Sequential Prediction of Drilling Fluid Loss Using Support Vector Machine and Decision Tree Methods

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Abstract

Machine learning methods have been applied to predict depths of fluid loss in hydrocarbon exploration.During drilling, lost circulation can be described as the unpleasant loss of all or part of drilling mud or fluid into the immediate formations or affected formation by excessive hydrostatic pressure, sufficient to fracture the formation or expand existing fractures encountered during the drilling process. In this study, we deployed Python codes of Support Vector Machine (SVM) and Decision Tree (DT) methodsto categorical data obtained from drilling operations in a producing field to predict lost circulation occurrence. The modelsleveraged the capability of both SVM and DT to achieve binary classification by adopting flow-out percentage of less than 70 percent as the points of lost circulation. That is, < 70% is represented as Loss and > 70% represented asNo Loss. Prediction models were applied to 10 input variables preprocessed with principal component analysis (PCA) to reduce dimensionality and focus on essential variables. The preprocessed SVM model gave an improved result while preprocessing does not affect DT models. Overall, DT models predicted accurate fluid losszones and can be scaled up to field operations with options ofcontinuous sampled variables.

Keywords: drilling fluid management & disposal, upstream oil & gas, drilling fluid, drilling fluids and materials, machine learning, artificial intelligence, petroleum engineering, engineering, eqn, fracture