Same Old Data
Different Approach
“The definition of insanity is doing something over and over again and expecting a different result.”

http://www.news.hypercrit.net/2012/11/13/einstein-on-insanity/
Seismic Data Available

UKCS 3D Seismic (Cumulative Totals; Proprietary in NDR)

<table>
<thead>
<tr>
<th>Projects</th>
<th>6</th>
<th>32</th>
<th>73</th>
<th>216</th>
<th>323</th>
<th>359</th>
<th>392</th>
<th>420</th>
<th>435</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>1.67GB</td>
<td>66.93GB</td>
<td>2.52TB</td>
<td>40.3TB</td>
<td>95.2TB</td>
<td>145TB</td>
<td>185TB</td>
<td>330TB</td>
<td>363TB</td>
</tr>
</tbody>
</table>

1970
- Concept of seismic attributes presented
  - Complex trace analysis

1980
- Response attributes
  - Interval Attributes

1990
- Dip / Azimuth
  - Coherence

2000
- Spectral Decomposition
  - Curvature Attributes

2010

2020
- More than 150 attributes available
<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>Interpretative Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous Attributes</td>
<td>Reflection Strength, Instantaneous Phase, Instantaneous Frequency, Quadrature, Instantaneous Q</td>
<td>Lithology Contrasts, Bedding Continuity, Porosity, DHIs, Stratigraphy, Thickness</td>
</tr>
<tr>
<td>Geometric Attributes</td>
<td>Semblance and Eigen-Based Coherency/Similarity, Curvature (Maximum, Minimum, Most Positive, Most Negative, Strike, Dip)</td>
<td>Faults, Fractures, Folds, Anisotropy, Regional Stress Fields</td>
</tr>
<tr>
<td>Amplitude Accentuating Attributes</td>
<td>RMS Amplitude, Relative Acoustic Impedance, Sweetness, Average Energy</td>
<td>Porosity, Stratigraphic and Lithologic Variations, DHIs</td>
</tr>
<tr>
<td>AVO Attributes</td>
<td>Intercept, Gradient, Intercept/Gradient Derivatives, Fluid Factor, Lambda-Mu-Rho, Far-Near, (Far-Near)Far</td>
<td>Pore fluid, Lithology, DHIs</td>
</tr>
<tr>
<td>Seismic Inversion Attributes</td>
<td>Colored inversion, Sparse Spike, Elastic Impedance, Extended Elastic Impedance, Prestack Simultaneous Inversion, Stochastic Inversion</td>
<td>Lithology, Porosity, Fluid Effects</td>
</tr>
<tr>
<td>Spectral Decomposition</td>
<td>Continuous Wavelet Transform, Matching Pursuit, Exponential Pursuit</td>
<td>Layer Thicknesses, Stratigraphic Variations</td>
</tr>
</tbody>
</table>
Cross Plots
Cross Plots
Applying unsupervised multi-attribute machine learning for 3D stratigraphic facies classification in a carbonate field, offshore Brazil

https://doi.org/10.1190/image2022-3750985.1
Example - Original

Arbitrary section

Salt base / top of the sag

Top of the rift

Slope and basin

Platform margin

Platform interior

Ramp

Platform margin

Slope

Reef
Example Seismic attributes used for facies classification

- Deviation
- Most Negative Curvature
- Sweetness
- Chaos
- Mobility Factor
- Homogeneity
Example: Comparison to modelled facies
Thanks

Tim Gibbons
Business Development – Europe
+447766024602
tim@hoolock-consulting.com