

# Machine learning-based prediction of soil compression modulus with application of 1D settlement

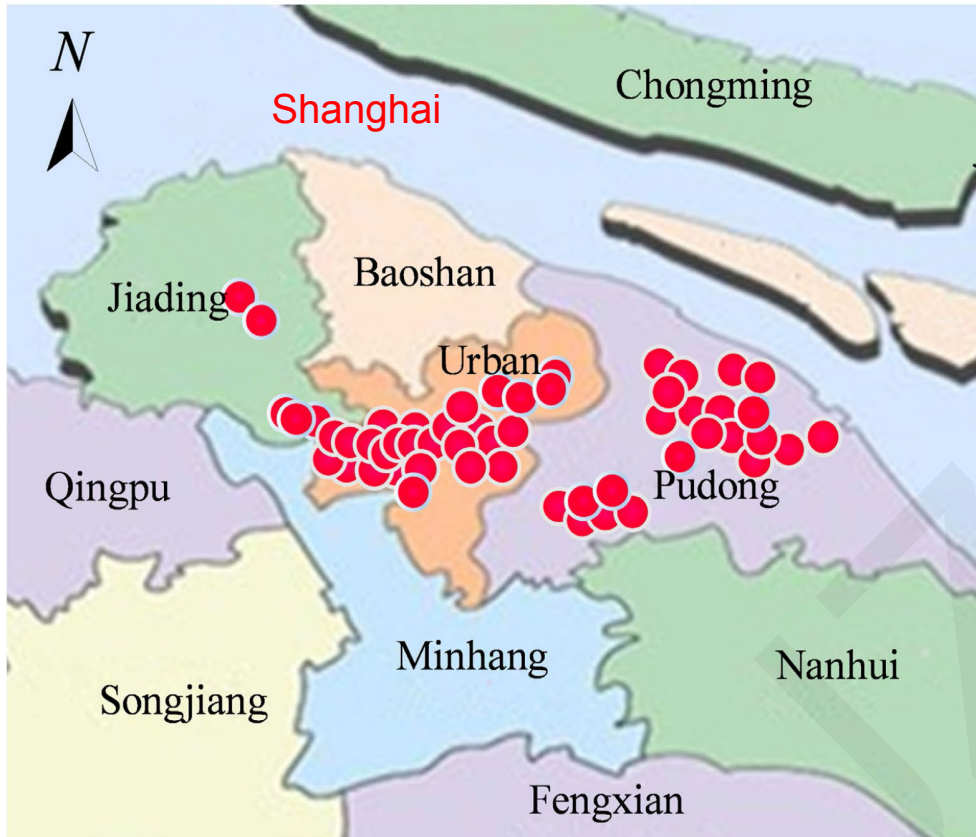
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## Key words:

