Machine Learning Applications in Quantitative Interpretation Workflow- North Sea Examples

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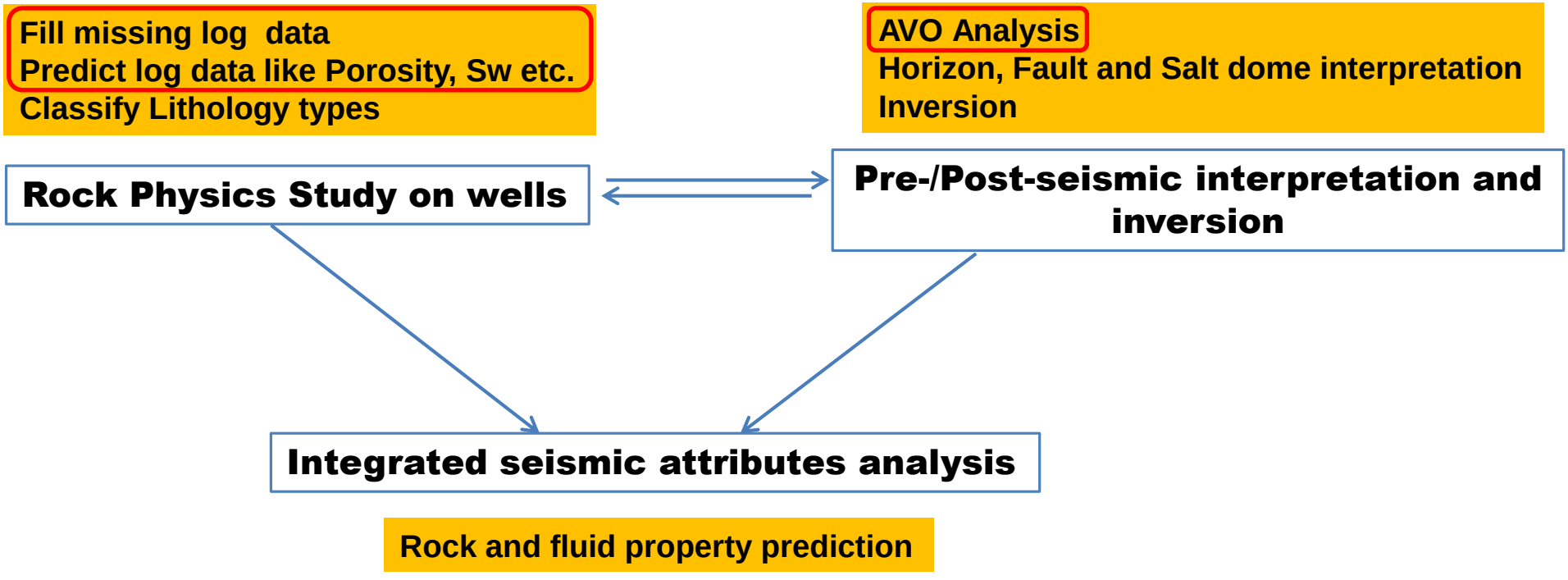
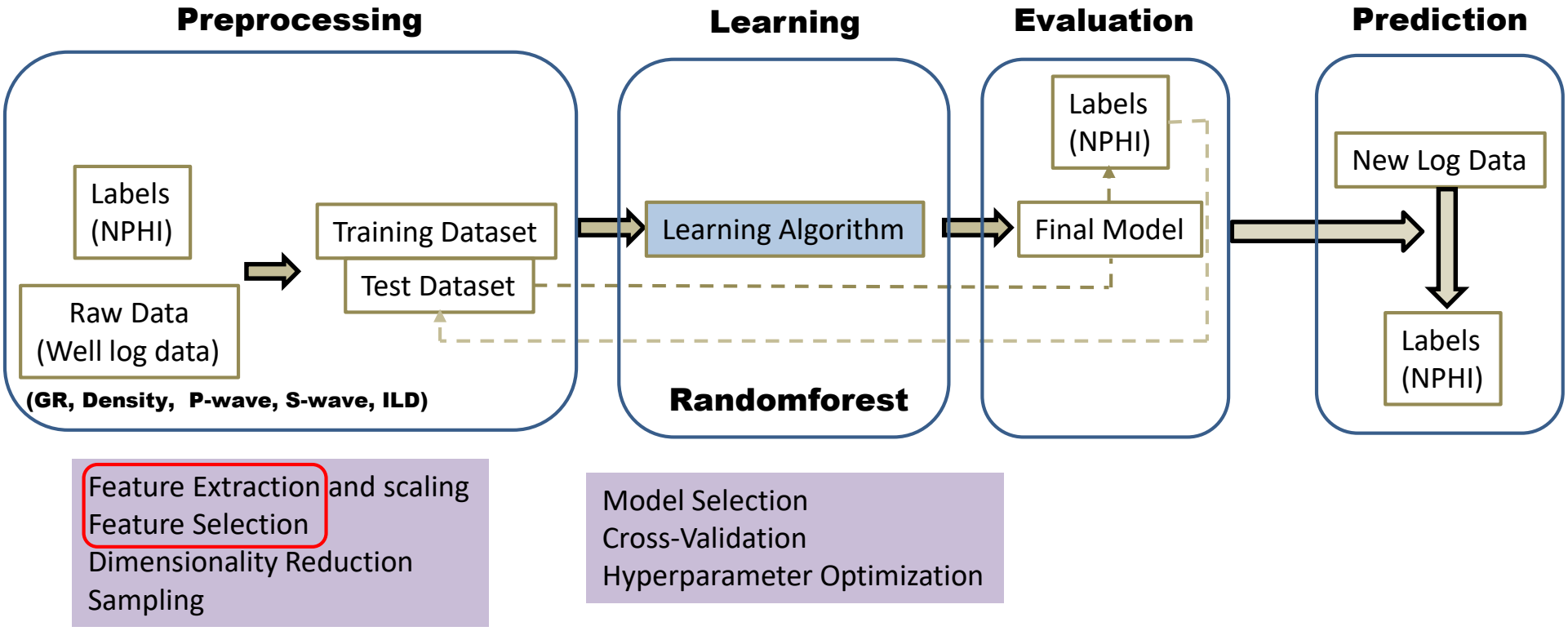
Thanks OGA and Equinor provided open data.

