NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Public Seminar on

Advancing Tunneling Risk Assessment and Practice through the use of Artificial Intelligence and Spatial Modeling Tools

By

**Bruce E. Grewcock Distinguished Chair Professor Michael Mooney
Colorado School of Mines, USA
Tan Swan Beng Endowed Visiting Professor to NTU**

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Date	:	**Monday, 9 December 2019**
Time	:	**2:30 – 4:30 pm** *(Registration starts at 2:15 pm)*
Venue	:	**LT 7, Block NS1, NS1-02-03 (NTU)**
Map	:	Location map

Free Admission! Please click here to register by Monday, 2 December 2019

Abstract

This two part presentation addresses how artificial intelligence (machine learning) and spatial modeling tools can advance tunneling practice. Tunnel construction presents considerable risk due to significant uncertainty in geological/hydrogeological conditions and consequential uncertainty in geotechnical parameters and behavior. Less than 0.01% of the alignment geology is sampled during geotechnical site investigation; the remaining 99.99% of the alignment geology must be estimated. Accordingly, design and construction analysis translates into conservative estimation, and risk management documents such as the geotechnical baseline report are used to allocate geotechnical risk.

The first part of the presentation addresses shield TBM tunneling risk in highly uncertain geological/geotechnical environments. A framework for common soft ground tunneling risks such as tool wear/interventions, clogging and ground deformation is developed. The framework employs the spatial quantification of geological unit and geotechnical property uncertainty using spatial modeling tools (including geostatistics). The framework carries this uncertainty through to the development of probabilistic risk maps. The approach is demonstrated using USA tunneling project data.

The second part of the presentation will show how we have learned – through physical modeling and artificial intelligence – the behaviors of earth pressure balance shield (EPBM) tunneling. The role and importance of ground conditioning, the ebbs and flows of muck and face pressure, and what influences advance rates are discussed. In addition, the presentation will describe how the as-encountered ground can be characterized using deep learning of EPBM data.
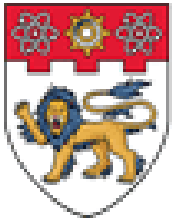
Biography

Prof Mike Mooney is the Bruce E. Grewcock Distinguished Chair Professor of Underground Construction & Tunneling, and a Professor of Civil – Geotechnical Engineering, at Colorado School of Mines. He is the founding Director of the university-wide Center for Underground. Dr. Mooney is also a consulting engineer and a licensed Professional Engineer.

Dr. Mooney's consulting, research and teaching focuses on analysis, design, construction and monitoring of tunnels via TBM and conventional methods, shafts, support of excavations, retaining walls and ground improvement. Dr. Mooney has extensive experience with pressure balance TBM tunnels, building and utility deformations, and risk management during tunneling. He has worked with contractors, designers, owners, and suppliers on numerous underground construction projects in the U.S. He leads the Tunneling short course for industry held annually at Colorado School of Mines, and was the Scientific Committee Chair for the 2016 World Tunneling Congress held in San Francisco.

Free Admission and Limited Seats!