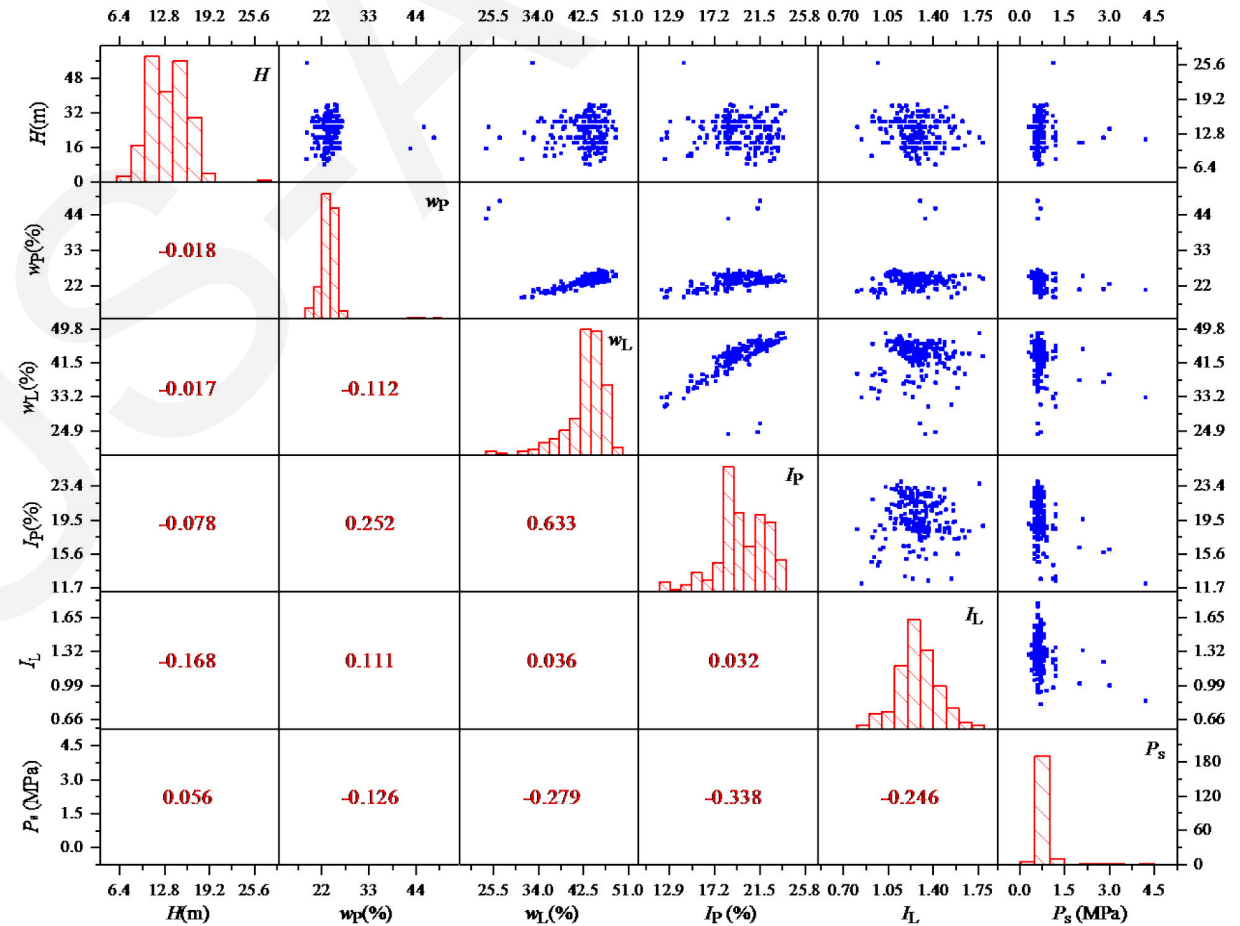
Compression modulus prediction; Machine learning (ML); Gradient boosted regression tree (GBRT); Genetic algorithm (GA); Foundation settlement

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# ➤ Data acquisition and analysis

