Jointly Organised between Geotechnical Engineering Technical Division(IEM GETD), The Malaysian Geotechnical Society (MGS), Nanjing University, China and Chinese Sub-society for Geoengineering Intelligent Monitoring, Chinese Society for Rock Mechanics & Engineering, China.

GEO-CIVIL INFRASTRUCTURE TEST AND MEASUREMENT (T&M) 2025:

"SEMINAR ON INTELLIGENT SENSING TECHNOLOGIES FOR GEO-CIVIL INFRASTRUCTURE: ADVANCING TESTING, MONITORING, AND PHOTONIC INNOVATION"

SPEAKERS:

Prof. Bin Shi

Prof. Kai Gu

Asst. Prof. Junyi Guo

Dr. Taiyin Zhang

Dr. Xing Wang

Mr. Dirk Uebe

Prof Ir. Dr. Paulus Pramono Rahardjo

Prof. Ir. Dr. Hisham Mohamad

Dr. Tee Bun Pin

22 SEPTEMBER 2025, MONDAY
8:00 am - 5:30 pm
FOUR POINTS BY SHERATON, PUCHONG

Registration fee (Subject to 8% SST)

GRADE	FEE
Student	RM 100
IEM & MGS Member / HRDC for IEM & MGS Member	RM 150 / RM 175
Non IEM & MGS Member / HRDC for Non IEM & MGS Member	RM 200 / RM 225

BEM Approved CPD: 7
Ref. No.: IEM25/HQ/387/S

APPROVED DURATION:
14/08/2025 - 14/05/2026
HRD CORP SERIAL NO:
10001587803

SYNOPSIS

The Seminar on Intelligent Sensing Technologies for Geo-Civil Infrastructure offers a premier platform for professionals, researchers, and industry stakeholders to explore the latest advancements in geotechnical and structural monitoring. Organised by the Geotechnical Engineering Technical Division (GETD) and supported by the Malaysian Geotechnical Society (MGS), the seminar is proudly co-organised by Nanjing University, China, and the Geological and Geotechnical Engineering Intelligent Monitoring Branch of the Chinese Society for Rock Mechanics & Engineering, China. This international collaboration underscores the seminar's focus on advancing global expertise in infrastructure sensing and diagnostics.

With infrastructure systems increasingly challenged by urbanisation, climate change, and ageing, this seminar highlights the transformative role of cutting-edge technologies such as Distributed Fibre Optic Sensing (DFOS), Fiber Bragg Gratings (FBG), Distributed Acoustic Sensing (DAS), wireless sensors, and automated remote sensing methods. These technologies are reshaping how engineers monitor structural integrity, track geotechnical behaviour, and manage infrastructure lifecycles.

The seminar also includes sharing of experience in the use of conventional instrumentation, offering a comprehensive overview of current and emerging tools for data-driven decision-making. A notable feature of the programme is the broad international perspective, with real-world case studies and insights presented from China, Germany, Indonesia, Malaysia, and other countries. This diversity promotes meaningful cross-border technical exchange and collaboration.

Participants will benefit from nine in-depth sessions covering the following themes:

- **Continuous geotechnical monitoring using DFOS (Prof. Bin Shi)**
- **Thermophysical property and seepage analysis via DTS (Prof. Kai Gu)**
- **Soil moisture profiling using advanced fibre-optic methods (Asst. Prof. Junyi Guo)**
- **DAS and machine learning for event detection (Dr. Taiyin Zhang)**
- **Real-time strain sensing in tunnels and slopes (Dr. Xing Wang)**
- **DFOS applications in global infrastructure projects (Mr. Dirk Uebe)**
- **Instrumentation experience from Indonesia including traditional systems (Prof. Paulus P. Rahardjo)**
- **Subsurface and utility mapping using DAS, PASS arrays, and BOTDA (Prof. Ir. Dr. Hisham Mohamad)**
- **Malaysian applications of smart monitoring with wireless sensors and robotic integration (Dr. Tee Bun Pin)**

This seminar will provide attendees with in-depth knowledge, exposure to next-generation monitoring solutions, and opportunities to engage with global experts. It aims to serve as a catalyst for collaboration, innovation, and professional development in the field of geo-civil infrastructure monitoring.

