Malaysian Geotechnical Society

WEBINAR— DEEP LEARNING IN TRENCHLESS TECHNOLOGY – A CASE FROM PIPE JACKING IN WEATHERED GEOLOGY

Presented by
Ir. Dr. Choo Chung Siung

13 April 2023 (Thursday)
4.00—6.00 pm, via Zoom

- BEM Approved CPD Hours: 2
  BEM/REG/12 Jld. 10 (119)
- Qualified for 2 PDUs by PEB
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Synopsis

- As pipe-jacking continues to be a chosen method for constructing buried infrastructure in densely populated urban areas, it is paramount to understand the effects of geology on jacking forces and construction parameters. This knowledge gap remains, especially for drives negotiating weathered geology.
- This talk presents the experiences gained from the Kuching Wastewater Management System during the construction of the trunk sewer network at depths of up to 30 m below the central business district of Kuching city, Sarawak, Malaysia. The encountered rocks exhibited RQD values of 0%, which created difficulties when extracting rock samples for strength characterization.
- Methods have been developed to characterize the encountered rocks. These strength parameters were then used to back analyse jacking force by interpreting the effects of arching and overcut lubrication on jacking forces. However, the developed parameters only present partial insight into the development of jacking forces.
- To complete the puzzle, some recent innovations will be presented showing the application of artificial intelligence (i.e. deep learning) to predict jacking forces from pipe jacking operation parameters, such as jacking speed, lubrication, and jacking forces. These operation parameters are key to on-site decision-making during the construction phase. Of interest is the variations of these operation parameters in different lithology. Through the use of attention mechanisms incorporated in the deep learning algorithm, it is possible to visualise the AI's reasoning. This allows for validation of the attention levels against established mechanistic approaches, while uncovering hidden knowledge in the pipe jacking data.

Speaker's Profile

- Ir. Dr. Choo Chung Siung is currently a Senior Lecturer of geomechanics and geotechnical engineering at Swinburne University of Technology, Sarawak Campus. He obtained his Bachelor of Engineering in Civil Engineering (1st Class Honours) for which he received the IEM Gold Medal Award. Subsequently, he completed his PhD, producing a thesis titled 'Development and assessment of equivalent rock strength parameters for the back-analysis of pipe-jacking forces'. He has contributed journal articles and has presented at various conferences and seminars. He currently serves as a committee member for the Malaysian Geotechnical Society (MGS), and for the Malaysian Association for Trenchless Technology (MATT). He is also a co-opted member of Engineers Australia, Malaysia Chapter (EAMC).
- Dr Choo is passionate about educating future civil engineers on soil mechanics and geotechnical engineering. Through his blended experience, he can bring real geotechnical engineering challenges into the classroom by researching current challenges faced by practising geotechnical engineers. His experience covers trenchless technologies, deep excavations, and slope engineering, using advanced computational modelling and machine learning. He also explores methods of upcycling industrial wastes into useful construction materials, and the use of augmented reality games for teaching geotechnical engineering.

Registration Fee:

MGS / IEM / GeoSS / CTGS Members: **Free**
Non Members: **RM20.00 per person**

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