Modeling of Pore Pressure using Artificial Neural Networks

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order to train the ANN while the remaining thirty percent (30%) data points were used to test and validate the accuracy of the Artificial Neuron Network model.

A statistical error analysis was conducted by computing the correlation coefficient and Root Mean Square Deviation of the actual data (Modular Dynamic Test data) and the predicted pressures so as to verify and ascertain the forecasting accuracy of the Artificial Neural network model.

The workflow adopted in the work is as follows;

- Importing the Modular Dynamic Tester data set into the software
- Partitioning the data set into two groups; the training or learning data set and the testing data set.
- Training the ANN model using the learning data set
- Applying the model with the aid of the testing set to predict the pore pressures.
- Evaluating the performance of the Artificial Neural Network model by computing the correlation coefficient and Root Mean Square Deviation of the results.

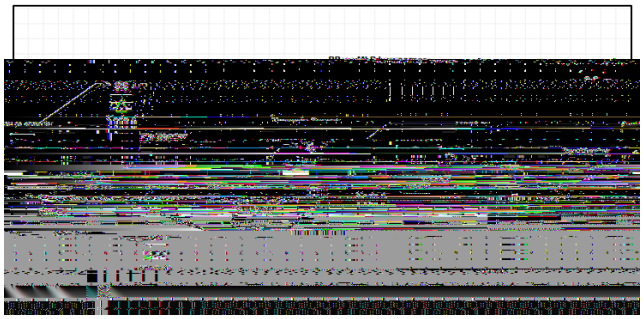

Figure 1: Workflow employed in modeling pore pressure

The data set is initially inputted into the file reader node of the software where it is inspected for anomalies after which it moves to the partitioning node where it is split into two groups, the training and the evaluation set. The training set is utilized in training the model while the evaluation set is employed in testing the accuracy of the model. The two sets of data are then sent to the learner and predictor nodes respectively , where the output from the predictor node is conveyed to the scorer node where statistical error analysis are conducted (Table 1).

Coefficient of Correlation

This is a statistical measure which indicates the relationship between

Results and Discussion

T e tables below present the results obtained from the modeling of Pore pressure using the Artifcial Neural network. As can be seen in (Table 2), the Artifcial Neural Network model showed a high degree of correlation with the actual pore pressures as evidenced by the low errors recorded at individual pressure points. More so, results of the statistical error analysis, (Table 3), further underscores the accuracy of the model with the model yielding a coef cient of correlation of 0.9927, a Root Mean Square Error of 1.6628 and a Relative Absolute Error of 10.95%. Figure 2 and 3 is a scatter plot of the predicted pore pressure against the actual pore pressure generated from the validation data set. T e predicted pore pressure is on the Y-axis while the actual pore pressure is on the X-axis. T e data points are represented by crosses whose size indicates the value of the error for that data point. T e smaller the cross size, the smaller the error and in turn the more accurate the prediction at that instance. It can be seen from the plot that the data crosses are relatively small in size and they form an imaginary straight line which is indicative of a strong correlation between the predicted and actual pore pressure. T ese results imply a strong degree of correlation and by extension the high accuracy of Artifcial Neural Network model in predicting pore pressure.

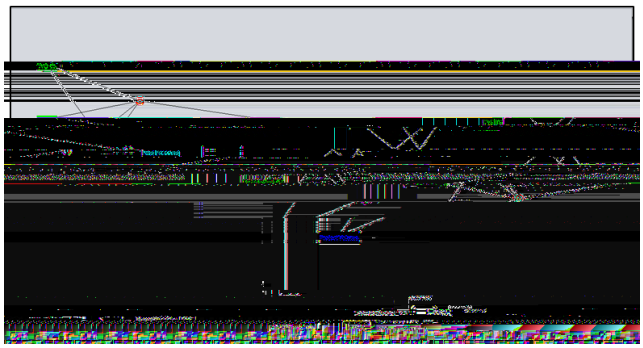

Figure 2: Artifcial Neural Network model with input parameters and pore pressure

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