Friday, November 29
London, UK

British Tunnelling Society Young Members

Presented in association with ARUP

Gold Sponsor & Venue Partner

BTSYM Conference
2024 Full Programme

80 Charlotte Street, Fitzrovia, London W1T 4QS
https://britishtunnelling.com/events/conferences/btsym-conference-2024

Our Sponsors

Gold

ARUP

Silver

Sika®

MOTT MACDONALD

Bronze

TYPSA

Excalibur® SCREWBOLTS

lba

Message
from the YM Chair

Thomas
Macgowan
BTSYM Chair 2024

Dear Young Members, Colleagues and Friends of the Tunnelling and Underground Space family,

On behalf of the British Tunnelling Society Young Members (BTSYM), it is my great pleasure to welcome you to the 2024 BTSYM Conference. This annual gathering holds a special place in our calendar as a time-honoured tradition that celebrates the future of our industry. The BTSYM Conference is uniquely designed to foster fresh connections, encourage wider participation beyond London, and provide early-career engineers with the invaluable experience of delivering their first public presentations.

The continued support from our sponsors speaks volumes about the exceptional talent within our community. Following the success of the 2023 conference, I am delighted that Arup has generously renewed their support and donated the venue for this year's event. The commitment of all our sponsors underscores the belief in the calibre of our presenters and delegates.

In uncertain times, societies like the BTSYM play a crucial role in uniting tunnellers and providing a collaborative platform to address challenges that may seem insurmountable individually. This year's conference promises to spark meaningful discussions on how our industry can enhance performance, deliver value for taxpayers, and strive towards achieving net-zero environmental impact.

I am immensely proud of the BTSYM and the dedication of our committee volunteers in bringing this event to life. I look forward to welcoming you all to what promises to be the highlight of our year—and a memorable conclusion to my term as BTSYM Chair.

See you at the conference!

01

Conference
Essentials

About this event

This is a conference about tunnel design and construction, organised and presented by under-35 industry professionals.

Growth & Success

By attending this full day event, you can take some time to break away from the daily routine and surround yourself with thought provoking peers that will have you talking about all the fresh ideas and strategies currently at play.

Educational Opportunities & Industry Expertise

Immerse yourself in four unique Technical Sessions on the latest UK industry updates and international topics. Our Speakers, chosen for their contribution to the tunnelling industry and ability to connect with the audience, will broaden your insight and share knowledge that you can apply in your day-to-day operations.

Real Value & Take-home learnings

Immerse yourself in discussions on real-life project performance. By keeping the conference focused, we bring together developmental opportunities and keep your conference learning experience dedicated only to the issues that matter most. Share your new-found knowledge with your co-workers and management team, and watch your team soar!

Attend, Learn, Network, Engage

More is better. Networking refreshment breaks and interactive closing events will complement the technical sessions. Nowhere else can you connect with such a diverse audience of like-minded goal-driven professionals in such an enjoyable way.

How much is it?

Free for BTSYM individual members - registration is required.

Further information on becoming BTSYM member available on the BTS Website.

Registration fee £65 for non-BTSYM members.

How to book

STEP 01

Register as a BTS Young Member

Visit https://britishtunnelling.com/membership/btsym-membership to join the BTSYM if you're not already a member. The subscription is billed at the same time as your ICE fee.

STEP 02

Register for the conference

Book your attendance at https://britishtunnelling.com/products/btsym-conference-2024. If you qualify for the YM rate, please check out using the 'invoice method'. You will not be charged.

STEP 03

Profit (from the knowledge)!

That's it! Were looking forward to seeing you on Friday, November 29th.

02

Location

Where to go

Central location

Hosted at Arup's offices in London, the venue is easily accessible from all directions

Breakfast, lunch & networking

Breakfast and lunch are provided, giving you an opportunity to network with other YM for the tunnelling industry.

Address:

ARUP

Offices

80 Charlotte Street, Fitzrovia
London, W1T 4QS

E-mail:

btsym@britishtunnelling.com

03

Special Guest
Keynote speaker

Hyuk-Il **Jung**

Associate Director, Tunnels, Arup

Jung is an Associate Director of Arup with over 24 years of tunnelling & geotechnical engineering experience, and currently leading London tunnelling team in the firm. Jung is the lead author of PAS8810 which is the first UK standardization document for the design of precast concrete segment lining.