The event will be held on 22 September 2025 at Four Points by Sheraton, Puchong, and is approved for Continuing Professional Development (CPD) hours by the Board of Engineers Malaysia (BEM).

Jointly Organised between Geotechnical Engineering Technical Division(IEM GETD), The Malaysian Geotechnical Society (MGS), Nanjing University, China and Chinese Sub-society for Geoengineering Intelligent Monitoring, Chinese Society for Rock Mechanics & Engineering, China.

PROGRAMME

Time	Description	Speaker
8:00am – 8:30am	Registration & Light Refreshment	
8:30am – 8:40am	Welcoming Address by the Chairman	
8:40am – 9:40am	Session 1: DFOS Applications in Geo-Engineering Monitoring	Prof. Bin Shi
9:40am – 10:40am	Session 2: Subsurface Imaging and Underground Monitoring Using Distributed Sensing: MASW via DAS, PASS Arrays, and BOTDA Diagnostics	Prof. Ir. Dr. Hisham bin Mohamad
10:40am – 11:00am	Morning Tea Break	
11:00am – 11:45am	Session 3: Deformation Monitoring of Geotechnical Engineering via Distributed Strain Sensing (DSS): Techniques and Cases	Dr. Xing Wang
11:45am – 12:30pm	Session 4: Transforming Infrastructure Monitoring in Malaysia: Smart Technologies for Safer Foundations and Structures	Dr. Tee Bun Pin
12:30pm – 1:00pm	Session 5: Characterizing Moisture Migration in Unsaturated Soils via Distributed Fiber Optic Sensing (DFOS): Techniques and Case Studies	Asst. Prof. Dr. Junyi Guo
1:00pm – 2:00pm	Lunch	
2:00pm - 3:00pm	Session 6: Beneficial Application of Fibre Optic Strain Measurement Combined with Other Instrumentation for Investigation and Monitoring of Geotechnical and Structural Components of Infrastructures in Indonesia	Prof. Paulus P. Rahardjo
3:00pm - 4:00pm	Session 7: Distributed Fiber Optic Sensing Monitoring in Critical Infrastructure	Dirk Uebe
4:00pm - 4:20pm	Afternoon Tea Break	
4:20pm - 4:50pm	Session 8: Evaluating Thermophysical Properties and Seepage Dynamics of Rock–Soil Media via Distributed Temperature Sensing (DTS): Methods and Applications	Prof. Kai Gu
4:50pm – 5:20pm	Session 9: Distributed Acoustic Sensing and Machine Learning for Engineering Event Detection	Dr. Taiyin Zhang
5:20pm - 5.30pm	Closing	

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REGISTRATION FORM

No	Name (s)	M'Ship Number	IC No.	Fee (RM)
			SUB TOTAL	
			ADD SST @8%	
			TOTAL PAYABLE	

***Fees MUST be fully paid BEFORE the CLOSING DATE. Seats could only be confirmed upon payment. Enclosed herewith a crossed cheque No: _____for the sum of RM _____ issued in favour of "The Institution of Engineers, Malaysia" and crossed 'A/C payee only'. I/We understand that the fee is not refundable if I/We withdraw after my/our application is accepted by the Organising Committee as stated in the cancellation term. If I/We fail to attend the seminar, the paid registration fee will not be refunded.**

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IMPORTANT:

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Your cooperation is highly appreciated.

CANCELLATION POLICY

IEM reserves the right to postpone, reschedule, allocate or cancel the event. Full refund if cancellation is received in writing more than 7 days before start date of the event. No cancellation will be accepted prior to the date of the event. However, replacement or substitute may be made at any time with prior notification and substitute will be charged according to membership status.

