

# Detecting seismic first arrivals using deep Convolution Neural Networks

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The accurate determination of the first arrivals of seismic signal, is of major concern for seismic reflection data processing. Several methods for auto-detecting first arrivals have ever been proposed. However, their reliability is easily influenced by the data quality. As a result, most of this procedure is carried out manually at present. It consumes about 20 percent of the total processing time of the seismic reflection analysis in some case.

Our new approach is based on the data transfer through deep Convolution Neural Networks (CNNs). We optimize CNNs model to calculate first arrivals time from seismic data. Manually picked data, few percent of all data, are used as the supervised data during model training.

Compared with previous methods, our method has advantages as follows; (1) robustness against random and impulsive noise, (2) high computationally speed after model trained, (3) broad applicability to picking other signals such as the onset of the S wave. Therefore, our proposed method is suitable for detecting natural earthquakes from existing seismographic network as well as for seismic reflection processing. We present the result of our method applied for the seismic reflection data in land.

Keywords: Detecting seismic first arrivals, Deep learning, Seismic reflection analysis