General QI Workflow integrated with Machine Learning



Log Prediction using Machine Learning

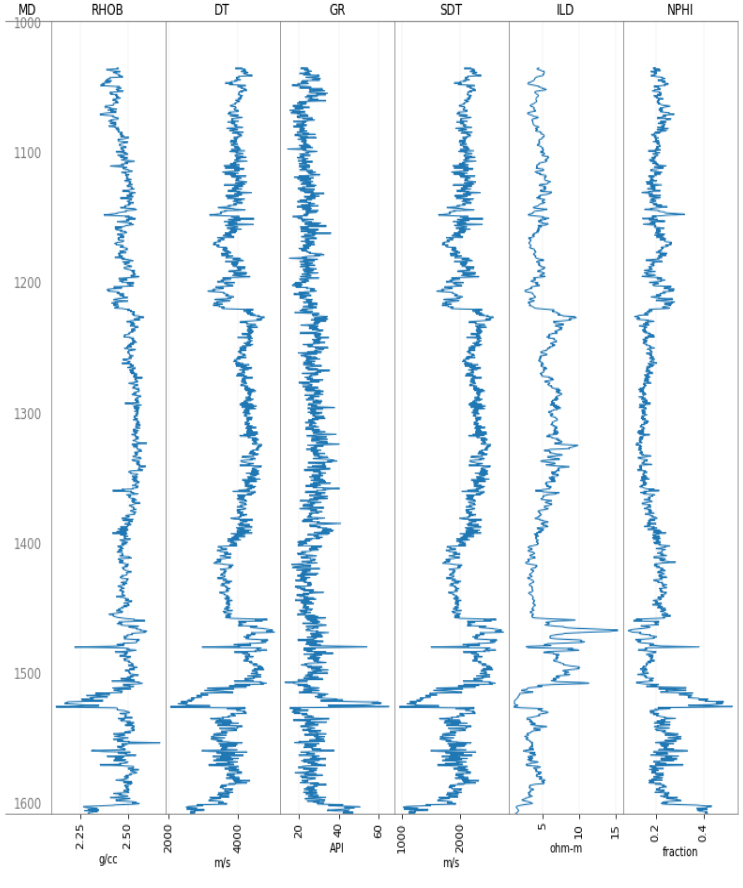
(Supervised Machine Learning Task)