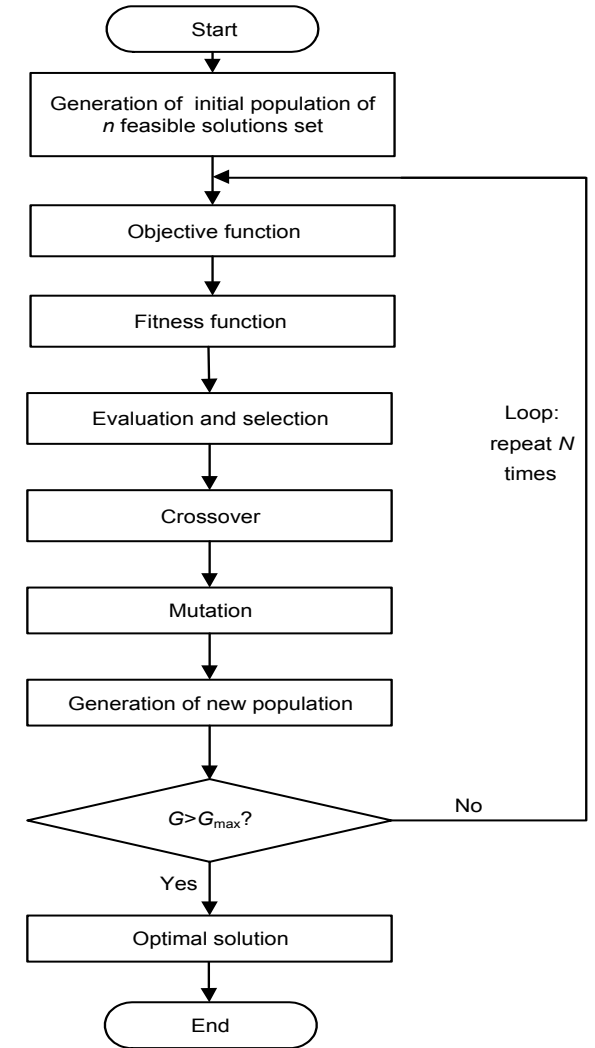
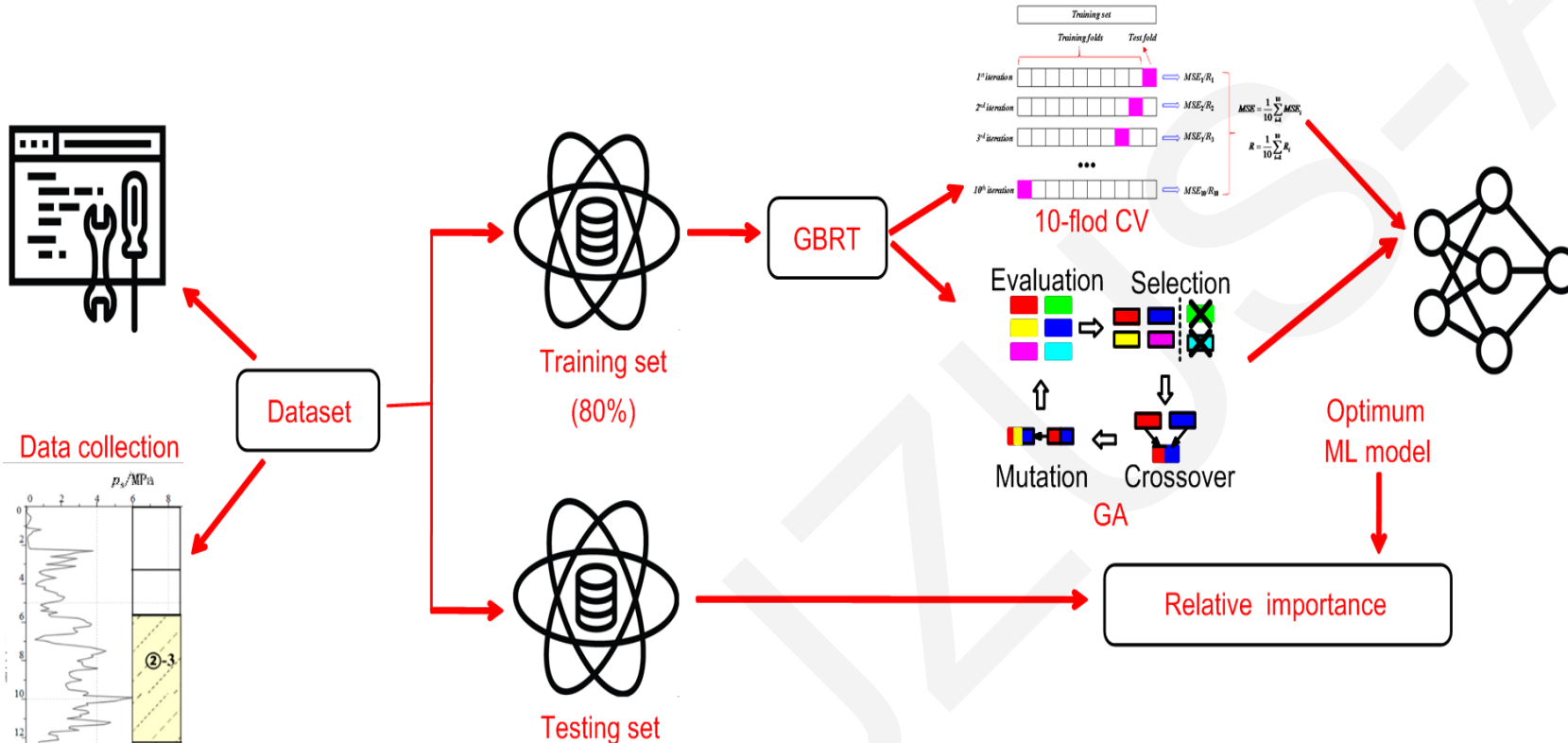


Location of sampling sites in Shanghai, China



Distributions and correlation coefficients of model input variables in the dataset