Keynote title:

Segmental Lined Tunnel Collapse and Its Recovery

A twin bored segmental lined tunnel being constructed in soft marine deposit ground had completely collapsed in March 2020 during the cross-passage construction. Arup is providing technical advice to the contractor for the recovery of the collapsed tunnel since 2020. This presentation will summarise the timeline of the collapse event with the mechanism of the tunnel collapse observed during incident. Also, will present the emergency mitigation measures taken by the contractor, together with the recovery works method adopted to re-build the collapsed section of the tunnel. This presentation will deliver message to the audience about the importance of the mitigating the ground risk, and what could be the consequence when the risk becomes a reality.

Comprehensive and holistic solutions for underground infrastructure.

For decades, Arup has been consistently delivering large scale multidisciplinary tunnelling projects throughout the world. Dedicated to sustainable development, we are a collective of designers, consultants and experts working across 140 countries to shape a better world.

Philip Morley
Director
t 020 7755 2013
e philip.morley@arup.com

Hyuk- Il Jung
Associate Director
t 020 7755 5052
e hyuk-il.jung@arup.com

www.arup.com

04

Programme

November 29th | 2024

08:30 - 10:00 Registration, breakfast and conference opening

08:30 - 09:30 Registration and breakfast

09:30 - 10:00 Opening and Keynote Lecture by Arup
Hyuk-Il Jung - Arup

10:00 - 11:25 Session 1: Tunnel Design

Chaired by: Aya Hasan - Typsa

10:00 - 10:15 Numerical Modelling of Twin Tunnel Interaction in Overconsolidated Clay with Changes in Shear Stiffness
Hashmi Sohawon - OTB Engineering Ltd

10:15 - 10:25 Investigating Thermal-Hydro-Mechanical Coupling in Mudstones under Varied Thermal Cycles
Amanda Norman - University of Leeds

10:25 - 10:35 Permanent works reinforcement optimization
David Maddison - Jacobs

10:35 - 10:50 Understanding convergence and support in rock tunnels
Christian Garvey - Arup

10:50 - 11:05 Numerical Modelling of the Thermo-Hydro-Mechanical Behaviour of Frozen Ground
Hoong Hao Yap - University of Cambridge

10:50 - 11:10 Q&A

11:25 - 11:40 Coffee break

11:40 - 13:05 Session 2: Projects & Construction

Chaired by: Asil Zaidi - London Bridge Associates

11:40 - 11:50 HS2 SCS Construction of Old Oak Common East and Euston Stub Tunnels
Charlotte Dickinson - SCS Railways

11:50 - 12:00 HS2 DH Design Site Support of Old Oak Common East and Euston Stub Tunnels
Liana Malhan - Arup

12:00 - 12:15 The Silvertown Tunnel Project
Annie May Goodman - BAM Nuttall / Leeds College of Building

12:15 - 12:30 Stuttgart21, Widening of a tunnel cross-section in an urban area
Luca Kammerer - ILF Consulting Engineers Austria GmbH

12:30 - 12:45 Cross passages and shafts: focus on the waterproofing challenges
Enrico Pavese - Renesco Holding AG

12:45 - 13:05 Q&A

13:05 - 14:05 Lunch

14:05 - 15:25 Session 3: Methods & sustainability
Chaired by: Arabel Vilas Serín

14:05 - 14:15 Jello-Mud: New Construction Method for Safer Tunnelling
Franck Peng - Balsam Laboratory Company Ltd

14:15 - 14:25 An Introduction to Tunnel Boring Machines - tips and tricks from a designer that learnt to operate a TBM
Zhen Ng - Dr. Sauer and Partners

14:25 - 14:35 Assessing the potential for automated condition assessment of masonry lined tunnels
Jack Smith - University of Leeds

14:35 - 14:45 Sprayed Concrete Mix design and optimisation
Matthew Callaghan - Skanska

14:45 - 14:55 Nurturing a sustainable future with the Early Career Challenge
Felix Lau - Mott MacDonald

