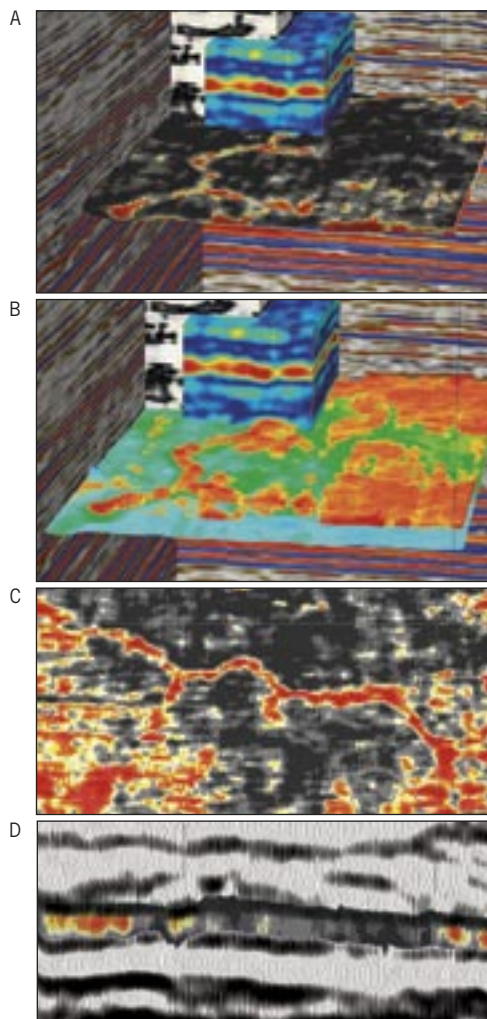


## SEISMIC FACIES CLASSIFICATION

### OVERVIEW

When analyzing large amounts of seismic data, having the right tools to classify the data can greatly increase interpretation efficiency. VisualVoxAt simplifies data analysis by extracting major attribute patterns with neural network facies classification. The resulting facies maps and volumes reveal data clustering that enhances seismic events normally overlooked in standard displays. By calibrating classification results to well data, the user can refine facies maps to improve lithology discrimination, fluid prediction and well accuracy.

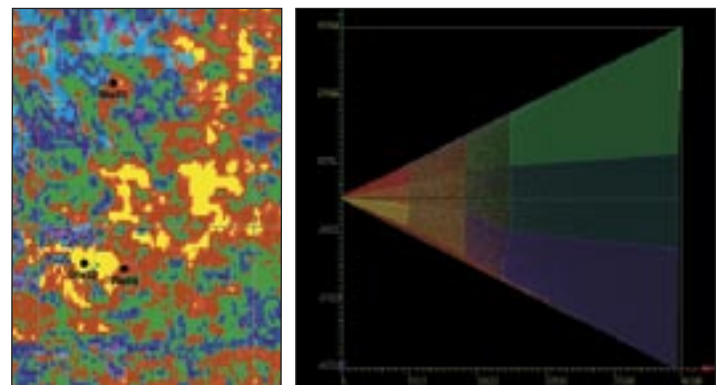


### QUICKLY VISUALIZE SEISMIC ATTRIBUTE PATTERNS

- Input to facies classification includes horizon-based, volume-based and trace attributes generated in VisualVoxAt or attributes imported from other applications.
- Neural network engine groups major waveform or attribute hierarchies into classes and assigns a number and color to each class.
- Output is a color-coded classification map or volume showing the distribution of seismic facies.
- Classifications can be viewed in map, section, 3D and cross-plot space.