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SPEAKERS PROFILE

Prof. Bin Shi

Session 1: DFOS Applications in Geo-Engineering Monitoring

Synopsis:

Earth habitability relies on the stability of geological bodies, which are continuously influenced by natural forces and human activities. Their instability often leads to serious geological and geotechnical disasters, posing significant risks to human safety, infrastructure resilience, and sustainable socio-economic development. The stability of these geological bodies is governed by various mechanical discontinuous interfaces—categorized as material, state, and movement types—which are challenging to identify due to their high concealment, complex structures, and strong uncertainty. This lecture provides a comprehensive review of the evolution of in-situ observation technologies, progressing from traditional detection and exploration to advanced monitoring and intelligent sensing. It highlights distributed fiber-optic sensing (DFOS) as a cutting-edge and highly precise method for continuous geotechnical monitoring. The speaker presents 20 years of research achievements, including developments in strain-sensing coupling theory, moisture and seepage detection, disaster recognition and prediction models, DFOS system deployment, and practical engineering applications. Future directions, scientific challenges, and the broader significance of DFOS in improving disaster resilience are also discussed.

Speaker's Profile:

Prof. Bin Shi is a distinguished professor and doctoral supervisor at Nanjing University, Dean of the Suzhou High-tech Research Institute of Nanjing University. He concurrently serves as President of the International Society of Environmental Geotechnical Engineering (ISEG), Chairman of the Geological and Geotechnical Engineering Intelligent Monitoring Branch of the Chinese Society for Rock Mechanics & Engineering, Deputy Director of the Engineering Geology Specialty Committee of the China Geological Society, and Deputy Chief Editor or Editorial Board Member of several professional journals. He holds Bachelor (1983), Master (1986), and Doctor (1995) degrees in Geotechnical Engineering and Engineering Geology from Nanjing University. Prof. Shi has conducted long-term research in Geotechnical Engineering and made systematic, creative contributions to the theory, technology, and application of distributed optical fiber sensing in this field. He received the First Prize of the National Science and Technology Progress Award (2018), nine provincial and ministerial awards, an Outstanding Contribution Award from ISEG (2004), a Gold Award at the Geneva International Invention Exhibition (2019), and the 2nd National Innovation Excellence Award (2020). He was named a National Outstanding Youth (2002), has published over 500 papers with 30,000+ citations, holds 80+ invention patents, and is chief editor of five national standards.

Prof. Ir. Dr. Hisham bin Mohamad

Session 2 : Subsurface Imaging and Underground Monitoring Using Distributed Sensing: MASW via DAS, PASS Arrays, and BOTDA Diagnostics

Synopsis:

This presentation explores emerging distributed sensing technologies that advance subsurface characterization and underground infrastructure monitoring. The first part highlights the innovative use of Distributed Acoustic Sensing (DAS) as a seismic receiver for Multichannel Analysis of Surface Waves (MASW), enabling extended-range shear wave profiling without dense geophone arrays. This is complemented by recent work on Passive Seismic Surface Wave (PASS) array techniques using ambient noise to extract near-surface velocity structure with minimal disturbance—offering scalable options for geotechnical and urban applications. The second part focuses on real-time utility diagnostics using fiber optics, where DAS is employed for vibration-based mapping of buried assets and disturbances, while BOTDA (Brillouin Optical Time-Domain Analysis) provides continuous temperature profiling to detect thermal anomalies and potential hotspots. Together, these methods represent a multi-modal, fiber-enabled framework for intelligent geotechnical sensing and infrastructure health management.

Speaker's Profile:

Prof. Ir. Dr. Hisham Mohamad is a Cambridge-trained engineer and Malaysia's leading expert in Distributed Fibre Optic Sensing (DFOS) for geotechnical and underground infrastructure monitoring. He has been instrumental in applying DFOS technologies to high-profile projects such as the Singapore MRT Circle Line and Merdeka 118. As Full Professor and Chair of Civil & Environmental Engineering at Universiti Teknologi PETRONAS, he has secured over RM9.9 million in research funding, supervised more than 18 postgraduate students, and authored widely cited work in the field. While his foundation is in geotechnical engineering, Prof. Hisham is actively advancing geophysical imaging research, particularly in seismic-based subsurface characterization. His multidisciplinary efforts continue to shape next-generation monitoring strategies across infrastructure, energy, and environmental sectors.