14:55 - 15:05 Refining the automation process of ground movement assessments for utility assets
Josh Tsui - Arup

15:05 - 15:25 Q&A

15:25 - 15:40 Break

15:40 - 17:30 Session 4: The Future of tunnelling
Chaired by: Ana Barbosa

15:40 - 16:00 Presentation of speaker gifts
John Corcoran - BTS Chair

16:00 - 16:20 **Future of tunnelling: High level review of emerging technologies**
Ben Gilson & Yung Loo - Arup

16:20 - 16:35 **BTSYM update**
Thomas Macgowan - BTSYM Chair 2024

16:35 - 17:20 **The future of tunnelling: a panel discussion on upcoming industry challenges and how the BTSYM can best help upskill its members**

17:20 - 17:25 **Introducing next year's Committee**
Arabel Vilas Serín - BTSYM Chair 2025

17:25 - 17:30 **Conference close**

17:30 - 19:30 Networking and refreshments

MOTT MACDONALD

A LIGHT AT THE END OF THE TUNNEL

With over 100 years of tunnelling experience we continue to innovate, evolve and deliver some of the most challenging projects ever undertaken across the world.

Shining a light on what's possible, we're designing for the future to transform transport systems, water and power supplies.

mottmac.com/tunnels

You can rely on our 110-year track record of providing concrete and waterproofing systems worldwide. Count on our products and technical support to solve your challenges.

BUILDING TRUST

Sika®

05

Speakers & Abstracts

Your fellow YM

Hashmi Sohawon

Geotechnical Engineer - OTB Engineering Ltd

Hashmi completed an MEng in Civil Engineering at UCL, an MSc in Soil Mechanics at Imperial College London and a PhD in Geotechnical Engineering at City St George's, University of London on the performance of constitutive models in predicting ground movements associated with excavations in clay. Hashmi has been working for OTB Engineering as an Engineer since graduating in 2023.

Numerical Modelling of Twin Tunnel Interaction in Overconsolidated Clay with Changes in Shear Stiffness

Underground infrastructure constructions, which consist primarily of excavations, have been focus of governmental development schemes in the recent years due to the lack of space above ground. When excavations are performed in urban areas, there is a need for geotechnical engineers to accurately assess the likely ground movements in the surrounding area, during and after construction, to prevent any damage to existing assets below or above ground and to ensure sustainable designs. The highly non-linear behaviour of soils calls for advanced constitutive laws that must be implemented in numerical analyses to model realistic soil stress-strain relationships. The good performance of the Advanced Hypoplastic model in predicting the real clay behaviour during excavations in high quality centrifuge tests, gave the motivation to carry out investigations to provide further and new insights in the complex twin tunnel interaction in terms of changes in stress-path, stress-strain behaviour and shear stiffness response.

Amanda Norman

PhD researcher - University of Leeds

Amanda is a PhD student studying "Thermo-mechanical Behaviour of Soft Sedimentary Rocks" at the University of Leeds. They completed their BSc in Geology at the University of Liverpool (2017-2020) and MSc in Structural Geology with Geophysics at the University of Leeds (2020-2021). Before their PhD, they worked as a geotechnical engineer.

Investigating Thermal-Hydro-Mechanical Coupling in Mudstones under Varied Thermal Cycles

Thermal loading has a significant impact on the mechanical properties of mudstone, which needs to be quantified and understood for deep earth engineering such as geological disposal of radioactive waste, geothermal energy and underground coal gasification where tunnelling will be needed. The testing was completed to analyse the response of the Sidmouth Mudstone, of the Mercia Mudstone Group, under triaxial compression with varied thermal loading conditions. Triaxial compression experiments were conducted at one and three thermal loading cycles of 90°C. The triaxial compression tests were conducted at confining pressures of 5 MPa, at both 90°C and at room temperature, for both the one and three thermal cycles. Ultimately, to determine the initial response to thermal loading and the permanent response from thermal loading. The results show that under triaxial compression at 90°C, independent of the number of thermal cycles, the Sidmouth Mudstone has a Poisson's Ratio comparable to that of water and the post peak behaviour is extremely brittle compared to triaxial compression at room temperature. Triaxial compression

after three thermal cycles of 90°C display a higher fracture density compared to triaxial compression after only one heating cycle but show varied strengths of 9 MPa and 24 MPa for tests at 90°C and room temperature respectively. The main mechanism driving the response for all tests is proposed to be thermal-hydro-mechanical coupling, where the induced pore pressure from thermal expansion is inducing localised strain and propagating thermally induced fractures for the porewater to spread throughout the sample. The testing described contributes to the understanding of the response of mudstones under thermal loading and the magnitude of the effect of thermal-hydro-mechanical coupling.

