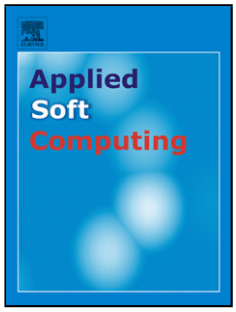

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A hybrid method for improved stability prediction in construction projects: a case study of stope hangingwall stability

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Highlights:

- A hybrid method is proposed for predicting construction projects safety.
- This method combines individual ML algorithms, data imputation, and the ensemble.
- Ensemble classifiers are built on seven optimum ML models.
- The proposed method is validated using an underground construction dataset.
- The results show such method has great potential for improved safety prediction.

Abstract: Artificial intelligence (AI) approaches have proliferated in stability prediction of construction projects in the paste decade. However, the application of AI approaches did not reach the peak of its potential due to the inappropriate handling of missing data and the omission of state-of-the-art techniques. In the present contribution, we proposed a hybrid method for the improved stability prediction of construction projects based on individual machine learning (ML) algorithms, input missing data imputation, semi-supervised learning and the classifier ensemble. Seven ML algorithms were selected to build individual classifiers for the classifier ensemble. 5-fold cross validation was used as the validation method and the performance measures were chosen to be the confusion matrix, the receiver operating characteristic (ROC) curve and the area under ROC curve (AUC). Exhaustive grid search and firefly algorithm were used for hyper-parameters and weights tuning respectively. The capability of the proposed method was verified using an underground construction dataset, the stope