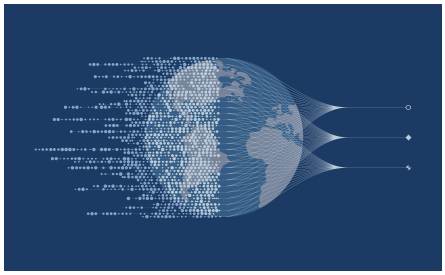

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seismic events in a noisy urban and industrial environment

Urban environments present unique challenges for seismic event monitoring and discrimination. Persistent anthropogenic noise can reduce the signal-to-noise ratios of seismic events and impulsive man-made events can falsely trigger detection algorithms. One approach to improving our monitoring algorithms—to accommodate diverse detection environments—is to incorporate more dynamic anthropogenic noise as training data. Here, we present a dataset of anomalous anthropogenic events detected in a unique urban and industrial environment in the Chicago area. We analyze data from a broadband seismometer, located within a few kilometers of quarrying operations, a flood-control reservoir, highways and dense residential districts. Applying both traditional (STA/LTA) and a state-of-the-art machine learning detector (EQTransformer) to the station's data generated a high false positive rate (>50%). To characterize these false positives and build a labeled dataset of events, we developed a semi-automated approach to cluster seismic events in two years of continuous data. We will present our methodology, which incorporates a power spectral density detector and K-means clustering. Our approach successfully identified several classes of signals, including high-amplitude quarry blasts, low-amplitude and low-frequency blasts, industrial machinery operations, and blast-like events of unknown sources. We will present example waveforms of these clusters and discuss potential sources of unknown events.

E-mail

annthomas2025@u.northwestern.edu

In-person or online preference

Primary author: THOMAS, Ann Mariam (Northwestern University)

Co-authors: Mr RANADIVE, Omkar (Northwestern University); VAN DER LEE, Suzan (Northwestern University)

Presenter: THOMAS, Ann Mariam (Northwestern University)

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