David Maddison

Associate Director of Tunnelling - Jacobs

David graduated from Cardiff University and now has 10 years' experience working on the Hinkley Point C Marine Works project. For the last 2 years, David has been the Design Manager for Jacobs for the implementation of the tunnel to shaft connections element of the project.

Permanent works reinforcement optimization

Within the HPC Marine Works, constrained geometries, stringent design requirements and design schedules led to densely reinforced structures initially being approved for construction in some locations. This presentation shares lessons learnt and provides an overview of how a site led design optimisation process was followed for the 90 degree elbows of the tunnel to shaft connections. This reduced the tonnage of permanent works reinforcement required which resulted in relative carbon emission savings, improved constructability and other project benefits.

Christian Garvey

Engineering Geologist - Arup

Christian is a Senior Engineering Geologist at Arup. He has experience across geotechnical and tunnelling design, typically rock engineering projects for infrastructure, energy storage and mining. He pursues interesting and sustainable projects which provide an environmental and social benefit.

Understanding convergence and support in rock tunnels

The convergence-confinement method is a well-established analytical method for anticipating tunnel convergence in homogenous ground conditions. A well-defined longitudinal displacement profile (LDP) along the tunnel aims to capture the anticipated rock mass behaviour and permit the design of appropriate and safe rock support systems, tunnel construction sequence and rock support installation process. However, is it appropriate to use this method to analyse tunnel excavations in massive rock mass within high stress environments?

The behaviour of massive rock mass under high in situ stress on a tunnelling scale can result in difficult to predict convergence, which is often manifested as large stress release and energetic deformation events in the rock mass and can severely impact the rock support and safety conditions inside the tunnel.

This complex rock mass behaviour can be analysed using advanced numerical methods. Continuum methods were initially used to derive indicative longitudinal displacement profiles (LDP) along an advancing tunnel within a massive rock mass. However, by adopting advanced quasi-discontinuum methods it will be possible to capture fracturing and spalling within the rock mass and further refine the design of appropriate rock support systems.

Hoong Hao Yap

Doctoral candidate - University of Cambridge

Hoong Hao is a Doctoral Scholar at the Centre for Doctoral Training in Future Infrastructure and Built Environment, University of Cambridge. His research focuses on Thermo-Hydro-Mechanical (THM) modelling of frozen ground. He holds a Master of Engineering from Imperial College London, where he completed his master's thesis on tunnelling at ETH Zürich, and a Master of Research from the University of Cambridge.

Numerical Modelling of the Thermo-Hydro-Mechanical Behaviour of Frozen Ground

Artificial ground freezing (AGF) has been employed for over 150 years, mainly for temporary excavation support, groundwater control, and contaminant containment. Despite its extensive history, the mechanical behaviour of frozen soil remains insufficiently understood, and AGF designs often rely on empirical methods that require large safety margins. This presentation addresses the key challenges in predicting frozen ground behaviour, focusing on the complex Thermo-Hydro-Mechanical (THM) interactions that are critical to AGF projects. Drawing from observation, we will explore the underlying mechanisms driving frozen soil behaviour and demonstrate how numerical modelling can enhance our ability to predict these processes. Using the Frozen Unfrozen Soil Model (FUSM) in PLAXIS®, we present findings from three distinct triaxial test setups, showing how different boundary conditions (permeable vs. impermeable) impact water movement and pressure build-up within the soil. These results highlight the importance of standardized testing for frozen soils and the need to better account for viscosity effects in AGF models. By addressing these gaps, we aim to provide the tunnelling industry with more robust tools for designing safer and more efficient AGF systems.

