Introduction

The aim of the course is to introduce how Machine Learning (ML) is used in Facies along a well-bore. It will give an understanding of the "workflows" used in ML. The used algorithms can be studied separately using references. Power-point presentations and videos will introduce various aspects of ML, but the emphasis is on computer-based exercises using open-source software.

Topics covered

The lectures and exercises deal with pre-conditioning the datasets (balancing the input classes, standardization & normalization of data) and applying several methods to classify the data: Bayes, Logistic, Multilayer Perceptron, Support Vector, Nearest Neighbour, AdaBoost, Trees. Non-linear Regression is used to predict porosity. Use will be made of an open-source package called Weka. The reason is that it is a user-friendly package with most relevant Machine learning algorithms, except truly Deep Learning. This suffices for most exploratory applications, where we like to learn the workflows and applications of Machine learning. Therefore, I have included an introduction to Google Colab. This runs on the Cloud and allows use of a GPU. It is "the way" to learn using a whole range of open-source Machine Learning algorithms. In an exercise you will get acquainted with using interactive python notebooks, how to get algorithms using Scikit-Learn (sklearn) and if you restrain yourself from using it in earnest on large datasets, it is free.

Learning methods and tools

At the end of the course participants will have a clear idea how Machine learning, being part of Artificial Intelligence will impact the future of Geosciences. This will be evident from the examples of Machine Learning discussed and applied to the case of predicting lithology and pore fluids.

Intended Audience

All those interested in understanding the impact Machine Learning will have on the Geosciences and then as an example the impact on lithology and pore-fluid prediction. Hence, geologists, geophysicists, and engineers, involved in exploration and development of hydrocarbon or mineral resources.

Pre-requisites

A basic understanding of Geophysics and Statistics

MLF	Machine learning for Facies Prediction			Blended Learning Interactive	
Part 1	Introduction 1. Biography	Presentation 2. ML Intro 3. Moodle 4. Weka	Presentation 5. Classification 6. Supervised	Exercise 7. Ex_Classification	
	Video 8. ML & Serendipity	Exercise 9. Ex_Attribute Filters	Exercise 10. Ex_Attribute Selection		
Part 2	Presentation 1. Clustering 2. Artificial NN	Presentation 3. Semi-supervised 4. Regression	Presentation 5. Ensemble	Presentation 6. Deep NN	
	Exercise 7. Ex_Clustering	Exercise 8. Ex_Regression	Exercise 9. Ex_Ensemble		Quiz Quiz 1
Part 3	Presentation 1. Over & underfitting	Presentation 2. Forward, Backward	Presentation 3. Activation Functions	Presentation 4. SVM	
	Exercise 5. Ex_Hyper parameters	Exercise 6. Ex_Comparing Algorithms	Exercise 7. Ex_ML Models		
Part 4	Presentation 1. Future ML in Geophysics 2. Boolean Logics	Presentation 3. Assist Acq & Proc	Presentation 4. Ex_KnowledgeFlow	Demo 4. Google Colab	
	Exercise 5. Ex_SVM	Exercise 6. Ex_Randomness	Video 7. Inv vs ML	Exercise 8. OneWell	Quiz Quiz 2
Part 5	Project: Clustering & Classification			Q&A	_