction error (RMS) for STA/LTA detections at station OSLN2 after the auto-encoder is applied. Comparison of both quantities shows that correlation is better suited for outlier detection. Figure S5 shows histograms of correlation values and the corresponding detection thresholds at station OSLN2 and EKBG1.



Figure S2: Performance of two different outlier detectors. One model was trained with data from OSNL2 and applied to STA/LTA detections at OSNL2 and OSLN3. The other model was trained with data from OSLN2 and OSNL3 and applied to both stations. The performance metrics are precision and recall using the reference data set as true events for different correlation thresholds given as text labels along the curves.



Figure S3: Performance of two blast classifiers. One model was trained with data from OSNL2 and applied to STA/LTA detections at OSNL2 and OSLN3. The other model was trained with data from OSLN2 and OSNL3 and applied to both stations. The performance metrics are precision and recall using the reference data set as true events for different probability thresholds given as text labels along the curves.

3 Examples of unlocatable events

Figure S3 shows examples of detected outliers which were unlocatable but turned out to be weak blast signals.



Figure S4: Comparison of construction error (RMS) and correlation coefficient after applying the autoencoder to all STA/LTA detections at station OSLN2. Confirmed blasts and outlier detection threshold are indicated.



Figure S5: Histograms of correlation values after applying the auto-encoder to all STA/LTA detections at station OSLN2 and EKBG1.



Figure S6: Four examples of unlocatable events detected by the outlier detector at station OSNL2 which are clear blast signals.