Prediction of Ultimate Bearing Capacity of Shallow Foundations on Cohesionless Soils Using Back Propagation Neural Networks (BPNN)

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This study explores the potential of back propagation neural networks (BPNN) computing paradigm to predict the ultimate bearing capacity of shallow foundations on cohesionless soils. The data from 97 load tests on footings (with sizes corresponding to those of real footings and smaller sized model footings) were used to train and validate the model. Five parameters are considered to have the most significant impact on the magnitude of ultimate bearing capacity of shallow foundations on cohesionless soil and are thus used as the model inputs. These include the width of the footing, depth of embedment, length to width ratio, dry or submerge unit weight and angle of internal friction of the soil.

The model output is the ultimate bearing capacity. Performance of the model was comprehensively evaluated. The values of the performance evaluation measures such as coefficient of correlation, root mean square error, mean absolute error reveal that the model can be effectively used for the bearing capacity prediction. BPNN model is compared with the values predicted by most commonly used bearing capacity theories. The results indicate that the model perform better than the theoretical methods.