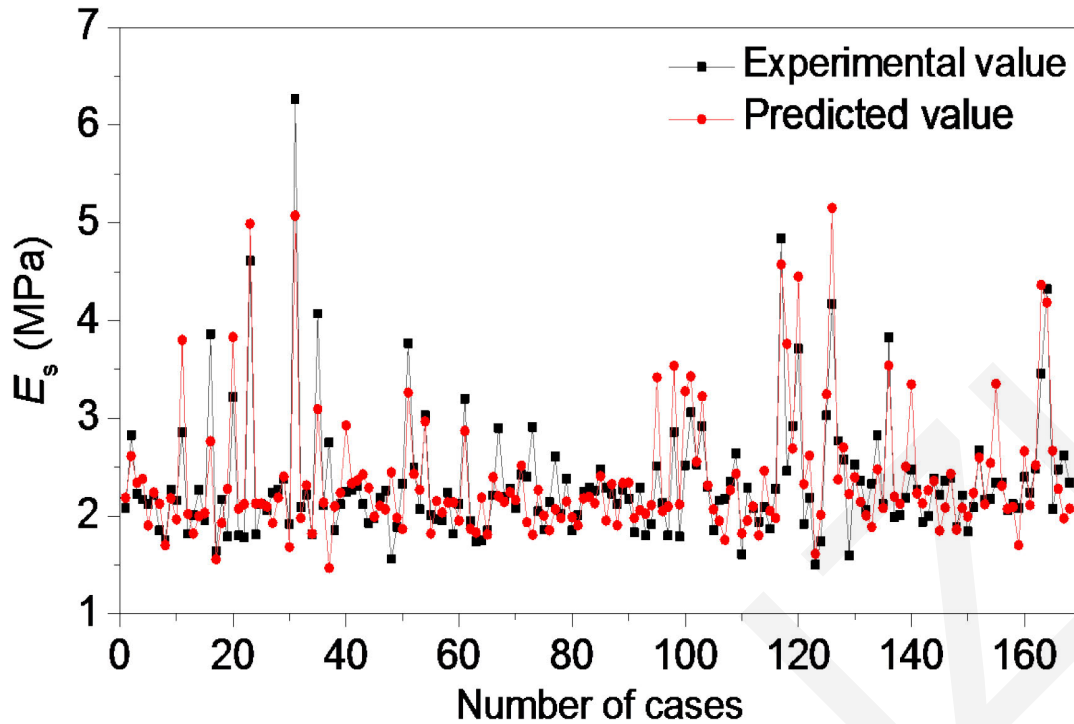
# GA-GBRT modelling



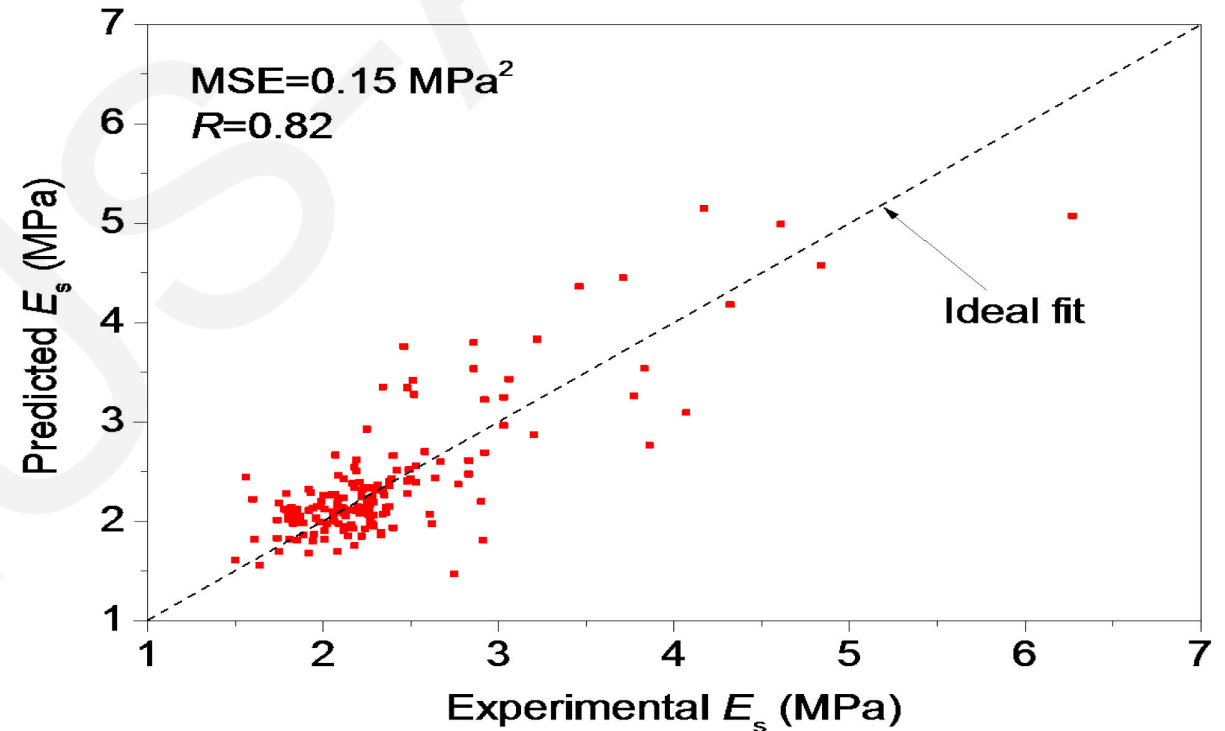
Procedure for using GA-GBRT approaches for compression module prediction