Charlotte Dickinson

Agent - SCS Railways

Since graduating from the Camborne School of Mines 12 years ago, Charlotte has worked in contract delivery roles on major tunnelling projects all over the UK and holds a strong belief in simplifying processes, creating clear communication pathways and setting up sites for success. Joining Costain and the SCS Railways joint venture in 2020 she has been part of the delivery team as Tunnel Agent, responsible for the successful construction of ~ 1km of Sprayed Concrete Lined tunnels across three assets of the HS2 project.

Liana Malhan

Tunnel Engineer - Arup

Since joining Arup as a graduate in 2018, Liana has developed experience across various geotechnical and tunnelling design projects, focusing primarily on SCL (Sprayed Concrete Lining) tunnelling and slope stabilization. Most recently, she has spent six months on-site as a Design House representative for the HS2 project.

HS2 SCS Construction & Design Site Support of Old Oak Common East and Euston Stub Tunnels

HS2's Main Works Civils Contractor (MWCC), Skanska Costain STRABAG JV (SCS JV), are responsible for the design and construction of major tunnels in the southern section of HS2. Situated in North Acton, London, the construction of approximately 1km of Sprayed Concrete Lined (SCL)Tunnels, connecting the main arteries of TBM bored tunnels has been quietly and successfully ticking along underground. The first half of this presentation will provide an overview of the sprayed concrete lined tunnels, emphasizing the importance of setting up for success and the current status of the works.

As a key component of the HS2 project, Arup, in collaboration with Strabag and Typsa under the Design House (DH) consortium, has taken the leading role in the intricate design of the primary and secondary linings for the Old Oak Common East (OOC-E) and Euston Stubs (ET-SCLS) tunnels. Arup's expertise extends beyond design; the firm is actively providing on-site support for this critical infrastructure project. This effort is spearheaded by Michele Mangione, with essential on-the-ground support from Liana Malhan, Ravi Shah, Aris Skarvelas, and Yannis Vazaios.

The Design House team's innovative contributions are transforming the project's impact and efficiency. By reducing the face sealing layer and eliminating L-bars at the SCL tunnel knees, they have not only optimized the tunnel design but also achieved significant reductions in carbon emissions. These strategic design adjustments have delivered substantial cost and time savings, reinforcing the project's commitment to sustainability and efficiency.

Annie May Goodman

Assistant Site Engineer - BAM Nuttall / Leeds College of Building

Annie May Goodman started her Degree Apprenticeship with Bam Nuttall in 2021 after finishing her A-Levels. She has been working at the Silvertown Tunnel project along with studying at Leeds College of Building for a degree in Civil Engineering. Her talk will focus on the Silvertown Tunnel Project, its challenges and how they were overcome.

The Silvertown Tunnel Project

This talk will focus on the Tunnelling works at the Silvertown Tunnel Project, which was constructed using a 11.91m diameter EPB TBM. The twin bore tunnel is connected with 7No. Cross Passages of which 4No required ground freezing.

Luca Kammerer

Geotechnical Engineer - ILF Consulting Engineers Austria GmbH

Luca graduated with a master's degree in Geotechnical and Hydraulic Engineering from the Technical University of Graz in May 2024. Currently based in Innsbruck with ILF Consulting Engineers, Luca contributes to Germany's Stuttgart 21 mega project, performing structural calculations for the inner and outer lining of the P-Option lot.

Stuttgart21, Widening of a tunnel cross-section in an urban area

As part of the Stuttgart railway junction reorganization, the main station is being converted from a terminal to an underground pass-through station. All approach routes, including long-distance connections from Bad Cannstatt and Feuerbach, will be relocated into tunnels, with sections built using traditional tunnelling methods.

The P-option, located near the North Station and east of the Prag Tunnel, connects the Bad Cannstatt Tunnel to the existing line. Initially considered during Stuttgart 21's planning, it is now part of the Federal Transport Infrastructure Plan, linked to the new Stuttgart-Ulm railway tunnel.

The project involves constructing branching structures from single-track tunnels and widening them for subsequent tunnels. ILF is responsible for planning the deconstruction of existing linings and designing the new tunnels. Complex 3D models calculated surface settlements and stresses, and SCIA calculations helped design the highly reinforced sections, especially in critical areas under shallow overburden.

