Cluster Assisted 3D Unsupervised and Supervised Seismic Facies Analysis –An Example from the Mid-Continent Region

Atish Roy and Kurt J. Marfurt
University of Oklahoma, Norman, OK

Automatic seismic facies analysis aims to classify similar seismic traces based on amplitude, phase, frequency and other seismic attributes. This talk reviews Kohonen Self Organizing Maps as one of the clustering algorithms that can generate 3D seismic facies volumes using multiple attributes as input. To avoid guessing at the number of clusters necessary to represent the data, we have over-defined the number of initial clusters (Prototype Vectors), which after subsequent iterations tends to converge to a lesser number of clusters. After the training is complete the modified PVs are then color-coded by using a 2D gradational colorscale (Matos et al., 2009). These colored PVs are then compared with the input data. Those traces with similar seismic nature are assigned the same colors, resulting in a 3D seismic facies volume.

If we have well information in certain areas of the survey we can assign their corresponding attribute patterns to Prototype Vectors that will be fixed for all iterations, thereby introducing some supervision in the application. We will be using volumetric attributes such as dip-magnitude, coherency, peak frequency and other mathematically independent and rotationally invariant volumetric attributes to come up with a 3D volume, highlighting variations in seismic facies and depositional environment of the survey area. We will also apply supervision in the application and compare the results.