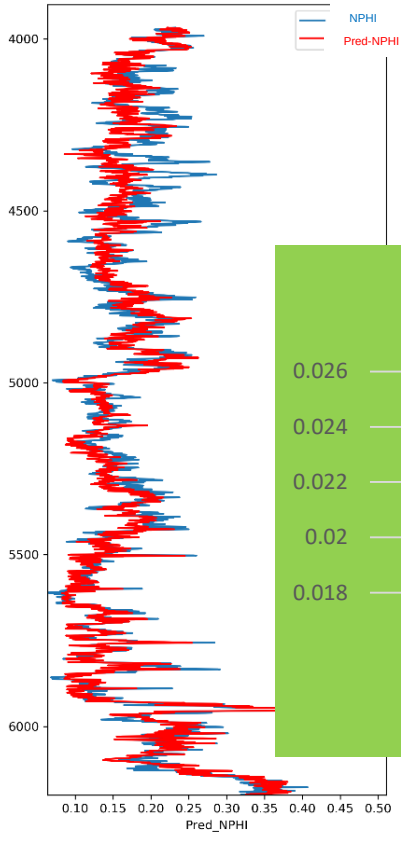
(Edited from Sebastian etc., 2017)

Log Prediction using Machine Learning

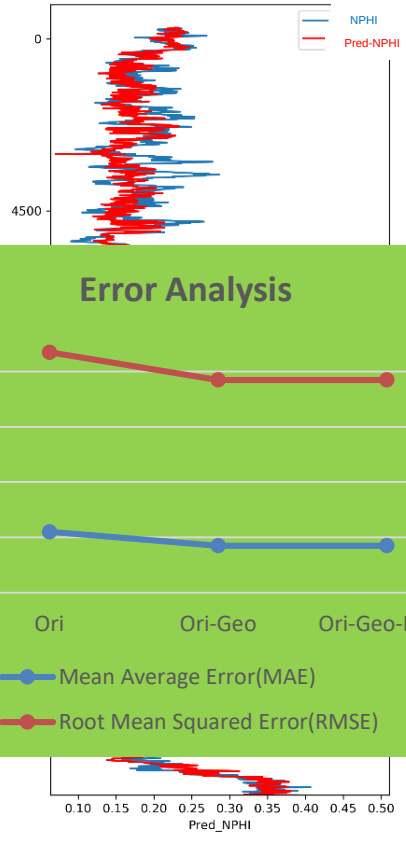
Mid North Sea High Well log data



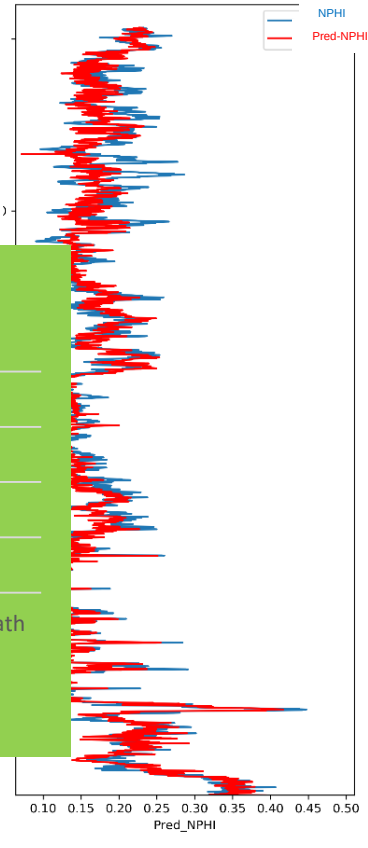
Using Original logs

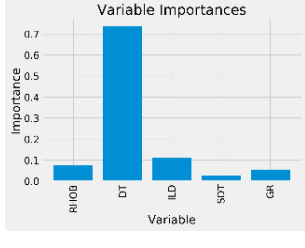


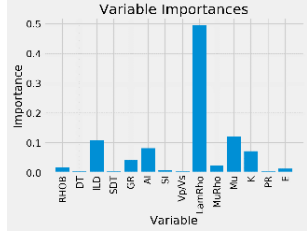
Using Original + Geophysical logs

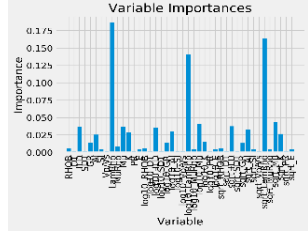


Using Original + Geophysical+ Math logs



