Seismic Factor Analysis

User Manual

IPLAB

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Seismic Factor Analysis

Seismic_Factor_Analysis – allow to calculate uncorrelated factors from set of cubes inside moving window based on two techniques. First is Autoencoder Analysis based on our Neural network learning technique and second is Correlation factors (use PCA - principal component analysis). Can be used for fracture and fault detection.

Autoencoder option – allow to use neural network with similar input and output layers. Output factors according this option is "bottleneck" hidden layer, what will concentrate all factors to minimize prediction error (see Figure 1)

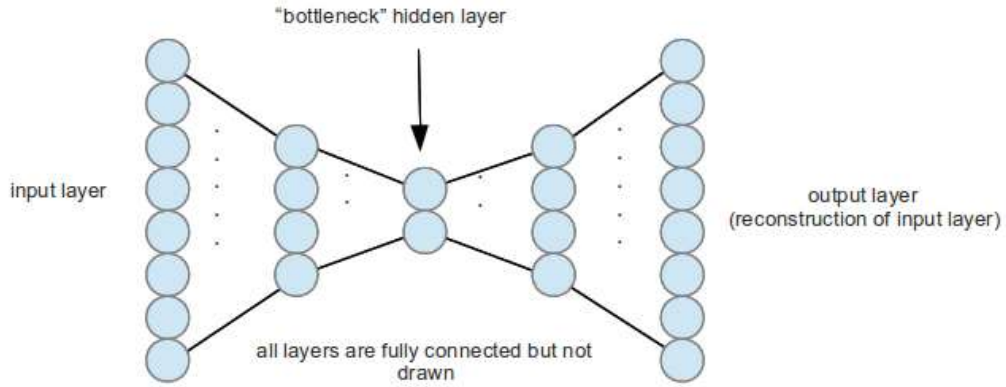

Figure 1: Autoencoder neural network schema.

Correlation factors – based on PCA - principal component analysis. This method use cross-correlation matrix on input and do decomposition of it to eigen values and vectors. It is allowing to get uncorrelated factors from defined input cubes and moving windows. If signal do not correlated to noise it will stay in separate factors. If do such analysis along slices (seismic or stratigraphic) it is allowing to get fracture or fault detection.

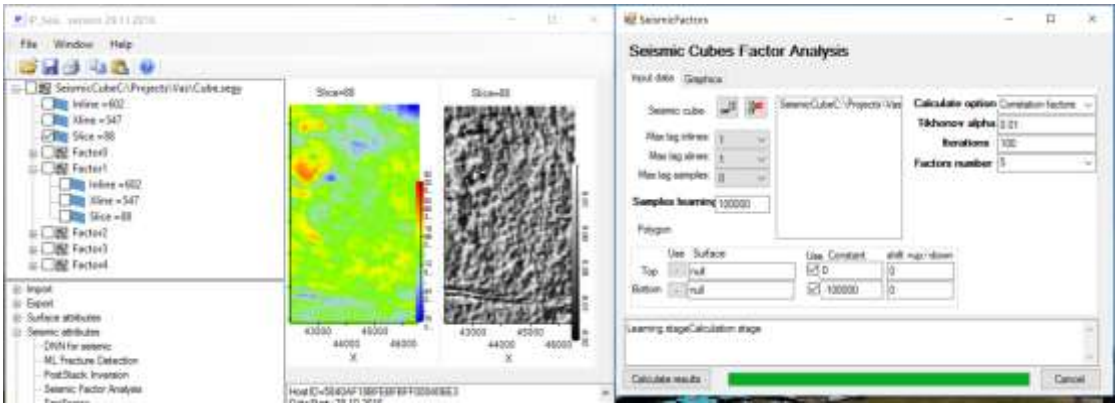

Figure 2: Seismic Cubes Factor analysis dialog window

Parameters have to be defined before calculation:

Seismic cube: allow select or unselect several cubes will be used for calculations.

Max lag inlines, Max lag xlines, Max lag samples: allow define moving window size around seismic sample.

Samples learning: defined number of samples selected randomly from defined cubes to use for learning.

Calculation option: Correlation factors or Autoencoder factors.

Tikhonov alpha: >0 and <1 allow avoid overlearning effect or instability for prediction. If alpha=0 then we can get very good approximation of the training set but the predictability can be very low and results can be very different for every realization. If alpha > 0 then training quality (correlation coefficient) will be less if use alpha=0, but predictability will be much higher

Iteration: (only for Autoencoder)allow define maximum iteration during training stage to teach the neural network.

Factors number: allow to define number result virtual cubes.

Results: sets of virtual cubes with factors