Generic framework for a simple GA

## ➤ Results of the optimum GBRT model



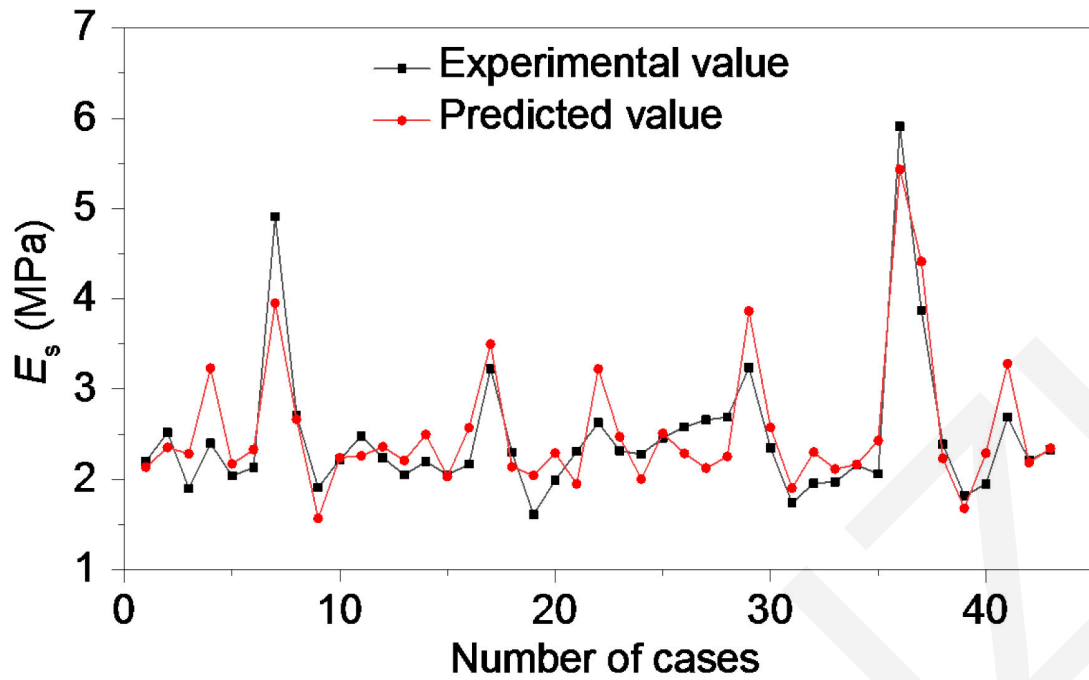
(a)



