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# An optimized model based on the gene expression programming method to estimate safety factor of rock slopes

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## Abstract

Geotechnical engineers must place a high priority on the analysis and forecasting of slope stability to prevent the disasters that can result from a failed slope. As a result, it is crucial to accurately estimate slope stability in order to ensure the project's success. This sort of information is indispensable in the early stages of concept and design, when important decisions must be made. In this study, an optimized GEP-based model for calculating the safety factor of rock slopes (SFERS) was proposed. For this purpose, a variety of rock slopes for circular failure mode were analyzed using the PLAXIS software to generate 325 datasets. In the datasets, six effective parameters on the SFERS including unit weight, friction angle, slope angle, cohesion, pore pressure ratio, and slope height were considered. 80% of the datasets were used for training and 20% for test. As a result of finding the optimal fit between the predictions, an equation for the refined GEP model was derived. Finally, the equation's potential ability to estimate SFERS was approved by comparing its outputs with the actual ones and comparing its behavior with practice. The mutual information sensitivity analysis revealed that the unit weight parameter is the most influential variable in the proposed equation. This model can reduce the uncertainties about the stability of rock slopes and give machine learning development in the field.