

## TC304/TC309 Student Contest on Clustering Applied to A Global DB

(December 4 2023, Okayama, Japan)

### Introduction of database:

There is global database containing 5 clay properties collected from 16 sites. A “site” in a database is defined as a group of records obtained from tests within a project boundary. Each record in the database includes undrained shear strength ( $s_u$ ), preconsolidation stress ( $\sigma'_p$ ), corrected cone tip resistance ( $q_t$ ), plastic index (PI) and vertical effective stress ( $\sigma'_v$ ). Figure 1 shows an example of scatter plot between  $s_u$  and  $\sigma'_p$ .

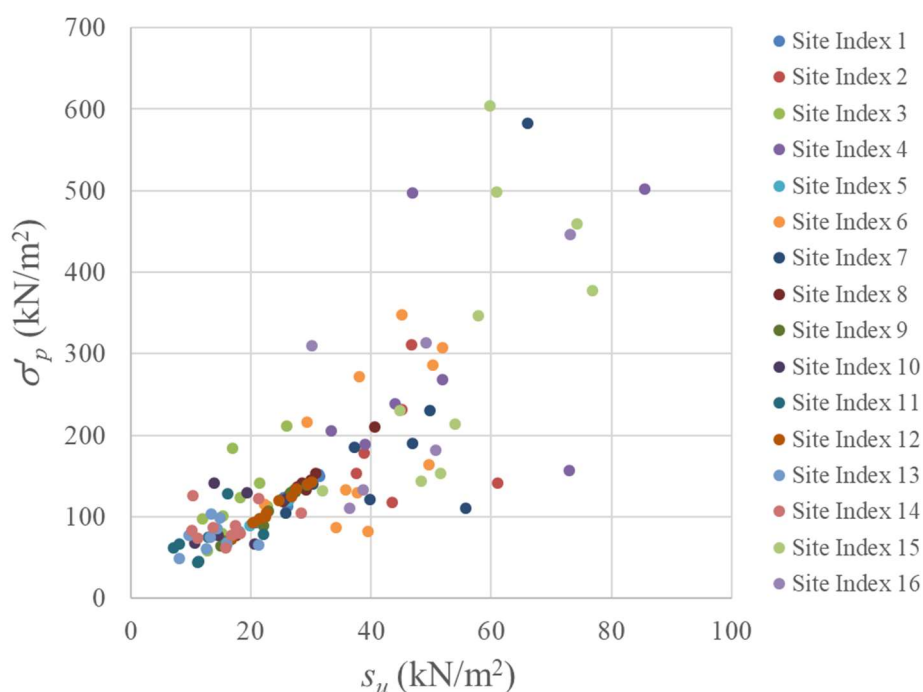


Figure 1 Scatter plot between  $s_u$  and  $\sigma'_p$ .

### Tasks of this student contest:

1. There is a target site that contains 7 records. Each record contains the 5 clay properties mentioned above. **Please list the sites in the global database that are similar to the target site.**
2. On the basis of the 7 records mentioned in Task 1, supplementary tests were carried out at the target site and 3 incomplete records were obtained. Each record only includes  $q_t$ , PI and  $\sigma'_v$ . Please predict the missing design properties (i.e.,  $s_u$  and  $\sigma'_p$ ) in the 3 incomplete records. **Please present your predictions using the median and the 95% confidence interval.**

Students are encouraged to read the following references to understand the challenge of this student contest. These references are meant to provide a flavor of the question and challenge. Students are not expected to apply the techniques in the papers.

- [1] Bishop, C.M. (2006). *Pattern Recognition and Machine Learning, Chapter 9: Mixture models and EM*, Springer, 423-459.
- [2] Saxena, A., Prasad, M., Gupta, A., Bharill, N., Patel, O.P., Tiwari, A., Er, M.J., Ding, W.P., and Lin, C.T. (2017). A review of clustering techniques and developments. *Neurocomputing*, 267, 664-681.
- [3] Sharma, A., Ching, J. and Phoon, K.K. (2022). A hierarchical Bayesian similarity measure for geotechnical site retrieval, *J. Eng. Mech.*, 148(10): 04022062.
- [4] Similarity measure: [https://en.wikipedia.org/wiki/Similarity\\_measure](https://en.wikipedia.org/wiki/Similarity_measure)

### **Requirements:**

The participants in the student contest session are required to: (1) Submit an extended abstract (it will not be formally published) in English. Academic staffs (e.g., professors) cannot be listed as co-authors, although they can be mentioned in acknowledgements; and (2) Physically attend the contest and present the research findings during the session (10 - 15 minutes presentation plus 5 minutes Q&A).

### **Other information:**

*As a special benefit for participating in the student contest, participants will be invited to the workshop and banquet free of charge!*

A TC304/TC309 award committee will review the papers/presentations and select the winner of the Student Contest Award. An award certificate will be given to the winner at the banquet of Workshop (<https://sites.google.com/view/fomlig2023/home>). Depending on the number of participants, several encouragement awards may be given as well.

### **Important dates:**

December 1 2023: Submission of extended abstract

December 4 2023: TC304/TC309 Student Contest

December 5 2023: Award Ceremony

### **Organizers:**

Takayuki Shuku, Okayama University

Cai Yongming, Singapore University of Technology and Design

Atma Sharma, Tongji University

\*If you have any questions, please contact Takayuki Shuku (shuku@cc.okayama-u.ac.jp).