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Mechanics and its  
Normalized  
Indices for  
Trenchless  
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Machine  
Learning**

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## **Contact Mechanics and its Normalized Indices for Trenchless Cutting Associated with Machine Learning**

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**ABSTRACT:** This study aims at investigation of underground mechanical excavation including both design and construction as turnkey project. During both stages, contact mechanics with unified normalized indices were developed for trenchless cutting process. By using dimensional analysis, the proposed model generalizes mechanical as well as geological characteristics corresponding to two main types of cutting forces (thrust and torque) to evaluate their excavation progress with penetration rate. Furthermore, the normalized cutting indices can be used not only to estimate the functionality and efficiency of cutting machine adopted for tunneling project, but also to offer a warning system for inadequate cutting strategy.

In addition, this study also examine the feasibility of cutting indices to predict the change in geological conditions during cutting process by using machine learning/data mining tool so-called WEKA. Comparing with two case histories, some crucial applicable results show that the difference methods between classical mechanics and novel AI approach are quite useful to examine the cutting behavior during the life cycle of tunneling project.