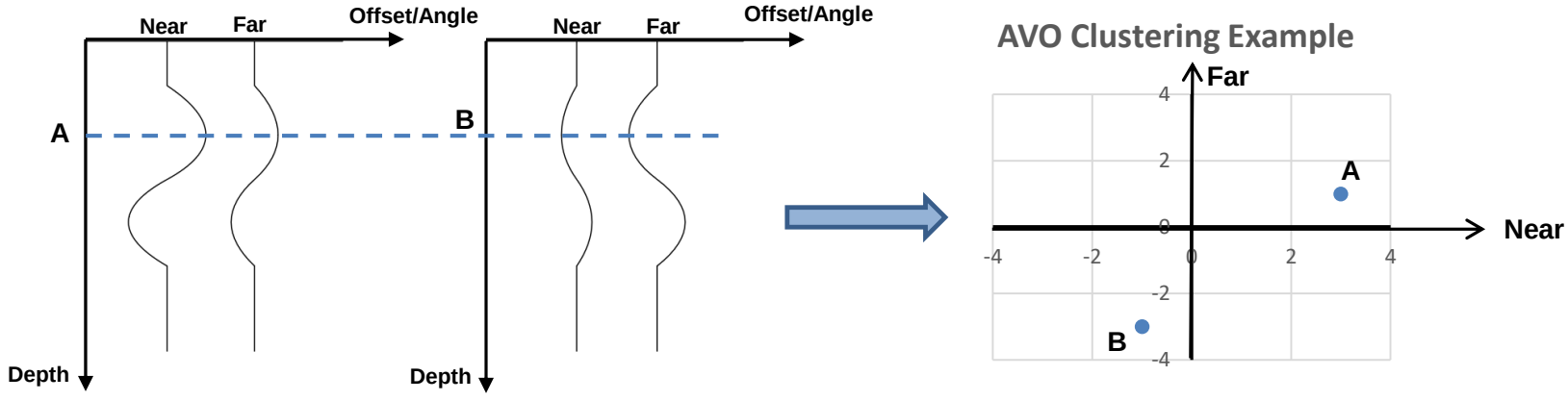






AVO Analysis using Machine Learning

- **AVO anomaly analysis can be considered as a clustering process, different AVO classes can be put into different clusters.**



- **This is unsupervised machine learning task (Clustering).**

- **Fuzzy c-means clustering can be used to solve the problem quickly.**

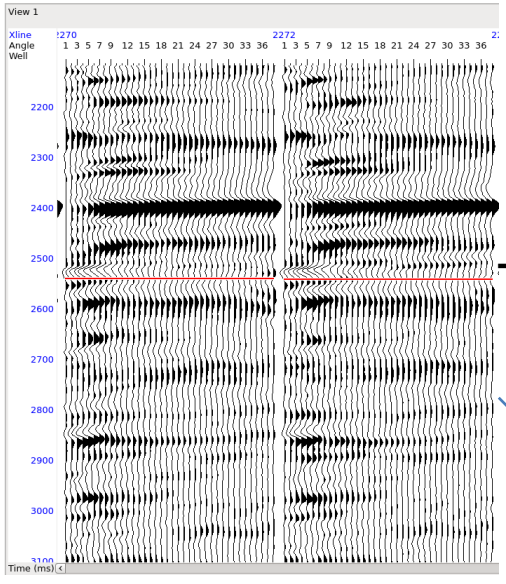
Input Data
Pre-stack Gathers
Partial Angle Stack Volumes
Number of Clusters