Enrico Pavese

Projects coordinator - Renesco Holding AG

Currently Project Coordinator for Renesco Group, providing technical and commercial support to colleagues across global subsidiaries. Waterproofing expert, specialising in waterproofing and injection products, for underground construction as well as providing required support to all parties (owner, designer, contractor) involved in the project, as per guidelines for respective country. Extensive chemical and industrial knowledge developed through previous position as MSc. Building Engineer for Mapei (HQ Underground Construction Division) from 2014 to 2021 working on international underground structure and infrastructure projects.

Cross passages and shafts: focus on the waterproofing challenges

Requirements for the long-term efficiency and quality of underground structures have increased in recent decades. Today, the standard lifetime requirement for an underground infrastructure project is 100 years and, in some cases, even higher. This calls for high increased attention to the durability of the whole structure and of each individual element. This attention also needs to be paid to waterproofing systems, which play an essential role in the durability and quality of the structures, as demonstrated by the very high impact that water inflows have on the damage of linings and infrastructure (Howard, 1991; Sandrone and Labiouse, 2011). This issue is even more relevant when considering that, in many cases, it is very difficult to repair/ replace waterproofing elements once the tunnel is finished because those elements are embedded between the primary and final lining.

This becomes even more challenging for shafts and cross passage waterproofing. These structures have become more common in underground projects because of the extensive use of the mechanised excavation method. Cross passages specifically, are unique due to their interface with other structures (segmental tunnels) with different construction methods which introduces discontinuities in the waterproofing system. With our experience in over more than hundreds cross passages, we want to explain the key factors (specification, materials and installation processes) which are crucial for a successful waterproofing installation of these unique structures.

Franck Peng

Business Development Lead - Balsam Laboratory Company Ltd

Franck Peng, is the business development lead at Balsam Laboratory based in Vancouver, Canada. Balsam Laboratory has been the leader in innovative tunnelling research and solutions for more than 25 years. One of the unique offerings includes the development of “”Jello-mud,”” a versatile grouting method that eliminates geological adversities such as ground settlement, ground water in-flush, and soil-swelling.

Jello-Mud: New Construction Method for Safer Tunnelling

The High Load-bearing Anti-settlement Jello-Mud Technology is a new construction method that is gradually being adapted in tunnel construction such as pipe jacking and shield tunneling. The principle is to use the reaction of bentonite and high molecular polymer to form a strong thixotropic slurry with cohesion properties. It is filled into the voids caused by tunnel constructions. Jello-Mud offers many benefits such as pressure building, reducing surrounding soil disturbance, and preventing soil settlement. At the same time, Jello-Mud has the effects of lubrication, drag reduction and water isolation. It plays a vital role in the safety and smoothness of construction. This article takes a few typical construction application cases as the background to introduce in detail the multiple applications of the High-load-bearing Anti-settlement Jello-Mud.

Zhen Ng

Engineer - Dr. Sauer and Partners

Zhen is a Tunnel Design Engineer at Dr. Sauer and Partners (DSP). Zhen started his tunnelling career as a trainee at Klang Valley MRT. He joined DSP in 2018 after completing MSc in Tunnelling (Warwick), and have worked on multiple tunnelling design projects globally. He operated TBM for a High-Speed Rail project.

An Introduction to Tunnel Boring Machines - tips and tricks from a designer that learnt to operate a TBM

Tunnelling is critical to the world’s low carbon future, to deliver infrastructures for rail transportation and enable energy transition. Tunnel boring machine (TBM) tunnelling is one of the most cost-effective options to deliver linear infrastructure in urban areas and countryside, by eliminating the “”hidden”” costs of the elevated or at-grade alternatives, in terms of environmental and social impacts during construction and in the long-term. Modern tunnel boring machines can construct tunnels of any diameter at any depth while minimising tunnelling impact. This presentation provides a detailed introduction to common TBM types in soft ground and hard rock, and an overview of temporary and permanent works structural design in mechanised tunnelling. The presenter discusses the details that designers need to know – from the perspective of a tunnel designer that stepped into the world of TBM operators.