SPEAKERS PROFILE

Dr Xing Wang

Session 3 : Deformation Monitoring of Geotechnical Engineering via Distributed Strain Sensing (DSS): Techniques and Cases

Synopsis:

Distributed Strain Sensing (DSS) leverages Brillouin scattering (BOTDR/A &BOFDA) and ultra-Weak Fiber Bragg Grating (uWFBG) to achieve continuous, high-resolution strain measurements along geological interfaces with high spatial resolution over kilometer-scale distances. This technology enables real-time detection of critical deformation phenomena, including displacements in shield tunnels, precursor strain surges preceding slope failure, and so on. The presenter systematically introduces the classification of DSS technologies and their typical application scenarios in geotechnical engineering, highlight the technical features and advantages of the novel uWFBG (Ultra-Weak Fiber Bragg Grating) sensing technique, and conclude by outlining its broad application prospects in future monitoring practices.

Speaker's Profile:

Dr. Xing Wang graduated from the School of Earth Sciences and Engineering at Nanjing University in 2017, currently serving as Deputy General Manager at Suzhou NanZee Sensing Technology Co., Ltd. (NanZeeSensing). Specializes in R&D and production of fiber-optic monitoring technologies for geotechnical engineering, awarded the title of "Dual-innovation Doctor" by Jiangsu Province and selected for the Gusu Key Industrial Talent Program. Has filed over 10 invention patents and contributed to advancements in distributed sensing applications for infrastructure safety.

Session 4 : Transforming Infrastructure Monitoring in Malaysia: Smart Technologies for Safer Foundations and Structures

Dr. Tee Bun Pin

Synopsis:

Malaysia's infrastructure is increasingly exposed to complex geotechnical and structural challenges, driven by urban growth, climate variability, and aging assets. In this context, smart sensing technologies offer a transformative solution for real-time, high-resolution monitoring and early risk detection. This presentation by Dr. Tee Bun Pin highlights how advanced systems such as Distributed Fibre Optic Sensing (DFOS), Fiber Bragg Grating (FBG), and wireless monitoring are being deployed across critical infrastructure in Malaysia. Drawing on case studies from tunnels, bridges, offshore crane structures, high-rise foundations, and landslide-prone slopes, the talk showcases how these technologies are used to track strain, deformation, temperature, vibration, and ground movement with unparalleled accuracy and continuity. It also introduces integrated monitoring platforms with robotic inclinometers, piezometers, and wireless sensors, providing centralized data visualization, anomaly detection, and predictive analytics. These innovations enable engineers to respond proactively to structural and geotechnical issues, reducing the risk of failure and improving asset lifecycle management. By comparing traditional and modern monitoring approaches, the presentation emphasizes the growing importance of data-driven decision-making in ensuring infrastructure safety, resilience, and sustainability. Attendees will gain insight into how Malaysia is leveraging intelligent sensing to build smarter, safer civil infrastructure.

Speaker's Profile:

Dr. Tee Bun Pin is an experienced civil engineer with a specialization in structural and geotechnical engineering. He holds a PhD, M.Eng, and B.Eng from Universiti Teknologi Malaysia. With over 20 years of combined experience in consultancy and construction, he has worked on the design and execution of numerous high-rise and infrastructure projects throughout Southeast Asia. Since 2012, Dr. Tee has focused on advancing and applying Fibre Optic Sensing Technology in civil engineering, with successful implementations across Malaysia, Singapore, Indonesia, Saudi Arabia,Kazakhstan, Australia, Cambodia and other countries. He is the founder and General Manager of Smart Sensing Technology Sdn Bhd (SST), established in 2015, which provides advanced testing and monitoring services using Distributed Fibre Optic Sensing (DFOS) and conventional instrumentations. Under his leadership, SST has been involved in landmark projects including MRT2, LRT3, Merdeka 118, Exchange 106, Changi Airport runway expansion, Penang Second Bridge, LRT Penang and ECRL.