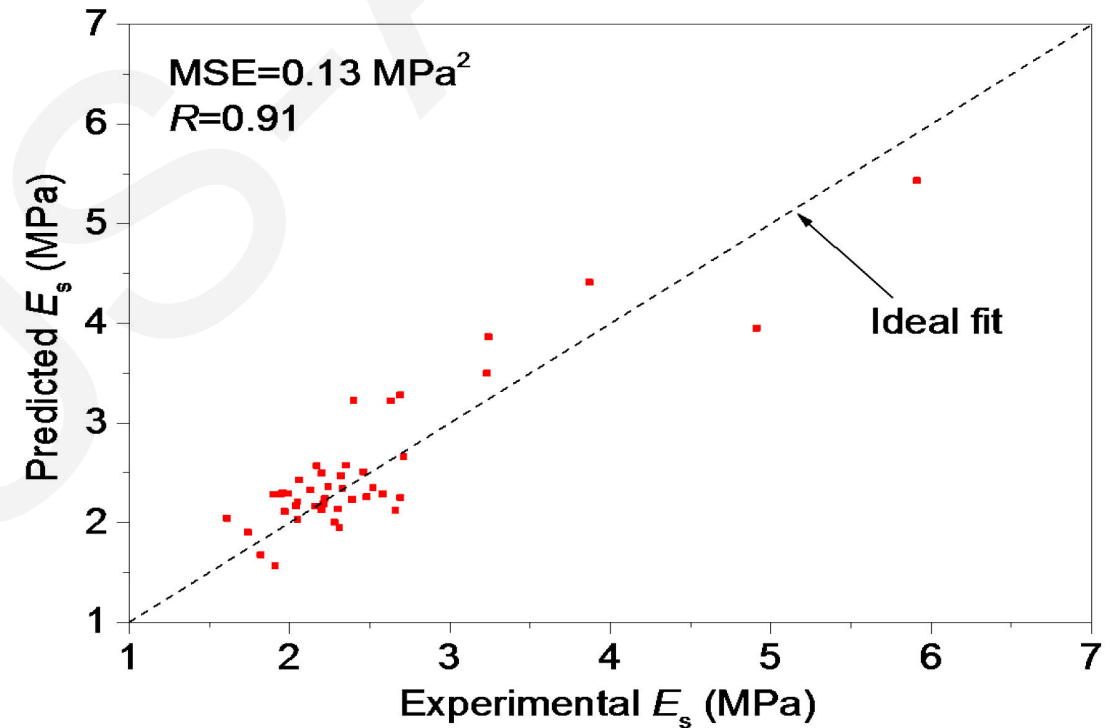
(b)

**Experimental versus predicted  $E_s$  for the GBRT model with the optimum hyper-parameters on the training set: (a) comparison of experimental and predicted  $E_s$ ; (b) regression**

## ► Results of the optimum GBRT model



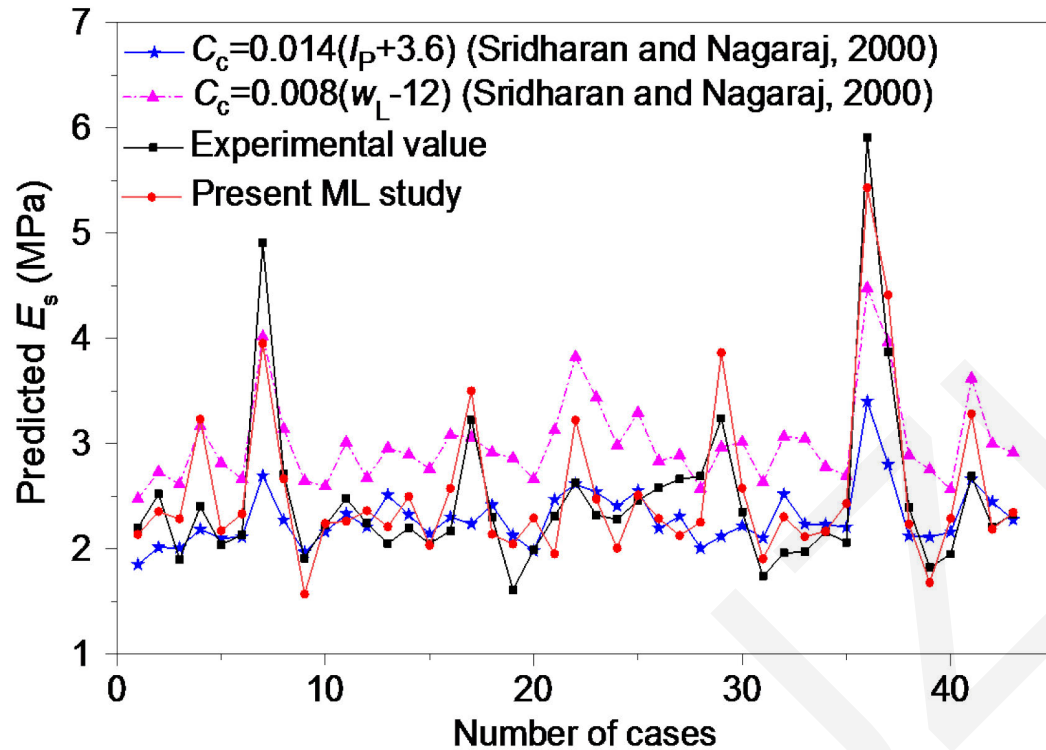
(a)



