

## ***Rock typing and Prediction Permeability Using Machine Learning Techniques in Mishrif formation, southern Iraq***

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**Abstract.** Mishrif Formation is one of the major carbonate reserves. Classifying rock types and Predicted Permeability in the Mishrif Formation in four wells (A, B, C, and D) is the primary goal of this research. Using Machine Learning Techniques, this research applies rock-typing techniques like the Flow Zone Indicator (FZI) method. In a core plug dataset, we can use unsupervised learning methods to automatically cluster hydraulic flow units (HFU) based on flow zone indicators (FZI), and we can use a supervised learning method by combining core and well log data to predict HFU (rock type) for the interval depths of the wells without core data. In this method, we were able to classify rocks into five distinct groups, or "rock types," or "RT" for short. RT1 rocks are the highest quality reservoir rocks, RT2 rocks are of good quality, RT3 rocks are of intermediate quality, RT4 rocks are of poor quality, and RT5 rocks are of very poor quality. Accurately estimating permeability in each rock type, not only does this help reduce uncertainty that occurs in reservoirs, but it also drives improvements in project economics by optimizing resource allocation and lowering costs. This is all thanks to the use of machine learning algorithms, which have proven to be highly effective in significantly enhancing the accuracy and precision of permeability predictions.

**Keywords:** Rock Typing; Machine learning; Permeability.

### **1. Introduction**

Characterization of carbonate reserves presents a number of difficulties. One of the biggest challenges is the presence of heterogeneity, which leads to large differences in rock type across the reservoir. Because of this variety, describing the reservoir and anticipating its behavior is difficult [1].[2]. The Hydraulic Flow Unit (Rock Type) is a method that was developed to classify rock types using core data. It was originally suggested by various authors [3]. Extensive research has confirmed that the