SPEAKERS PROFILE

Asst. Prof. Junyi Guo

Session 5 : Characterizing Moisture Migration in Unsaturated Soils via Fiber-Optic Sensing: Techniques and Case Studies

Synopsis:

Accurate in-situ monitoring of moisture dynamics in loess is essential for advancing the understanding of subsurface hydrothermal processes, improving geotechnical stability assessments, and supporting the prevention of moisture-induced geological hazards. To address the limitations of conventional methods, we present a suite of novel fiber-optic sensing technologies for characterizing soil moisture fields, including actively heated fiber Bragg grating (AH-FBG), actively heated distributed temperature sensing (AH-DTS), and fiber-optic humidity sensing techniques. This report will first introduce the sensing principles and calibration procedures of each method, followed by field deployment strategies enabling full-depth, multi-parameter monitoring through single-fiber borehole configurations. At present, three fiber-optic monitoring sites for moisture field observation have been established in Yan'an, located in Ganguyi, Yan'an New District, and Luochuan. The following sections will present monitoring results and key findings from each of these sites, highlighting their contributions to understanding moisture dynamics in loess and the implications for engineering and environmental applications.

Speaker's Profile:

Dr. Junyi Guo graduated from the School of Earth Sciences and Engineering at Nanjing University in 2025 with a Ph.D. in Geological Engineering. Her expertise lies in the development and application of fiber-optic sensing technologies for monitoring water vapor transport in unsaturated soils. From 2023 to 2024, she conducted academic research at Graz University of Technology in Austria under the supervision of Professor Werner Lienhart, supported by the China Scholarship Council. She has published 13 SCI-indexed papers in high-impact journals such as Geotechnique, Geoderma, and Tunnelling and Underground Space Technology, including 8 as first author. She has led both national and provincial research projects, and her academic excellence has been recognized through multiple honors, including the National Scholarship and the Top Graduate Student Award of Nanjing University. Her research contributes to the advancement of intelligent, high-resolution monitoring approaches for soil moisture and environmental stability in loess regions.

SPEAKERS PROFILE

Session 6 : Beneficial Application of Fibre Optic Strain Measurement Combined with Other Instrumentation for Investigation and Monitoring of Geotechnical and Structural Components of Infrastructures in Indonesia

Prof. Paulus P. Rahardjo

Synopsis:

Fibre optic strain measurement has revolutionized the field of geotechnical and structural monitoring, offering unparalleled accuracy and reliability. This lecture explores the applications of fibre optic sensing technology in monitoring structural health, ground surface deformation, and geological processes. Distributed fibre optic strain sensing (DFOSS) technology enables continuous deformation monitoring, providing valuable insights into soil-structure interactions and geological behavior. This lecture presents selected cases of 10 years experience on the beneficial use of fibre optic strain measurement on various projects in Indonesia including bridges, box tunnel under high embankment, boredpiles and driven piles, basement slabs, geotextiles etc. Of particular interests are use of FO in piles where the strain monitoring has been used to obtain load transfer in pile testings, derive t-z curves and also detect bad concrete from high strains during axial load tests, and in reclamation area it has been used to investigate Negative Skin Friction; behavior of box tunnel during backfilling of high embankment for airport runway, as well as elongation of geotextile under embankment on soft soils. Benefits of fibre optic sensing, including high sensitivity, durability, and resistance to electromagnetic interference, as well as challenges in installation, data interpretation, and cost-effectiveness The lecture will highlight recent advancements in fibre optic sensing technology, comprehensive understanding of the principles, applications, and benefits of fibre optic strain measurement in geotechnical and structural engineering.