Jack Smith

PhD Candidate - University of Leeds

Jack graduated with an MEng in Engineering Science from the University of Oxford. Supervised by Dr Chrysothemis Paraskevopoulou, he is now in his final year studying for a PhD at the University of Leeds. With industrial support from Bedi Consulting Ltd, Jack is using deep learning to investigate how new technologies can be applied to

improve the condition assessment process of historical masonry lined tunnels.

Assessing the potential for automated condition assessment of masonry lined tunnels

Recent developments in computer vision using machine learning have led to the creation of automated tunnel condition assessment workflows. However, it is unknown how well these methods generalise to the wide variety of real world geometries, materials and conditions of tunnels observed in practise. There are also other barriers preventing their application becoming routine, including scarcity of training data and limited explainability of these methods.

This presentation will introduce a case study workflow designed for assessing the severity of spalling on masonry lined railway tunnels. It will then outline work conducted to determine how much training data was required to achieve acceptable performance and how performance was affected by different real world tunnel conditions. In addition, the presentation will show a selection of methods for predicting algorithm performance that can be used to help determine if the workflow is applicable to a particular tunnel in advance.

Matthew Callaghan

Materials Engineer - Skanska

Matt is a skilled Materials Engineer with extensive experience in concrete applications. Specialising in the design, quality control, and execution of sprayed concrete solutions, having a deep technical understanding and hands-on expertise to each project. Understanding material properties and performance to ensure optimal results for both standard and complex applications.

Sprayed Concrete Mix design and optimisation

Looking at the constituents of a concrete mix and what makes a good sprayed concrete mix design. How to improve the performance of a sprayed concrete mix design and a brief look at problem solving with use of examples. This will cover, Aggregate types and selection, Cement and cement replacements, Admixtures and fibre selection and more. Will briefly cover how each of the variabilities of these constituents can effect the performance of a concrete and the defects that can occur. Highlighting on the importance of getting it right first time

Felix Lau

Assistant Geotechnical Engineer - Mott MacDonald

Felix is an Assistant Geotechnical Engineer at Mott MacDonald with 3 years of experience in designing underground basements, retaining structures, and slope upgrading works. He is now part of the HS2 site team, providing technical support for design changes.

Nurturing a sustainable future with the Early Career Challenge

Ground Engineering and Mott MacDonald are hosting the second Early Careers Challenge, following the success of last year's event. The challenge provides early career professionals, postgraduates, and undergraduates with an opportunity to tackle a geotechnical problem, guided by mentors from across the industry. It's a unique chance for participants to inspire each other, collaborate, and develop a sustainable solution that considers risk, cost, program, and constructibility. This year, we have developed the challenge to focus on the major role our ground engineers play in the sustainability race to deliver the net zero transformation. It's a key challenge for our industry. Achieving and demonstrating new developments are sustainable is a requirement for project legacies. Our 2024 Early Career Challenge will show the teams that their talents and efforts will be making a difference for the future.

Josh Tsui

Tunnel Engineer - Arup

Josh completed his MEng in Civil Engineering from Cardiff University in 2022. Since then, he has been located in Arup's London office, focusing on European tunnelling projects. His work covers the design and assessment of various water, gas, and

transport tunnels, with notable projects such as SESRO, Aramis, and HS2.

Refining the automation process of ground movement assessments for utility assets

HS2 excavation works interact with thousands of utility assets which all need to be assessed. Design House's Asset Protection discipline has employed a 3 phased process for ground movement assessments to analyse the impact on utilities due to these excavation works. This consolidation process filters through assets to provide an appropriate level of assessment. However, such a quantity still requires the run of thousands of models and production of hundreds of reports. This presentation will discuss how the introduction of scripting and automation has been used to improve workflow, provide cost and programme savings, and enable more comprehensive analysis. Hopefully, this will encourage further adoption of scripting across the industry through showcase of the practical advantages in a tangible example.

Ben Gilson

Associate - Arup

Ben Gilson is an Associate at Arup with over 14 years of experience in geotechnical engineering, specialising in tunnelling and underground construction. Ben has led geotechnical teams on major infrastructure projects, including the Sydney Metro West Airport Station, DLR Thamesmead Extension, HS2 Euston, Crossrail 2 and the Euston Conventional Station redevelopment. Ben also leads geotechnical projects that interface with existing tunnels, such as Earls Court Village and several London commercial development projects directly above tunnels. Ben's work has been published in several prestigious journals and conferences, showcasing his innovative approach to geotechnical engineering and tunnelling technology.

