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In order to process your paper (please note if there are review reports these will be included below), we require:

• A point-by-point response to the comments, including a description of any additional experiments that were carried out and a detailed rebuttal of any criticisms or requested revisions that you disagreed with.

This must be uploaded as a 'Point-by-point response' file. All changes to the manuscript must be highlighted or indicated by using tracked changes.

At this stage, please also ensure that you have replaced your initial-submission image files with production quality figures. These should be supplied at 300 dpi resolution for .jpeg and .tiff or as .eps files Figures should not include Figure number labels in the image.

Please ensure you conform to our authorship policies, also outlined here: https://www.springer.com/journal/12145/submission-guidelines

REVIEWER REPORTS

Reviewer Comments:

Reviewer 1

I have reviewed the above titled article. While the article have adopted optimized machine learning tools to predict the TBM cutting force relying on the existing dataset in the literature, the article has some issues which might have affected the practical applicability of the models. Some of the issues are listed as follows:

Using the intact rock properties to predict the TBM cutting forces may not be realistic. In this situation rock mass properties is more reasonable. Can the authors justify the reliability and usability of their proposed models?

"Rock mass properties"（岩石群性质）通常指的是一块岩石群体（或称岩体）的整体性质和特性，这与单一岩石种类的性质有所区别。岩石群性质不仅涉及岩石本身的物理和化学特性，还包括岩石内部的结构特征，如裂缝、节理、断层等，这些都会影响其作为一个整体时的力学行为和稳定性。

以下是一些岩石群性质的例子，用于更清楚地说明它们包括哪些方面：

**结构特征：包括岩石中裂缝的密度和方向、节理、层理等。**

**力学性质：如岩体的强度、模量和变形特性，**这些常常受到岩石内部裂缝和其他不连续面的影响。

水文地质特性：岩体对水的渗透性和流动特性，这影响着水工结构和矿山的安全。

岩石质量等级（RMR, Rock Mass Rating）：一种评估岩体质量和适用工程类型的系统。

因此，当谈论到“rock mass properties”时，我们是在考虑一个区域内所有岩石的综合属性，这通常是在地质工程和土木工程领域中考虑的关键因素，比如在隧道施工、岩土支护设计等方面。

Some references are not well cited within the text in relation to the convention

Under materials section: The variability in the rock properties and behaviour may make the gathered data unrealistic. Can the authors establish which rock type was used by the authors where the data were obtained to get the intact rock properties? What are the specifications of the TBM used by these authors including the machine parameters?

Line 334: As mentioned earlier, the values of FN or FR are affected by various factors. The factors should be mentioned or the authors can refer to where the factors were mentioned earlier. Are the authors predicting FN or FR? Do they have the same values? Can both FN and FR be treated as the same?

Line 341 to 342: I am of the opinion that Rock mass properties are necessary here more than just these intact rock properties

Line 398 to 401 should be recasted.

The work lacks practical applications. Can the authors explain how practicable are their models?

The methodology is unclear as the authors seems to lump everything up. For instance, the software where the models were implemented are not mentioned. The data predicted and obtained should be presented for the training and validation. In fact the whole date mined from the internet should be added as supplementary.

Reviewer 2

§ The paper missed to explain the applications of the Lagrange optimization technique based on the conversion of quadratic programming issues.

§ The effectiveness of the RBF kernel function in the context of SVR model enhancement is not fully explained.

§ The paper does not deliver data about the implications that arise from the results of the systematic decrease from 2 to 0 across consecutive iterations within a vector.

§ How the integration of the sine function and cosine function aids in simulating the alternating process within the foraging stage is missing in the paper.

§ The author does not precisely articulate the core objective of modulating the steep magnitude toward the particle's personal and global bests.

§ The distinctive challenges encountered by indicator evaluation while determining the optimal population value is yet to be sated.

§ Critical factors that could influence the value of FN or FR in the material section were delivered without data.

§ There is a poor report on the obstacles that occurred as a result of non-linear regression in terms of SCR.

§ You missed to investigate the salient capability of the curated training set in terms of improving the model generalization and preventing overfitting.

§ Not enough explanation was delivered for how the normalization range of (-1,1) results from reducing the impact of parameter variation on model performance.

§ The paper failed to illustrate the assessment of performance indicators of the trained predicted models through the comprehensive evaluation.

§ The CSM model comparison section failed to establish supplementary data on the rationale for selecting the semi-theoretical prediction model.

§ A key consideration for finding an appropriate kernel function with regard to overcoming the problem of non-linear regression was delivered with a poor report.

§ Poor explanation is delivered for how the presence of the limited size and scope of the rock sample render results from poor prediction accuracy in the model.