Speaker's Profile:

Prof Ir. Dr. Paulus Pramono Rahardjo completed undergraduate study at Universitas Katolik Parahyangan (UNPAR) and since then has been faculty member at the university. He pursued graduate study in highway engineering at Bandung Institute of Technology (ITB), then Master's degree and PhD degree from Virginia Tech (USA). His dedication in teaching, research and community services led him to the position of full professor in the year 2000. He has been actively engaged in teaching, research as well as thousands of geotechnical consultancies. He works for design and advising clients on many geotechnical problems including building foundations, highways, tunnels, bridges, jetty and wharfs, dams, landslides hazards, earthquakes, coal mining etc. Among his specialties with intense experience in research and practice are in the field of in-situ testing, landslides or slope protections and seismic hazard study. He has written more than 200 articles/ papers, research reports, books and manuals. He has served the university as Department Head, Vice Dean of Faculty of Engineering, Director of the Graduate Program and Vice Rector for Academic Affairs. Currently, he is the leader of Head of Geotechnical Research Centre. In professional practice he works as director of Consulting Companies including director of PT Geotechnical Engineering Consultant and PT Testana Indoteknika as well as an Independent Geotechnical Expert. His affiliation includes the Indonesian Geotechnical Society (HATTI), American Society of Civil Engineers in the Geo-Institute, the Indonesian Experts on Disasters (IABI) and Board Representative of International Consortium on Landslides (ICL). Currently he is member of KKBG (Indonesian Committee on the Safety of Buildings) and Expert for IKN (New Capital) and Panel for Buildings (TABG) of DKI Jakarta and Directorate of Housing in the Indonesian Ministry of Public Work

SPEAKERS PROFILE

Mr. Dirk Uebe

Session 7 : Distributed Fiber Optic Sensing Monitoring in Critical Infrastructure

Synopsis:

This presentation, co-delivered by Dirk Uebe and James Wu of AP Sensing, presents how Distributed Fibre Optic Sensing (FOS) technologies—specifically Distributed Acoustic Sensing (DAS) and Distributed Temperature & Strain Sensing (DTSS)—can be applied to enhance monitoring across critical railway infrastructure. Drawing on global field deployments and study results, the session highlights how FOS can address a wide range of safety-related and operational challenges.

DAS can be deployed across entire rail corridors for use cases such as track condition monitoring, potential rail break detection, wheel defect indication, and detection of events like trespassing or natural hazards. Signal interpretation must be adapted to different track structures—such as ballast versus slab track-due to distinct acoustic signature profiles.
In tunnel sections, DAS and DTSS can be used in parallel to increase detection sensitivity and enable data fusion, improving reliability in detecting rail integrity issues and structural anomalies. DTSS also enables long-term structural health monitoring of bridges, tunnels, and elevated sections through temperature and strain trend evaluation.

An advanced DAS application-below-ballast scanning-can create an image of the substructure and surrounding underground (to depths of up to 50 m), making it particularly valuable in sections with unstable or risk-prone geotechnical conditions.
DAS can also be used for train tracking in areas without CBTC coverage, potentially providing additional information such as speed, length, and relative axle load-without any onboard equipment.
The session will summarize applied use cases, performance benchmarks, and practical insights from both pilot and live deployments, demonstrating how FOS can support predictive maintenance strategies and the broader digitalization of rail infrastructure.

Speaker's Profile:

Dirk Uebe is an experienced expert in railway technology and fiber optic sensing, with over 25 years of international experience in engineering, project management, and business development. At AP Sensing, he is responsible for global railway solutions, focusing on the application of Distributed Fibre Optic Sensing (DFOS) in safety-critical infrastructure environments.

His career spans senior roles at Thales, GE Transportation, GE Harris Railway Electronics, and AP Sensing, covering advanced monitoring technologies in railways, including track condition monitoring, intrusion detection, and early hazard warning. Dirk's presentation will explore how DFOS is enabling real-time monitoring across railway and geo-civil infrastructure, offering practical examples and perspectives on system integration and performance.

