ID: Type: **Poster**

# Automatic Classification of Seismic P and S Wave Signals Using Multiple Parameters, Frequency Ranges and Artificial Neural Network

Automatic classification of seismic P and S wave signals is essential in automatic seismic event detection and location systems. The problem is tackled by utilizing multiple signals of different types each in several frequency bands. Artificial Neural Networks (ANN) are a robust and efficient tool in classification using large amount of input parameters. P and S wave signals have fundamentally different polarization properties. The input parameters depending on signal polarization in this study included rectilinearity, principal ellipticity, global polarization parameter, eigenresultants, quadratic resultant and predicted coherency. Several statistical parameters were used also. They included skewness, kurtosis and Jarque-Bera test. Instead of or in addition to several parameters their variances in time were added to the input database. Different amplitude ratios were used also. Many of the parameters were computed separately from vertical and horizontal channels. All parameters were were computed at 6 different frequency range and time window combinations resulting 210 input parameters. The parameters were computed from 10634 seismic traces of local events creating 2.2 new time-series. Independent training, testing and validation datasets picked from these time-series consisted ~1.5M inputs each. Using a deep ANN with 4 hidden layers 98% of signals of validation data were classified correctly.

**Primary author:** TIIRA, Timo (University of Helsinki, Institute of Seismology)

**Presenter:** TIIRA, Timo (University of Helsinki, Institute of Seismology)

**Track Classification:** 3. Advances in sensors, networks and processing