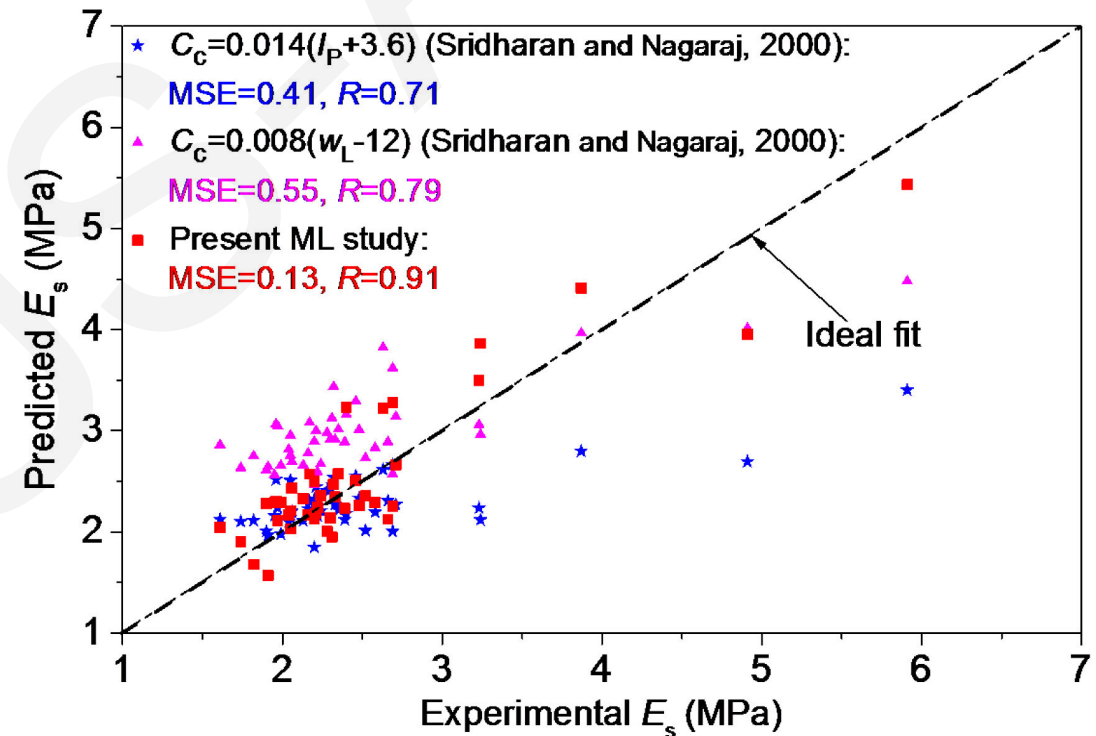
(b)

**Experimental versus predicted  $E_s$  for the GBRT model with the optimum hyper-parameters on the test set: (a) comparison of experimental and predicted  $E_s$ ; (b) regression**