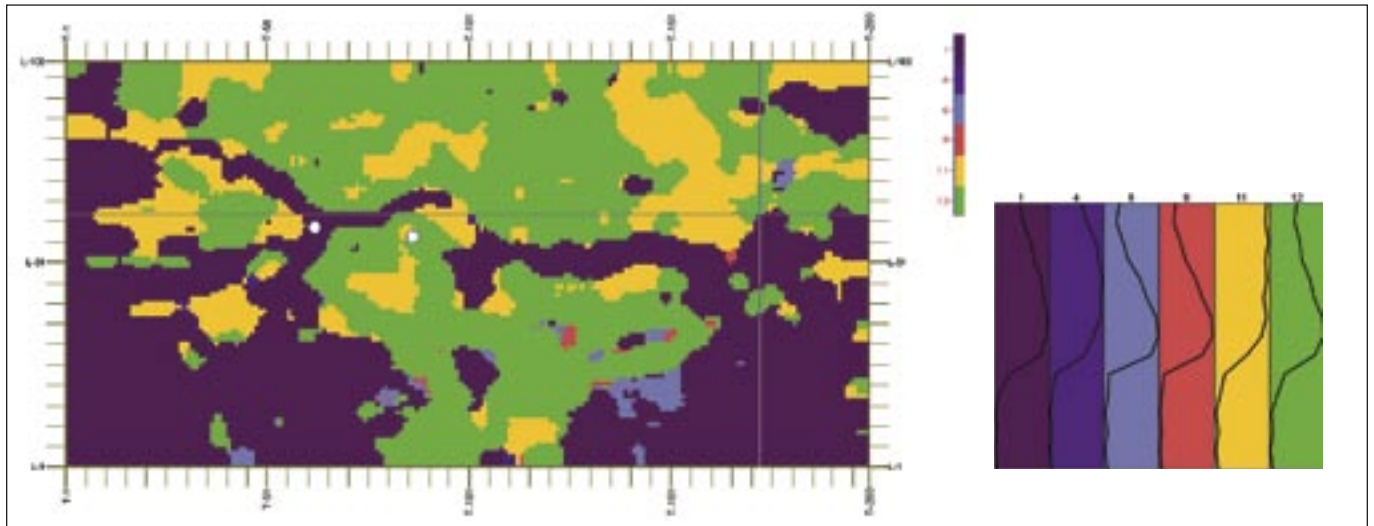
◀ Figure 1: Facies classification maps derived from 12 classes, highlighting a channel in red. The facies maps are shown in 3D view (A), with opacity (B), map view (C) and in an interactive view of facies volume behind wiggle trace (D).

▼ Figure 2: Facies map derived from color-coded cross-plot results highlighting channel point bar facies in yellow.



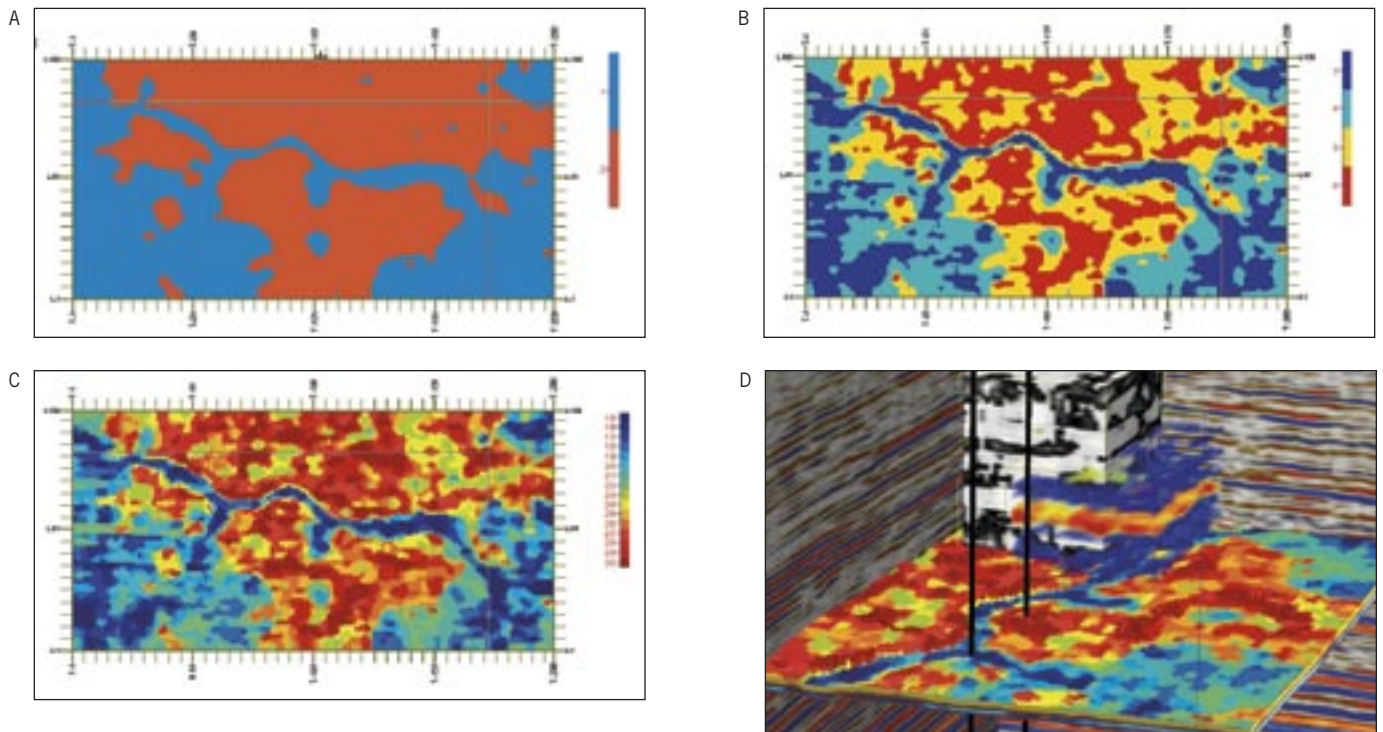
## SUPERVISED AND UNSUPERVISED FACIES CLASSIFICATION

- Supervised and unsupervised seismic facies classification can be applied to horizon, interval, volume, strata-grid and trace displays.
- In unsupervised classifications, the data is classified based on the number of classes specified by the user.
- In supervised workflows, users can specify sub-classes with hierarchical methods to refine facies maps and separate subtle variations in mapped zones.



