

## Deep Neural Networks for Prediction of Undrained Shear Strength of Clays

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**Abstract:** This study focuses on application of novel machine learning approaches such as deep neural networks in geotechnics, to improve the understanding on the relationships between various soil parameters and index properties. A general approach is developed using deep neural networks, to predict the undrained shear strength ( $s_u$ ) of clays, based on soil data from many sites in Sweden and Finland, available in the TC304 database. The liquid limit, plastic limit, water content, vertical effective stress and preconsolidation stress are used as regressors in this model for prediction of  $s_u$ . The model has been constructed, numerous times, on a random portion of the dataset as the training set and validated on the remaining part of the data as the test set. The results of this deep neural networks model, and comparisons with the performance of other traditional methods are presented. It is shown that deep neural networks outperform these traditional approaches and can be a useful tool for future research and application in geotechnics. Although this study has been conducted on a limited data set, with sufficient amount of data, a new model can potentially be built based on the proposed approach, for prediction of soil properties in different parts of the world with reasonable reliability.

**Keywords:** Undrained Shear Strength; Clays; Deep Neural Networks; Prediction; Machine Learning.