SPEAKERS PROFILE

Prof. Kai Gu

Session 8: Evaluating Thermophysical Properties and Seepage Dynamics of Rock–Soil Media via Distributed Temperature Sensing (DTS): Methods and Applications

Synopsis:

Accurate in-situ evaluation of thermophysical properties and seepage in rock–soil media is essential in civil engineering, geology, transportation, and water conservancy. To overcome the limitations of traditional testing methods—such as low accuracy, inefficiency, and high cost—we propose an active distributed temperature sensing (A-DTS) approach enabling fine-scale, high-precision assessment of thermal conductivity and seepage. This report introduces the principles of A-DTS-based thermal conductivity testing, supported by numerical simulations and laboratory experiments to examine key influencing factors and establish a standardized methodology. Additionally, a new quantitative method for seepage velocity evaluation, based on moving line heat source theory, is developed. This breakthrough greatly enhances spatial resolution and detection efficiency while simplifying deployment and lowering monitoring costs. Applications of the proposed technology span geotechnical site investigations, geothermal resource exploration, dam and embankment seepage risk prevention, and tunnel engineering. Overall, this work promotes broader adoption of DTS technology for efficient multiparameter in-situ measurement in complex rock–soil environments.

Speaker's Profile:

Dr. Kai Gu is a full professor in Engineering Geology at the School of Earth Sciences and Engineering, Nanjing University, China. He serves as Vice-Secretary General of the International Society of Environmental Geotechnology (ISEG), Associate of the UNESCO Land Subsidence International Initiative (LaSII), and Council Member of the Division of Intelligent Monitoring in Geology and Geotechnical Engineering of the Chinese Society for Rock Mechanics and Engineering (CSRME). He received his BSc and PhD from Nanjing University in 2009 and 2014, respectively, and was a visiting scholar at the University of Cambridge from 2012 to 2013. His expertise includes multi-physics field monitoring with fiber-optic technology, shallow geothermal energy, and geoenvironmental engineering with sustainable materials. He has led 16 projects and published over 90 peer-reviewed papers. He received the First Prize of the National Science and Technology Progress Award (2018) as a team member, Silver Award at the Geneva International Invention Exhibition (2023), ICGdR Outstanding Young Scientist Award (2020), Second Prize of Science and Technology Progress Award of Jiangsu Higher Education Institutions (2023), and Jiangsu Patent Silver Award (2023), among others.

Dr. Taiyin Zhang

Session 9 : Distributed Acoustic Sensing and Machine Learning for Engineering Event Detection

Synopsis:

This presentation explores the innovative application of Distributed Acoustic Sensing (DAS) technology for monitoring engineering events, with particular attention to recent progress in fiber-optic cable design, data acquisition, and real-time event detection. DAS transforms conventional fiber-optic cables into thousands of spatially distributed vibration sensors, enabling continuous and remote surveillance of large-scale infrastructure such as pipelines, bridges, and railways. A central focus is the integration of DAS with machine learning techniques, which enables the system to autonomously recognize, classify, and interpret complex vibration signals. This synergy allows for accurate differentiation between normal operational activities (e.g., traffic, human movement) and potentially hazardous events such as rockfalls, seepage, or pipeline leaks. By shifting from passive sensing to intelligent, real-time analysis, this approach supports proactive maintenance strategies and early warning systems, thereby reducing safety risks and enhancing infrastructure reliability. Real-world applications in the construction and energy sectors demonstrate the practical viability and scalability of AI-enhanced DAS systems. These advancements represent a significant step toward smart, autonomous structural health monitoring, with far-reaching implications for infrastructure resilience and public safety.

Speaker's Profile:

Taiyin Zhang is a Ph.D. student in Geological Engineering at Nanjing University. His interest is in analyzing disturbance signals recorded by distributed acoustic sensing (DAS) and quantifying the potential hazards they pose. He is particularly interested in leveraging DAS technology to enhance real-time monitoring and early warning capabilities for critical infrastructure. Taiyin has extensive experience in applying data mining and machine learning techniques to process, classify, and interpret large volumes of continuous DAS waveform data. His work aims to develop intelligent sensing frameworks capable of automatically detecting and assessing potential threats. Through an interdisciplinary approach that integrates geophysics, data science, and engineering, he seeks to advance the application of DAS in both academic research and practical hazard mitigation.