▲ Figure 3: Unsupervised classification of instantaneous amplitude cube. Six facies are represented in basemap and trace extraction.

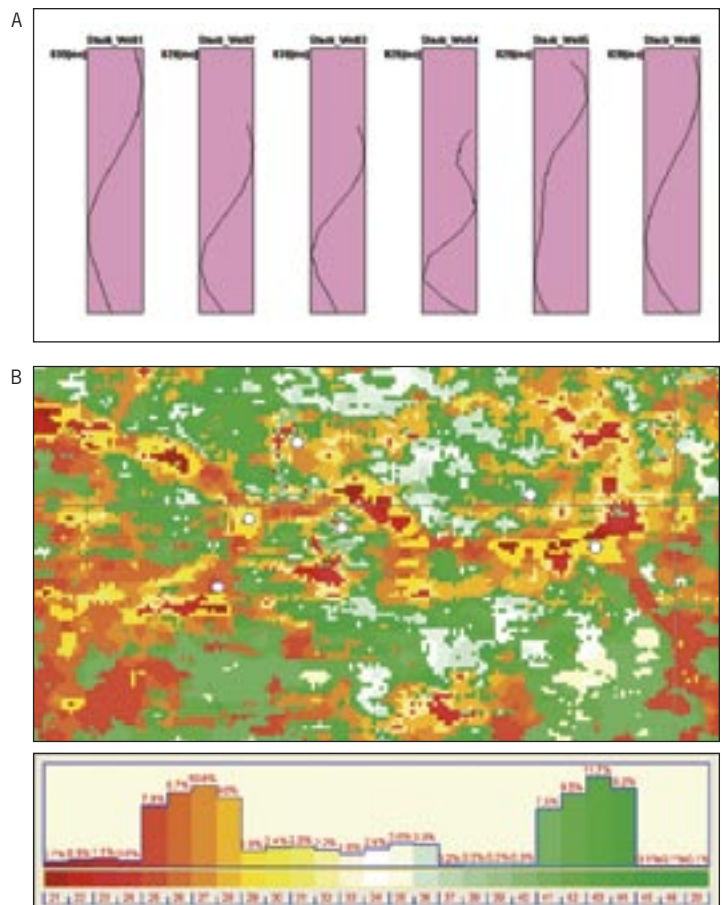
▼ Figure 4: Hierarchical classification workflow showing facies maps with 2, 4 and 15 sub-classes. The final classification clearly delineates a channel running diagonally across the map. Results are also shown in 3D view (D).



## ACCURATELY PREDICT RESERVOIR PROPERTIES AWAY FROM WELLS

- Calibrate facies classifications to well data to correlate geology with specific waveforms.
- Apply correlations to areas away from wells to identify similar lithologies and potential hydrocarbon zones.
- Generate drilling prospects and improve well accuracy based on reliable classification results.

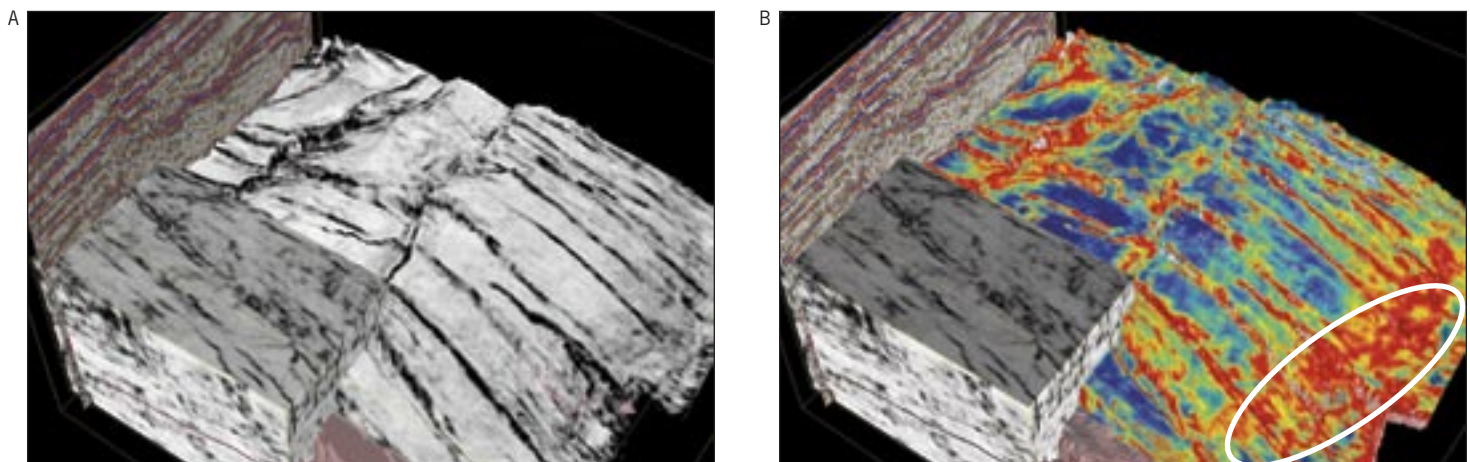
Figure 5: Extracted traces at well location (A) were used to generate a facies map highlighting channel morphology (B). Classification results are also represented in 2D section (C).