## ➤ Comparison of empirical formulas and ML training effects



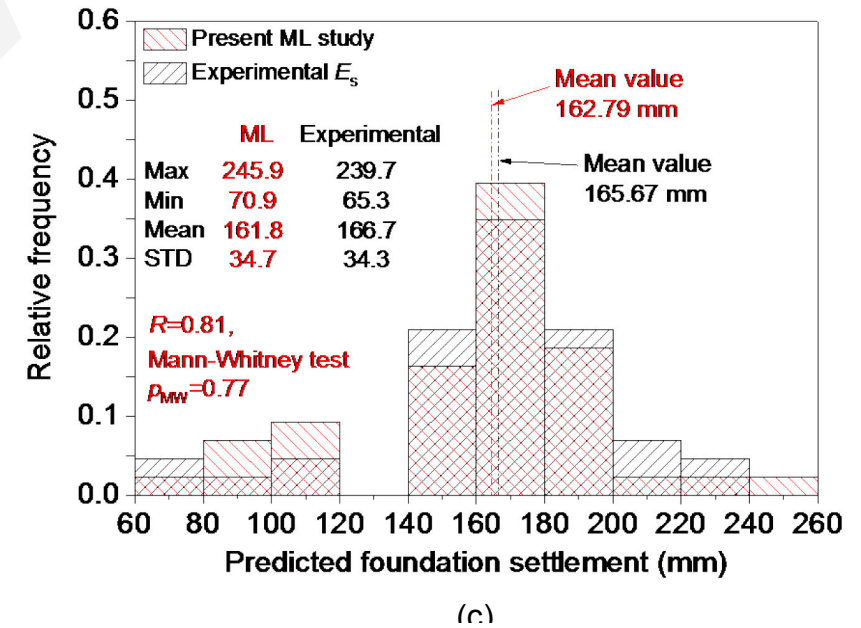
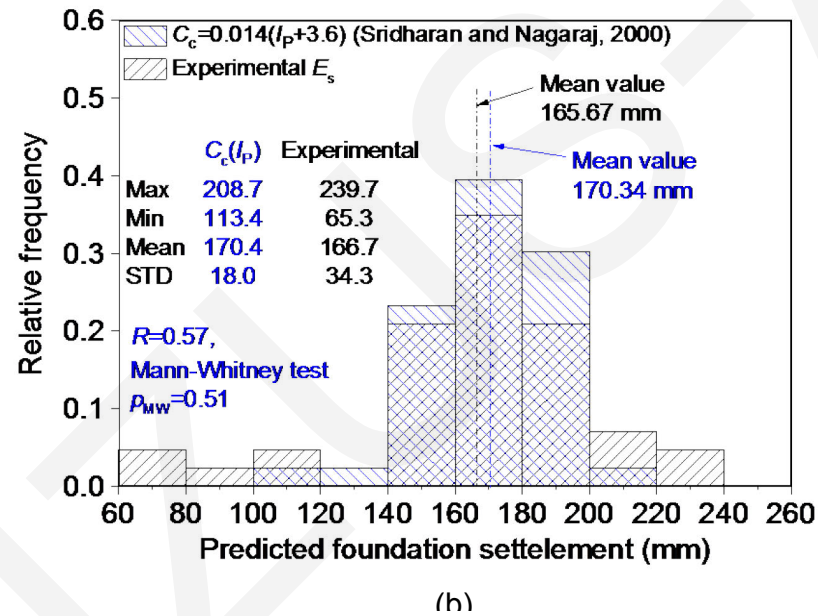
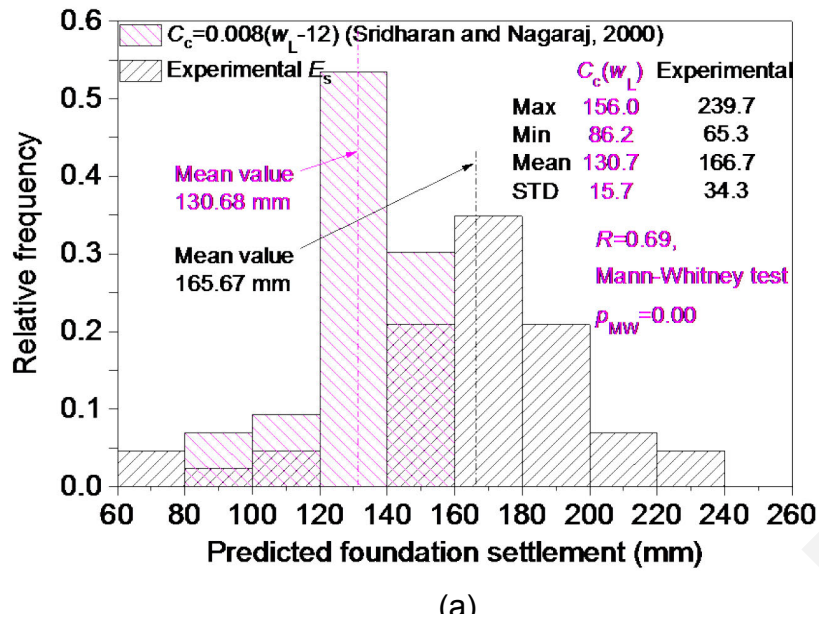
(a)



(b)

Comparison of performance between empirical formulas and the proposed ML method for predicting  $E_s$ : (a) experimental and predicted  $E_s$ ; (b) regression

## ➤ Comparison of foundation settlement



Comparison of performance between empirical formulas and present ML method for predicting foundation settlement: (a) empirical formula  $w_L$ ; (b) empirical formula  $I_P$ ; (c) present ML method

Thanks