

RockNet: Rockfall and earthquake detection and association via multitask learning and transfer learning

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Abstract

Seismological data can provide timely information for slope failure hazard assessments, among which rockfall waveform identification is challenging for its high waveform variations across different events and stations. A rockfall waveform does not have typical body waves as earthquakes do, so researchers have made enormous efforts to explore characteristic function parameters for automatic rockfall waveform detection. With recent advances in deep learning, algorithms can learn to automatically map the input data to target functions. We develop RockNet via multitask and transfer learning; the network consists of a single-station detection model and an association model. The former discriminates rockfall and earthquake waveforms. The latter determines the local occurrences of rockfall and earthquake events by assembling the single-station detection model representations with multiple station recordings. RockNet achieves macro F1 scores of 0.990 and 0.981 in terms of discriminating earthquakes and rockfalls from other events with the single-station detection and association models, respectively.