Beyond projects, Ben has a longstanding interest in subsurface development and has worked on programmes including the National Underground Asset Register (NUAR) and the new Government Office for Science foresight project: The Future of the Subsurface. Ben co-lead a study with Yung Loo on the Future of Tunnelling: High-Level Review of Emerging Technologies, an annex to the Future of the Subsurface report.

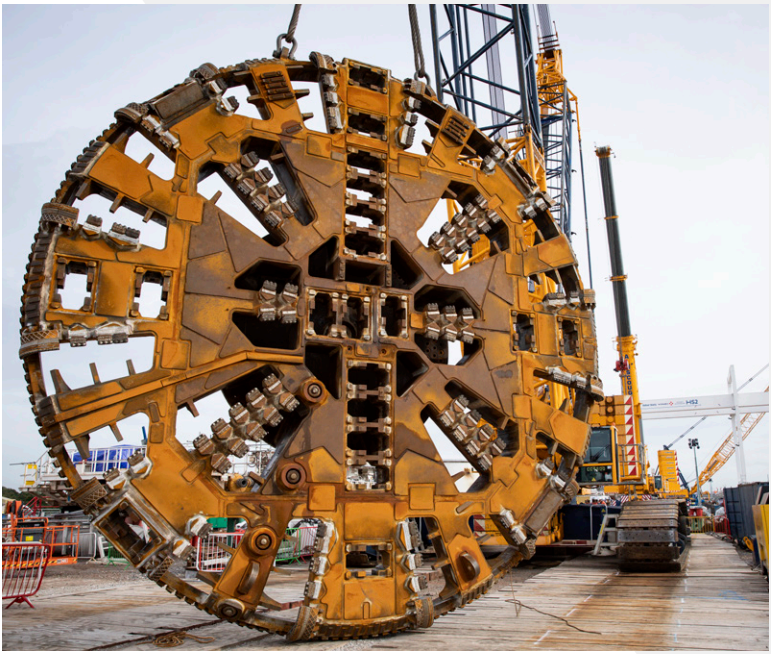
Yung Loo

Senior Engineer - Arup

Yung Loo is a Senior Engineer at Arup with over 14 years of experience in infrastructure design, planning and asset management in tunnelling and underground space. He leads projects and teams focussing on digital technology and data driven innovation, across transport and energy sectors, including projects with UK Power Networks, CERN, High Speed 1, Femern and Woodsmith Mine. He has published and presented on innovation, sustainability and technology in the tunnelling sector, and is previously Arup's global tunnel digital skills leader. He is part of the industry's project steering group for the upcoming CIRIA guidance on tunnel asset management, and co-lead the study with Ben Gilson on the Future of Tunnelling: High-Level Review of Emerging Technologies, an annex to the Future of the Subsurface report.

Future of tunnelling: High level review of emerging technologies

This presentation provides an overview of a high-level study into the emerging trends and technologies in tunnelling at scales from trenchless drilling to large transport tunnels commissioned as part of the Government Office for Science foresight project: Future of the Subsurface. Below ground space provides society and the economy with a range of uses, which are set to increase in variety and criticality over the coming decades considering population growth, emerging technologies, the need to decarbonise, food, water and energy security, and the impacts of climate change. The aim of the study was to inform future scenarios for subsurface use and the potential need for more coordination and regulation to unlock value in the use of underground space, focussing on tunnels. Current context in the UK informs the outcomes highlighting key opportunities and challenges across the themes of investigation and sensing, design, construction methodology, operation, planning and powers to construct, repurposing and reusing tunnels, and sharing tunnel usage



HS2 Bromford Tunnel – Photo courtesy Mott MacDonald

Thank you!

BTSYM CONFERENCE
2024

British Tunnelling Society Young Members
Institution of Civil Engineers
One Great George Street
London, SW1P 3AA
United Kingdom

Keep in touch:
Scan to join the
BTSYM mailing list