

Title: WELL LOGS AND SEISMIC BASED MACHINE LEARNING FACIES CLASSIFICATION IN JURASSIC RESERVOIRS OF RAUDHATAIN FIELD, KUWAIT

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Summary:

This research provides valuable insights in applying different types of machine learning for geologic interpretation of the Raudhatain Field, Kuwait. Facies recognition utilizing machine learning has high potential in reducing uncertainties of reservoir characterization. ML-based algorithm enables automation of interpretation techniques in large portions of data which reduces the seismic and well log interpretation workflows cycle time. Facies classifications through predictive learning were obtained from two case studies: 1) semi-supervised learning to unlabeled well logs and 2) unsupervised learning to unlabeled post-stack seismic data in Raudhatain Field, Kuwait. The first case demonstrates that K-means semi-supervised learning reduces cycle time for facies classification in well logs. Combining petrophysics-based domain knowledge with machine learning increases efficiency in facies classification. In the second case, Self-Organizing Maps (SOM) proves to be a good tool for seismic interpretation. This paper demonstrates the usefulness of leveraging machine learning in the interpretation of facies in Raudhatain Field, Kuwait. SOM is a practical way to identify natural clusters in multi-attribute seismic data. As a lesson learned, the ability to determine a good seismic data set is a deciding factor for a successful SOM analysis and developing meaningful neural classes. In the end, this K-Means and SOM data-driven approach allows for automation of facies classification in large amount of unlabeled well logs and seismic data, reduces human biased, and permits new possible findings of clusters and characteristics hidden in the data which is essential for reservoir characterization.

Theory / Method / Workflow

This research provides valuable insights in applying different types of machine learning for geologic interpretation of the Raudhatain Field, Kuwait. Facies recognition utilizing machine learning has high potential in reducing uncertainties of reservoir characterization. ML-based algorithm enables automation of interpretation techniques in large portions of data which reduces the seismic and well log interpretation workflows cycle time

Results, Observations, Conclusions

Facies classifications through predictive learning were obtained from two case studies: 1) semi-supervised learning to unlabeled well logs and 2) unsupervised learning to unlabeled post-stack seismic data in Raudhatain Field, Kuwait. The first case demonstrates that K-means semi-supervised learning reduces cycle time for facies classification in well logs. Combining petrophysics-based domain knowledge with machine learning increases efficiency in facies classification. In the second case, Self-Organizing Maps (SOM) proves to be a good tool for seismic interpretation.

Novel/Additive Information

This paper demonstrates the usefulness of leveraging machine learning in the interpretation of facies in Raudhatain Field, Kuwait. SOM is a practical way to identify natural clusters in multi-attribute seismic data. As a lesson learned, the ability to determine a good seismic data set is a deciding factor for a successful SOM analysis and developing meaningful neural classes. In the end, this K-Means and SOM data-driven approach allows for automation of facies classification in large amount of unlabeled well logs and seismic data, reduces human biased, and permits new possible findings of clusters and characteristics hidden in the data which is essential for reservoir characterization.

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