Fuzzy C-Means Clustering

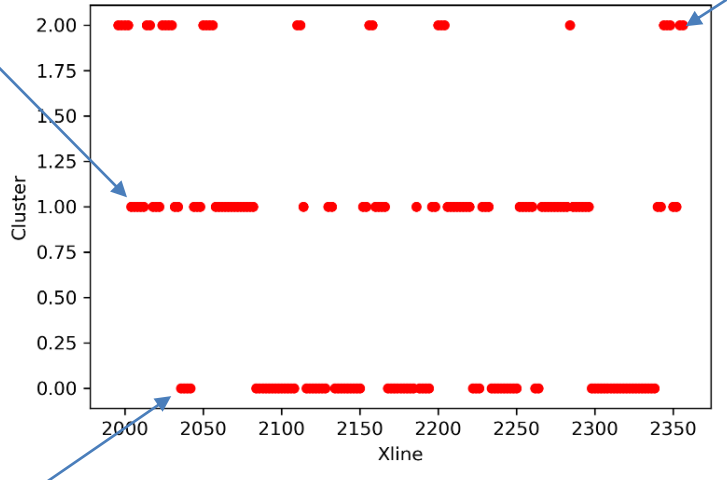
A "soft clustering" technique, which allows one piece of data to belong to two or more clusters.
Membership grades are assigned to each of the data points. These membership grades indicate the degree to which data points belong to each cluster.

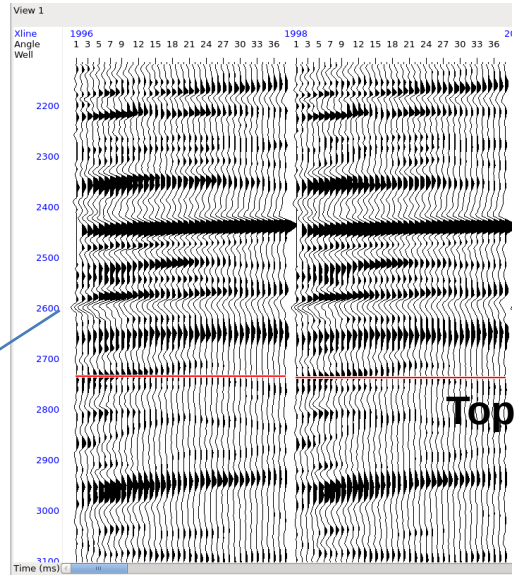
Outputs
- **Labelled Cluster volume**
- **Probability of Cluster Membership Volume for Each Cluster**

(Edited from Laura etc., 2018)

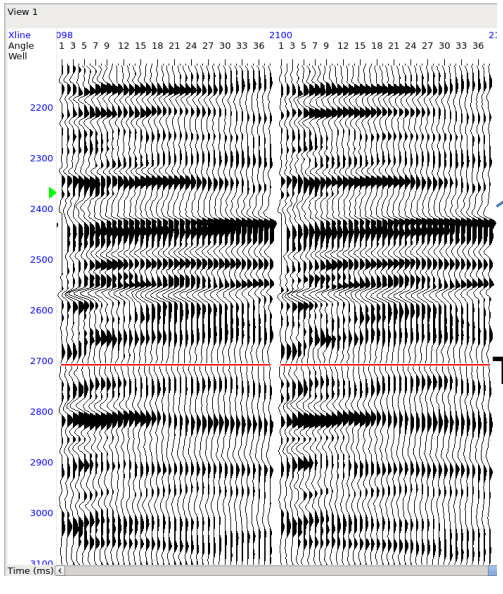


Top Hugin



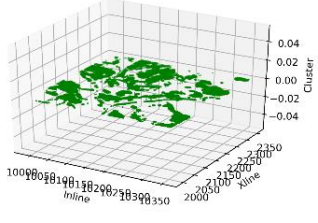


Top Hugin

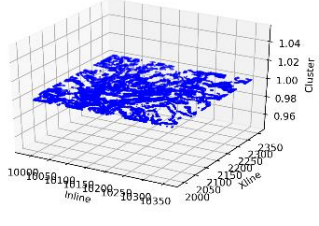


Top Hugin

Cluster 0



Cluster 1



Cluster 2