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Application of Model Tree in the Prediction of TBM Rate of Penetration with Synthetic Minority Oversampling Technique

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Abstract : The rate of penetration is (RoP) one of the vital factors in the cost and time of tunnel boring projects; therefore, predicting it can lead to a substantial increase in the efficiency of the project. RoP is heavily dependent geological properties of the project site and TBM properties. In this study, 151-point data from Queen's water tunnel is collected, which includes unconfined compression strength, peak slope index, angle with weak planes, and distance between planes of weaknesses. Since the size of the data is small, it was observed that it is imbalanced. To solve that problem synthetic minority oversampling technique is utilized. The model based on the model tree is proposed, where each leaf consists of a support vector machine model. Proposed model performance is then compared to existing empirical equations in the literature.

Keywords : Model tree, SMOTE, rate of penetration, TBM(tunnel boring machine), SVM
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