Evaluation of Several Machine Learning Models for Field Canal Improvement Project Cost Prediction

Saadi Shartooh Sharqi and Aayush Bhattarai

Project cost prediction is one of the key elements in the civil engineering activities development. Project cost is a highly sensitive component to diverse parameters and hence it is associated with complex trends that make it difficult to be predicted and fully understood. Due to the massive advancement of soft computing (SC) and Internet of things (IoT), the main research objective of the current study was initiative. Several machine learning (ML) models including extreme learning machine (ELM), multivariate adaptive regression spline (MARS), and partial least square regression (PLS) were a dopted to predict field canal cost. Several essential predictors were used to develop the prediction network "the learning process" including the total length of the PVC pipeline, served area, geographical zone, construction year, and cost and duration of field canal improvement projects (FCIP) construction. Data were collected from the open source published literature. The modeling results evidenced the potential of the applied SC models in predicting the FCIP cost. In numerical magnitude evaluation, MARS model indicated the least value for the root mean square error (RMSE 27422.7), mean absolute error (MAE 19761.8), and mean absolute percentage error (MAPE 0.05454) with Nash–Sutcliffe efficiency (NSE 0.94), agreement index (MD 0.89), and coefficient of determination (R2 0.94), with best precision of prediction using all predictors, except geographical zone parameter in which less influence on the cost construction is presented. In general, the research outcome gave an informative primary cost initiative for cost civil engineering project.