Name(s)	Project Number
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Project Title

An Autopicking Algorithm for the Detection of Seismic Event Arrivals

Abstract

Objectives/Goals

This project aims to solve the problem in computational seismology of automatically picking the arrival of an earthquake from data points that represent a seismogram. The algorithm developed in this project uses a neural network to refine an approximate pick calculated from the quadratic mean of the data.

Methods/Materials

An algorithm was written and programmed that uses the quadratic means (also known as the root-mean-squares) of two sections of a seismogram to calculate an approximate pick, and then inputs the approximate pick into a neural network for refinement. Using the backpropagation algorithm, the neural net was trained four times with a set of fifty data files, and different parameters of the network were changed between each training. Throughout each training, the neural network picks for a data file selected from a testing set of ten data files were recorded, and the difference from these picks to the manual picks for the data file were graphed as a function of the number of files with which the network had been trained.

Results

A combination of network parameters was found that produced two trainings with negative slopes for the graph of distance from neural net pick to manual pick versus files with which the network had been trained. Without thorough and repetitive training, however, the approximate picks calculated from the quadratic means are more consistently accurate than those produced by the neural network.

Conclusions/Discussion

These results suggest that with thorough and repetitive training, the neural network can produce accurate results. Areas of further study for this project include changes in the design and structure of the network, minimization of human error caused by inconsistent manual picks, and minimization of error caused by computer rounding.

Summary Statement

An algorithm was developed to automatically pick the arrival of an earthquake on a seismogram.

Help Received

Father helped find data sources; Mother helped cut paper for display