## FAULT CLASSIFICATION MAPS

- Use multiple structure attributes to classify faults and enhance stratigraphic detail.
- Input horizon attributes (phase, dip-azimuth, semblance, throw, strike, curvature) and volume attributes (semblance, waveform difference, spectral deconvolution, simple difference).
- Refine fault attributes with hierarchical neural network classification or cross-plot analysis.

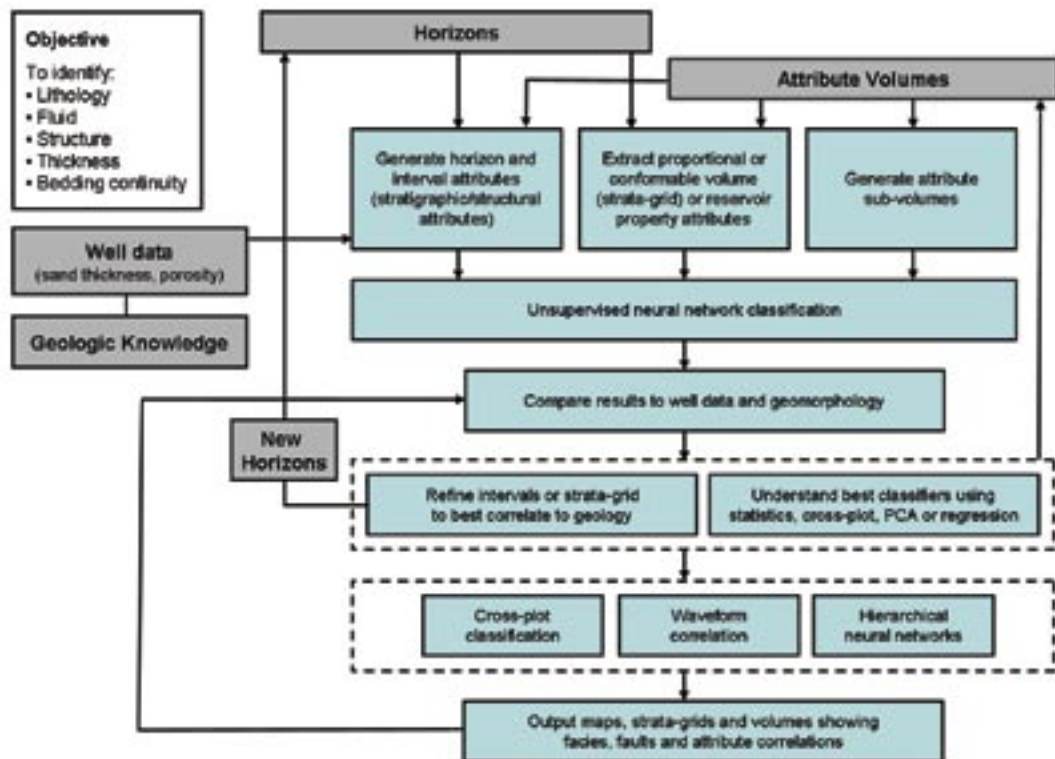
Figure 6: Semblance cube showing fault structures (A). Edge classification on the same cube (B) enhances the faults and highlights a braided channel facies (circled).



## IMPROVED ATTRIBUTE ANALYSIS AND INTERPRETATION

- Solve specific geological problems with organized workflows.
- Visualize subtle details missed by conventional seismic analysis.
- Refine interval, strata-grid and volume analysis to correlate with well data and geology.

## SEISMIC ATTRIBUTE CLASSIFICATION WORKFLOW



VisualVoxAt is an integrated, Windows-based toolkit for seismic attribute generation, visualization, calibration, classification and interpretation. The software combines fast rendering technology with easy-to-use analysis tools to reduce cycle times for faster decisions. As a plug-in to reservoir interpretation workflows, VisualVoxAt is a cost-effective solution for optimizing reservoir assets and increasing well accuracy.