DeepDetect: Application of Deep Densely Connected Convolutional Neural Network to Detect Earthquake Events

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Earthquake detection is a fundamental element in seismic data processing. How to automatically detect earthquakes in an accurate and efficient way is of particular interest as today' seismic data volume is rapidly growing. Here we present a software package, DeepDetect, to accurately and efficiently detect earthquakes from continuous seismic records. We build our algorithm on convolutional neural network (CNN) model to detect earthquakes and identify the arrival time of each event. The CNN is the backbone of our model, which serves the purpose of extracting features from the waveform. A classifier and a regressor are built on top of the CNN backbone. The classifier aims to detect events from the signal and the regressor further predicts the arrival times of events detected by the classifier. We demonstrate the capability of our algorithm using dataset from the IRIS Community Wavefield Experiment in Oklahoma. We show that our algorithm can not only capture most earthquakes, but also accurately identify the arrival time of each event, holding great potential for efficient earthquake detection.